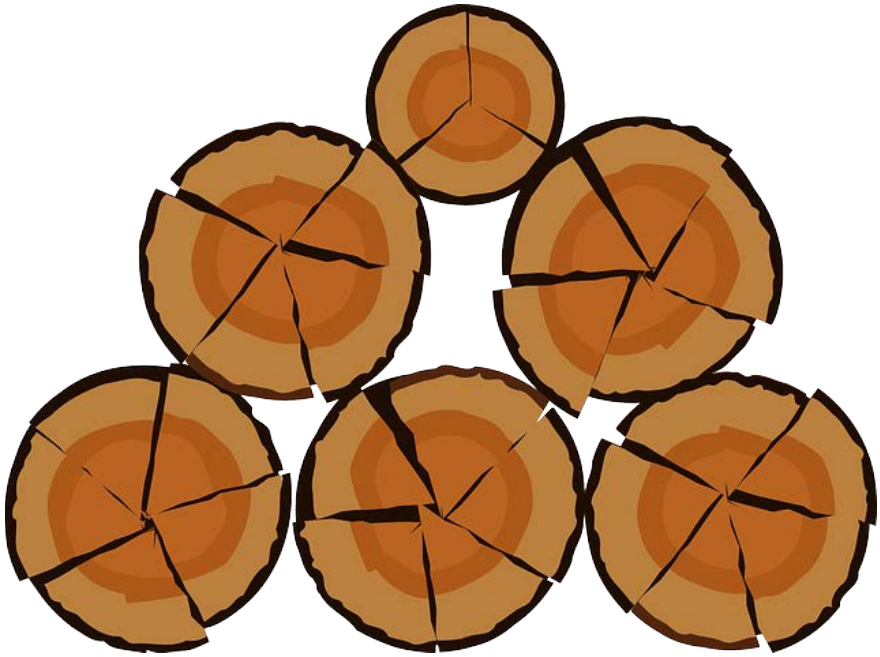
Six Twigs

Environmental Assessment



DOI-BLM-ORWA-C040-2013-003-EA
Bureau of Land Management
Coos Bay District
1300 Airport Lane
North Bend, Oregon 97459

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Chapter 1 - Purpose and Need

This chapter presents the proposed Six Twigs regeneration harvest (Proposed Action Alternative or proposed project), its location, purpose, and need.

Background

The Bureau of Land Management (BLM), Coos Bay District forests contain highly productive Oregon and California Railroad Revested Lands (O&C Lands). The O&C Act (Public Law 75-405) requires the BLM to manage O&C Lands for the permanent production of timber.

The BLM has designated a quantity of O&C Lands to the Matrix land use allocation, outside of reserves and special management areas, which is available for timber harvest. The BLM maintains a permanent production of timber on Matrix lands through management activities such as timber harvest, reestablishment of timber stands, and silviculture practices that control stocking and produce desired stand conditions.

Stand exam surveys conducted in the New River Frontal and Sixes River watersheds confirmed certain stands are overstocked, negatively affecting timber productivity. The BLM is proposing to manage selected stands with regeneration harvest treatments and to reestablish the stands with desired composition and characteristics.

Purpose (Objectives)

Management activities carried out in the Coos Bay District follow the direction of the District's 1995 Record of Decision and Resource Management Plan (ROD/RMP: USDI 1995). The District's ROD/RMP responds to the O&C Act requirements through an ecosystem management strategy under which BLM-administered lands "will be managed to maintain healthy, functioning ecosystems from which a sustainable production of natural resources can be provided" (ROD/RMP p. 5).

The purpose of the proposed project is to implement management activities that meet the objectives provided in the ROD/RMP. The implementation of this project would support the District in meeting the following objectives:

Provide a sustainable supply of timber and other forest commodities to provide jobs and contribute to community stability (p. 22) by:

- Conducting timber harvest and other silvicultural activities on suitable forested lands within the Matrix (p. 22),
- Within available forested lands, selecting treatment areas, when feasible, from the least productive stands first; stands that appear to have generally low growth rates would receive a higher priority for harvest (p. E-3), and
- Providing timber sale volume towards the Coos Bay District ASQ (allowable sale quantity), as required by the O&C Act (p. 52).

Protect, manage, and conserve federally listed and proposed species and their habitats to achieve their recovery in compliance with the Endangered Species Act, approved recovery plans, and the Bureau Special Status Program (p. 32) by:

- Providing for important ecological functions such as dispersal of organisms, carryover of some species from one stand to the next, and maintenance of ecologically valuable structural components, like down logs, snags and large trees (p. 22),

- Retaining, at a minimum, six green conifer trees per acre to provide a source of snag recruitment and a legacy for bridging past and future forests (p. 53), and
- Retaining snags within a timber harvest unit at levels sufficient to support species of cavity-nesting birds at 40 percent of potential population levels (p. 53).

Provide early-successional habitat by:

- Maintaining a well-distributed pattern of early and mid-seral forest across the Matrix (p. 53), and
- Applying silvicultural systems that produce, over time, forests with desired species composition, structural characteristics, and distribution of seral classes (p. 53).

Contribute to local, state, national and international economies through sustainable use of BLM-managed lands and resources, and use of innovative contracting and other implementation strategies (p. 45).

- Planning and designing forest management activities to produce a sustained yield of products to support local and regional economic activity.

Need for the Six Twigs Project

The BLM has assessed stand conditions and timber productivity in areas proposed for treatment. The Six Twigs Interdisciplinary Team (ID Team) established the need for the proposed regeneration treatments after reviewing the differences between existing and desired stand conditions.

There is a need to conduct regeneration harvest activities in suitable Matrix lands (RMP p. 22). The stands proposed for treatments exhibit overstocked conditions with limited growth capacity. Overstocked stands exhibit characteristics such as small crown and root biomass, which makes them particularly susceptible to wind damage and not suitable for thinning treatments. Applying thinning treatments to stands in this condition and in an area with winds in excess of 90 miles per hour during severe storms would put residual trees at a high risk of blowdown. Furthermore, stands proposed for regeneration treatment have achieved culmination of mean annual increment (CMAI), meaning they are in the age range that has produced the maximum average annual growth over the lifetime of the stand and are now slowing in growth. Stands in this condition meet the regeneration harvest objectives of the RMP, which states “regeneration harvests would generally occur in stands at or above the age of culmination of mean annual increment” (p. E-1) and “when feasible, from the least productive stands first (p. E-3)”. The BLM can achieve optimal productivity for a patch of ground through multiple rotations when the stand is harvested at the culmination age; achieving optimal productivity through multiple harvest rotations is directly tied to ensuring a continuous supply of timber or sustained yield, which is required by the O&C Act.

There is a need to supply timber (RMP p. 52). The timber volume generated would support local and regional economic activity as envisioned by the ROD/RMP (p. 45).The Coos Bay District’s declared ASQ reflects the O&C Act requirements to manage suitable land in the Matrix for sustainable timber production. Regeneration harvests are the most efficient method of supplying timber to meet the ASQ. The Coos Bay District RMP projected that in the third decade (fiscal years 15–24), the District would harvest 7,900 acres of timber using regeneration harvest techniques to meet the ASQ (USDI 1995, p. E-9). At the close of fiscal year 2015 the District harvested 84 acres (or 1 percent) of the projected acres (USDI 2015a). The District fell well below the acres projected to be regenerated in the second decade, only harvesting 385 acres (or 4.8 percent) of the 7,900 acres projected (USDI 2014a). Implementing regeneration treatments analyzed in this EA would contribute 217 acres (or 2.7 percent) to the third decade projection (7,900 acres).

There is a need for lands in the Matrix to have a balanced distribution of age classes (RMP p. 53). Regeneration harvests would help establish a desired age class distribution within BLM lands. Lack of

regeneration harvest on BLM lands over the past 20 years has caused a trend toward mature and older forests. Consequently, there are very few young stands on BLM-administered lands, with only 0.03 percent of BLM-owned stands within the New River Frontal and Sixes River watersheds within the 0–20 age class. A more detailed description of stand ages on BLM-owned lands within the New River Frontal and Sixes River watersheds is in the Forest Productivity section of Chapter 3.

Decisions to be Made

The decision-maker (Authorized Officer) for this project is the Coos Bay District BLM, Myrtlewood Field Manager. The decision-maker must decide whether to conduct the proposed vegetation treatments within the analysis area. Chapter 2 contains a detailed description of the proposed project.

The decision-maker must also determine if the selected alternative is a major Federal action that would significantly affect the quality of the human environment. Chapter 3 contains a comparison of the No Action Alternative to the Proposed Action Alternative (proposed project) to support a determination. If the decision-maker decides the selected alternative would not significantly affect the quality of the environment, then the decision-maker would prepare and sign a FONSI (Finding of No Significant Impact).

If the decision-maker determines that the selected alternative would significantly affect the quality of the environment, then the BLM would drop or modify the Proposed Action Alternative, or would have an EIS (Environmental Impact Statement) and a ROD (Record of Decision) prepared and signed prior to implementation.

Decision Factors

In choosing an alternative that best meets the Purpose and Need, the Authorized Officer will consider the extent to which each alternative would—

1. Provide for future sustained harvests by converting underproducing stands within the Matrix;
2. Protect, manage, and conserve federally listed and proposed species and their habitats to achieve their recovery in compliance with the Endangered Species Act, approved recovery plans, and the Bureau Special Status Species Program;
3. Provide cost-effective management that would allow achieving these objectives while providing collateral economic benefits to society; and
4. Comply with applicable laws and BLM 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.

Conformance with Existing Land Use Plans

This environmental assessment (EA) is tiered to and in conformance with the Coos Bay District ROD/RMP (USDI 1995) and 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 For and its ROD (USDA and USDI 1994a) as supplemented and amended by:

- Management of Port-Orford-cedar in Southwest Oregon Final Supplemental Environmental Impact Statement (USDA and USDI 2004) and its ROD (USDI 2004).
- Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigations Measures Standards and Guidelines (USDA and USDI 2001).

This project utilizes the State Director's December 2003 Special Status Species list. This list incorporates species changes and removals made due to the 2001, 2002, and 2003 Annual Species Reviews (ASR),

with the exception of the red tree vole. The Ninth Circuit Court of Appeals in *KSWC et al. v. Boody et al.*, vacated the category change and removal of the red tree vole in the mesic zone, and returned the red tree vole to its status as existed in the 2001 ROD Standards and Guidelines, which makes the species Category C throughout its range.

Endangered Species Act

Consultation with the U.S. Fish and Wildlife Service (USFWS) as provided in Section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1536 (a)(2) and (a)(4)), as amended was completed in October 2015. The USFWS issued a Biological Opinion on February 1, 2016 (Tails No. 01EOFW00-2016-F-0068) that concludes the Six Twigs proposed project "is not likely to jeopardize the spotted owl or the murrelet because the proposed project has been planned consistent with the Northwest Forest Plan" (USDI 2016). The BLM would incorporate all of the applicable Terms and Conditions of the Biological Opinion.

The BLM will not request consultation with the National Marine Fisheries Service. The ID Team has determined the proposed project would have a "no effect" to threatened Oregon Coast coho salmon and would not adversely affect essential fish habitat under the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1855 (b)).

Documents Incorporated by Reference

The ID Team used the following documents to assist in the analysis and the design of the proposed project, which are referenced throughout this document:

Watershed Analysis of the Sixes and New River Area (USDI 2008d)

- Analysis files containing referenced staff reports and Instructional Memoranda
- Western Oregon District's Transportation Management Plan (USDI 2010 *Update*)
- Recovery Plan for the Marbled Murrelet in Washington, Oregon, and California (USDI 1997b)
- Revised Recovery Plan for the Northern Spotted Owl (USDI 2011)

Public Involvement

On September 15, 2014, the BLM initiated scoping for this EA. The primary purpose of scoping is to identify agency and public concerns relating to a proposed project and to define the environmental issues of concern examined in detail in an EA. The BLM sent scoping notices by mail to adjacent landowners, agencies, individuals, and organizations that requested these documents. The formal scoping period ran from September 15, 2014 to October 31, 2014. During the scoping period the BLM conducted a public field tour (October 14, 2014) for presenting stands proposed for treatment to interested parties and to answer questions posed by field tour participants. The BLM received six letters that contained comments or issues concerning the Six Twigs proposed project during scoping.

On April 15, 2016 the BLM published the EA and unsigned FONSI for public review and received two comment letters. Both comment letters posed questions about thinning treatments. The BLM considered a thinning alternative and determined a thinning alternative would not meet the purpose and need for the proposed project, therefore, the BLM did not propose thinning treatments as a reasonable alternative in this EA. The ID Team synthesized the analysis conducted on stands within the initial planning area that supports the conclusion that thinning treatments are not appropriate for stands analyzed in the Six Twigs EA; this analysis is included in **Appendix A**, Alternatives Considered but not Analyzed in Detail. The BLM also received a comment letter from Curry County through our O&C Counties Memorandum of Agreement on the proposed decommissioning; Curry County does not support decommissioning any roads as part of the Six Twigs proposed action.

The following section discusses other comments submitted during either scoping or during public review of the EA and unsigned FONSI.

Issues Reviewed but Eliminated from Further Consideration

There were many different issues presented in comments submitted during the formal scoping period and during public review of the EA and unsigned FONSI. The ID Team reviewed all comments and determined that the issues raised did not identify circumstances that would require the development of additional action alternatives. Some comments were concerned with issues that are outside the scope of this project and are not relevant to this NEPA (National Environmental Policy Act) process and the development of this EA. Other comments suggested conducting analysis that was already completed and included in the EA. The following summarizes and addresses issues presented by interested parties by topics:

- *One of the project objectives is to provide jobs; thinning treatments provide more jobs than regeneration harvests.*

Rationale for elimination: There is no basis for making a conclusion that thinning treatments provide more jobs than regeneration harvest and in fact, the BLM could argue the opposite. Regeneration harvest may provide a range of timber species, log sizes, and grades that thinning treatments traditionally do not. The assortment of timber from regeneration harvest may provide opportunities to manufacture a wider array of higher value products, which may allow for greater utilization of manufacturing capacity and higher employment levels. Site preparation and reforestation provides employment to contractors and crews who conduct burning activities and silvicultural activities after regeneration harvest. The BLM also hires forestry crews to conduct pre-commercial thinning at the appropriate stage of stand development. Thinning in smaller diameter stands provides wood that has limited manufacturing options, and does not provide the job opportunities associated with intensive silvicultural management for sustainable production of future harvestable timber rotations.

- *The RMP does not allow regeneration on stands younger than 60 years old; these stands are 50-70 years of age.*
- *One of the project objectives is to schedule regeneration harvest in stands at or above CMAI; the proposed action includes units that are not above CMAI.*

Rationale for elimination: These are not issues. The proposed project does not include regeneration harvest on stands younger than 60 years of age. The ROD/RMP states that regeneration harvests would *generally* occur in stands at or above the age of CMAI (USDI 1995, p. E-1). CMAI can occur over multiple years, it is not necessarily a peak. Instead, there is a period of several decades during which MAI changes very little. Chapter 3 of this EA, under Forest Productivity, contains a detailed analysis of the forest productivity, including a tables and graphs that illustrate that stands within the Six Twigs proposed project have achieved CMAI.

- *The BLM should consider the effects of the proposed action on peak flows and the general health of the watershed.*
- *The BLM must revise the water quality section of the EA to consider all ownerships within the watershed.*

Rationale for elimination: The EA contains a lengthy analysis concerning the effects on water resources, including effects of the proposed project on peak flows and water quality.

- *The BLM should mitigate for the clearcutting on non-Federal lands in this watershed.*

- *The BLM should reserve 12 green trees per acre to mitigate for less conservative forest management practices on privately owned land.*

Rational for elimination: These are not issues. Mitigating forest management practices conducted on privately owned land is outside the scope of this project. Furthermore, the BLM has no statutory or regulatory requirement to manage BLM lands in a manner that mitigates for the effects of land management on private land holdings. The BLM analyzes the direct, indirect, and cumulative impacts of resources affected by the proposed project in this EA.

- *The EA must consider new information on climate change when conducting the air quality analysis.*

Rationale for elimination: The BLM is complying with Secretarial Order No. 3226 and OR/WA Instruction Memorandum OR-2010-012 (USDI 2010a), which directs us to consider the effects of our actions on greenhouse gas emissions and climate change. The ID Team did analyze the effects of the proposed project on greenhouse gas emissions and climate change; the analysis and conclusions are presented under the Climate Change section in Chapter 3. The ID Team used research published between 2003 and 2010 to support this analysis.

In addition to the EA analysis, the ID Team reviewed the information on climate change submitted by commenters during the scoping period. The materials submitted on climate change focus on producing wood biomass for biofuels and the ID Team concluded that the materials did not present any new information that would change the ID Team analysis or add value to the ID Team analysis.

- *The EA should fully describe how limited access influences bidding, monitoring, and fair public access to Federal lands.*
- *The BLM should develop an alternative that allows members of the public to evaluate the existing conditions and monitor the conditions through implementation.*

Rationale for elimination*:* These are not issues. Public access is not available to these lands under the existing road right-of-way agreements that regulate the BLM's access with adjacent, industrial-forestland owners and the purpose of the proposed project is not to secure legal, public access to these lands. Conversely, ROW agreements allow the BLM and individuals who indicate a business relationship (such as verifying volume prior to bid) access. The BLM acknowledged there is no public access to these lands, and offered guided public tours of the proposed treatment areas. The BLM also allows prescheduled, guided access to harvest sites located behind locked gates.

- *The BLM should wait until past clearcuts have recovered before clearcutting additional mature forest Late Sessional Reserve (LSR).*

Rationale for elimination: This is not an issue. There is no LSR designated in the project area.

- *Regeneration harvest inherently leaves a deficit of snags because all of the trees are removed from the site; the "potential population" methodology used in the RMP for developing standards for dead wood habitat is scientifically discredited and ID Team needs to consider new science that shows more snags are needed to assure adequate habitat for wildlife.*

Rationale for elimination: The RMP requires retention of snags, within a timber harvest unit, at levels sufficient to support species of cavity-nesting birds at 40 percent of potential population levels (p.53). For the Coos Bay District, this has been equated to 1.5 snags per acre of harvest unit (USDI 2002). The proposed project would reserve snags to the extent possible, except those that operators must fall to meet

safety standards. In addition, the BLM has not found scientific evidence that suggests 1.5 snags per acre is insufficient to support species of cavity-nesting birds at 40 percent potential population levels. Furthermore, the Six Twigs proposed project includes retaining at least 2 green trees per acre for snag creation, which would support species of cavity-nesting birds at approximately 50 percent potential population levels, compliant with management direction.

- *The BLM should drop the longest new road with the fewest acres harvested from the project.*

Rationale for elimination: The BLM has no basis for dropping the longest new road with the fewest acres harvested from the proposed action, nor was a basis provided in the comment submitted. The ID Team carefully assessed each new road with regard to the purpose and need of the project; all new road construction would be necessary for access to timber sale units.

Furthermore, roads represent a project cost that reduces timber sale value and receipts to the BLM and O&C County governments. Consequently, it is not in the BLM's interest to construct more road than is necessary for accessing timber sale units for harvest.

- *All new road construction should be fully decommissioned.*

Rationale for elimination: The BLM has no basis for fully (permanently) decommissioning all new road construction. On the contrary, the ID Team carefully assessed each new road and determined—based on resource protection needs and the RMP directives—the appropriate category of road closure for proposed new road construction within the Six Twigs project area. Based on resource protection needs, the ID Team identified new road construction in Units 6, 8, and 17 as being appropriate for long-term decommissioning. The BLM intends to use all new roads again in the future; therefore, permanent decommissioning is not appropriate. The ID Team used the updated Western Oregon Districts Transportation Management Plan (USDI 2010 Update) to manage the transportation system in a manner consistent with the RMP and other current regulations.

- *Consider impacts vs benefits when analyzing roads; there are roads that should be shortened and could achieve the same amount of harvest.*

Rationale for elimination: The commenters did not provide information to the BLM identifying which roads the BLM should shorten or how the BLM should shorten those roads. The ID Team analyzed the effects of roads on water, wildlife, and fisheries resources within the proposed project area in detail and proposed the most appropriate road locations based on resource protection needs, feasibility, and Best Management Practices. It is not in the BLM's interest to construct more road than is necessary for accessing timber sale units for harvest as roads represent a project cost that reduces timber sale value and receipts to the BLM and O&C County governments.

- *The EA should contain the number of road miles per square mile of watershed, the condition of each road, and the BLM road monitoring strategy.*

Rationale for elimination: This EA analyzed the potential risk of the road network to cause an effect on stream flow within the three subwatersheds (6^{th} field watersheds) surrounding the proposed project. **Table 3-17** of Chapter 3 illustrates percent area covered by roads and the risk level for the three subwatersheds; all three subwatersheds are categorized as "low" risk of hydrologic effects based on the percentage of catchment area covered by roads. Reporting the condition of all roads within the affected watersheds would not be helpful in determining an effect on water resources from road construction included in the Six Twigs proposed action.

The BLM would monitor roads within the Six Twigs project area in conjunction with contract administration for the timber sale (up to three years after the sale is awarded) and in conjunction with silviculture monitoring and silviculture treatments, which would continue for up to 12 years after the timber sale contract is fulfilled.

- *The BLM should consider an option for treating in the adjacent riparian reserve as a part of this project.*

Rationale for elimination: The purpose of implementing treatments in Riparian Reserve is to meet Aquatic Conservation Strategy objectives. For example, the BLM would want treatment of the stands in adjacent Riparian Reserve to enhance fish habitat among other restoration activities. After considering site conditions, the ID Team determined that treatments in the adjacent Riparian Reserve would not necessarily enhance habitat for fish or other aquatic or riparian species.

- *The EA must consider the loss of existing and future nesting habitat for the marbled murrelet and spotted owl.*
- *The EA does not demonstrate that this project complies with management direction for the marbled murrelet.*

Rationale for elimination: These are not issues. The 1995 Coos Bay RMP/EIS considered where to designate reserves for wildlife habitat; the BLM designated Late-Successional Reserves (LSR) to serve as habitat for northern spotted owl and marbled murrelet. The Six Twigs proposed project is not located within LSR, rather is it located in the GFMA portion of the Matrix land use allocation (LUA). The 1995 RMP/FEIS also considered private, industrial land management when designating BLM lands to LUAs. This is EA contains a lengthy analysis on the effects of the proposed project on wildlife, including habitat for both the marbled murrelet and the northern spotted owl. Furthermore, the BLM consulted with the USFWS on the Six Twigs Proposed Action, as directed by Section 7 of the ESA, and received a Biological Opinion on February 1, 2016 that concludes the Six Twigs proposed project is not likely to jeopardize the continued existence of the northern spotted owl or the marbled murrelet.

- *The BLM should explain why it considers the risk of blowdown from thinning a larger concern than blowdown of trees reserved from harvest as part of the proposed action.*

Rationale for elimination: For this proposed regeneration harvest, specialists considered the blowdown risk for retained green trees and proposed to locate retained green trees in areas that would reduce the risk of blowdown (see the Forest Productivity section of Chapter 3 of this EA). Furthermore, it is reasonable that some retained green trees would blow down since retained green trees are intended to provide a source of down wood and snags over the next management cycle (1995 ROD/RMP p. 54).

The purpose for conducting thinning treatments is different from the purpose for conducting regeneration treatments; the BLM wants to avoid thinning in areas where residual trees are at high risk of blowdown because if severe blowdown were to occur after the thinning, stands would not achieve desired outcomes.

Chapter 2 - Description of Alternatives

This chapter describes the No Action Alternative and the Proposed Action Alternative (proposed project). Resources not analyzed in detail are discussed in brief at the end of this chapter. For the BLM to consider an action alternative, that alternative must meet the purpose and need while not violating any minimum environmental standards. An action alternative must be consistent with the RMP and satisfy the purpose and need of implementing the RMP.

No Action Alternative

The No Action Alternative describes the existing condition and the continuing trends anticipated in the absence of the Proposed Action Alternative but with the implementation of other reasonably foreseeable Federal and private projects. The No Action Alternative provides a baseline for the comparison of the Proposed Action Alternative.

If the BLM Authorized Officer selects the No Action Alternative there would be no harvesting of timber within the proposed units at this time. Forest stands within the proposed units would continue to stagnate under generally dense and overstocked conditions in a way that negatively affects productivity. Activities that would continue to occur in the analysis area include silvicultural activities in young stands, wildfire suppression, construction of roads across BLM land under existing right-of-way agreements, routine road maintenance, control of noxious weeds, and other projects covered by earlier decision records. Private lands, which make up 84 percent of the analysis area and surround the proposed project, also have scheduled harvest activities. Private landowners typically conduct regeneration harvest on a rotation driven by economics, which may be as short as 40 years.

Selection of the No Action Alternative would not constitute a decision to reallocate these lands to non-commodity uses and would not preclude the BLM from considering treatments in this area under a subsequent EA.

The No Action Alternative would not meet the purpose and need. Under the No Action Alternative, the BLM would still be obligated to harvest timber under the O&C Act and would continue proposing projects to harvest timber within Matrix lands to satisfy the District's ASQ.

Proposed Action Alternative

The BLM used an interdisciplinary team to analyze the Proposed Action Alternative (proposed project). The ID Team based all quantifications (e.g., acres and miles) on estimates obtained from geographic information systems (GIS). In implementing these plans in the field, final numbers could vary slightly. Stand conditions and harvest volumes for density management treatments are estimates derived from stand exam information, LiDAR[1] imagery, and Forest Vegetation Simulator (FVS) model projections.[2] Volume estimates are variable and actual volume harvested may differ.

If the Authorized Officer selects the Proposed Action Alternative, the BLM would implement selected actions and project design features analyzed in this EA through project layout (physical delineation of treatment boundaries and road locations) and through contract provisions. The timber sale contract would be written and administered by the BLM and would require the timber sale purchaser to

[1] Light Detection and Ranging

[2] The Forest Vegetation Simulator (FVS, version 2.03) is an individual-tree, distance-independent, growth and yield model (Dixon 2002), calibrated for the Pacific Northwest for the purposes of this analysis.

accomplish the requirements of the contract in a manner that is consistent with the actions and PDFs analyzed in this EA and approved in any subsequent Decision Record.

Timber Harvest

The BLM proposes to manage approximately 217 acres of timber, from units ranging in size from 3 acres to 63 acres, through regeneration harvest within the New River Frontal and Sixes River 5th field watersheds. The BLM manages 3.5 percent or 6,459 acres of the land within the New River Frontal (99,371 acres) and Sixes River (85,832 acres) watersheds. The U.S. Forest Service manages 11.7 percent or 21,692 acres and private landowners manage the majority of the remaining 84 percent of the land. **Table 2-1** shows a breakdown of land ownership within this analysis area (New River Frontal and Sixes River watersheds).

Table 2-1 Land ownership by acres located within the analysis area.

Total Acres	Private	U.S. Forest Service	State & County	BLM	BLM Proposed Action
185,203	156,118	21,692	932	6,459	217

All units proposed for harvest are located within the General Forest Management Area (GFMA) portion of the Matrix land use allocation (LUA) as defined in the District's ROD/RMP. Stands proposed for treatment are approximately 60–74 years old. The BLM would divide treatments among 12 units and would implement treatments through multiple timber contracts expected to sell in fiscal year 2017 (**Map 1**). The BLM would require that purchasers harvest timber within 3 years of the date of sale. **Table 2-2** contains a summary of the proposed harvest activities. The BLM planned proposed treatments to meet the purpose and need of the Six Twigs proposed project and determined treatment type and location primarily by: land use allocation, stand age and condition; past management; topography; and protection of threatened, endangered or sensitive species.

Table 2-2 Summary of proposed harvest activities.

				Harvest Method			Site Preparation (Fuels Management)	
Timber Sale Area	Unit	Acres	2015 Stand Age	Ground-Based Yarding	Cable Yarding	Unit Volume (MBF)	Broadcast Burn (acres)	Pile Burning (acres)
Crystal Clear	3	22	71	0	22	389	18	4
	4	63	73	15	48	3,431	21	42
	5	7	70	1	6	304	-	7
	6	3	74	3	0	165	-	3
	7	5	72	1	4	215	-	5
	8	16	71	4	12	739	11	5
First Floras	9	5	74	1	4	136	-	5
	11	16	74	6	10	712	-	16
	12	4	60	0	4	153	-	4
Six One	16	42	72	0	42	1,556	-	42
	17	29	73	11	18	966	-	29
	18	5	71	2	3	120	-	5
	Total	217	N/A	44	173	8,886	50	167

Sample Tree Falling

The BLM would hire contractors to conduct sample tree falling in preparation of timber sale contracts. This would improve the accuracy of the final cruise of the proposed timber volume offered for sale. Sample tree falling would not occur in areas reserved from harvest. **Appendix B** contains more information about sample tree falling. If a timber sale were not to occur, any felled trees would remain on site as large down wood and, coincidentally, would enhance forest structure complexity and habitat.

Site Preparation and Reforestation

The BLM proposes to use a combination of prescribed fire and mechanical treatments in order to reduce hazardous fuel loadings and prepare sites for reforestation activities. Prescribed fire treatments would include broadcast burning and pile burning. BLM fuels specialists could choose to use more than one type of prescribed fire in one unit. Broadcast burning activities may occur within units 3, 4, and 8, for a total of approximately 50 acres. The remaining units would be either hand-piled or machine-piled, and burned as necessary (**Table 2-2**). Mechanical treatments could also include lop and scatter and cutting and piling, with no subsequent burning, to clear the ground for replanting. The BLM would replant all units with Douglas fir, Western hemlock, western redcedar, and disease resistant Port-Orford-cedar (POC).

POC currently exist within the project area. In accordance with the 2004 Final Supplemental Final Environmental Impact Statement for Management of Port-Orford-cedar in Southwest Oregon (USDA and USDI 2004) and its Record of Decision (USDI 2004), the ID Team applied the POC Risk Key and determined no specific POC management would be required. However, to maintain POC on the landscape, the BLM would replant POC with disease-resistant POC seedlings and locate seedlings greater than 50 feet from the road. The POC Risk Key is contained in **Appendix C.**

Created Structural Legacies – Snags and Down Wood

Following harvest operations, at least six green trees per acre would be left on site. The BLM would retain down wood and snags in decay Class 1 and 2 if feasible. Existing stands within the proposed harvest area have a deficit of down wood and snags and therefore additional green trees would be reserved to meet RMP direction. The RMP requires providing 120 linear board feet of down wood per acre (averaged over the cutting area) and snags sufficient to support 40 percent of cavity nesting birds. For the Coos Bay District, this is calculated as 1.5 snags per acre. The proposed project would average 2 snags per acre by 1) protecting existing snags where feasible and 2) retaining additional green trees from harvest and then girdling or topping these trees to create snags. The BLM would provide snags to support approximately 50 percent of cavity nesting birds under the proposed project in comparison to 40 percent required in the RMP. Additional green trees would be left as needed and felled to meet the RMP requirement of 120 linear feet per acre of down wood after harvest. **Table 2-3** shows the number of green trees the BLM would leave per acre for each unit to meet the RMP requirements for legacy retention, snags, and down wood.

Table 2-3 Green tree (GT) retention per unit for the Six Twigs Proposed Action.[1]

Timber Sale Area	Unit Number	GT for Down Wood (trees per acre)[2]	GT for Snags (trees per acre)	GT for Legacy Retention (trees per acre)	Total Unit Acres, Including Survey and Manage Buffers	Total Number of GTs Retained by Unit[3]
Crystal Clear	3	6	2	6	29	406
	4	2	2	7	72	792
	5	2	2	6	7	70
	6	2	2	6	13	130
	7	2	2	6	5	50
	8	3	2	7	19	228
First Floras	9	2	2	6	5	50
	11	3	2	7	16	192
	12	3	2	6	5	55
Six One	16	4	2	7	46	598
	17	4	2	7	32	416
	18	3	2	6	11	121
				Total Green Trees Retained	*262*	*3,131*

[1] GT retention includes living trees retained for (1) down wood creation, (2) snag creation, and (3) legacy retention.
[2] Number of GT left for down wood creation is dependent on the individual tree form class. Therefore, the numbers of GT per acres listed above are an estimate based on Coos Bay District form class and taper tables. The BLM would leave enough GT to meet the District's 1995 ROD/RMP requirement of 120 linear feet of down wood per acres.
[3] Calculated by multiplying number of total retention trees per acre by number of total unit acres. The Total Unit Acres column includes acres reserved from harvest in the form of buffers for the protection of rare species.

Road Management

Road management consists of developing and maintaining a transportation system that serves the project needs in an environmentally sound manner as directed by the District's ROD/RMP and the Western Oregon District's Transportation Management Plan (USDI 2010 *Update*). The proposed transportation system would involve the construction of new roads, renovation and improvement of existing roads, and decommissioning of roads. Construction of new roads and use of existing roads would be designed to allow yarding and hauling operations to occur at the most favorable times of the year, after considering adjacent wildlife habitat, existing road conditions, unit size, unit volume, and logging cost. The BLM would sell trees felled for new construction, renovation n, and improvements as part of a timber sale, including trees felled within Riparian Reserve or protection buffers. Proposed road management activities are discussed below and shown in **Table 2-4** and **Table 2-5**. The ID Team estimated miles using GIS. Estimated mileage may change as the BLM refines the project design on the ground; the variability of these estimates is included in the effects analysis in this EA.

New Road Construction

The BLM would provide access across BLM-controlled roads and private roads over which the BLM has rights of use under the terms of reciprocal rights-of-way agreements. The BLM would construct new roads in order to access proposed units and landing locations that facilitate safe yarding and provide corridor alignment for environmentally responsible harvesting. The BLM would supplement the existing road network by construction of approximately 3.5 miles of new roads, as presented in **Table 2-4** and on **Maps 2a–2c** (Chapter 7). The majority of roads would be rocked for winter operations and retained to provide continued access for long-term reforestation activities and future timber harvest.

The ID Team designed proposed roads on ridge tops and stable slope locations that would be disconnected from the hydrologic network. Landing construction would occur adjacent to or at the end of new roads and used for yarding and loading logs. Landings are generally less than ¼ acre in size.

The Best Management Practices listed under the Project Design Features section would guide final road location and design. As development of each individual sale progresses and becomes more refined, some short unidentified spur roads or landings may be required that would better facilitate harvest operations. This unidentified new construction would be implemented using these same Best Management Practices. Appendix D of the Coos Bay District RMP (USDI 1995) describes the best management and conservation practices for harvest related activities that the BLM could require during implementation of the proposed project. Past BLM experience shows that additional spurs added during advanced sale planning are less than 500 feet and landings are less than ¼ acre. These additions would not change effects to resources because road locations analyzed in this EA are primarily planned outside of reserves and on ridge tops; any changes to unit boundaries, roads, or landings different from what is described in this EA would be documented in subsequent decision rationale documents.

Road Improvement and Renovation

The BLM would require improvement or renovation of existing roads to meet transportation needs over approximately 15 miles of haul routes crossing BLM and private lands. **Table 2-5** and Table 2-6 contain a summary of proposed roadwork.

Road *renovation* involves bringing an existing road back up to the original design standard. Road renovations could include adding rock to surfaced roads that the ID Team identifies as inadequate for winter operations. Renovations may also include, but would not be limited to, clearing brush within the road prism, cleaning or replacing ditch relief/stream crossing culverts, restoring proper road surface drainage, and grading. Road *improvement* consists of increasing the existing road standard to a higher design standard than originally designed.

Road Decommissioning

The project would decommission a total of 0.8 miles of roads for long-term closure (**Table 2-4**). Roads identified for long-term closure (decommission) would be closed to vehicle traffic but may be opened and maintained for future use. These roads would be left in an erosion-resistant condition by installing waterbars, rolling dips, eliminating diversion potential at stream channels, stabilizing or removing fills on unstable areas, and treating exposed soils. If slash were available, it would be scattered over the road surface. In some cases, crossing culverts may be removed.

Haul Route Maintenance

Maintenance of roughly 17.7 miles of roads would occur. Maintenance consists of, but is not limited to, brushing to control vegetation, cleaning of drainage ditches, maintaining the road surface (such as grading), and removal of road debris creating safety hazards (slough material, fallen trees, etc.).

Table 2-4 Summary of Proposed Road Construction.

Unit Number	Road No.	Surface Type	Closure Type	Haul Season	Miles	Miles in RR
3	03-2	Rock	None	All	0.15	-
	03-3	Rock	None	All	0.24	-
4	04-3	Rock	None	All	0.25	-
	04-4	Rock	None	All	0.08	-
	04-7	Rock	None	All	0.16	-
	04-8	Rock	None	All	0.35	-
5	05-1	Rock	None	All	0.10	-
6	06-2	Dirt	Decommission	Summer	0.08	-
7	07-2	Rock	None	All	0.21	-
8	08-2.0	Rock	None	All	0.11	-
	08-2.1	Rock	Decommission	All	0.23	0.03
	08-3	Rock	Decommission	All	0.04	-
	08-4	Rock	Decommission	All	0.04	-
9	09-2	Rock	None	All	0.28	-
11	11-2	Rock	None	All	0.25	-
16	16-1	Rock	None	All	0.13	-
	16-2	Rock	None	All	0.02	-
	16-3	Rock	None	All	0.37	-
17	17-1	Dirt	Decommission	Summer	0.26	-
	17-2	Dirt	Decommission	Summer	0.05	-
	17-3	Dirt	Decommission	Summer	0.10	
Total					*3.50*	*0.03*

Table 2-5 Road renovation and improvement by treatment area.

Unit No.	Road No.	Road Work	Surface Type	Haul Season	Miles
3	03-1	Renovation	Rock	All	0.20
4,5,6,7,8	31-14-29.0	Renovation	Rock	All	1.74
4	04-1	Renovation	Rock	All	0.07
	04-2	Improvement	Rock	All	0.21
6	06-1	Renovation	Rock	All	0.49
7	07-1	Renovation	Rock	All	0.14
8	08-1	Renovation	Rock	All	0.26
9,11,12	31-14-6.0	Renovation	Rock	All	2.62
9	09-1	Renovation	Rock	All	0.56
11	11-1	Renovation	Rock	All	0.04
12	31-14-17.3	Renovation	Rock	All	0.59
	31-14-17.5	Renovation	Rock	All	0.27
16,17	31-14-21.2	Renovation	Rock	All	0.38
	31-14-22.0	Renovation	Rock	All	0.59
17	31-14-15.0	Renovation	Rock	All	0.41
	31-14-15.1	Renovation	Rock	All	0.10
	31-14-22.1	Renovation	Rock	All	0.13
18	31-14-22.2	Renovation	Rock	All	0.74
Total					*9.54*

Table 2-6 Identified culvert renovation (shown on Map 2a).

Road Number (Culvert Location Number)	Culvert Work Type	Drainage Feature Type
31-14-6.0	Replace or install 18" pipe	Ditch Relief

Design Features for the Proposed Project

Project design features (or design features) are site-specific measures, restrictions, requirements, or mitigations included in the design of a project in order to reduce, if not eliminate, adverse environmental impacts. This section describes the design features the BLM would implement as part of the proposed project; the BLM would include these design features as contract provisions in contracts associated with the timber sale to avoid, minimize, or mitigate impacts on resources. The following design features are included as part of the proposed project.

Riparian Reserve (RR)

- No harvest would occur in RR, except trees felled for road construction. If operators fall trees in Unit 3 to facilitate yarding corridors, operators would directionally fall trees towards stream channels and leave the trees on site.
- Construct yarding corridors no more than 12 feet wide and place corridors perpendicular to streams to the extent possible.
- Minimize the total length of openings created by the yarding corridors along the stream channel and use natural openings if possible.
- Use full suspension across all stream channels and all identified wetlands if feasible.
- Avoid cutting trees ≥ 24 inches DBH in yarding corridors to the extent operationally feasible.
- Construct fire lines no more than 30 feet into the RR boundary.
- Decommission Road No. 8-2.1.

General Harvest Operations

- Use mechanical harvesters or chainsaws for tree felling.
- Fall trees away from all unit boundaries, green tree retention areas, reserves, and property lines.
- Reserve existing snags from cutting, except snags that operators must fall to meet safety standards; any felled or accidentally knocked over snags would remain on site.
- Protect down logs and snags from damage during logging operations to the extent possible.
- Use cable yarding with at least one-end suspension.

Ground-Based Areas

- Use ground-based equipment, including machine piling, only in areas with slopes less than 35 percent and only in the dry season when soil moistures are below the 25 percent threshold; the BLM would require the discontinuation or limitation of ground-based operations when soil moisture content is above 25 percent.
- Designate skid trails with the objective of having less than 12 percent of a harvest area affected by compaction; existing skid roads/trails would be used to the extent practical.
- If available, utilize slash layers created by the harvesting process to limit bare soil exposure and compaction.
- Apply drainage and erosion control measures, including water barring of skid trails, to bare soil areas following use and prior to winter rains.
- Block access points for skid trails with a barrier or logging debris to prevent vehicle access after

harvest operations are completed.

- Use a skyline cable system capable of achieving one-end suspension during the wet season; however, depending on road surface condition the BLM may restrict timber haul.

Harvested Volume (sample tree falling)

The BLM would provide 100 percent contract administration throughout the sample tree falling process.

- Only fall sample trees within a subset of those already designated for removal.
- Fall no more than 1 (one) sample tree per 2.5 acres.
- Apply all seasonal and daily timing restrictions for threatened and endangered species.
- Leave felled sample trees on site, which would provide down woody material, if the BLM were not to offer the timber sale.

Site Preparation

The BLM would provide 100 percent contract administration throughout any prescribed fire treatments; design features common to all prescribed fire treatments include:

- Comply with Federal and agency guidelines.
- Comply with State of Oregon fire and smoke regulations and the unit-specific prescribed fire plan; a variety of smoke reduction techniques would be used, as appropriate, to minimize impacts to public health.
- Prohibit burning activities further than 30 feet into a RR or areas reserved from harvest.
- Fire personnel would prevent concentrations of smoke in known marbled murrelet sites by only igniting when wind would move smoke away from areas of concern.
- Fire personnel would perform mop-up activities in compliance with requirements of the Coos Forest Protective Association at the time of project implementation.

Design features common to broadcast burn treatments:

- Only burn in areas that have a defendable boundary and sufficient access for crews and equipment, and adequate water.
- Burn under spring-like conditions when soil moisture is highest and large fuels are relatively wet to aid in protection of retention features such as down wood, snags, and adjacent forest vegetation.
- Broadcast burning proposed within Units 3, 4, and 8 would not occur between June 1 and September 30 for the protection of the marbled murrelet and northern spotted owl.
- Protect snags from burning through pullback of slash material as necessary.
- Slash and scatter areas of undesired vegetation (brush, non-commercial hardwoods, prostrate and damaged conifers), either during or after harvest, in order to create a compact and uniform fuel bed.
- Construct adequate hand lines to prevent fire impacts to vegetation in RRs, reserve trees, and other areas of concern. Line construction would include: cutting brush and limbing trees; digging/scraping away duff and organic material to expose mineral soil; and, constructing cup trenches to catch rolling material on steeper slopes.
- Water bar all fire lines where necessary, following the trail slope guidelines below:
    - < 9 percent, 1 water bar every 300 feet
    - 10–29 percent, 1 water bar every 200 feet
    - ≥ 30 percent, 1 water bar every 100 feet
- Rehabilitate immediately after mop-up is completed; rehabilitation would include reconstruction of water bars and pulling slash and duff material back over exposed mineral soil.

Design features common to pile burn treatments:

- Burn piles during the rainy season to minimize the chance of escaped wildfires and problematic fire behavior.
- Pile burning, proposed within portions of all units, would not occur between April 1 and September 30 for the protection of the murrelet and northern spotted owl.
- Piled areas would have undesired vegetation (brush, non-commercial hardwoods, prostrate and damaged conifers) slashed, either during or after harvest.
- Include logging debris and other slashed vegetation from ½ inch to 4 inches in diameter in piles.
- Cover all piles with plastic in accordance with Oregon Department of Forestry guidance (OAR 629-048-0210), using 4 mil black polyethylene sheeting.
- Construct piles a minimum of 15 feet from retention features to minimize the risk of the damage from excess heat or burning.

Roads

New Construction

The BLM would require implementation of the following Best Management Practices for road and landing construction (USDI 1995, p. D2–D6):

- Limit construction activities to the dry season, generally from May to October.
- Design and construct roads to the narrowest and smallest sizes that would meet safety standards, objectives of anticipated uses, and resource protection. For this project, rocked and natural surface roads would typically have a running surface less than 16 feet (**Figure 1)**.
- Locate roads and landings on stable locations, such as ridge tops, stable benches or flats, and gentle-to-moderate side-slopes.
- Locate stable end-haul (waste) sites prior to end hauling and keep properly shaped, drained, and vegetated.
- Design drainage to minimize soil erosion and stream sedimentation and use energy dissipaters[3], such as culvert down pipes or riprap, where water discharges onto loose material and onto erodible or steep slopes.
- Direct, when possible, road drainage onto convex slopes (ridges) and not onto concave slopes (troughs) to prevent adding more water to typically wet, slide-prone areas.
- Shape road surface (e.g. crowning, insloping, and outsloping) to meet planned use and resource protection needs.
- Cover bare soil areas created from landing and road construction (or any other disturbance) with mulch or appropriate weed-free straw, or equivalent, and seed with a native grass mix.
- Seasonally maintain natural surface roads and landings prior to winter rains if road/landing use is required the following year. Maintenance may include, but is not limited to, the addition of water bars, mulching and seeding with weed-free seed mix.
- Size drainage installation/culverts appropriate to the drainage area and for a 100-year flood event.
- When installing stream culverts, divert stream flow around the work area, contain sediment using appropriate filters or barriers, and pump turbid water from the excavation site onto a vegetated terrace or hill slope.
- Use right-of-way clearing limits, which includes the roadbed, approximately 35 feet (**Figure 1)**.
- Follow the ODFW in-stream timing guideline, which is from July 15 through September 30, when installing culverts.

[3] Energy dissipaters protect erosion by reducing the velocity of flow and could consist of downpipe or riprap.

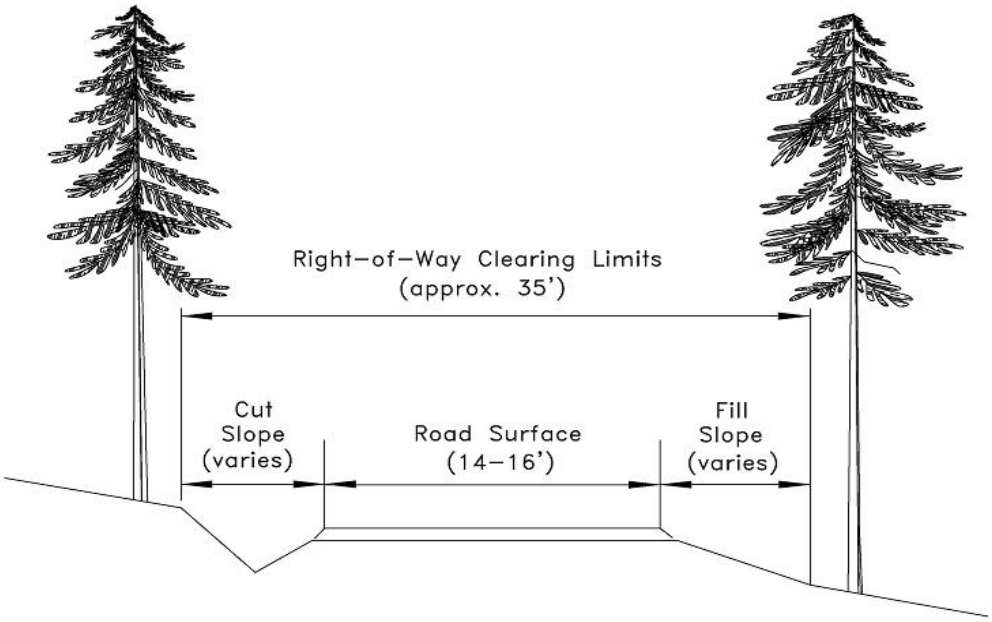

Figure 2-1 Illustration of road widths and clearing limits for visibility.

Road Maintenance, Renovation, Reconstruction, and Improvement

The BLM would require implementation of the following Best Management Practices for road maintenance, renovation, reconstruction, and improvements (USDI 1995, p. D2–D6):

- Apply drainage and erosion control practices to renovated or reconstructed roads in the same manner as newly constructed roads. 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.
- Plan road maintenance/renovation activities to minimize soil erosion and subsequent stream sedimentation. These may include, but are not limited to, grading to remove ruts, removal of bank slough 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.
- Place sediment filters at designated locations on the following five roads: 31-14-6.0, 31-14-21.2, 31-14-22.0, 08-1, and 08-2.0 as part of renovation or maintenance activities. The BLM contract administrator could require placement of additional sediment filters to prevent sediment from entering stream channels from road ditch lines if determined necessary. All sediment filters would be monitored and receive maintenance as necessary. Maintenance could include removal and disposal of the captured sediment. Sediment disposal areas would not be located in areas with potential of delivery to stream channels.
- Conduct seasonal preventative maintenance on dirt roads and landings 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.
- Size drainage installation appropriate to the drainage area and for a 100-year flood event.
- When replacing stream culverts, divert stream flow around the work area, contain sediment using appropriate filters or barriers, and pump turbid water from the excavation site onto a vegetated

terrace or hill slope. Follow ODFW in-stream timing guidelines, which is from July 15 through September 30, when replacing stream culverts.

- Install additional stream culverts or cross-drains, as necessary, in areas with deficient drainage during road maintenance or renovation. **Table 2-7** would be used as the guide for road drainage spacing. A road drainage feature may 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. When possible, road drainage would be directed onto convex slopes (ridges) and not onto concave slopes (troughs) to prevent adding more water to typically wet, slide-prone areas.

Haul

- Hauling on dirt-surfaced roads would be prohibited during the wet season, generally November through April.
- The BLM contract administrator would monitor road conditions during winter use to prevent rutting of the rock surface and delivery of fine sediment to stream networks.
- The BLM would require an additional lift of rock to the area of a road that can influence the stream prior to erosion and sediment delivery occurring from the road tread near live stream crossings.
- If the ground is already saturated from winter rains and more than 1 inch of precipitation is predicted in the project area over the next 24 hours, then winter haul would be suspended. Operations would resume after the 24-hour suspension, except when another storm (exceeding 1 inch) is forecasted. Currently, precipitation predictions are based on the Quantitative Precipitation Forecast (QPF) maps from the National Weather Service, Weather Prediction Center internet site: http://www.wpc.ncep.noaa.gov/qpf/qpf2.shtml. A similar predictive model internet site may be used if this site should be unavailable in the future.

Table 2-7 Guide for drainage spacing by soil erosion class (road surface) and road grade.

Gradients (%)	Road Surface	
	Natural[1]	Rock or Paved[1]
3-5	200	400
6-10	150	300
11-15	100	200
16-20	75	150
21-35	50	100
36+	50	50

[1] Spacing is in feet and is the maximum allowed for the grade. Drainage features may include cross drains, waterbars, ditch-outs, or water dips.

Decommissioning

- Apply soil-stabilization techniques such as seeding, mulching, and fertilizing to treat exposed soils. Other activities may include installation of water bars/dips to route surface runoff to vegetated areas depending on site-specific conditions. Spacing of water bars/dips to be based on a spacing recommendations listed in **Table 2-7** and site-specific conditions that will minimize potential surface erosion and hydrologic connectivity to streams.
- Decommission roads identified for decommissioning prior to winter rains.
- Closure of decommissioned roads would include the installation of a barrier to prevent vehicular traffic.
- If available, operators would scatter slash material over the road surface to protect and

reintroduce organic material to the soil. Slash material would also be used to prevent vehicle access.

- If slash were not available, operators would use soil stabilization techniques and block the road to vehicular access. Barriers could include, but are not limited to, earthen and boulder barriers.
- Diversion potential would be eliminated at stream crossings. This may include installation of an armored trench that protects the fill and road if the culvert is plugged by debris.
- Stream channels would be restored when stream crossings are removed. The natural channel gradient, width, and floodplain would be reestablished. Stream banks would be excavated to establish a maximum 50 percent side-slope, if feasible. Banks would be protected from erosion using seed and mulch, geotextiles, rock or other soil stabilization materials.

Legacy components

- Retain six green trees per acre as legacy trees, at a minimum.
- Choose green tree retention (GTR) areas to reflect the conifer species mix in the treatment units.
- Place GTR in clumps to protect existing snags and down logs, where feasible.
- Clump roughly 60 percent of the GTR in areas between 0.5 and 2.5 acres in size or greater, with the remaining GTR scattered throughout the units (GTR areas would be primarily located to protect Survey and Manage species in the form of a buffer, protecting species located adjacent to harvest areas).
- Avoid retaining GTR areas predicted to be highly susceptible to wind throw.
- Avoid retaining green trees within 100 feet uphill and 50 feet downhill of open roads to reduce theft, potential hazard trees, and damage to road surface.
- Retain existing snags and down wood, except where doing so would create a safety hazard. Snag creation would involve girdling and topping of trees, and would be implemented within two years of completion of harvest.
- Retain more than a minimum of six green trees per acre for future snags and down wood creation in units where a deficit of snags or down wood was determined. **Table 2-3** shows the proposed green tree retention per unit, based on existing conditions.
- Retain snags sufficient to support species of cavity-nesting birds of at least 40 percent of potential population levels.
- Retain a minimum of 120 linear board feet of down logs per acre; each log would be ≥ 16 inches in diameter at the large end and ≥ 16 feet long.

Special Status Species - Including Federal Threatened and Endangered and Survey and Manage Species

- Maintain a minimum 300-foot buffer between cutting area and occupied marbled murrelet sites to protect sites from edge effect.
- Adhere to northern spotted owl (spotted owl) seasonal restrictions when conducting harvest and road activities within identified areas (**Maps 3a–3c**). Spotted owl seasonal restrictions prohibit operations from March 1 to July 7. A unit biologist may recommend modifications to spotted owl seasonal restrictions based on the results of spot check surveys.
- Adhere to marbled murrelet (murrelet) seasonal restrictions when conducting harvest and road activities, including the use of tailhold anchors and guylines, within identified areas (**Maps 3a–3c**). Murrelet restrictions prohibit activities between April 1 and August 5 and include daily timing restrictions prohibiting activities from two hours after sunrise to two hours before sunset from August 6 to September 15.
- Follow BLM management guidelines to protect species of concern if species of concern are found

after the contract is awarded; these species include threatened and endangered species, occupied murrelet sites, active raptor nests, federally proposed and candidate species, and Bureau sensitive or state-listed species protected under BLM Manual 6840 (USDI 2001).

- Conduct all harvest activities outside protection buffers for Bureau sensitive and Survey and Manage vascular plant, lichen, and bryophyte plant species found during pre-disturbance surveys to protect the microsite for the species to persist at the site.
- Follow the most current BLM direction for all Survey and Manage wildlife species if found during operations.

Noxious Weeds

- Wash all equipment before arriving on BLM lands.
- Keep vehicles and equipment on road and landing surfaces, except equipment specifically designated to operate off roads and landings (e.g. mechanical harvesters).

Reforestation

- The planting stock would be principally Douglas-fir, but would also include some western red cedar, western hemlock, and disease resistant Port-Orford-cedar.
- Genetically improved stock would be used when available. Seedlings would be planted at approximately 435 trees per acre (TPA) and receive Vexar tubing if needed for animal protections to ensure regeneration occurs.

Port-Orford-cedar (POC)

- To maintain POC on the landscape, the BLM would replant POC with disease resistant POC seedlings and locate seedlings greater than 50 feet from the road.

Cultural Resources

- If the BLM or contractors find any objects or sites of possible cultural value such as historical or prehistoric ruins, fossils, or artifacts during project implementation, the BLM would suspend project activities near these areas and notify the Authorized Officer of the findings.

Acres Considered and Eliminated from Detailed Analysis

The ID Team evaluated approximately 481 acres for regeneration harvest during preliminary planning and eliminated roughly half from consideration due to poor suitability for regeneration and protection of rare species of wildlife or botany. **Table 2-8** presents the dropped units and the reason for elimination.

Table 2-8 Total acres considered for regeneration harvest, including acres eliminated from detailed analysis.

Unit	Total Acres	Dropped Acres	Harvest Acres Remaining	Reason for Elimination
1	16	16	0	Marbled Murrelet Occupied
2	19	19	0	Marbled Murrelet Occupied
3	29	7	22	Survey and Manage Buffer
4	72	9	63	Survey and Manage Buffer
5	7	0	7	No Acres Eliminated
6	13	10	3	Deferred/Survey and Manage Buffer
7	14	9	5	Deferred/Poor Suitability
8	25	9	16	Deferred/Survey and Manage Buffer/Poor Suitability
9	6	1	5	Deferred/Survey and Manage Buffer
10	5	5	0	Deferred/Survey and Manage Buffer
11	16	0	16	No Acres Eliminated
12	4	0	4	No Acres Eliminated
13	2	2	0	Marbled Murrelet Occupied
14	29	29	0	Marbled Murrelet Occupied
15	17	17	0	Deferred/Marbled Murrelet Occupied
16	46	4	42	Survey and Manage Buffer
17	32	3	29	Survey and Manage Buffer
18	12	7	5	Deferred/Survey and Manage Buffer
19	26	26	0	Marbled Murrelet Occupied
20	27	27	0	Marbled Murrelet Occupied
21	19	19	0	Deferred/Plant Special Status Species
22	16	16	0	Deferred/Plant Special Status Species
23	28	28	0	Marbled Murrelet Occupied
Total	481	264	217	

Analysis Background

This chapter includes the affected environment and the effects analysis discussion for those resources that the BLM could affect from implementation of each alternative. This chapter identifies the direct, indirect, and cumulative environmental effects that could result from implementation of either of the two alternatives described in Chapter 2 and describes how those effects would occur. Cumulative effects are the effects to resources resulting from the incremental effect of our action added to the other past, present, and reasonably-foreseeable future actions on the same resource. The description of the current conditions inherently includes and represents the cumulative effects of past and current land management activities undertaken by the BLM, other Federal or governmental agencies, Tribes, and private entities.

Reasonably Foreseeable Activities

Annual recurring activities are likely to occur within the project area. These include, but are not limited to, fire suppression activities, routine road maintenance, treatment of noxious weeds, and silvicultural activities in young stands. **Table 3-1** displays the known Federal timber sales that are active or will be active in the analysis area over the next five years. The BLM assumes intensive management of private forests on a 40-year harvest rotation under the guidelines of the State of Oregon Forests Practices Act (OAR 2016).

Table 3-1 Proposed or active Federal timber sales within the Six Twigs project analysis area (AA).

EA Name/Number	Timber Sale Name	Contract Number	Type of Treatment	Acres in AA
Edson Thin OR128-07-02	Ocean View	ORC00-TS-2014.0034	CT	195
	Edson Plum	ORC00-TS-2014.0032	CT	179

Cumulative Effects Considerations

The Council on Environmental Quality (CEQ) provided guidance on June 24, 2005, as to the extent to which Federal agencies are required to analyze the environmental effects of past actions when describing the cumulative environmental effect of a proposed project 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 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 or indirect effects of the action alternative should be based on generally accepted scientific methods such as empirical research. The cumulative effects analysis 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 project.

Resources

Forest Productivity

Stand Establishment

Forested portions of the analysis area (defined as the Sixes River and New River Frontal watersheds for this discussion) are part of the Southern Oregon Coastal Mountains ecoregion within the Coast Range ecoregion (EPA 2009). Prior to mechanized logging, fire was the primary disturbance in this ecoregion, producing forest structure distinct from the Northern Coast Range ecoregion at several spatial scales. At the stand scale, the intensity of fires and frequency of burns in these stands appear to have led to lower densities of scattered older trees, snags, and downed logs in the analysis area, even in stands supporting a moderate density of older live trees (Jimerson *et al.* 1996).

On stands within units proposed for regeneration harvest, it is difficult to determine, using district records and aerial photos, if stands regenerated through silvicultural practices or natural seeding. Eight of twelve stands show signs of past logging based on historic, aerial photo interpretation of observable skid trails, down logs, and green tree retention (photo year range 1943–1955). Three of the stands are dense hemlock dominated stands that indicate they regenerated naturally following a large disturbance (logging or fire). The other nine stands are Douglas-fir dominated and are uniform in structure which suggests some form of silviculture (planting or aerial seeding) was used to reestablish these stands after a major disturbance. Stand disturbance indicators (logging or fire) are present in all of the stands within the proposed project area.

Units Proposed for Regeneration Harvest

The BLM manages approximately 6,459 or 3.5 percent of acres within the analysis area, all classified as Matrix lands. These Matrix lands include available Matrix and Connectivity, Riparian Reserves, non-forested lands, and unmapped LSR (northern spotted owl, marbled murrelet, and bald eagle sites). Based on current forest operation inventory (FOI) data the age class distribution of BLM lands within the analysis area are 196 acres in the 0–20 years of age, 2,392 acres in the 21–79 years of age, 2,753 acres ≥ 80 years of age, and 1,119 acres of non-forest (**Table 3-2**). Acres of forested lands in the 0–20 age class are disproportionally lower than forested lands in other age classes.

Table 3-2 Shows current age classes of BLM managed lands within the analysis area.

Matrix Land Use Allocation	Age Class	Current Acres	Total Acres by Age Class
GFMA	0 to 20 Years	196	196
CON	21 to 79 Years	154	2,392
GFMA	21 to 79 Years	2,238	
CON	80+ Years	703	2,753
GFMA	80+ Years	2,049	
GFMA	* Non Forest	1,119	1,119
	Total Acres	*6,459*	*6,459*

* Non-forest lands are areas designated for utilities and recreation or are rock outcroppings or meadows that do not support trees.

Project foresters evaluated multiple stand characteristics to determine an appropriate stand classification scheme to describe the stands within the proposed project area. By definition, the 1994 RMP/EIS (USDI 1994) would classify these stands as late seral based on age and structure. Franklin *et al.* (2002) stand classification scheme further defines late seral into two categories Biomass Accumulation/Competition Exclusion (BACE) stage and maturation stage. Of the different stand classification schemes listed in **Table 3-3**, the Franklin *et al.* (2002) stand classification scheme best describes the stands included in the proposed project area. Based on field-collected data and application of stand characterization from Franklin *et al.* (2002) all stands within the proposed project area are in the BACE stage of development. Rapid growth and biomass accumulation, competitive exclusion of many organisms, and in many cases,

intense competition within the tree cohort characterizes the BACE stage of stand development (Franklin *et al.* 2002). Stem mortality is more common in stands where uniformed tree size and high stand densities are aggressively created than in natural stands which are understocked by traditional forest management standards (Franklin *et al.* 2002). None of the units in the proposed project area would meet the definition of maturation (late-successional) forest (FEMAT 1993, Spies and Franklin 1991, USDA 1993, USDI 1995: p. 90). The proposed project area lacks substantial late-successional characteristics or has very low densities and arrangements of late-successional structures, meeting few of the criteria for structurally mature forest conditions (Garman *et al.* 2003, USDA 1993). Late-successional forest is defined as, "Forests seral stages that include mature and old-growth age classes, 80 years and older" (USDI 1995: p. 90). Table 3-3 demonstrates the many ways to express stand characterizations and classify stands into a developmental stage.

Table 3-3 Comparison of different stand classifications schemes and the structural stage classification used to describe stand conditions within the proposed project area. (Adapted from (USDI 2008c).

Typical stand age (years)[1]	Oliver (1981) Stand development stages	Franklin *et al.* (2002) Structural stages	1994 RMP/EIS Seral stage	2008 RMP/EIS Structural stages
0	Disturbance and legacy creation			
20	Stand initiation	Cohort establishment	Early seral	Stand establishment
30	Stem exclusion	Canopy closure	Mid seral	Young
50		Biomass accumulation/competitive exclusion	Late seral	
80	Understory reinitiating	Maturation		Mature
150	Old Growth	Vertical diversification	Mature seral	Structurally complex
300		Horizontal diversification	Old-growth	
800-1200		Pioneer cohort loss		

[1]Stand ages are provided as references. However, stands can achieve structural classes at different stand ages, depending on disturbance and site conditions.

Forest stands in the proposed project area are best described by plant associations in the western hemlock series of southwestern Oregon (Aztet *et al.* 1996, McCain and Diaz 2002), most commonly the Pacific Rhododendron/Dwarf Oregongrape and Tanoak/Evergreen Huckleberry associations. This includes an overstory of Douglas-fir and western hemlock with occasional Port-Orford cedar (POC). Hardwood tree species include red alder (often associated with soil disturbance), tanoak, and Oregon myrtle (California laurel) and are a minor component throughout the proposed stands.

Modeling used stand statistics collected through stand exams conducted in 2005 and 2006. These exams collected basic tree measurements (diameter, height, species composition, current age, growth rate, canopy cover, percent crown, etc.) along with snag and down wood inventory. Stand exams conducted in 2014 collected only diameter, height, and species composition data and were used in generating current stand statistics (average diameter breast height (DBH), height, basal area (BA), trees per acre (TPA), relative density (RD) and quadratic mean diameter (QMD)) and species composition. Stand exam data

from 2014 did not include age or growth rate data therefore current age and culmination of mean annual increment (CMAI) was generated using 2005 and 2006 stand exam data.

Overall, stands proposed for regeneration are characterized as uniform in diameter, with average DBH of 17 inches or less. These stands average more than 222 trees per acre and have relative densities over 48 (**Table 3-4**). Stands proposed for regeneration harvest are densely stocked with conifer trees ranging in age from 60–74 years-old (using age data collected in 2005 and 2006 stand exams, age is projected to year 2015). Douglas-fir (*Pseudotsuga menziesii*) is the primary over-story tree and the most common species in 9 of the 12 units proposed for harvest. Western hemlock (*Tsuga heterophylla*) is the dominant overstory species in the remaining three units (Units 11, 16, and 17, **Table 3-4**). The proposed units have a species composition of approximately 72 percent Douglas-fir and 21 percent Western hemlock and 7 percent minor tree species (Port-Ordford-cedar, red alder, tan oak, and golden chinkapin) (**Table 3-4**).

The proposed units have relative densities (RD) ranging from 48–100 which is high compared to RDs of open grown stands of 22–25 (Davis and Johnson 1987). At RDs around 50, stand growth begins to slow and at RDs between 60 and 66 a stand's ability to respond to environmental change drastically diminishes (Davis and Johnson 1986). The high stocking of stands in the proposed project area has led to the development of stands with low size differentiation and poor crown development.

Table 3-4 Stand statistics from 2014 stand exam data.

					Average					* Species Composition by %						
Timber Sale Area	EA Unit	Harvest Acres	Age 2015	TPA	DBH	Ht	BA/ac	QMD	RD	DF	WH	RA	TO	POC	CQ	CMAI age
Crystal Clear	3	22	71	298	8.4	43	149	9.6	48	88.6	0.7	—	10.4	0.3	0.3	131
	4	63	73	312	14.4	80	406	15.4	100	94.2	1.3	1.9	2.6	—	—	63
	5	7	70	350	13.8	90	385	14.2	100	100	—	—	—	—	—	60
	6	3	74	247	15.7	98	371	16.6	91	86.2	6.1	7.7	—	—	—	64
	7	5	72	246	17.0	91	443	18.2	100	79.7	—	1.6	18.7	—	—	62
	8	16	71	290	14.3	80	377	15.4	96	93.1	0.7	2.1	4.1	—	—	61
First Floras	9	5	74	258	15.4	78	387	16.6	95	65.9	16.7	17.1	—	—	—	104
	11	16	74	222	14.6	84	289	15.4	73	10.8	78.4	10.8	—	—	—	84
	12	4	60	321	10.4	60	193	10.5	59	98.8	0.6	—	—	0.6	—	50
Six One	16	42	72	400	12.2	73	360	12.8	100	31.0	66.0	—	—	3.0	—	62
	17	29	73	411	11.8	82	329	12.1	94	25.8	72.5	1.2	—	0.5	—	63
	18	5	71	238	14.8	72	357	16.6	88	92.0	7.1	—	0.8	—	—	62
EA Stand Ave.			*71*	*299*	*14*	*77*	*337*	*14.5*	*88*	*72.2*	*20.8*	*3.5*	*3.1*	*0.4*	*0.0*	*74*

*DF= Douglas-fir, WH=western hemlock, RA= red alder, TO= tan oak, POC= Port-Ordford-cedar, CQ=golden chinkapin
From the FVS growth runs, Total Volume was used for CMAI determination. For this evaluation, the CMAI threshold was assumed to be the first age (10-year FVS modeling cycle) at which the difference between periodic annual increment and mean annual increment was zero or negative. See culmination ages in **Table 3-4**.

A detailed discussion of the concept of Culmination of Mean Annual Increment, or CMAI, is included below to address multiple comments received during the scoping period and during public review of the EA and unsigned FONSI.

The periodic annual increment or PAI is the amount of growth (typically measured as wood volume) a stand of trees accumulates in any given year. This value fluctuates from year to year depending on growing conditions but generally starts out slow in a young stand, builds to a maximum, and then declines as the stand ages. The mean annual increment or MAI is the average of these annual increments through the total life of the stand but is calculated by dividing the total volume of a stand divided by its total age. Culmination occurs when the period growth is equal to or less than the mean annual growth. This results in a flattening and decline of the mean annual increment curve (signifying slowed growth rates). Based on growth model (FVS model) estimates, and analysis of model outputs, all of the stands proposed for regeneration harvest are at CMAI.

From the FVS growth model, two stands (Units 3 and 9) show a modeled CMAI occurring later than the current stand age. These two units have a flat MAI growth curve (**Figure 3-1**), illustrating that identification of the CMAI at an exact age is futile. In **Figure 3-1 the** MAIs of Units 3 and 9 are compared to Units 18 and 6, respectively, as they are of similar site class. As stated in Tappeiner *et al.* (2007), "It is important to recognize that culmination of MAI is not a peak. Instead, there is a period of several decades during which MAI changes very little." Both units are well-stocked stands with slow growth and very little mortality, exhibiting a high density in Unit 3 and patches of high densities in Unit 9.

These two stands represent the point made by Tappeiner *et al.* (2007), as modeling shows that stands in both units would not achieve CMAI until over 100 years of age. Even though modeling shows these two stands have not reached CMAI based on age, when you compare the MAI from one growth cycle to the next there is a period over several decades during which MAI is decreasing or changing very little (0.2-5.2 ft³/ac). For Unit 3 from 2015 to 2025, MAI shows an increase of 5 ft³/ac and from 2025 to 2035 an increase of 4 ft³/ac, which represents a loss of 1 ft³/ac of growth from the previous 10 year cycle (**Figure 3-1** and **Table 3-5**). This loss of growth continues as the stand ages, demonstrating a slowing in the growth of the stand and therefore a flattening of the MAI growth curve. For Unit 9 from 2015 to 2025 the MAI increased by 5 ft³/ac and from 2025 to 2035 it increased by 2 ft³/ac, representing a loss of 3 ft³/ac from the previous 10 year cycle and showing the same downward trend (loss of growth) as Unit 3. This gradual loss in the MAI leads to the flattening of the MAI growth curve over several decades, signifying CMAI as Tappeiner *et al.* (2007) describes.

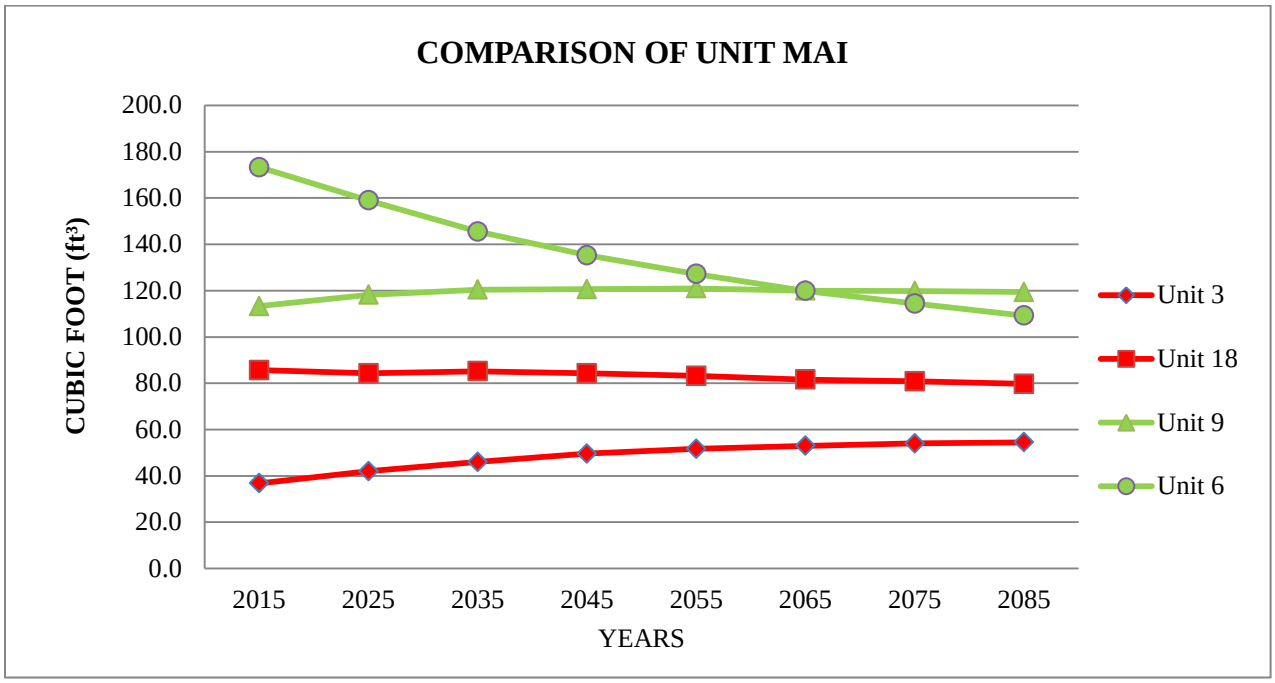

Figure 3-1 The above graph shows a comparison of MAIs for similar site classes and illustrates the flattening growth curve of Units 3 and 9. Unit 3 and 18 are of similar site class as are Units 9 and 6.

Table 3-5 Decreasing MAI in Units 3 and 9 from one growth period to the next, causing the flattening of the MAI growth curves shown in Figure 3-1.

	Unit 3			Unit 9		
Year	Age	MAI (ft^3)	Δ in 10yr MAI	Age	MAI (ft^3)	Δ in 10yr MAI
2006	62	36.9	-	65	109.9	-
2015	71	36.8	-0.1	74	113.3	3.4
2025	81	42.0	5.2	84	118.2	4.9
2035	91	46.0	4.0	94	120.4	2.2
2045	101	49.6	3.6	104	120.6	0.2
2055	111	51.7	2.1	114	121.0	0.4
2065	121	53.0	1.3	124	120.0	-1.0
2075	131	54.0	1.0	134	119.8	-1.0
2085	141	54.5	0.5	144	119.4	-1.0

Legacy Structure

Remnant trees (mostly Douglas-fir and western hemlock) in the proposed project area are scattered among proposed units 6, 8, and 11 with varying density from 0.3 to 1.4 trees per acre. Snags (≥ 16 inches) are also variable throughout the proposed units, averaging 1.5 snags per acre.

Within the proposed harvest areas, down wood varies in quantity and quality based on surveys and general observations. Surveys show a lack (< 120 linear feet per acre) of down wood in decay classes 1 and 2 (≥ 16 inches diameter) across all of the proposed units. Down wood in higher decay classes (decay class 3–5, ≥ 16 inches diameter) is present in over half the proposed units. Smaller down wood resulting from suppression mortality occurs more uniformly throughout all harvest units. These pieces show advanced decay and may not persist longer than 10 years.

No Action Alternative

Stand development and succession in the proposed project area are dependent on current stand structural stage and ensuing natural density-dependent and density-independent (e.g., wind, fire) disturbances. Slow growth and suppression mortality would continue, over time, in densely stocked stands in the BACE and maturation stages, producing small-diameter snags and down wood.

Individual tree mortality is closely linked to the relative size of the tree in the stand. Mortality is concentrated on the smaller stems so a few of the largest trees in a stand die because of competition (Peet and Christensen 1987). Considering the stagnant growth and high height/diameter ratios (ratios > 70) in these units, it is probable that stand-modifying disturbance would be required to initiate conifers capable of becoming the large overstory dominants associated with structurally complex, mature forest (Poage and Tappeiner 2002). In the absence of stand-level disturbance, understory reinitiation and vertical stand complexity would need to develop through individual stem mortality therefore requiring many decades to begin. Based solely on age these units would, within 6–10 years, be defined as late-successional forest (≥ 80 years of age) (USDI 1995: p. 90). However, these units are not predicted to develop a moderate density of large conifers and multiple canopies (including a shade-tolerant tree understory) for over a century.

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). With the finite site resources being divided among many trees, the individual trees would have slower

growth rates, and therefore would be smaller than trees growing in the more open areas of a stand (Oliver and Larson 1996). High tree density and slowed stand development do not support current RMP management objectives for BLM lands in the Matrix LUA. If BLM does not regenerate these stands then the BLM would search for other opportunities elsewhere to perform regeneration harvest to meet RMP management objectives and district annual ASQ targets.

Proposed Action Alternative

Within the analysis area, the proposed project would remove 217 (3 percent) acres of the General Forest Management Area (GFMA) out of the BACE stage of stand development and would shift it to the cohort establishment phase. This action would increase the cohort establishment acres to 413 (6 percent) acres and decrease the BACE acres to 2,021 (31 percent) within in the analysis area (**Table 3-6**). The BLM manages 6,459 acres (3.5 percent) of the 185,796 acres within the analysis area. Based on age (stands between ≥ 21 and ≤ 79 years of age) the analysis area contains approximately 2,392 (1.3 percent) acres of the district's Matrix lands in a BACE stage.

Table 3-6 Structure and age classes of BLM managed lands within the analysis area according to Franklin *et al.* 2002. Also shows age class acres before and after proposed project implementation.

			Current			New	
Structural Stage	Matrix	Age Classes	Acres	Percent Analysis Area	Proposed Action Acres	Acres	Percent Analysis Area
Cohort establishment	GFMA	0 to 20 Years	196	3%		413	6%
Canopy Closure and BACE	CON	21 to 79 Years	154	2%		154	2%
	GFMA	21 to 79 Years	2,238	35%	217	2,021	31%
Maturation and older	CON	80+ Years	703	11%		703	11%
	GFMA	80+ Years	2,049	32%		2,049	32%
Non Forest	GFMA	Non Forest	1,119	17%		1,119	17%
Total			6,459		217	6,459	

Stands proposed for regeneration harvest would change from a tall, predominantly single-story canopy with occasional gaps and understory trees to a stand providing early-successional habitat with small patches of older forest in the form of green tree retention (GTR) groups and Survey and Manage buffers. Regenerated areas would contain occasional legacy trees, large down wood, and eventually a dense cover of shrub and tree species. The GTR groups within portions of the harvest area would reduce loss of structural diversity and structural legacies because the GTR groups would be designed to provide habitat components over the next management cycle and would be located to protect existing structures. The individual tree retention would add future structural diversity in regenerating stands.

Some vegetation, including rhododendron, salmonberry, western hemlock, Douglas-fir, Port-Orford-cedar, and other minor trees, shrubs, and grasses would regenerate naturally depending on seedbed conditions, environmental conditions, and seed sources. The majority of Douglas-fir, western hemlock, western redcedar, and disease resistant Port-Orford-cedar would occur as seedlings planted at uniform densities with a target density of 400 trees per acre and 260 trees per acre by age 15.

The proposed project would increase the overall stand complexity within the analysis area by removing a portion of existing stands through regeneration harvests (harvest areas range from 3 to 63 acres) and resetting that area to an early seral stage. The remaining portions of the stand (within Riparian Reserve, Survey and Manage buffers, and adjacent occupied marbled murrelet buffers and sites) would go untreated therefore increasing the diversity of stand structure within the analysis area. Additionally, individual green tree retention, GTR groups, and legacy tree dispersal within the harvest footprint would "Provide for important ecological function such as dispersal of organisms, carryover of some species

from one stand to the next, and maintenance of ecologically valuable structural components such as down logs, snags, and large trees" (USDI 1995, pg. 22). As part of the proposed project, the BLM would retain 6 to 7 green trees per acre to meet RMP guidance of at least 6 green trees per acre and leave extra green trees within the harvest footprint to create 2 snags per acre and 120 linear feet per acre of down wood.

It is possible that many of the green trees left would blow over, break off, or die due to the high winds; however, this is reasonable since retained green trees are intended to provide a source of down wood and snags over the next management cycle (USDI 1995, pg. 54). To help prevent retained green trees from blowing over the BLM would cluster the majority of these trees in groups and in areas that are less susceptible to wind (*e.g.* dry draw, bowls, below ridge lines, and on the edge of units). The majority of these retained green trees would be placed into large groups within and adjacent to Survey and Manage buffers within the harvest unit. The placement of retained green trees in the locations described above and clumping trees together would decrease the exposure of these trees to wind throw.

The stand productivity in all the Six Twigs EA stands is low (based on modeled CMAI) and therefore is consistent with the RMP direction to regenerate less productive stands first and defer harvests in productive stands (USDI 1995 pg. E-6). Low mortality levels have led to overstocked conditions thus creating a high level of inter-tree competition for resources. Under these conditions, normally stands would go through a stem exclusion phase where suppressed and a few intermediate trees would succumb to stem mortality. This mortality would free up resources for other trees, increase individual tree growth, and stand productivity. However, in the stands proposed for treatment, high winds have caused canopy abrasion (this happens when the wind blows tree canopies causing an oscillation effect where the tree sways in a circular pattern). Canopy abrasion resulted in stands of trees with smaller crowns and breaks in the canopies that mimic open growing conditions by allowing an increase of light to reach suppressed and intermediate trees in the understory, but does not free up other resources. Canopy abrasion staves off individual stem mortality and creates stands with low growth rates.

It is not possible to model canopy abrasion with in FVS, which makes it difficult to model delay in stem mortality. This low productivity is evident when comparing model results of the No Action Alternative and the Proposed Action Alternative (proposed project) over a 50-year period. Model results show that 7 of the 12 stands within the proposed project area have a greater increase of volume per acre under the Proposed Action Alternative than under the No Action Alternative, with a total increase of volume of approximately 28 percent (**Table 3-7**).

Table 3-7 Difference between the No Action Alternative (NA) and Proposed Action Alternative (PA) over a 50-year period in terms of total cubic feet of growth.

EA Unit	3	4	5	6	7	8	9	11	12	16	17	18	Total	Mean
NA	3,210	1,850	1,952	1,807	1,405	2,010	6,440	6,950	1,660	3,851	5,131	3,582	39,848	3,321
PA	2,063	4,075	4,508	7,637	5,118	5,429	5,355	6,187	2,957	3,969	4,731	2,940	54,969	4,581
Diff.	-1,147	2,225	2,556	5,830	3,713	3,419	-1,085	-763	1,297	118	-400	-642	15,121	1,260
% Diff	-56%	55%	57%	76%	73%	63%	-20%	-12%	44%	3%	-8%	-22%	28%	28%

Five stands (Units 3, 9, 11, 17 and 18) show a greater increase in volume under the No Action Alternative, which is likely linked to the BLM not being able to replicate the effect of crown abrasion in FVS. Other reasons that could account for the model showing increased volume under the No Action Alternative are the difference in TPA, age, and volume per tree. This is can be demonstrated when the stands are grown under the proposed action to age 61, which is approximately the same age (age range 62–64) of these stands when the stand data from 2005 and 2006 was collected. Looking at the growth under the proposed action at this age removes the canopy abrasion error and allows for a better (more equal) comparison to the No Action Alternative. It is true there would still be a canopy abrasion error generated from growing the stands under the proposed action in FVS, however, this would be minimal

due to the silvicultural prescription of thinning to 260 TPA by age 15 years-old (the canopies would have more room to grow). Taking the starting volume (ft^3) and dividing it by TPA generates the cubic foot per tree. Volume per tree allows us to assess the quality of timber. The proposed action shows a higher volume per tree at age 61 than under the No Action Alternative at approximately the same age (age 62–65) (See **Table 3-8**). Having more volume per tree reflects that trees are larger in both diameter and height, which equates to better quality of timber. Larger trees would give managers more option in the future, since larger timber supports a greater diversity of forest products than small timber.

Table 3-8 Shows stand production based on the volume per tree (ft^3/tree) for units 3, 9, 11, 17 and 18. Having a greater volume per tree equates to a higher quality of timber.

			Volume	
Unit	Age	TPA	ft^3/ac	ft^3/tree
17-NA	63	790	12,449	16
17-PA	61	192	6,111	32
11-NA	64	252	10,305	41
11-PA	61	186	7,881	42
9-NA	65	288	7,699	27
9-PA	61	188	6,477	34
18-NA	62	351	6,177	18
18-PA	61	191	3,766	20
3-NA	62	1111	3,960	4
3-PA	61	188	2,803	15

NA = No Action, PA = Proposed Action; *Example: 17-NA = Unit 17 No Action alternative*

Wildlife

The wildlife analysis area for the Six Twigs proposed project includes all lands within 1.3 miles from the perimeter of the proposed harvest units. This is the provincial home range for northern spotted owls within the Klamath province, and is a sufficient size to accurately analyze direct, indirect, and cumulative effects to other wildlife from implementation of the proposed project. The wildlife analysis area for this project is 22,650 acres, of which 2,944 acres (13 percent) is under BLM management (**Map 1**).

Threatened and Endangered Species

The wildlife analysis area is within the range of two species federally listed as threatened under the Endangered Species Act: the northern spotted owl (*Strix occidentalis caurina*; spotted owl) and the marbled murrelet (*Brachyramphus marmoratus*; murrelet).

Northern Spotted Owl

The proposed project is within the Klamath physiographic providence and southern edge of the Oregon Coast zone for the spotted owl. While spotted owls in the Oregon Coast Range rely heavily on northern flying squirrels for prey species, spotted owls in the Klamath province incorporate more woodrats into their diet. Northern flying squirrels tend to associate with structurally complex, mature forests while woodrats tend to associate with younger forests and shrub cover (Forsman *et al.* 2004).

Within the New River Frontal and Sixes River 5th field watersheds there are two known spotted owl sites on BLM lands and two known spotted owl sites on U.S. Forest Service lands. All four sites, including the home ranges, are outside the wildlife analysis area and the BLM anticipates no effects to these sites. There are no known owl sites on private lands within the wildlife analysis area.

Surveys

To verify vacancy, the BLM completed spotted owl surveys according to the Protocol for Surveying Proposed Management Activities that may Impact Northern Spotted Owls (USDI 2012 *revision*). Surveyors did not record any spotted owl detections during the protocol surveys; however, in 2014, surveyors recorded three incidental spotted owl detections in the Floras Creek area (First Floras timber sale area). Murrelet surveyors recorded two spotted owl detections at murrelet survey stations, one week apart, in late June 2014. In both detections, the owl flew silently into the murrelet survey station and departed without vocalizing. Spotted owl surveyors recorded the third detection in late July 2014, prior to the start of the evening surveys. In route to the first survey station, spotted owl surveyors observed the owl perched on the side of the road at which point the owl flew off and hooted a single, four-note call, allowing surveyors to identify the individual as a male.

The 2011 Revised Recovery Plan for the Northern Spotted Owl (USDI 2011) has identified barred owls as a continued threat to spotted owl recovery. Surveyors recorded 15 detections of barred owls during the 2014 and 2015 spotted owl surveys. Survey results included detections of three juvenile barred owls and one pair of barred owls. The survey results indicate a local population of barred owls within the Floras Creek and Crystal Creek survey areas with an estimated three pairs of barred owls occupying stands. The proposed project would not remove suitable spotted owl habitat, and the percentage of dispersal/foraging habitat removed is inconsequential at the watershed scale; therefore, the BLM does not expect implementation of the proposed project would increase competition for resources between spotted owls and barred owls. Effects on the interaction between spotted and barred owls are not analyzed further in this assessment.

Habitat

Spotted owl habitat is broken into two classifications: (1) dispersal habitat; and (2) nesting, roosting and foraging (NRF) habitat (commonly referred to as suitable habitat). Dispersal habitat represents any type of spotted owl habitat (dispersal quality or better) that spotted owls would use to move across landscapes. Dispersal habitat is defined as "forest stands with an average tree diameter ≥ 11 inches and conifer overstory trees with closed canopies (> 40 percent canopy closure in moist forests) and with open space needed for successful dispersal" (USDI 2012 *revision*). Natal dispersal occurs as juveniles and subadults disperse from nest patches, utilizing dispersal habitat as corridors that provide adequate cover and forage while searching for NRF habitat to establish their own territories. Adults similarly utilize dispersal habitat when establishing new territory, for instance if a mate dies or to escape pressure from barred owls (Forsman *et al.* 2002). Such landscape movement also provides for seasonal expansion of home ranges and is essential to providing for genetic-interchange and individual colonization within and among regional populations.

Proposed harvest units are conifer dominated, ranging from 60 to 74 years of age. Within the analysis area, conifer dominated stands ranging from 40 to 79 years of age typically function as dispersal habitat. Overall, these stands are relatively simple and homogenous in terms of vertical and horizontal diversity, canopy complexity, and dominant tree crown size and differentiation. Areas with higher stem densities also reduce sub-canopy flying room necessary for dispersal and foraging. Stands in these conditions have low quality and low amounts of forage habitat.

The USFWS classifies spotted owl NRF habitat as forest containing important stand elements such as high occurrence of large diameter trees (> 30 inches), high canopy closure (60–80 percent), a multi-layered, multi-species canopy with larger overstory trees, a presence of broken-topped trees or other nesting platforms, and large down logs and snags (USDI 2012 *revision*). These characteristics are considered necessary for supporting a nesting pair of spotted owls, providing thermal and protective cover and habitat for forage species. Forage habitat in the Klamath zone shows greater divergence from nesting/roosting habitat than other zones, with lower canopy cover and tree size; thus, some dispersal

habitat is also forage habitat (USDI 2012 *revision*). The units proposed for regeneration lack the complex forest characteristics typically necessary to provide for the nesting and roosting needs of the spotted owl.

An estimated 964 acres (4 percent) of NRF and 1,230 acres (5 percent) of dispersal habitat are available on BLM lands within the wildlife analysis area. All of the proposed harvest units support the dispersal needs of the spotted owl and serve as dispersal or dispersal/foraging habitat. No NRF habitat exists within the proposed harvest areas; however, several units; 5, 6, 11, 17 and 18, are immediately adjacent to, or in the proximity of, NRF habitat.

Additionally, dispersal habitat is evaluated at the 5th field watershed scale, for analyzing the continued function of dispersal across the landscape. Watersheds with less than 50 percent available dispersal are considered limited. The Sixes River 5th field watershed currently supports 54.3 percent dispersal habitat, while the New River-Frontal 5th field watershed currently supports 30.7 percent of available dispersal habitat. While further removal of dispersal could cause effects to the dispersal capabilities of spotted owls, because of (1) the small percentage of acres proposed for removal, (2) the size and scattered arrangement of proposed units, and (3) the proposed green tree retention and full Riparian Reserves, implementation of the proposed harvest would not constrain the ability of the spotted owl to disperse across the landscape. Because the removal of dispersal at the landscape scale is negligible and would not result in an appreciable difference in a spotted owl's ability to disperse, this topic is not analyzed in further detail.

Willow Trib Temporary Site

The BLM created a temporary spotted owl site, Willow Trib, based on the single resident detections near the First Floras timber sale area (**Map 3a**). The site center was located within the best available habitat (largest patch of NRF habitat) among the three detections; however, there is limited amount of NRF habitat within this site, with only 4 percent of Federal land within of the home range containing NRF habitat. **Table 3-9** shows a breakdown of habitat availability within the Willow Trib by Federal and non-Federal lands.

Due to the single resident detections, the BLM conservatively chooses to analyze Willow Trib as an occupied spotted owl site for all purposes of this assessment. Full, six-visit surveys, consistent with the spotted owl survey protocol, will be conducted through the 2016 survey season, within the site's 1.3 mile home range for the purposes of obtaining additional data, regardless of future forest management decisions. Spot check surveys would continue within the Willow Trib site territory until harvest operations were complete.

Habitat Conditions within the Willow Trib Temporary Site

Spotted owl survival and fitness are positively correlated with large patch sizes of structurally complex, mature forest. NRF habitat above 40 percent at the home range (1.3 miles around the site center) and 50 percent at the core area (0.5 mile radius around the site center) indicate better habitat-fitness for the northern spotted owl; these thresholds are also used by the USFWS as a suggested minima to support essential spotted owl life history functions (USDI 2012). Three of the units proposed for treatment are within the home range: Unit 9, Unit 11, and Unit 12 (Map 3a). Discussion of the effects of treatment within these units appears on pages 32–35.

Of the 3,399 acres of forest capable lands within the Willow Trib site territory, only 600 acres (17 percent) are under Federal management. The Willow Trib site contains 7 percent of NRF habitat within the home range and 6 percent of NRF habitat within the core area (**Table 3-9**).[4] These values indicate the

[4] The BLM cannot accurately assess habitat conditions of forested lands that are not BLM-managed. The BLM assumes that private landowners within the analysis area harvest forested lands on a 40-year rotation; stands under

potential site territory is severely compromised in terms of providing for pair occupation and successful reproduction. Under this circumstance, it would be essential that dispersal and forage-only habitat assist in sustaining a resident pair and successful reproduction. Dispersal habitat can provide, in varying diminished quality and amount, *some* of the attributes of NRF habitat, such as, roosting, foraging, thermal protection, and habitat to rear young. The amount and manner of this contribution depends primarily on the quality and quantity of foraging attributes as well as patch size, contiguity, and orientation. Generally, the quality of dispersal habitat would need to be sufficient for classification as at least low quality forage-only habitat to support a spotted owl resident or pair.

Current amounts of all habitat types (NRF and dispersal) within the home range and core area of the Willow Trib site are 44 percent and 51 percent respectively. The dispersal habitat on Federal lands within the site territory examined in the field (as well as aerial photo interpretation/extrapolation and GIS modeling) showed only minimal quality and amounts of forage attributes. Considering the low amount of NRF habitat and the quality of dispersal habitat, it is unlikely that the Willow Tribe site territory provides sufficient habitat of high enough quality to support nesting owls.

Table 3-9 Habitat availability on Federal and non-Federal lands within the Willow Trib temporary owl site.[1]

Area/Landowner	Spotted Owl Habitat Classes					
	Dispersal Habitat		NRF Habitat		All Habitat	
	Acres	Percent[1]	Acres	Percent[1]	Acres	Percent[1]
NEST PATCH (300 meters/0.19 mile; 70 ac.)						
Federal	41	59%	12	17%	53	76%
Non-Federal	3	4%	none		3	4%
TOTAL	44	63%	12	17%	56	80%
CORE AREA (0.5 mile; 503 ac.)						
Federal	128	25%	25	5%	153	30%
Non-Federal	95	19%	7	1%	103	20%
TOTAL	223	44%	32	6%	255	51%
PROVINCIAL HOME RANGE (1.3 miles; 3399 ac.)						
Federal	202	6%	132	4%	334	10%
Non-Federal	1063	31%	91	3%	1154	34%
TOTAL	1265	37%	223	7%	1488	44%

[1] The BLM cannot accurately assess habitat conditions of forested lands that are not BLM-managed. The BLM assumes that private landowners within the analysis area harvest forested lands on a 40-year rotation; stands under this assumption would not achieve NRF characteristics. The BLM chose to estimate NRF within the analysis area using aerial photo interpretation and GIS modeling, and included privately held forested lands only for the purposes of this assessment.

[2] Percent= Percent of 3399 acres in Prov. Home Range, 503 acres in Core Area and 70 acres in Nest Patch.
Estimated forest-capable lands exceed 98% in the Prov. Home Range and 99.5% in the Core Area and Nest Patch.

Recovery Action 10 (RA10), Recovery Action 32 (RA32), Critical Habitat

Consistent with RA10 recommendations, the BLM surveyed habitat in the analysis area, per survey protocol, for two consecutive years. The only spotted owl detections occurred within the temporary Willow Trib site. The Willow Trib site has very low habitat quality, in a watershed with limited Federal lands and available NRF habitat, and no recent history of supporting a nesting pair of spotted owls. Considering these qualities the BLM would not consider habitat within the Willow Trib site high value; therefore the proposed project would not modify high value spotted owl habitat addressed by RA10.

Stands within Six Twigs units proposed for harvest do not meet the criteria for RA32 habitat because they are not structurally complex and do not contain multi-layered canopies; implementation of the proposed project would not affect RA32 habitat. No critical habitat is within the wildlife analysis area; thus, there

this assumption would not achieve NRF characteristics. The BLM chose to estimate NRF within the analysis area using aerial photo interpretation and GIS modeling, and included privately held forested lands only for the purposes of this assessment; this is not an actual determination of habitat on private lands.

would be no effects to critical habitat. RA10, RA32, and critical habitat are not discussed further in this EA.

No Action Alternative

As discussed under the No Action Alternative under the Forest Productivity section of this chapter of this EA, the units proposed for harvest are densely stocked, and have limited capability of producing stands with a moderate density of large conifers with multiple canopy layers and therefore not likely to develop into NRF habitat within the foreseeable future. Furthermore, these stands are designated under the Matrix land use allocation, meaning stands would continue to serve the dispersal needs of the northern spotted owl until a decision is made to harvest the stands. Within the Matrix land use allocation, Riparian Reserve is anticipated to provide NRF and dispersal habitat (USDI 1994, p. 4-72).

Proposed Action Alternative

Nesting, Roosting, Foraging (NRF) Habitat—Analysis Area

The proposed project would not remove or modify NRF habitat. Depending on the attributes, distribution and survival of green trees retained in harvest units, harvested stands would return to dispersal habitat in approximately 35–45 years and potentially low quality, NRF habitat in 70–80 years. It is not anticipated that these stands would achieve NRF qualities prior to the next harvest because (1) they are located in the Matrix land use allocation and (2) they have limited capability to produce a moderate density of large conifers with multiple canopy layers in the foreseeable future.

As a result of murrelet surveys completed for the Six Twigs proposed project, approximately 237 acres of BLM lands were delineated as occupied murrelet sites, which are managed as un-mapped LSR (Late-Successional Reserve). Of these LSR acres, almost 200 acres are NRF spotted owl habitat. This habitat would continue to persist on the landscape. These sites are scattered in 8–60 acre parcel sizes. While these are generally small (less than 40 acres) parcels, and unlikely to support nesting, they would provide areas of structurally complex, mature stand refugia within the landscape mosaic.

Dispersal Habitat—Analysis Area

The proposed project would remove 217 acres of dispersal habitat. Most of the dispersal area is low quality habitat with minimal forage potential. The proposed project would remove the dispersal habitat from the landscape for the next 35–45 years, until regenerated areas develop the forest structure to support spotted owl dispersal. Effects on dispersal habitat would be minimized by the small unit size or width of unit (for many of the units), and green tree retention (GTR). GTR reduces the distance between the dispersal and NRF habitat refugia outside the proposed harvest units to allow spotted owls to move across the landscape.

The proposed project would reserve a minimum of six green trees per acre within the harvest boundary. The Six Twigs units are in a wind prone area and are susceptible to wind throw. Many of these GTR areas would be located inside the 45 acres of Survey and Manage protection buffers, within the proposed project units (**Table 2-3**). Additional trees, even in units where GTR thresholds are met within Survey and Manage buffers, would be used to protect identified legacy features, such as remnant trees, snags, and coarse woody debris. If additional trees remain in the GTR quota, individual trees would be scattered across the unit. The BLM determined that trees within clusters would have a higher likelihood of remaining on the landscape to meet habitat goals and to provide for the carry-over of species from one stand to the next, while maintaining ecologically valuable structural components such as down logs, snags, and large trees, as stated in our purpose and need. For this reason, and the high likelihood of windthrow within in the Six Twigs proposed project area, isolated, individual retained trees are not a project design feature. Green tree retention reduces the distance between the dispersal and NRF habitat refugia outside of the proposed harvest units to allow spotted owls to move easily across the landscape.

In addition to retaining six green trees per acre, the proposed project includes retaining additional trees for snags and down wood. **Table 2-3** in Chapter 2 shows the number of green trees per acre the BLM would retain for creation of snags and down wood as part of the proposed project. Snag creation would occur as snags scattered across the units and in snag clusters, potentially next to GTR areas. Green trees reserved for coarse down wood would be felled and scattered across units at the conclusion of harvest. Green trees for snag and course wood creation would be reserved within the harvest footprint, leaving the Survey and Manage buffers intact. The combination of GTR areas and green trees reserved for snag and down wood creation would provide additional complexity within stands, supporting needs of many wildlife species, including spotted owl prey species. These legacy features would reduce the amount of time required for stands to achieve dispersal and forage characteristics, and potentially provide for dispersal and forage needs of spotted owls until the BLM harvested the stands as part of a future decision. Furthermore, lands within the proposed project area are designated as Matrix and are intended for timber production; therefore, project effects are within the range anticipated and analyzed in the FEIS supporting the Coos Bay District RMP (USDI 1995).

Habitat—Willow Trib Temporary Site

The proposed project would remove 25 acres of dispersal habitat in the home range of the Willow Trib temporary site. While the BLM generally considers the removal of dispersal habitat within a site that is not limited in dispersal to have minimal to inconsequential effect to the spotted owl, the Willow Trib site is limited in NRF habitat. When sites have low levels of NRF habitat, dispersal habitat may be providing the necessary support for foraging and roosting needs.

The proposed project would remove 25 acres of dispersal habitat within the home range, of which 24 acres are located within the core area; no harvest would occur in the nest patch (**Map 3a**). Harvest would result in a change from current to post-treatment conditions for all habitat types (dispersal and NRF) from 51 to 46 percent within the core area and from 44 to 43 percent within the home range. Lands under Federal management would experience a 5 percent reduction of all habitat within the core area. When evaluated at the home range scale, harvest would not change habitat conditions within the Willow Trib site territory or on Federal lands, due to the small percentage (less than 1 percent) of habitat removed (**Table 3-8**).

Due to the three northern spotted owl detections in 2014, the BLM chose to analyze Willow Trib as an occupied spotted owl site. Because the stand conditions within the estimated home range provide minimal amounts of NRF, the analysis assumes dispersal within the home range is providing essential life history functions, beyond dispersal only (**Table 3-8**). However, much of the dispersal within the Willow Trib site (including the areas proposed for harvest) is of low quality and is unlikely to provide for functions beyond dispersal, such as foraging and roosting. For this reason, while the proposed project would remove dispersal habitat within the core area and home range of the Willow Trib site, it is unlikely the removal of this dispersal would appreciably degrade the forage and roosting functions of the site and further limit the site's fitness potential for supporting a spotted owl.

The BLM chose to analyze Willow Trib as an occupied spotted owl site. The full, six-visit survey protocol would be conducted through the 2016 survey season, within the site's 1.3 mile home range regardless of future forest management decisions. If surveyors do not detect spotted owls within the Willow Trib site territory during 2016 surveys, it would be the second year of no detections and the BLM would reevaluate the need for seasonal restrictions within the Willow Trib home range.

Disruption

Project activities conducted during the critical breeding season (March 1 to July 7) have the potential to generate sounds in excess of ambient levels, which could disrupt nesting, roosting, and foraging behavior of owls. Seasonal restrictions would prohibit potentially disrupting project activities in the Floras Creek timber sale area during the critical breeding season (**Map 3a**). Pile burning would not occur in any portion

of the proposed project during the critical breeding season or the late breeding season. Proposed broadcast burning within the Crystal Clear timber sale area (**Table 2-2**) would not occur from June 1 to September 30, which includes the later portion of the critical breeding season through the end of the late breeding season.

Spot-check surveys would continue in both the Floras Creek and the Crystal Clear timber sale areas. A Myrtlewood Field Office wildlife biologist may modify seasonal restrictions based on the results of spot check surveys. Due to seasonal restrictions and spot check surveys, the BLM does not anticipate disruption of spotted owls from implementation of the proposed project.

Table 3-10 NRF and dispersal habitat change within the Willow Trib temporary site, under the Proposed Action Alternative.

	Spotted Owl Habitat-All Lands				Spotted Owl Habitat Federal Lands Only			
	NRF[1]		All Habitat		NRF		All Habitat	
	Acres[2]	Percent[3]	Acres[2]	Percent[3]	Acres	Percent	Acres	Percent
NEST PATCH (300 meters/0.19 mile)								
Current Condition	12	17%	56	80%	12	17%	53	76%
Harvest Acres	*0*	*0*	*0*	*0*	*0*	*0*	*0*	0
Post-Harvest Condition	12	17%	56	80%	12	17%	53	76%
CORE AREA (0.5 mile)								
Current Condition	32	6%	255	51%	25	5%	153	30%
Harvest Acres	*0*	*0*	*24*	*5%*	*0*	*0*	*24*	*5%*
Post-Harvest Condition	32	6%	231	46%	25	5%	129	26%
PROVINCIAL HOME RANGE (1.3 miles)								
Current Condition	223	7%	1488	44%	132	4%	334	10%
Harvest Acres	*0*	*0*	*25*	*1%*	*0*	*0*	*25*	*1%*
Post-Harvest Condition	223	7%	1463	43%	132	4%	309	9%

[1] The BLM cannot accurately assess habitat conditions of forested lands that are not BLM-managed. The BLM assumes that private landowners within the analysis area harvest forested lands on a 40-year rotation; stands under this assumption would not achieve NRF characteristics. The BLM chose to estimate NRF within the analysis area using aerial photo interpretation and GIS modeling, and included privately held forested lands only for the purposes of this assessment; this is not an actual determination of habitat on private lands.

[2] Estimated forest-capable lands exceed 98 percent within the home range and 99 percent within the core area and nest patch. Values exclude an additional 0.6 acres of Special Status Species no-harvest buffers contiguous with harvest area in First Floras Unit 9.

[3] Percent = Percent of 3399 acres within the home range, 503 acres in core area and 70 acres in nest patch.

Marbled Murrelet

Marbled murrelets (*Brachyramphus marmoratus*; murrelet) are small sea birds occurring from the Aleutian Islands to central California. While they spend most of their life foraging at sea, marbled murrelets fly inland to nest in late-successional and old-growth forests. The USFWS listed the marbled murrelet as threatened in 1992 (USDI 1992). The recovery plan identified six conservation zones for the marbled murrelet. The Six Twigs proposed project occurs on the northern portion of Zone 4, the Siskiyou Coast Range. Recovery actions include preventing loss and degradation of occupied nesting habitat, minimizing the loss of unoccupied, but suitable habitat, and decreasing the time for development of new suitable habitat (USDI 1997).

Population

Marine marbled murrelet population counts from 2000–2010 showed a 2.7–4.8 percent annual decline in population across the species range. Zone 4 specific surveys showed a population decline of 0.9 percent; however, the trend was not statistically significant (Miller *et al.* 2012). Murrelets have a very low fecundity rate, with estimates ranging from 0.065 to 0.027 (USDI 2009). Habitat loss, habitat fragmentation, and changes in the marine environment (increased competition for forage, climate change) continue to be a concern for the species.

Surveys

Wildlife specialists evaluated all units proposed during scoping for potential murrelet nesting structure following guidelines in the murrelet survey protocol: Methods for surveying marbled murrelets in forests: a revised protocol for land management and research, for the Pacific Seabird Group (Mack *et al.* 2003). The wildlife staff used the murrelet platform metrics outlined in the Revised Policy for the Management of Marbled Murrelet Nesting structure within Younger Stands, Roseburg and Coos Bay BLM Districts (USDI 2012), to evaluate the proposed and adjacent stands for trees capable of supporting a marbled murrelet nest. A tree supporting nesting platforms:

- Occurs within 50 miles of the coast (USDI 1997: page 32);
- Is a conifer tree (USDI 1997: page 18);
- Is ≥ 19.1 inches DBH, > 107 feet in height, has at least one platform ≥ 4 inches in diameter, with nesting substrate (moss, epiphytes, duff, etc.), and an access route through the canopy that a murrelet could use to approach and land on the platform (Burger 2002, Nelson and Wilson 2002: 24, 27, 42, 97, 100);
- The potential platform is ≥ 32.5 feet above the ground; and
- Has a tree branch or foliage, either on the tree with the potential platform or on a surrounding tree, that provides protective cover over the platform (Nelson and Wilson, 2002: 98 and 99, USDI 2012).

After the completion of stand searches, surveys were determined to be necessary in 17 separate sites. These sites were created based on marbled murrelet survey protocol (Mack *et al.* 2003). Surveys were initiated in May 2014, and concluded in August 2015. After the 2014 season, seven of the survey sites were determined to be occupied. An occupying behavior requires the detection of a murrelet at or below the canopy of the site (Mack *et al.* 2003). All harvest areas proposed in scoping for the Six Twigs project located within occupied sites were dropped from the proposed project. These portions of the proposed project that the BLM dropped are shown on Table 2-8 in Chapter 2. No additional occupying behavior was detected during 2015 surveys and the ten sites surveyed through the 2015 season are classified as unoccupied.

Habitat

Murrelets nest in structurally complex, mature coniferous forests throughout most of their range (Hamer and Nelson 1995, Ralph *et al.*1995, USDI 1997). They also have been found in younger forests with structural elements similar to old growth, such as remnant old-growth trees or younger trees with platforms created by deformities or dwarf mistletoe infestations (Hamer and Nelson 1995, Nelson and Wilson 2002).

The current proposed units are younger stands, 60–74 years old, some with scattered remnants from previous disturbances. Most identified remnants are outside final unit boundaries. Units 6, 8, 11 and 17 have remnants within or immediately adjacent to the final harvest boundaries. These remnants were evaluated for murrelet nesting potential; all were surveyed to the 2003 PSG protocol standards and are likely to be unoccupied. Most remnants supported characteristics deemed necessary for murrelet nesting (defined above); however, a cluster of five remnants within Unit 11 are substantially above the surrounding canopy. Due to the exposure, the trees have minimal moss cover and almost no protective cover around the larger branches. These trees were determined not to meet the requirements for platform trees, and while they are remnants, are not considered murrelet platform trees. Unit 11 has four additional remnants that do meet the nesting platform criteria, and are considered murrelet platform trees.

Sites

There are 19 occupied murrelet sites within the wildlife analysis area; occupied sites are shown on **Maps 3a–3c**. Three of the sites within the wildlife analysis area were determined to be occupied as a result of surveys in 2014. The other 16 sites were determined to be occupied prior to 2014. The 19 sites include 92 percent of the potential murrelet nesting habitat available in the wildlife analysis area. The BLM considers occupied murrelet sites un-mapped LSR, restricting management activities that can occur with the site.

Critical Habitat

There is no critical habitat within the wildlife analysis area; thus, there would be no effect to critical habitat.

No Action Alternative

These stands are designated under the Matrix LUA; therefore, stands would continue to develop until a decision were made to harvest. As discussed in the Forest Productivity portion of this document, the identified harvest units are densely stocked, and have limited capability of producing a stand with a moderate density of large conifers with multiple canopy layers.

Proposed Action Alternative

Habitat

The proposed project would not remove any trees with currently available murrelet structure; however, the removal of the stand around the unoccupied trees with nesting structure would decrease their overall nesting quality. The current stand conditions of the proposed units would not support further murrelet nest platform development in the next few decades (> 25 years). Within the units proposed for harvest, the following units contain trees that could support murrelet nesting: Unit 6 (4 trees), Unit 8 (3 trees), Unit 11 (4 trees), and Unit 17 (5 trees). These trees were surveyed in 2014 and 2015 and surveyed unoccupied. The proposed project would retain these identified remnant trees, and adjacent trees with interlocking branches, to the extent feasible. Retaining adjacent trees would protect remnant trees from potential damage during harvest and would provide additional cover for the platforms within the remnant trees. When available, additional GTR trees would be used to connect the remnant tree clusters to the edge of the harvest unit. The proposed project would decrease the cover surrounding the suitable nesting trees, potentially reducing the suitability of the remnants for nesting until the canopy matures. The BLM expects the stands proposed for harvest would be harvested, due to the Matrix LUA, before they would achieve characteristics necessary for murrelet nesting.

Occupied Sites and Site Buffers

The proposed project would not remove or modify any occupied murrelet sites. Murrelet nest sites have been shown to have higher predation rates adjacent to hard edges (Hamer 1995; Malt and Lank 2007). Recovery Action 3.1.1.3 addresses this by recommending a minimum 300-foot buffer around existing occupied sites (USDI 1997). While the proposed project would create hard edges, all occupied murrelet sites have been buffered with at least a 300-foot no harvest buffer, with inconsequential exceptions in the buffers adjacent to Units 9 and 16, which are discussed below. The 300-foot no harvest buffer would protect the stand from the hard edge effects associated with regeneration harvest, minimizing the increased risk of predation.

The no harvest buffers around 5 occupied sites, totaling 73 acres, would continue to develop and mature, while reducing effects of a hard edge on occupied murrelet sites. Many of the buffered stands within these buffers are in the same overstocked condition as the units proposed for harvest. The overstocked conditions may delay the development of large trees capable of supporting nesting murrelets until a stand level disturbance occurs. Stands within the buffers currently range in age from 60 to 160 years old.

Road construction and renovation planned for Unit 9 and Unit 16 would remove or modify portions of the occupied site buffer. The road renovation and construction planned for Unit 9 would modify the buffer around two occupied sites (**Map 3a**). The road renovation includes removing trees adjacent and within a current road bed. Most of these trees are alders and smaller conifers. The road would enlarge a 1.4 acre opening that runs parallel with the occupied sites, but that does not expose the occupied sites. The road runs along a ridge top, and stays at least 100 feet away from the occupied sites, and 233 feet from the closest potential nest tree. The new road construction would remove approximately 0.25 acres from the occupied site buffer adjacent to Unit 9. The habitat removed consists of small to medium sized (< 24 inches) conifers on the edge of the buffer, 250 feet from the occupied site and 290 feet from the nearest platform tree. Substantial topography features (ridgetops and stream drainages) separate the road construction from the occupied sites. The topography and remaining stands would continue to protect the occupied sites from edge effects.

A road with a switchback would be constructed within the murrelet buffer adjacent to Unit 16 (**Map 3c**), removing 0.35 acres of the buffer. A majority of the removal would be on a different aspect than the occupied site, reducing the exposure to the occupied site. As the occupied habitat is already fragmented by a road, the impact to the buffer is not expected to increase the predation risk to the occupied site.

Disruption

Several units have small portions of the harvest unit within the 110-yard disruption buffer around occupied murrelet sites (**Table 3-11**). These portions would be subject to seasonal restrictions (no activities between April 1 and August 5) and daily timing restrictions (delaying harvest activities until two hours after sunrise and ending harvest activities two hours before sunset) until September 15. Road construction and renovation within the occupied site buffers would also be subject to seasonal and daily timing restrictions.

Table 3-11 Murrelet occupied sites and suitable habitat within disturbance distances of harvest units.

Sale Name	Sale Acres	Occupied Sites within 110 yards (acres)	Occupied Sites within 0.25 miles (acres)	Surveyed Unoccupied Sites 110 yards (acres)*	Surveyed Unoccupied Sites within 0.25 miles (acres)*	Restrictions	EA Unit
Six One	75	1.9	32.3	2	13.6	Yes	16, 18
Crystal Clear	117	0	0	14	14	No	5, 6
First Floras	25	3.2	53.2	0	0	Yes	9, 12

*Stands surveyed unoccupied in 2014 and 2015.

Three roads would be opened or built within the 110-yard marbled murrelet disruption buffer. Roads 9-1 and 9-2 (**Map 3a**) would be within the disruption buffer of occupied sites within the First Floras timber sale area. Along with road construction and harvest activities, haul on Road No. 9-1 and Road No. 9-2 would be seasonally restricted with the same conditions. Road No. 16-3 road would be within the disruption buffer of occupied sites within the Six One timber sale area. The 31-14-22.0 road is an active haul road running through the same disruption buffer and continuing through occupied murrelet habitat. It is reasonable to assume birds nesting within the disruption buffer are acclimated to noise associated with haul; therefore, haul on Road No.16-3 would not need seasonal restrictions.

Survey and Manage Species

The IM OR-2014-037 instructs projects planned under the Northwest Forest Plan to refer to the 2003 Survey and Manage list, with the 2001 listing for the red tree-vole for species analysis. In the Six Twigs analysis area, only one species of concern occurs or is known to occur, the red tree vole (*Arborimus longicaudus*; RTV). **Appendix D** contains the Survey and Manage Tracking Form for the Six Twigs proposed project.

Red Tree Vole (RTV)

The red tree vole is a small arboreal microtine endemic to the coniferous forests of western Oregon and northwestern California (Howell 1926, Verts and Carraway 1998). The RTV is primarily arboreal, but moves across the ground when no branch pathways exist between neighboring trees (Swingle and Forsman 2009). RTVs feed almost exclusively on the needles and twig bark of conifer trees, often discarding the resin duct of the needle (Howell, 1926). While structurally complex, mature forest habitat is known to provide ideal habitat for the RTV, little is known about minimum stand requirements to support a local population (USDA and USDI 2001). RTVs are solitary except during periods of mating and rearing of young (Swingle and Forsman 2009). RTVs are prey to many species, including northern spotted owls (Forsman *et al.* 1984).

BLM wildlife biologists evaluated stands per the Survey Protocol for the Red Tree Vole, Version 3.0 (Huff *et al.* 2012). Per the RTV protocol, units containing stands with an18-inch QMD (quadratic mean diameter) or greater required surveys. Two units, Unit 10 in the First Floras area and Unit 7 in the Crystal Clear area, met the 18-inch QMD threshold; both units were surveyed according to the RTV protocol. In Unit 7, biologists identified one platform. Tree climbers collected samples, which were evaluated by wildlife biologists. The platform identified in Unit 7 was determined to be a squirrel nest and showed no sign of RTV activity. In Unit 10, wildlife biologists identified six platforms. After collecting samples through tree climbing, wildlife biologists identified one nest as recently active (the resin ducts were still a light green, but not fresh). Four nests were identified as inactive RTV nests (brown resin ducts within the nests), and one platform was determined to have had no RTV activity.

To meet the guidance in the Management Recommendations for the RTV (USDA and USDI 2000), a 10-acre habitat management area was delineated (**Map 3a**). Because most of Unit 10 was within the boundaries of the habitat area, it was dropped from the final proposed project (Table 2-8 shows units dropped from the proposed project). The habitat area is made up of stands from two different age classes, bisected by a road. The stand north of the road is estimated at 40 years old, and is a dense, single aged stand of predominately Douglas-fir. South of the road, stand exams for Unit 10 estimated a 76-year age class. The older stand is a mix of Douglas-fir, hemlock, and alder, many with deformities that provide nesting structures. The recently active RTV nest is on the north side of this road, in a larger tree on the edge of the 40-year-old stand.

No Action Alternative

Stands within the proposed units would continue to develop on their current growth trajectory. Conditions within the proposed units would likely persist as they currently exist until a decision were made to harvest the stands, as they are designated as Matrix LUA.

Proposed Action Alternative

Habitat

The proposed project would harvest 217 acres of stands within the wildlife analysis area. Of these, only Unit 7 (totaling 5 acres) is considered potentially suitable habitat for the RTV. Unit 7 has a QMD greater than 18 inches, however, this stand is densely stocked and the canopies have limited development. This stand was surveyed for RTVs and was determined to be likely unoccupied. Other stands within the harvest area have QMD less than 16.6 inches and do not support characteristics of a mature stand. Green tree retention within areas within the units proposed for harvest would reduce the total number of acres removed, providing additional complexity as the new stand regenerates, and decreasing the time necessary for stands to reach a complexity level capable of supporting RTVs. It could take approximately 60-70 years for the stands to return to their present condition; however, harvested stands are not anticipated to reach maturity prior to future harvests, likely not providing habitat for the RTVs in the future.

No harvest is proposed within the red tree vole habitat management area; however, approximately 0.25 acres of habitat modification would occur within the Habitat Area due to approximately 50 feet of new road construction (11-2 road), 1000 feet of renovation on an open road (31-14-6.0 road), and 350 feet of road renovation on a closed road (09-1 road) (**Map 3a**). The proposed project actions would be consistent with management within red tree vole Habitat Areas, as described in the "Management Recommendations for the Oregon Red Tree Vole":

> "Any management that occurs within a Habitat Area should not remove or modify nest trees, the canopy structure of the stand, or remove any of the dominant, codominant, or intermediate (Daniel et al. 1979) crowns. This includes activities that may isolate nest trees or alter the microclimate within the stand." (USDA and USDI, 2000)

The proposed road construction and road renovation would comply with management recommendations within the Habitat Area for the following reasons:

> No removal/modification of nest trees:
> No RTV nest trees, or trees immediately adjacent to nest trees, would be removed or modified during the construction or renovation process. A majority of the trees removed with the habitat area during construction and renovation would be red alder.
>
> No removal of the canopy structure of the stand, including dominate, codominant, or intermediate crowns:
> The new road construction would remove about 0.1 acre of alder with the Habitat Area, and the renovations along the 31-14-6.0 road would not require any tree removal.
>
> Renovations on the 09-1 road would require the removal of alder, within clearing limits (estimated 16 feet on either side of the centerline), that has a grown within the existing road bed, extending approximately 350 ft through the Habitat Area. In addition to the alder, two hemlocks with intermediate to codominant crowns would be removed within the habitat area. The canopies of these two hemlocks are currently disconnected from nearby conifers, due to the high alder component within the stand and their proximity to the existing road bed. The removal of the two hemlocks, and several additional smaller sub-canopy hemlocks, would allow the road to avoid two Douglas-fir trees that are codominant and connected with the adjacent stand. Renovation of the 09-1 road would result in a small gap about 32 feet wide and 350 feet long (approximately 0.25 acre) in the Habitat Area. This would not be a barrier to red tree vole movement within the Habitat Area (Swingle and Foresman, 2009). The historic 09-1 road is currently a gap in the canopy cover, as measured by dominant and codominant trees and renovation would not alter this condition. The effects due to the removal of the alder and hemlocks would be negligible and is not anticipated to impede RTV mobility though the stand.
>
> No isolation of nest trees:
> The 31-14-6.0 road bisects a cluster of four RTV nest trees. Renovations are not expected to further isolate these trees, as the road is currently open and renovations on this road would not remove additional trees. The proposed new construction is on the edge of the Habitat Management Area, within the road prism and would not remove any conifer trees. The renovations on the 09-1 road are at least 220 feet from the nearest RTV nest tree and would not further isolate the nest trees.

No alternation of stand microclimate:
As described above, the habitat area is comprised of two stand types. The northern stand is a young, 40 year old plantation. The proposed road construction is on the edge of this stand and is isolated from a majority of the nest sites by roads and topography. The removal of the alder due to this construction (less than 0.1 acre) would not alter the microclimate of this stand. The renovation of the 31-14-6.0 road bisects the 40-year-old stand from the 76-year-old stand to the south. Renovations on this road would not alter the microclimate of either stand. The 76 year-old stand is a mixed conifer/alder stand. The proposed renovations on the 09-1 road would alter 0.25 acres; however, this comprises only 4 percent of the 76 year old stand (2 percent of the habitat area). Due to the small area affected by the renovation of the 09-1 road, effects to the microclimate within the stand are anticipated to be negligible. Additionally, renovations would not occur adjacent to nests sites, and would not alter the microclimate of the nest sites.

In addition to the RTV Habitat Area, the 273 acres of occupied murrelet sites delineated after murrelet surveys are capable of supporting RTVs. Two occupied murrelet sites had incidental documentation of resin ducts during field surveys, an indicator of RTV presence.

Special Status Species

The Coos Bay Special Status Species list is included in **Appendix E**. Species with known sites or habitat within the analysis area are analyzed in detail below. Other species on the list were excluded for one of the following reasons: (1) the project is outside of the species' known range; (2) key habitat features are not within the reach of project impacts; (3) the species is unlikely to be present because key habitat features are lacking or (4) other evidence suggests they would not be present or impacted by the proposed project (i.e., rare migrants).

Pre-implementation surveys for Bureau Sensitive wildlife species are not required. All sightings and survey information for Bureau Sensitive Species are housed in BLM's GeoBOB (Geographic Biotic Observations*)* geodatabase.

Pacific Fisher

The Pacific fisher (*Pekania pennanti*) was proposed for listing under the Endangered Species Act, on October 7, 2014. Fishers are consistently associated with coniferous and mixed conifer/hardwood forests with characteristics of late successional forests, in low to mid elevation areas. There are two known small, disjoint populations in Oregon; an indigenous population in the Siskiyou Mountains and a reintroduced population in the southern Cascades (Aubry and Lewis 2003). In Washington and Oregon, outside of the existing known populations, fishers are considered likely extirpated (USDI 2014b).

Protocol surveys were conducted in 2005–2006 in T26S R10W and T27S R10W. No fishers or martens were detected. Recent fisher surveys conducted on district lands in 2012-2013 near the California border detected fishers at five remote camera stations. To date, camera surveys have not documented any fisher north of the Rogue River. It is possible, but unlikely, that fishers are elsewhere on district; there is no documentation of fisher presence within the analysis area.

The distance from known populations, and the highly fragmented, intensely managed forest condition within the analysis area, makes it unlikely that the fisher would be affected by the proposed project. The fisher is not analyzed in further detail.

Townsend's Big-eared Bat and Fringed Myotis

While the Townsend's big-eared bat (*Corynorhinus townsendii*) and fringed myotis (*Myotis thysanodes*) occur in the watershed, both typically roost in snags, caves, abandoned mines, rock crevices and man-made structures such as buildings, tunnels and bridges (Kunz and Martin 1982, Dobkin et al, 1995). The

Townsends is also known to roost in basal hollows in large trees, particularly in areas with few caverns (Fellers and Pierson 2002, Mazurek, 2004), while the fringed myotis selects snags ≥ 30 centimeters DBH, and in decay class 2 to 3 (Weller and Zabel 2001). There are limited numbers of large trees available for roosts, and no known caves or rock formations within the analysis area. Based on the lack of available suitable habitat, it is unlikely the Townsend's big-eared bat or fringed myotis roost within the treatment units.

Purple Martin

Purple martins (*Progne subis*) are known to occur within the analysis area. In Oregon, purple martins are uncommon, but found in the Coast Range and Willamette Valley during the summer. Purple martins nest in snags in clear cuts, burns or sand dunes, or in anthropogenic structures such as pilings, nest boxes, or gourds, often near or over open water, although they can be found as far as three miles away from water (Horvath 2003, 2006). Purple martins were observed during murrelet surveys. Currently, stands within proposed project units have few openings and snags, necessary characteristics for nesting.

No Action Alternative

Under the no action alternative stands would continue on their current growth trajectory, until a future decision were made to harvest the stands. These stands currently have few large snags that would support roosting or nesting habitat. Development of large snags would be minimal as mortality in the stem exclusion phase is concentrated on the smaller stems within the stand (Peet and Christensen 1987). These smaller stems are not suitable for bat roosting or nesting purple martins. The stands would continue to provide minimal support for roosting and nesting.

Proposed Action Alternative

Habitat

The proposed project includes the creation of two snags per acre. These snags have the potential to provide roosting and nesting habitat for bat species in the future. The early seral habitat created would increase forage opportunities for the Townsend's big-eared bat, the fringed myotis, and purple martin; each forage along edge habitats. Additionally, snags currently on the landscape would be protected, when feasible, providing snags in advance decay classes immediately post-harvest. Even though surveys were not completed, due to dense stand conditions and lack of large snags, it is unlikely either bat species, or the purple martin, occupies roost or nest sites within the proposed harvest areas. For these reasons, proposed project is not expected to contribute to the future listing of these species; on the contrary, the snag creation requirements and an increase in available forage habitat may provide benefits for all three species.

Migratory Birds

In the Memorandum of Understanding to Promote the Conservation of Migratory Birds between the BLM and the USFWS (USDI 2010b), the BLM agrees to: "evaluate the effects of the BLM's actions on migratory birds during the NEPA process, if any, and identify where take reasonably attributable to agency actions may have a measureable negative effect on migratory bird populations, focusing first on species of concern, priority habitats and key risk factors."

According to the Birds of Conservation Concern (USDI 2008a), the Six Twigs proposed project falls within Bird Conservation Region (BCR) 5, Northern Pacific Forest. Of the birds included on this list, the following have the potential to be affected by the proposed project: Marbled murrelet (analyzed in detail), rufous hummingbird (*Selasphorus rufus*), and the olive-sided flycatcher (*Contopus cooperi*). Bald Eagles and peregrine falcons occur within the watersheds; however, there are no known nest or eyrie sites within the wildlife analysis area. For this reason, these two species are not discussed further.

The rufous humming bird and olive-sided flycatcher are associated with early seral habitat, adjacent to older mature forests. The rufous hummingbird requires an abundance of nectar producing, flowering vegetation. This vegetation is associated with open areas in mature forests or in complex early seral areas. The olive-sided flycatcher requires tall trees and snags within an open habitat for singing and foraging (Altman and Alexander 2012). The stands in the wildlife analysis area are densely stocked, with minimal understory growth. Currently, available nectar producing plants can be found in riparian areas and in areas where understory exists. Early seral habitat is available on private lands, but is intensely managed and treated with herbicides, reducing species cover and diversity and scattered large trees and snags (Morrison and Meslow 1983).

No Action Alternative

Under the no action alternative stands would continue to develop under generally overstocked conditions. The units proposed for harvest do not contain early seral habitat for species requiring open growing conditions. Nectar producing plants would continue to be available at the current population levels. Development of large snags would be minimal as mortality in the stem exclusion phase is concentrated on the smaller stems within the stand (Peet and Christensen 1987). Additionally, it is highly probable a stand level disturbance would be required to produce trees capable of becoming the large, overstory dominants associated with a complex old-growth forest, limiting the future old-growth functionality of these stands. Stands would continue to persist in similar conditions until a decision were made to harvest these stands in accordance with harvest goals within the Matrix LUA.

Proposed Action

The proposed project would return 217 acres of densely forested lands to an early seral condition. The early seral would remain on the landscape for 5-15 years. GTR, snag, and down wood requirements would provide complexity to the early seral stand, supporting many bird species, including the rufous humming birds and olive-sided flycatchers, that would be likely to use the habitat created as part of the project area. Riparian Reserve and the GTR clusters would provide a mosaic of older stand habitat available for these and other bird species. Existing snags would be protected, when feasible, and additional snags would be created. These snags would provide a range of decay classes supporting foraging and nesting needs of several species. Additionally, some snags would be protected by GTR clusters, while others would be left in more open conditions, benefiting a variety of bird species.

The proposed project does not include industrial use of herbicides post treatment, a common practice on private timber lands, which reduces forage and habitat for migratory birds. While herbicides are not used, manual maintenance of the stand would reduce shrub cover, allowing the planted stand to grow with limited competition. The manually maintained stand is anticipated to support higher plant diversity and cover than industrial treatments, but reduced cover compared to stands left to regenerate after a natural disturbance (Gagne *et al.* 1999).

In addition, the 237 acres of occupied murrelet sites, managed as un-mapped LSR, are scattered across the landscape, providing refuges of late successional forest adjacent to areas available for more intensive timber management. These late successional reserves would continue to provide habitat for additional migratory bird species.

Cumulative Effects -All Species

No additional BLM actions are planned in the reasonably foreseeable future; however, two thinning projects are currently ongoing within the analysis area. The effects of these thinning projects were evaluated under the Edson Thin EA, and were factored into the baseline habitat conditions.

A majority of the lands within the analysis area are privately owned. These private timberlands are generally harvested every 40 years. It is assumed stands would continue to be managed in this manner,

providing the same ratios of stand ages across the planning area. The effects of the proposed project as described above, when added to the effects of the baseline conditions would not have a measureable additive effect on wildlife.

Botany

There are no threatened or endangered plant species known or suspected to occur within the Six Twigs proposed project area.

Survey and Manage/Special Status Species

Aerial photographic interpretation, review of information on each species habitat requirements, and proximity of known site locations determined potential habitat surveyed for Bureau Sensitive and Survey and Manage species. There are twenty-five Bureau Sensitive plant species suspected within the proposed project area (**Appendix F**) and six of Category "A" and "C" Survey and Manage species with habitat within the proposed project area (**Appendix G**).

All required surveys for vascular plant, lichen, and bryophyte Bureau Sensitive and Survey and Manage surveys were completed on all units proposed for regeneration harvest. The BLM conducted field surveys using the intuitive controlled method where high likelihood habitats are surveyed more intensively than other areas within the project (USDA and USDI 1997, USDA and USDI 2003). Survey routes, dates of survey, and sites are flagged in the field and are recorded on data sheets, GPS data recorders, and topographic maps. **Table 3-12** presents a summary of Bureau Sensitive and Survey and Manage sites found in each unit proposed for harvest.

Table 3-12 Bureau Sensitive and Survey and Manage sites found within units proposed for harvest.

Timber Sale Area	Unit	Bureau Sensitive Special Status Site(s)	Survey and Manage Site(s)
Crystal Clear	3	Two lichen sites both *Hypotrachyna revoluta*.	Three Category "E" lichen sites: one *Peltigera pacifica* and two *Hypotrachyna revoluta*.
	4	None	Four Fungal Sites: one Category "B" *Phaeocollybia spadicea*, two Category "B" *Ramaria stuntzii*, and one Category "D" *Phaeocollybia attenuata*.
	6	None	Two Category "B" Fungal Sites both *Ramaria araiospora*; one Category "B" lichen, *Chaenotheca chrysocephala*.
	8	None	One Category "B" Fungal Site, *Ramaria araiospora*.
First Floras	9	One lichen site, *Hypotrachyna revoluta* and one fungal site, *Ramaria rubella* var. *blanda*.	One Category "E" lichen site, *Hypotrachyna revoluta* and on Category "B" fungal site, *Ramaria rubella* var. *blanda*.
Six One	16	None	One Category "E" lichen site, *Peltigera pacifica* and one Category "D" fungal site, *Phaeocollybia kauffmanii*.
	17	None	Three Category "E" lichen sites: one *Peltigera pacifica* and two *Hypotrachyna revoluta*.
	18	None	Two Category "B" fungal sites: one *Phaeocollybia pseudofestiva* and one *Phaeocollybia spadicea*. Three Category "D" fungal sites: one *Phaeocollybia attenuata*, one *Phaeocollybia fallax*, and one *Phaeocollybia kauffmanii*. One Category "E" lichen site, *Peltigera pacifica*.

Surveys are not conducted for Bureau Strategic species although occurrence data is collected if they are incidentally encountered during formal surveys. No Bureau Strategic species were found during formal surveys. In addition, fungi are not considered practical to survey for (Cushman and Huff 2007), so no formal surveys were done for any fungi species. However, where these species are incidentally

discovered, site data is collected and sites are managed (except Category "F" species which do not require management) so the microclimate is protected such that the species would persist at the site. **Table 3-12** includes fungi species incidentally encountered during formal surveys. **Appendix H** contains a full list of Special Status and Survey and Manage fungi species known or suspected within units proposed for regeneration.

No Action Alternative

The BLM has two timber sales operating within the analysis area, the Ocean View timber sale and the Edson Plum timber sale, analyzed under the Edson Thin EA. The sales both consist of commercial thinning of stands less than 80 years of age with no Special Status Species plant sites located during botany surveys. Thus, there would be no known cumulative impacts to any Special Status Species vascular, lichen, or bryophyte plant species.

Proposed Action Alternative

All sites of Bureau Sensitive and Survey and Manage species found during surveys on the proposed timber sale units (**Table 3-12**) would be buffered with a one-hectare buffer (except Category "F" species which do not require management) to protect microclimate such that the species persist at the site. This translates to a 185-foot, no-cut buffer at each site. Research suggests that one-hectare buffers are sufficiently large enough to contain areas with light, temperature, and soil moisture that are comparable to those in undisturbed forest and suitable, in the short term, for persistence of forest-dependent species (Heithecker and Halpern 2007). The BLM would not harvest within these site buffers as part of the proposed project; therefore, implementation of the proposed project would not increase the likelihood that the Bureau Special Status and Survey and Manage species found within these sites would become listed under the Endangered Species Act.

Since fungi are not practical to survey for (Cushman and Huff 2007), the BLM did not conduct formal surveys for any Bureau Sensitive or Survey and Manage fungi species. The effects of the proposed regeneration harvest to Survey and Manage fungi species tiers to the analysis in the 2000 Final SEIS and is incorporated here by reference. As described below, the proposed project is consistent with the 2001 Survey and Manage ROD and implementation of the proposed project would not have effects beyond those already analyzed in the 2000 Final SEIS (p. 241–252). A summary of effects is also included in **Appendix H**.

The predicted rate of habitat disturbance on Federal lands in the Northwest Forest Plan area is within that analyzed in the 2000 Final SEIS. The predicted rate of habitat loss due to management activities is described on pages 180–181:

> *...the likelihood that an activity modifying late-successional forest will occur within the range of a truly rare of localized species population must be viewed in light of the relatively conservative degree of modification of late-successional forest projected to occur within the northwest Forest Plan Area. For example, management activities (timber harvest and prescribed fire) are projected to modify approximately 3 percent of the late-successional forest within the area over the next decade.*

The Northwest Forest Plan 15-year Monitoring Report on Status and Trends of Late-Successional and Old-Growth Forests (Moeur *et al.* 2011) concluded that Late-Successional and old-growth forests areas decreased on Federal lands by an estimated 1.9 percent within the plan area over the monitoring period (1994–2008). This loss of habitat was from all sources, mostly wildfire. Actual losses from management activities were less than 0.5 percent. This is substantially less than the 3 percent predicted in the 2000 Final SEIS. The effects to these species are well within what was anticipated in the 2000 Final SEIS, even including the potential effects from implementation of the proposed project.

Endangered Species Act

The analysis area is located within the Oregon Coast coho, *Oncorhynchus kisutch*, Evolutionarily Significant Unit (ESU). The National Marine Fisheries Service (NMFS) published the listing determination and designation for Oregon Coast coho critical habitat (CCH) as threatened February 11, 2008 effective May 12, 2008 (73 FR 7816).

Oregon Department of Fish and Wildlife (ODFW) released the 2005 Oregon Native Fish Status Report, which has six criteria to assess the status of many native fish species in Oregon including Oregon Coast coho. The six criteria include existing populations, habitat use distribution, abundance, productivity, reproductive independence, and hybridization. This assessment focused on groups of populations from a common geographic area with similar genetic and life history characteristics called Species Management Units (SMUs). SMUs are made up of smaller populations. "Populations within an SMU are locally adapted to the specific conditions encountered in their native streams" (ODFW 2005). All six of the criteria were met by at least 80 percent of the smaller populations within the Oregon Coast coho SMU. This SMU was classified as "not at risk." Smaller populations of Oregon Coast coho, which the analysis area is located within, include Floras Creek and Sixes River. The Floras and Sixes populations met five of the six criteria, failing in the productivity category.

The Oregon Coast coho Conservation Plan found the Oregon Coast coho ESU is viable (ODFW 2007). This conclusion was based on the status of Oregon Coastal coho relative to viability criteria presented in the Oregon Coastal Coho Assessment completed by the Governor's Natural Resource Office in 2005. The Conservation Plan found coho populations generally had sufficient abundance, productivity, distribution, and diversity to be sustained under the current and foreseeable range of environmental conditions (ODFW 2007).

Streams used by coho or designated as coho critical habitat within the analysis area include: Floras Creek, Willow Creek, Crystal Creek, Edson Creek, and Sixes River (StreamNet GIS, BLM OR ARIMS Reach Fish Anadromous Line 2009, and 73 FR 7816). This list does not include all the streams within the New River Frontal and Sixes River 5th field watersheds used by coho, only the coho streams with the potential of being affected by the proposed project.

Magnuson-Stevens Act

Streams used by coho and chinook salmon within the analysis area are designated as Essential Fish Habitat (EFH) under the Magnuson-Stevens Fishery Conservation and Management Act. The Magnuson-Stevens Act defines EFH as "...those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (67 FR 2343).

Streams with EFH within the analysis area include: Floras Creek, Willow Creek, Crystal Creek, Edson Creek, and Sixes River (StreamNet GIS data 2012, BLM OR ARIMS data 2009). This list does not include all the streams within the New River Frontal and Sixes River 5th field watersheds with EFH, only the EFH streams with the potential of being affected by the proposed project.

Special Status Species

Aquatic Sensitive species from the Special Status Species list occurring in the analysis area include Oregon Coast coho (Federal threatened), Oregon Coast steelhead (Bureau Sensitive), foothill yellow–legged frog (Bureau Sensitive), and the robust walker aquatic snail (Sensitive). Effects to yellow-legged frogs are not analyzed in detail in this EA because the species lacks habitat within the project area; the species is addressed in **Appendix E**. **Table 3-13** lists other aquatic Bureau Sensitive species found within the Coos Bay District, but not within the analysis area.

The robust walker, *Pomatiopsis californica*, is an aquatic snail found in perennial seeps, shallow mud banks, and marsh seeps leading into shallow streams. The snail was documented in a 1998 survey in the Twomile 6th field subwatershed, which is within the New River Frontal 5th field watershed.

The 2005 Oregon Native Fish Status Report assessed the status of Oregon Coast steelhead. The Oregon Coast winter steelhead SMU met five of the six interim criteria, the reproductive independence criteria failed. This SMU was classified as "potentially at risk" (ODFW 2005). "Failure of the reproductive independence criterion places the near-term sustainability of the SMU potentially at risk" (ODFW 2005). Smaller populations of Oregon Coast winter steelhead are located at Floras Creek and Sixes River. The Floras and Sixes populations passed all six criteria.

Streams used by steelhead within the analysis area includes: Floras Creek, South Fork Floras Creek, West Fork Floras Creek, Dwyer Creek, Willow Creek, Crystal Creek, Edson Creek, Sixes River, Elephant Rock, unnamed tributary to Sixes River with confluence in T. 32 S., R. 13 W., Sec. 7, Sugar Creek, Otter Creek, Big Creek, unnamed tributary to Sixes River with confluence in T. 32 S., R. 13 W., Sec. 9, North Fork Sixes River, and Haines Creek (StreamNet GIS data 2012 and BLM OR ARIMS data 2009). This list does not include all the streams within the New River Frontal and Sixes River 5th field watersheds used by steelhead, rather only the steelhead streams with the potential of being affected by the proposed project.

Table 3-13 Aquatic Bureau Sensitive species located within the Coos Bay District but not present in the analysis area.

Species Name	Species Range
Pacific Coast chum salmon *Onchorhynchus keta*	The 2005 Oregon Native Fish Status Report does not show Chum occurring or having occurred south of the Coquille Watershed (ODFW 2005). Therefore, Chum are not considered to occur in the analysis area, which is south of the Coquille Watershed.
Klamath Mountains Province steelhead *Onchorhynchus mykiss*	The Klamath Mountains Province steelhead distinct population segment (DPS) is located south of the analysis area.
Southern Oregon Northern California chinook salmon *Oncorhynchus tshawytscha*	The Southern Oregon Northern California chinook salmon ESU is located south of the analysis area.
Rotund lanx (snail) *Lanx subrotunda*	Turbulent water of large rivers provide habitat for rotund lanx. Range: Mainstem Rogue and Umpqua Rivers. The analysis area is outside of known range.
Pacific walker (snail) *Pomatiopsis californica*	Wet leaf litter and vegetation near flowing or standing water in shaded areas, with high humidity provide habitat for the Pacific walker. Range: Lower Millicoma sub-basin. The analysis area is outside of the known range.
Caddisfly *Rhyacophila chandleri*	This species of caddisfly occupy freshwater habitats. Range: Lane, Deschutes, and Siskiyou (CA) counties. The analysis area is outside of the known range.
Haddock's Rhyacophilan Caddisfly *Rhyacophila haddocki*	Haddock's rhyacophilan caddisfly occupy small mountain streams. A survey documented its presences 1.5 miles above the Elk River fish hatchery in Curry County. The analysis area is outside of the known range.

Special Status Species Habitat

The term fish habitat includes CCH, ESH, and SSS habitat for Bureau Sensitive species. Fish habitat has been influenced by human activities in the analysis area. Many stream channels in the lower valleys are down-cut and not connected with their floodplains. Road development near streams channelized the streams and reduced stream meander. Past timber harvest practices near streams caused a loss of large wood and a diminished recruitment of future large wood. Fish habitat within the analysis area is generally lacking in-stream structure, channel complexity, and large wood.

Timber harvest occurs primarily in the middle and upper portions of the New River Frontal and Sixes River 5th field watersheds. Grazing, rural residential development, and other agricultural uses are dominant in the lower portion of the Floras Creek and Sixes watersheds (Maguire 2001a and Maguire 2001b). Over 90 percent of the Floras Creek watershed is in private ownership (Maguire 2001a). Approximately 69 percent of the Sixes River watershed is in private ownership (Maguire 2001b).

The Oregon Department of Environmental Quality (ODEQ) monitors water quality in Oregon's waters and reports impaired waters on the ODEQ 303(d) list. Water temperature can affect fish survival. The following streams within the analysis area are listed on the Oregon Department of Environmental Quality 303(d) list for high water temperatures: Crystal Creek, Dwyer Creek, Edson Creek, Sixes River, Willow Creek, Floras Creek, West Fork Floras Creek, and South Fork Floras Creek. Small streams within the proposed treatment units are currently well shaded by conifers with some hardwoods.

Sedimentation can affect stream habitat, dissolved oxygen, and aquatic invertebrate populations. There are no streams in the analysis area currently listed for sedimentation. Floras Creek and the Sixes River are listed for not meeting standards for dissolved oxygen. Floras Creek and the Sixes River are listed for not meeting standards for biologic criteria (ODEQ 2006).
Field examinations have determined that some roads in the analysis area show evidence of surface erosion, inadequate drainage, inadequate stream crossings, or unstable cut-banks and fill slopes. Adjacent streams have been subject to episodes of fine sediment input due to poor road design and lack of maintenance. Well-designed and maintained roads in the analysis area do not contribute sediment to stream channels. Fine sediment generated from these roads infiltrate into adjacent forest soils and do not flow directly into streams and fish habitat.

Stream habitat inventory surveys are generally lacking in the analysis area. A survey was conducted in Edson Creek in 2000 by ODFW (ODFW 2000). The lower three reaches were slightly above the desirable range for percent of silt and sand in riffles. The upper fourth reach was within the desirable range for percent of silt and sand in riffles. The four reaches surveyed in Edson Creek were undesirable in the number of key pieces of large wood. The survey found Edson Creek was in the desirable range in reach one for all pieces of wood, reach two was undesirable, and reaches three and four were close to the desirable range. The four reaches surveyed in Edson Creek were desirable for pool frequency and complexity. Habitat conditions were determined by comparing stream conditions to the ODFW Aquatic Habitat Benchmarks for western Oregon (Moore and Miner 1997).

The trees in the Riparian Reserve within the proposed project area range in age from 60 to 74 years old. Past timber harvest and road building practices have altered riparian areas on BLM and private land. The result is younger riparian stands in the analysis area. Younger riparian stands can result in a reduction of channel complexity and large wood recruitment.

For a detailed description of aquatic habitat in the analysis area, refer to the Watershed Analysis of the Sixes and New River Area (USDI 2008d, p.63-71).

No Action Alternative

Riparian Reserve would continue successional processes and would continue to provide shade, nutrient input, and future large wood recruitment under the No Action Alternative.

The levels of sediment currently in stream channels within the analysis area could remain the same or increase in the short and long terms under the no action alternative because of degraded road conditions. Those roads contributing sediment to streams could have short- and long-term negative effects to fish habitat. Increased levels of sediment entering streams could result in a reduction of spawning production,

juvenile rearing survival, and insect production (Everest *et al.* 1987, Meehan 1991, Meyer *et al.* 2005, Waters 1995).

Proposed Action Alternative

Harvest

The proposed harvest is not expected to result in sediment reaching fish habitat. Sediment would not be transported to stream channels or fish habitat as a result of harvest activities because: 1) full Riparian Reserve buffers of one site-potential-tree height on intermittent and perennial streams and two site-potential-tree heights on fish-bearing streams would be retained; 2) any yarding corridors across stream channels would be full suspension; and 3) ground based equipment would not operate within Riparian Reserve. Timber harvest is not proposed within Riparian Reserve. The vegetation within the Riparian Reserve would remain intact to filter any derived sediment from bare soils. Well drained soils have the capacity to capture fine sediment through infiltration and not transport it to stream channels. Site preparation under the proposed spring-like conditions would leave both large woody material and a thin layer of organic matter to protect and capture fine sediment.

The proposed yarding corridors would not measurably increase sediment delivered to streams. The yarding corridors would be constructed according to the project design features. Yarding corridors would be dispersed, would only be 12 feet wide, and would utilize full-suspension when yarding across stream channels. Unit 3 may have up to three yarding corridors in a Riparian Reserve that would cross an intermittent stream; the closest corridor would be 0.13 miles from perennial streams, 0.3 miles from fish-bearing streams, and 3.5 miles from coho-bearing streams. The proposed yarding corridors as described would not result in compacted soils, would not cause overland flow, and thus not create a route for sediment to enter stream channels. Trees felled for yarding corridors in the Riparian Reserve would be felled toward the stream channel and left on site.

New Road Construction

Proposed road construction would include only one new stream crossing (Road No. 08-2.1) and would result in a short-term negligible amount of sediment entering a stream channel. Sediment entering stream channels would be minimized because the road construction would follow all applicable Best Management Practices and project design features. Sediment would not be expected to reach fish habitat because the new stream crossing would be at least 1 mile from fish habitat and all applicable project design features would be followed. Road drainage features would be designed so that any sediment-laden surface water would quickly infiltrate into forest soils. The new road constructed in a Riparian Reserve would be decommissioned and left in an erosion resistant condition. This culvert would not have any long-term impacts to sediment input because it would be removed after harvest and stream bank slopes would be pulled back to match natural contours and left in an erosion resistant condition.

All dirt roads would be temporarily decommissioned prior to fall rains according to project design features and decommissioned at the completion of harvest.

Haul

Sediment generated from winter haul could move off-site during winter rains. During the dry season when there is no water flowing on the road surface or in ditchlines, sediment delivery to streams would not occur. The amount of sediment which could reach stream channels would be indiscernible from existing conditions, could not be meaningfully measured, and would not affect fish habitat. Implementation of design features, Best Management Practices, adequately surfaced gravel roads, and well-vegetated ditchlines would reduce if not eliminate sediment transport to stream channels. Road improvements and renovation completed prior to haul, and roadwork conducted after haul would further reduce the amount of off-site sediment movement during and after hauling. Dirt surface roads would be restricted to summer haul, resulting in little or no offsite sediment that could reach streams and would be decommissioned after

harvest completes. Sediment derived from winter hauling would be primarily directed to ditchlines and then out of ditchlines, via ditch relief culverts, onto the vegetated-forest floor. Sediment directed to hillsides by ditch-relief culverts would filter soil prior to the sediment reaching stream channels. Brake *et al.* (1997) found that on established logging roads within the Oregon Coast Range, the maximum observed distance sediment traveled below a ditch relief culvert with vegetation filtering or a stream crossing culvert with stream material present (large woody debris, boulders, etc.) was typically not more than 20 feet. All graveled surface roads would be available for winter haul, except for the Crystal Creek mainline which would be restricted to summer haul only due to proximity to coho critical habitat.

Road Maintenance, Renovation, Reconstruction, and Improvement

Sediment generated from maintenance, renovation, reconstruction, and improvement could move off-site during winter rains; however the amount of sediment to reach stream channels would be short-term and indistinguishable from existing conditions. Following the first winter after road activities, sediment entering streams would become negligible. Best Management Practices and project design features are expected to reduce and in some cases eliminate sediment from entering stream channels. Sediment derived from road work would be primarily directed to ditchlines and then out of the ditchlines via ditch relief culverts. Where roads are connected to streams, sediment could enter stream channels. However, well vegetated ditchlines would exist within the majority of the analysis area and would reduce the amount of sediment reaching stream channels. Sediment control devices would be installed, as needed, to trap and store sediment which would further reduce sediment delivered to streams.

Road renovation and maintenance activities could include stream and cross-drain culvert replacement. The ID Team identified 6 culverts to be replaced during road renovation (**Table 2-6**). BLM engineers would determine additional culvert replacement at the time the timber sale contract is prepared. Depending on the engineer's assessment of the structural stability of the culverts they may or may not be replaced under the timber sale contract. No culvert replacements would occur where steelhead, coho, CCH, or EFH are present. Replacing the culverts would result in a short-term input of sediment to stream channels. However, the sediment would not affect fish habitat because of the distance from the culverts to fish habitat, implementation of design features for culvert replacements, and the dispersal of these culvert locations over the analysis area. Replacing the culverts would reduce the risk of culvert failure.

Some roads proposed for maintenance, renovation, reconstruction, or improvement have poor drainage, show signs of erosion, and are an existing source of fine sediment to streams. The proposed road work would reduce the amount of sediment entering streams in the long-term. Cleaning plugged stream and ditch relief culverts would reduce the risk of culvert and road failure.

The proposed road closure activities would result in a short-term negligible amount of sediment entering stream channels. Road closure activities are not expected to affect fish habitat because of the distance from the activities to fish habitat and project design features that would be followed. However, there would be an expected long-term reduction of sediment entering stream networks and thus fish habitat. Replacing stream culverts, installing waterbars, and stabilizing the drainage on roads would reduce the potential of the roads failing, causing sediment to enter streams, and affecting fish habitat.

Conclusion

The sediment generated from the above harvest and road activities would not result in negative effects to the federally listed coho, CCH, or EFH. The sediment input would not contribute to the need to list any Bureau Special Status Species under the ESA. Implementation of project design features and Best Management Practices, and the proximity of species and habitats in relation to harvest and road activities would minimize if not eliminate sediment input to these habitats. Sediment entering stream channels as a result of road activities would not result in effects to fish habitat. The BLM would maintain coho and other Bureau Special Status Species survival and production as part of the proposed project. The amount

of sediment reaching headwater channels would not cause a reduction in macroinvertebrate production, which is a food source for fish. Changes in embeddedness, interstitial spaces, and pool depth would not occur. An overall long-term reduction in sediment entering streams and fish habitat is expected following road renovation, improvement, maintenance, and decommissioning because these road activities would generally reduce erosion and improve drainage problems.

Riparian Reserve Characteristics including Large Wood

The proposed project would include the following harvest related activities in Riparian Reserve: yarding corridors and construction of one new road totaling 0.03 miles in Riparian Reserve.

Up to three yarding corridors could be constructed across an intermittent stream through Riparian Reserve adjacent to Unit 3 and approximately 0.03 miles (158 feet) of new road construction would occur in the Riparian Reserve (Road No. 8-2.1). These proposed activities within Riparian Reserve would not result in effects to future large wood recruitment in stream channels or fish habitat because:

- Yarding corridors in a Riparian Reserve would utilize full suspension across streams and one-end suspension would occur no closer than 100 feet from a stream, reducing sediment delivery.
- Corridors are not proposed across fish habitat. The closest potential corridor would be 0.13 miles from perennial, 0.3 miles from fish-bearing streams, and 3.5 miles from coho-bearing streams.
- Trees felled for yarding corridors in the Riparian Reserve would be felled toward the stream channel and left on site to function as woody debris.
- The yarding corridors would be constructed according to the project design features and would be widely dispersed. The corridors would be limited to 12 feet in width.
- The intermittent stream with yarding corridors is small in size and not prone to debris flows, so large wood would not likely reach fish habitat.
- The roads would be constructed to the minimum width necessary for operations, with a clearing limit of less than 36 feet and have a 16-foot running surface.
- No new roads would cross fish habitat. The closest new road in a Riparian Reserve or with a stream crossing would be 1.0 miles from steelhead distribution, and 2.3 miles from steelhead, coho, CCH, or EFH.
- The BLM would maintain full Riparian Reserve buffers reducing or eliminating effects to future large wood recruitment in stream channels or fish habitat.

Unit 6 is the only harvest area that is adjacent to steelhead and cutthroat (Crystal Creek). No harvest areas are adjacent to coho. Two site-potential-tree heights would be retained adjacent to fish-bearing streams and one site-potential-tree height would be retained adjacent to perennial and intermittent streams. The site-potential-tree height in the Sixes River 5th field watershed is 180 feet and is 200 feet in the New River Frontal 5th field watershed.

Most site preparation activities would occur outside of Riparian Reserve boundaries. However, depending on slope, topography, and Riparian Reserve locations hand-constructed fire lines could be constructed up to 30 feet inside the Riparian Reserve. Hand-constructed fire lines would not remove overstory conifers or hardwoods. Site preparation would not result in overstory mortality within the Riparian Reserve because (1) burning would occur under spring-like conditions when soil moisture, fuel moisture, and relative humidity is high, which would minimize the likelihood of problematic fire behavior or escaped wildfires and (2) ignitions would not occur within Riparian Reserve.

The following are details of the proposed new road construction involving stream crossings and Riparian Reserve:

- Road No. 8-2 would be rocked with one temporary intermittent stream crossing that is 1.0 mile from steelhead habitat and 2.3 miles from coho, CCH, or EFH (**Map 2b**). The road would be

temporarily decommissioned following Best Management Practices after harvest. The stream crossing culvert would be removed and slopes pulled back to match natural contours. All disturbed areas would be treated with certified weed-free mulch and grass seed prior to fall rains. Waterbars would be installed on each side of the crossing to minimize hydrologic connectivity between ditches and the stream.

Essential Fish Habitat Assessment

The proposed project would not affect EFH. The EFH analysis was included in the "no effect" report for Oregon Coast coho and fulfills the requirements as described in the Magnuson-Stevens Fishery Conservation Management Act (16 U.S.C 1855((b)).

Endangered Species Act

An effects analysis, located in the administrative record, of the proposed project on Oregon Coast coho and CCH resulted in a "no effect" determination.

Bureau Special Status Species

Negative effects to Special Status Species and their habitat would not occur as a result of the proposed project because of the implementation of project design features, the proximity of the proposed project to Special Status Species habitat, and the relatively small amount of area included in the proposed project. The Riparian Reserve buffers would protect habitat which may be used by the robust walker. There would be no expected increase in stream temperatures or peak flows (discussed in detail under the Water Resources section of this chapter). Sediment input to stream channels would not affect Special Status Species or their habitat because of the project design features and the distance of the proposed project to SSS habitat. The proposed yarding corridors and new road construction would not lead to a decrease in large wood recruitment to Special Status Species habitat. The proposed project would not increase the likelihood for the need to list the Sensitive species found in the analysis area under the ESA.

Cumulative Effects

Effects of past land management practices within the analysis area have contributed to the degraded conditions of fish habitat. Reduced sediment input due to the proposed road work is expected to contribute to improved localized stream conditions and benefit fish habitat within the Sixes River and New River Frontal 5th field watersheds, although at a site-specific scale. There would be no cumulative effects to coho, CCH, Special Status Species habitat, or EFH from harvest or road activities at the 6th or 5th field watersheds. The potential increase of sediment from the proposed road related activities, when added to land management practices lands within the analysis area, would not affect fish habitat at the 6th or 5th field watershed scale. The cumulative effects are within the scope of anticipated effects to aquatic resources including fisheries analyzed in the Coos Bay District RMP EIS (USDI 1994).

Water Resources

The proposed harvest units are located in the New River Frontal and Sixes River Watersheds (approximately 155 and 134 square miles respectively); this combined area is the analysis area for the purposes of analyzing water resources in this EA. Watershed is defined as the 5th field hydrologic unit level. The ID Team used a smaller, *subwatershed* scale to analyze the Six Twigs proposed project to more accurately detect potential effects. A subwatershed refers to a 6th field hydrologic unit, which varies from about 26 to 44 square miles within the analysis area (**Table 3-14**). The rationale is that adverse or beneficial effects to water resources are more accurate to detect in smaller catchments (Bosch and Hewlett 1982). **Table 3-14** below shows the location and scale of the project by subwatershed. The three subwatersheds shown below comprise the analysis area.

Table 3-14 Location and Area of Proposed Harvest by Subwatershed.

Watershed (5th field)	Subwatershed (6th field)	Harvest Unit No.	[1]Harvest unit acres	[1]Square Miles	[1]Acres	[1]Harvest Acres	Percent of Subwatershed
New River Frontal	Floras Creek	9	5	41	26,506	101	0.38
		11	16				
		12	4				
		16	42				
		17	29				
		18	5				
Sixes River	Middle Sixes	4	44	44	27,973	65	0.23
		7	5				
		8	16				
	Lower Sixes	3	22	26	16,564	51	0.31
		4	19				
		5	7				
		6	3				
	Totals		**217**	**111**	**71,043**	**217**	0.31

[1]Approximate values based on GIS data

Stream Flow and Annual Yield

The analysis area is within the Southern Oregon Coastal Basin and has a Mediterranean type of climate characterized by cool, wet winters and warm, dry summers. The volume of stream flow closely parallels the precipitation pattern. Most of the yearly precipitation total occurs between November and March. Therefore, peak stream flows occur during the same period, and the lowest stream flows occur from July to October. The majority of precipitation is in the form of rain; however, some snow is likely at higher elevations in most years. Average annual precipitation ranges from 60 inches per year in the coastal lowlands to 140 inches per year in the upper elevations of the watersheds (USDI 2008d). Within the analysis area, approximately 95 percent of first- and second-order headwater streams are intermittent and have no surface flow during the dry season in most years. There are two small, second order perennial tributaries to Crystal creek that are adjacent to Units 3, 5 and 6. The northwest corner of Unit 4 is 450 feet away from Crystal Creek. These perennial streams are buffered at least one full site-potential tree (180 feet) mitigating any measurable impact from harvest activities.

Peak Flows and Forest Harvest

Peak flows in this analysis are defined as greater than or equal to the 1-year recurrence interval flood unless noted otherwise. This threshold is used because flows below this level are not likely to affect stream channel morphology (Grant *et al.* 2008). The mechanism by which peak flows are affected by harvest depends on the peak-flow generating process in a watershed. Peak flow processes are categorized into three zones as rain-dominated, rain-on-snow, or snowmelt (WPN 1999, pp. IV-7 to IV-11). These zones are largely a function of elevation in a particular region. For the analysis area, the rain-dominated zone occupies the coastal lowlands and the rain-on-snow (ROS) zone occurs above approximately 2,000 feet. There is less than 3 percent of the proposed harvest acres total within the rain-on-snow zone. The effect of harvest in the rain-on-snow zone would be indistinguishable from any effects of harvest outside of the ROS zone and therefore is not analyzed.

The greatest potential for forest harvest to change peak flows is by altering the amount of snow accumulation and subsequent melt rates in the rain-on-snow zone (Harr 1986, Harr and Coffin 1992, WDNR 1997). For example, warm winds or rain-on-snow events can melt snow accumulation rapidly and create higher than normal flows. Proposed Units 3, 5, 8, 9, 11 and 12 in the three subwatersheds have portions that are within the rain-on-snow zone; however, only a small portion of each subwatershed is in the rain-on-snow zone with 6 percent within Floras Creek, 4 percent within Middle Sixes, and 2 percent within Lower Sixes (**Table 3-15**).

The rain-dominated zone accounts for approximately 94 percent to 89 percent by subwatershed with an average of 95 percent for the entire analysis area. Oregon's Watershed Assessment Manual states that watersheds with greater than 75 percent in the rain-dominated zone have low potential risk of peak-flow enhancement from timber harvest (WPN 1999, p. IV-9). In other words, even with the entire rain-on-snow zone in an open condition there would be a low risk of peak flow increase in any of the affected subwatersheds. Therefore, the proposed harvest units located in the rain-on-snow zone would not affect peak flows by rain-on-snow events and these effects are not discussed further in this analysis.

Annual Yield, Low Flow, and Forest Harvest

Timber harvest can increase annual water yield and the magnitude of low flows by reducing evapotranspiration and interception (Harr *et al.* 1982). In an overview of several studies, Satterlund and Adams (1992, p 253) found that the effect on streamflow is generally proportional to the amount of vegetation removed. From looking at several paired watershed studies, Stednick (1996) found that about 25 percent of a watershed in the Pacific Coast region needed to be harvested to detect an increase in annual yield. A review of studies by Moore and Wondzell (2005) found that periods of extreme low flow decreased for at least the first few years after harvest in rain-dominated areas. An increase in water yield, especially during summer and early fall low flow periods, is perceived as a net benefit in most cases (WDNR 1997, p. C-44). In some cases, vegetation removal has been used as a tool to increase available water.

Table 3-15 Rain-on-snow Area and Risk for Increase in Peak Flows.

Subwatershed (6th field)	Acres[1]	Rain-on-snow Zone Acres[1]	Percent of Subwatershed	Harvest Unit in RSZ	Harvest Units in RSZ[1]	Percent of Harvest Acres in RSZ	Risk for Increase in Peak Flows[2]
Floras Creek	26,506	1,660	6.26	12	4	4.52	Low
				16	42		
				17	25		
				18	5		
Middle Sixes	27,973	1,200	4.29	8	4	0.30	Low
Lower Sixes	16,564	260	1.57	3	3	1.59	Low
				5	1		
Totals (Ave.)	71,043	3,120	(4.39)	N/A	83	(2.65)	Low

[1] Approximate values based on GIS

[2] Risk level from Oregon Watershed Assessment Manual (WPN 1999, pp. IV 9 – 11) Low is defined as approximately 15% of forestry related action on 100% of land within the ROS zone with less than 30% crown closure

Moisture from fog or low clouds intercepted by the forest canopy may also be a factor in the annual water balance of coastal areas. A study in the H. J. Andrews Experimental Forest near Springfield OR showed that forest harvest in foggy, coastal areas can actually decrease annual yield as there is less leaf area to capture the moisture (Harr 1982). This effect is difficult to measure (Jones 2000), and would be immeasurable in the analysis area due to the existing environmental factors such as the relatively small harvest area compared to the surrounding non BLM harvested lands.

In most cases, harvested areas do not permanently change water yield. As trees are replanted and grow, evapotranspiration would increase over time thereby reducing annual yield to previous levels (Jones and Grant 1996, Thomas and Megahan 1998, and Jones 2000). Equivalent Clearcut Area (ECA, see Reid 1993 for a review) has been used to calculate the change in water yield for a basin from past and future harvest activity. The ECA model generates the cumulative effect of harvest by comparing the total vegetative disturbance in a catchment to an equivalent clearcut area.

One ECA model on the Umatilla National Forest (Ager and Clifton 2005) uses a post-harvest recovery rate (increase in evapotranspiration) of 4.3 percent per year for moist forests with full recovery at 23 years. These recovery values and harvest history were used to calculate ECA. Harvest history was based on the Oregon Department of Forestry Change Detection History maps (Lennartz 2005), USGS Landsat images (USDI 2014c), and aerial photos. These data cover harvest history from 1972 to present. Areas harvested and replanted 25 years ago (before 1984) were assumed to be fully recovered. Using these values, **Table 3-16** below shows the equivalent percent harvested as the existing condition of the analysis area in terms of ECA. Equivalent percent harvested varies from about 14.9 percent (Lower Sixes) to 26.2 percent (Floras Creek) by subwatershed.

A simple hydrologic model was used predict the potential increase in annual yield from equivalent percent harvested. It is based on the principle that annual water yield or runoff (RO) is equal to the amount of annual precipitation (P) minus water lost through evapotranspiration (ET), plus or minus the change in storage (S). Thus, the complete runoff formula is $RO = P - ET + \Delta S$. Because the annual amount of precipitation going into storage tends to balance out year-to-year over time, it is typically ignored in long term considerations of water yield (Satterlund and Adams 1992, p 5). Therefore, the simplified formula used in this analysis is $RO = P - ET$.

Table 3-16 Equivalent Clearcut Area and Existing Increase in Annual Yield by Subwatershed.

Subwatershed (6th field)	Forested Acres[1]	Existing ECA (acres)[2]	Equivalent Percent Harvested	Existing increase in Annual Yield (inches)[3]	Increase in Annual Yield[4]
Floras Creek	26,039	6826	26.2	6.6	10.1
Middle Sixes	27,984	4850	17.3	4.3	6.7
Lower Sixes	13,540	2012	14.9	3.7	5.7
Total (Ave.)	67,563	13,688	(20.3)	5.1	(7.8)

[1] Based on ODF Change Detection History (2005)
[2] GIS calculation based on ODF data above, 2014 Landsat imagery, aerial photos, and Ager and Clifton (2005)
[3] Based on a 2.5 inch runoff increase for each 10 percent harvested (Stednick 1996)
[4] Based on average annual yield of 65 inches (precipitation of 90 inches minus evapotranspiration of 25 inches)

The average annual precipitation in the analysis area is approximately 90 inches. Therefore, RO = 90 inches – ET. Based on a review of the literature (Jones and Grant 1996, Thomas and Megahan 1998, Jones 2000, Zeimer 1981), the Douglas-fir/western hemlock forests of the Pacific Coast generally have an average annual evapotranspiration of approximately 25 inches. So, in the undisturbed state, RO = 90 inches – 25 inches, or about 65 inches. Assuming the decrease in evapotranspiration is proportional to the amount of vegetation removed, every 1 percent harvested would result in a decrease of 0.25 inches in evapotranspiration (1 percent of 25 inches total evapotranspiration) and a corresponding increase in runoff of 0.25 inches. **Table 3-16** shows the change in annual yield by subwatershed based on existing (2014) percent harvested area. The percentage increase in annual yield ranges from 5.7 to 10.1 percent with an average 7.8 percent increase. If measurable, this change would be most noticeable as an increase in summer and early fall streamflow compared to an undisturbed condition.

Peak Flows and Roads

Roads have the potential to increase peak flows (Beschta 1978, Wemple *et al.* 1996). Mid-slope roads can intercept surface and subsurface water, divert it into the road drainage system, and then into streams. This can effectively extend the stream channel network and speed up delivery of water to streams because surface flow on roads and ditchlines is much faster than normal subsurface flow in soils of the adjacent hill-slopes. Roads or road segments that drain directly into stream channels have been termed "hydrologically-connected" roads (Furniss *et al.* 2000).

Most paired-watershed studies used to detect the hydrologic effects of road building have included clear-cut timber harvest. The range of various results for paired-watershed studies have shown that the

combination of forest harvest and roads can increase the size of peakflows, decrease the size of peak flows, or have no extensive effect (Harr and McCorison 1979, Austin 1999, and Moore and Wondzell 2005). The greatest response has been measured in small peak flows (< 1 to 2 yr. return interval) and small catchments (< a few km^2). Two studies of small coastal basins, one in western Washington by Bowling and Lettenmaier (1997), and one in the Oregon Coast Range by Harr *et al.* (1975) documented peak flow increases of 11 and 20 percent respectively for low peak flow events. Small peak flows have little effect on channel form compared to larger events. Large peak flows (> 5 yr. return interval) which can scour stream channels, modify floodplains, and carry tremendous quantities of sediment have not been affected in paired watershed studies (Harr 1976 and Rothacher 1973).

In larger catchments, peaks may be smoothed out due to changes in flow timing from adjacent watersheds. As small streams form increasingly larger drainage networks, the ability of individual small watersheds to affect flow decreases (Garbrecht 1991). As a result, peak flow increases following harvest or road-building at the drainage level are likely to be undetectable farther downstream. Therefore, analysis of larger watersheds generally has not been able to document road-induced increases in peak flows.

Although changes to stream flow from roads has been difficult to measure, the causal mechanisms are well understood. Changes to subsurface flow paths, and their relative contribution to surface stream flow, depend on the location and design of the road. A study by Wemple and Jones (2003) determined that hillslope length, soil depth, and cutbank depth largely determined the difference in flow magnitude and timing between catchments and between storm events. The simplest way to ameliorate the hydrologic effect of mid-slope roads is to disconnect them from the stream network. This can be accomplished by increasing the number of drainage structures (cross drains, water bars, out-sloping the road prism, etc.) and improving their placement and design.

A method for assessing the potential risk of the road network to cause an impact on stream flow was developed for the Governors Watershed Enhancement Board (GWEB). The assessment assigns a "threshold of concern" for hydrologic impacts based on the percentage of catchment area covered by roads. The threshold levels are 0–4 percent low risk, 4–8 percent moderate risk, and above 8 percent high risk (WPN 1999 p IV-15). **Table 3-17** below illustrates percent area covered by roads and the risk level for the three affected subwatersheds. The existing GIS layer for roads was based on 2009 data. However, a review of 2014 aerial photos shows an increase in road mileage since then. Based on a sample analysis of drainages in the project area, road mileage has increased about 40 percent in the analysis area between 2009 and 2014. This 40 percent increase was used to estimate road mileage across the analysis area for 2014.

Table 3-17 Road Area and Hydrologic Risk Level by Subwatershed.

Subwatershed (6th field)	Area (square miles)	Road Length 2009 (miles)[1]	Road Length 2014 est. (miles)[2]	Road Area 2014 est. (square miles)[3]	Percent Road Area	GWEB Risk Level
Floras Creek	41.4	125	175	1.00	2.42	Low
Middle Sixes	43.7	122	171	0.97	2.22	Low
Lower Sixes	25.9	61	85	0.48	1.85	Low
Totals (Ave.)	111	308	331	(1.89)	(1.70)	Low

[1]Approximate values are based on 2009 GIS data
[2]Estimate based on a 40 percent increase in road mileage from 2009 to 2014 and rounded up to show no effect from increase road miles
[3] Based on an average road width of 30 feet (0.0057 miles)
[4] 0–4 percent low risk, 4–8 percent moderate risk, and above 8 percent high risk (WPN 1999 p IV–15)

Percent area covered by roads is between 1.85 percent and 2.42 percent with an average for the analysis area of 1.70 percent. Therefore, according to the GWEB method, the affected subwatersheds currently have a low risk (less than 4 percent road area) of hydrologic impacts due to roads. However, as stated by the authors, the condition of roads and the design of drainage systems may be just as important in determining the impact of roads on stream flow. However, the drainage systems of some legacy roads in the analysis area, including portions of the proposed haul route, are directly connected to stream channels. The affect existing roads have on stream flow would be mitigated by Best Management Practices to address road runoff, and sediment delivery and therefore would not be a measurable effect.

Water Quality

Sedimentation and stream temperature are the primary water quality parameters likely to be affected by past forest management in the project area. The Oregon Department of Environmental Quality (ODEQ) develops water quality standards that protect beneficial uses of rivers, streams, lakes, and estuaries. Domestic water supply and fish and aquatic life are two beneficial uses of water that could be affected by the project. Water bodies that do not meet water quality standards are placed on the States' 303(d) list as Water Quality Limited (ODEQ 2012).

Stream Temperature

Floras Creek, South Fork Floras Creek, North Fork Floras Creek, East Fork Floras Creek, Edson Creek, Crystal Creek, Willow Creek, and the Sixes River are listed for high stream temperature. Elevated stream temperatures can be caused by a lack of stream shading because a reduction in shade increases the amount of solar radiation reaching the stream surface (Brown and Krygier 1970 and Moore and Miner 1997). As noted above, some of the larger streams in the affected subwatersheds are listed for not meeting temperature standards. However, small streams within or adjacent to the proposed units are currently well shaded by dense stands of conifers, some hardwoods, and brush and are located within full riparian buffers of one site tree (180 feet). The proposed project would have no impact on stream temperatures.

Sediment

No streams in the analysis area are currently listed for sedimentation. Natural and management-related processes introduce sediment to stream channels. Natural sediment sources include hillslope erosion, episodic landslides, and stream bank erosion. Harvest operations and roads can also contribute sediment to stream channels. Management-related increases in sedimentation are most often the result of poorly designed and poorly maintained forest roads. Poorly designed and poorly maintained roads can be a major contributor of fine sediment to streams (Reid and Dunne 1984).

Sediment delivery to streams from roads is caused by down cutting of ditch lines and by erosion of unprotected road surfaces from overland flow. Landslides can occur when road drainage is concentrated on unstable or erosive slopes. In addition, failure of inadequately sized or plugged road/stream crossings has the potential to deliver large inputs of sediment to streams. Reid and Dunne (1984) and others found that the amount of sediment produced by a road is highly dependent on the location, amount of use, surface type and other factors. They 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 percent as much sediment as a heavily used gravel road. It is also important to note that the roads must be hydrologically 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.

There are no streams in the affected subwatersheds currently listed by DEQ as impaired by excess fine sediment. However, observation of the road network in the proposed project area by BLM personnel indicates that portions of (Plum Trees, Crystal Creek Mainline) roads proposed for haul are not able to meet BLM standards for winter haul. Adjacent streams have been subject to episodes of excess fine

sediment input due to poor road design and inadequate maintenance. This could cause future washouts and subsequent debris flows.

Most stream crossing and road drainage culverts in the affected area are constructed of corrugated metal. The useful life of these culverts is approximately 25-30 years. Some of the existing culverts are much older and are rusted, undersized, damaged, filled by debris, or are otherwise in poor condition and are at risk of failure within the next 5-10 years (**Table 2-6**).

No Action Alternative

Under the No Action Alternative the BLM would propose timber harvest in another location to meet the District timber harvest commitment from Matrix lands. Private land management could continue to have timber harvest activities and road construction and maintenance. These actions would have an impact on current hydrologic conditions in the analysis area but are beyond BLM control. There would also be the natural variability of degradation, reforestation, and rehabilitation within the analysis area. Stream flow and water quality would also depend on the frequency and intensity of non-BLM operations, road maintenance, traffic, and future BLM operations.

Proposed Action Alternative

New road construction, road renovation, and regeneration harvest described in Chapter 2 would take place. A combination of ground-based and cable yarding would be used where appropriate to minimize ground disturbance and the number of access roads. The proposed project includes harvest only outside the Riparian Reserve. Wet areas and seeps/springs would be flagged out and protected from ground disturbing activities.

The proposed project has 3.5 miles of new construction of road and one intermittent stream crossing; 9.54 miles of renovation on existing roads with 7 intermittent stream crossings. Road No. 31-14-6.0 has six cross drains scheduled to be replaced and one new cross drain installed all for ditch relief.

Stream Flow – Peak flow, low flow, and annual yield

Peak Flows and Forest Harvest

A synthesis of forest harvest effects on peak flows (Grant *et al.* 2008) based primarily on small, paired-watershed studies concluded that rain dominated regions are less susceptible to peak flow increases compared with those in the rain-on-snow zone. When increases did occur, they primarily affected low flows (summer season). In addition, study results of harvest treatments for the rain-dominated zone included the effects of roads and other harvest practices (primarily through soil compaction) that can also increase peak flows (see Peak Flow and Roads below). The authors noted that most of the studies involved clear-cutting a large portion of small catchments (< 4 mi^2) and likely represented the maximum effect possible. They also state that effects to flow should diminish, or at most remain constant, with increasing watershed size. Reported increases in peak flows for larger basins (subwatershed scale and larger) have been less than the interannual (occurring between two or more years) variation in streamflow for the same period.

Under the Proposed Action Alternative, harvest-related peak flow increases in stream reaches draining regeneration units may occur due to reductions in interception and evapotranspiration, but the magnitude of such events would not likely alter the stream channel morphology.

The Grant *et al.* (2008) synthesis set the minimum level for risk of increasing peak flows in rain-dominated watersheds at 29 percent of the watershed harvested. Using an Equivalent Clearcut Area (ECA) approach to determine whether a proposed harvest would approach this 29 percent threshold. The ECA calculation for the existing percent harvested is discussed in detail under the Affected Environment

section. The ECA calculation conducted for this analysis resulted in an existing percent harvested area between about 15.2 percent (Lower Sixes) and 26.6 percent (Floras Creek) with an average of 20.6 percent for the analysis area (**Table 3-18**). The resulting percentages are well below the minimum reported level for risk of increasing peak flows.

The increase in equivalent percent harvested area that would result from the proposed project, by subwatershed, ranges from 0.24 percent in Middle Sixes to 0.39 percent in Floras Creek with an average of 0.34 percent for the analysis area. These percentages are so miniscule that increases in peak flows as a result of the proposed harvest would not be measurable.

Table 3-18 Equivalent Clearcut Area (ECA) and Equivalent Percent Harvest (EPH).

Subwatershed (6^{th} field)	[1]Forested Acres	Existing ECA (acres)[2]	Existing EPH	Proposed Harvest Acres	Proposed EPH	Cumulative EPH	Cumulative % Increase[3]
Floras Creek	26,039	6826	26.6	101	0.39	26.6	0.00
Middle Sixes	27,984	4850	17.6	65	0.24	17.6	0.00
Lower Sixes	13,540	2012	15.2	51	0.38	15.2	0.00
Total (Ave.)	*67,563*	*13,688*	*(20.6)*	*217*	*(0.34)*	*(20.6)*	*0.00*

[1] Based on ODF Change Detection History (2005)
[2] GIS calculation based on ODF data above, 2014 Landsat imagery, aerial photos, and Ager and Clifton (2005)
[3] Note that with rounding there is an infinitesimal percent increase and therefore is not considered for the analysis.

Table 3-18 also shows results of the cumulative ECA calculation for this analysis. The cumulative percent harvest in the analysis area would range from approximately 15.2 percent to 26.6 percent for the affected subwatersheds with an average value of 20.6 percent for the analysis area. This level of harvest is below the 29 percent minimum threshold suggested by Grant *et al.* (2008) for risk of increasing peak flows in rain-dominated catchments.

The 29 percent level published by Grant *et al.* is a very conservative number. In fact, the authors state that the "first detectable reported value [in the paired watershed studies] occurs at 40 percent. The response line for mean reported change crosses the detection limit at 45 percent harvest."

The Grant *et al.* synthesis was based primarily on paired watershed studies to determine the effect of harvest on peak flows. However, based on physical processes of the water cycle in rain-dominated watersheds, there is little evidence to link large peak flows (> 1 year events) with harvest alone. In rain-dominated watersheds the three dominant physical processes also affected by removal of vegetation are (A) evapotranspiration, (B) direct interception, and (C) cloud water interception in order of dominance (Grant *et al.* 2008). All of these processes are part of the effect of low flow, peak flow, and annual yield. For rain-dominated watersheds, these factors are negligible when compared to large rain events. For example, the largest flow in Floras Creek during the 2014 water year occurred on December 21, 2014 and measured 5,560 cfs (OWRD 2015). This is roughly equivalent to a two-year recurrence interval flood which is estimated at about 5,750 cfs (OWRD 2015). Rainfall measured at the Bandon AgriMet Station that caused this peak flow event occurred over 3 days from December 18-20, 2014 and totaled 4.16 inches (BANO 2015). There are no rain gages in the higher elevations, but since rainfall increases with elevation in this area, a reasonable estimate would be approximately 6 inches of rain in the Floras Creek watershed over 3 days.

Evapotranspiration - Evapotranspiration amounts to about 25 inches per year in the analysis area. This would be an average of 0.07 inches/day (25 inches/365 days). However, in the winter when large peak flows occur, evapotranspiration would be less than half the average value or less than 0.035 inches/day. If all of the vegetation in the watershed was removed, this would be about 0.1 inch (0.35 inches/day

multiplied by 3 days) of evapotranspiration or 1.7 percent of the storm (0.1 inches evapotranspiration/6 inches total rainfall. Ziemer (1981) also determined that changes to evapotranspiration (i.e., from forest harvest) are not important to peak flows in the coastal region because larger peaks occur during winter when precipitation is high and evapotranspiration is low. During summer and fall low flows, when precipitation is low and evapotranspiration is high, flow can be increased by a reduction in evapotranspiration due to timber harvest. However, these increases in seasonal low flows have an immeasurable effect to downstream resources (Ziemer 1981).

Direct Interception - This factor is also important during dry periods when a large portion of rainfall can be captured by the forest canopy. Rainfall may be delayed in reaching the soil surface or never reach the soil if evaporation rates are high as during summer. However, evaporation rates are low during winter and the canopy is likely to be saturated from antecedent moisture. Prior to the example storm above, approximately 26.5 inches of rain fell between the start of the water year on October 1, 2014 and the peak flow on December 20. Ziemer (1981) concluded that during these large rainfall events "interception becomes an insignificant factor affecting runoff patterns."

Cloud water interception - This effect is difficult to measure (Jones 2000), but is likely to occur in the analysis area. If cloud water interception occurred during the example peak flow, removal of vegetation would have the effect of decreasing the peak flow as less water would be captured by the forest canopy (Grant *et al.* 2008).

Therefore, based on the negligible effect of these three physical processes during large rain events in the analysis area, there would be no effect to peak flows as a result of the proposed harvest.

Annual Yield and Low Flow

The proposed project would result in a slight increase in the average annual yield in the analysis area due to decreased evapotranspiration. **Table 3-19** shows the calculated increase in annual yield as a result of the proposed project (see Affected Environment/Annual Yield and Low Flow for a description of methods). Percent increase in annual yield would range from 0.08 to 0.15 percent (0.05 to 0.1 inches) with an average of 0.12 percent (0.08 inches) for the analysis area. This increase is negligible and is much less than the annual variation in precipitation and runoff. Any potential increase in annual yield would cease once trees regrow and become established decreasing infiltration rates of precipitation to the soil and groundwater as well as absorbing precipitation before it forms into runoff.

Table 3-19 also shows the cumulative increase in annual yield the proposed harvest. The cumulative post-project increase value would be between 6 percent (Lower Sixes) and 10 percent (Floras Creek) with an average 8 percent (5.15 inches) increase.

A 10 percent change in annual yield or runoff is often used as the minimum detectable level. Therefore, the cumulative increase in annual yield for the Floras Creek subwatershed would just meet the detectable level. The Oregon Department of Water Resources gage on Floras Creek had about 87 inches of runoff or about 272,400 acre-feet for the 2012 published water year (ODWR 2015). The analysis above shows this is about 10 percent or 27,000 acre-feet more than it would be compared to a baseline, undisturbed condition (fully vegetated with no fire, disease, or insect damage). Detection of any effects from the Proposed Alternative would immeasurable.

Table 3-19 Increase in Annual Yield from Proposed Harvest.

Subwatershed (6th field)	[1]Equivalent % Harvested	Increase in Annual Yield from PA (in)[2]	Percent Increase in Annual Yield[3]	Cumulative Increase in Annual Yield (in) [4]	Cumulative % Increase in Annual Yield[5]
Floras Creek	0.39	0.10	0.15	6.65	10
Middle Sixes	0.24	0.06	0.08	4.39	7
Lower Sixes	0.38	0.10	0.15	3.81	6
Total (ave.)	*0.34*	*0.08*	*0.12*	*5.15*	*8*

[1] From **Table 3-16**
[2] Based on a 2.5 inch runoff increase for each 10 percent harvested (Stednick 1996)
[3] Based on average annual yield of 65 inches (precipitation of 90 inches minus ET of 25 inches)
[4] Based on a 2.5 inch runoff increase for each 10 percent harvested (Stednick 1996)
[5] Based on average annual yield of 65 inches (precipitation of 90 inches minus ET of 25 inches)

Peak Flows and Roads

The 3.5 miles of proposed new road construction would increase road area approximately 1.6 percent in the analysis area. The cumulative percent road area would be between 1.85 percent (Lower Sixes) and 2.42 percent (Floras Creek) with an average of approximately 1.7 percent for the analysis area (**Table 3-20**). Using the GWEB model, this is still well within the low (< 4 percent) risk of concern for hydrologic impacts.

All of the new roads except Road No. 08-2.1, constructed for the proposed project would be located on or near ridge tops. Ridge-top roads have little potential to modify subsurface flow paths. Road No. 08-2.1 would cross an intermittent stream to access Unit 8. These new roads would incorporate design features that reduce effects to streamflow. Road drainage features for new road construction would be designed so that surface water would be diverted onto and infiltrate into forest soils. Specifications for the design and spacing of drainage structures are located in Chapter 2, Design Features for the Proposed Action. Therefore, when properly maintained, these roads would have an immeasurable effect on flow routing or peak flows in the affected watersheds.

The new intermittent stream crossing to access Unit 8 would be temporarily installed for all-season use and removed after harvest. Therefore, this crossing would not add to the drainage network and would be decommissioned post-harvest activity.

Table 3-20 Risk of Hydrologic Impacts with New Road Construction.

Subwatershed (6th field)	Area (square miles)	Road Length 2009 est. (miles)[1]	New Road Construction from project (miles)	Total Road Area 2014 est. (square miles)[2]	Percent Road Area	GWEB Risk Level
Floras Creek	41.4	125	1.5	1.0	2.42	Low
Middle Sixes	43.7	122	1.3	1.0	2.22	Low
Lower Sixes	25.9	61	0.7	0.5	1.85	Low
Totals (Ave.)	111	308	3.5	2.5	(1.70)	Low

[1] From **Table 3-15.**
[2] Based on an average road width of 30 feet (0.0057 miles) and from **Table 3-15** road lengths.

Approximately 9.54 miles of existing haul road would be renovated. Renovation would include installation or repair of drainage features including cross drains and ditch lines. Renovation would be designed to effectively disconnect the roads from the stream network. Therefore, considering the negligible effect of new road construction, renovation of these legacy roads would result in a net benefit to flow routing in the analysis area. Any yarding corridors in the Riparian Reserve for Unit 3 would not contribute to any additional flow due to the quantity and size of the corridors (up to 3 corridors no more than 12 feet wide, or up to 4 acres).

Water Quality

Stream Temperature

Shade would not be reduced and stream temperatures would not be increased as a result of the proposed harvest. Full Riparian Reserve buffers would remain throughout the project area. Site potential tree height is 180 feet for Sixes and 200 feet for the Floras subwatersheds. Brazier and Brown (1973) found that maximum angular canopy density (direct shade from solar radiation) was reached within a width of 80 feet from the small streams in their study. Therefore, due to the much wider Riparian Reserve buffers, there would be no potential for an increase in solar radiation and stream heating from the proposed harvest. Corridors in Riparian Reserve in Unit 3 would not be numerous (approximately three) or large (approximately 12 feet) enough to show any measurable effect on temperature.

Sediment

Sediment delivery from felling and yarding operations would be negligible. A recent study across the state of Washington, by Rashin *et al.* (2006) showed that 10 meter buffers were effective at preventing sediment delivery to streams from harvest operations. Therefore, due to the much wider Riparian Reserve buffers and project design features that include full suspension across stream channels, there would be no potential for an increase in sediment delivery to streams from yarding and felling operations.

The proposed project includes road work and hauling activities that could potentially affect the volume of sediment reaching stream channels. The project includes renovation and decommissioning of roads that have poor drainage, show signs of erosion and are a known source of fine sediment to stream channels. Proposed road renovation/decommissioning would potentially reduce the volume of fine sediment entering stream channels. The effects of proposed road work and use are analyzed below by category.

Road Construction

Approximately 3.5 miles of natural or rocked surface road would be constructed to access harvest units. Of this amount, approximately 3.47 miles would be constructed on or near ridgetops. Ridgetops do not have enough runoff potential to generate measurable amounts of sediment delivery and all the ridge top roads are approximately 200 feet away from any headwaters providing sufficient filtration to prevent sediment from entering streams. Unit 8 would require approximately 0.45 miles of new, mid-slope road across one intermittent stream. The proposed new roads and landings would incorporate design features that avoid fragile or unstable areas, minimize excavation and height of cuts, require endhaul of waste material where appropriate, and require construction during the dry season (USDI 1995, pp. D3–D4). Road drainage features would be designed so that any sediment-laden surface water would quickly infiltrate into forest soils. Therefore, when properly maintained, these roads would have a negligible effect on sediment delivery to stream channels and would have little potential to affect water quality.

One new intermittent stream crossing to access unit 8 would be temporarily installed to support all season haul and pulled after harvest. Soil disturbance from installation and removal of one temporary stream culvert would cause a short-term increase in sediment delivery, that would be unnoticeable in the overall drainage system. This soil disturbance would be minimized due to the use of BPMs designed to protect water quality (USDI 1995, pp. D3–D4). Even so, it is estimated that 1–5 tons (~1 to 4 cubic yards @ 2,500 lbs/yd^3) of sediment could enter the stream from the crossing during the first few major storm events in the winter after work is completed. This would be seen at the site level as a temporary increase in stream turbidity. These roads would have no potential to affect sediment delivery.

For comparison, due to high rainfall and geologic type, average annual sediment yield for basins in southwest Oregon may vary from 5,000 to 8,000 tons per square mile per year on average (Reiter and Beschta 1995). Therefore, the total of any temporary input of sediment from constructing the proposed stream crossing would be immeasurable compared to background levels.

Road Renovation/Reconstruction/Improvement

Approximately 9.54 miles of the existing, proposed haul route would be reconstructed, renovated, or improved. Some renovation of spur roads would meet dry season standards and would not be surfaced. Renovation of these roads to standards required for new construction (USDI 1995, pp. D3–D4) would divert road drainage away from stream channels and toward the forest floor where it could re-infiltrate. Renovation may include but is not limited to surfacing with rock, stabilizing cutbanks and fill slopes, restoring outslope or crown sections, restoring adequate drainage, and improving stream crossings. Some of these roads have sections with ditch lines and cross drains that flow directly into headwalls or stream channels. Renovation of these roads would reduce their potential to deliver sediment to stream channels.

Road reconstruction, renovation, and improvement would occur in the dry season. The project would include replacement of one stream crossing culvert. Several ditch relief culverts (cross drains) would also be replaced in order to provide additional drainage while upgrading road grade and surface conditions. Renovation would have a minor, short-term (1–2 years) potential for increased sediment caused by soil displacement activities including the placement of upgraded culverts and associated fill material. In contrast, renovation would provide a long-term (>2 years) benefit to flow routing and water quality in the affected subwatersheds.

Road Decommissioning

Approximately 0.8 miles of the newly constructed roads would be decommissioned long-term when project activities associated with each road are completed. Decommissioning may include but is not limited to; pulling stream crossings, installing waterbars, and blocking the road with a suitable barrier. All disturbed soils associated with new construction of natural surface roads and landings would be seasonally maintained prior to winter rains if planned to be used the following year. Seasonal maintenance may include but is not limited to providing adequate water bars, mulching with wood chips or straw, and seeding with a district approved erosion-control seed mix. The roads are not expected to increase sediment delivery to stream channels due to their locations, intervening forest buffers, and distances to streams. Therefore, the new roads and landings would have little potential to affect water quality.

Decommissioning for Road No. 8-2.1 would be designed to restore natural hydrologic flow and may include but is not limited to tilling, removal of unstable fills, removal of cross drains, construction of water bars, removal of stream crossings, and construction of a suitable barrier to block access. Decommissioning of roads in Units 6, 8, and 17 would reduce the potential to deliver sediment to stream channels or alter flow routing in the affected drainages. Decommissioning would have a minor, short-term (1-2 years) potential for increased sediment. In contrast, decommissioning would provide a long-term (>2 years) benefit to flow routing and water quality in the affected drainages.

Haul Activities and Road Maintenance

Access to the proposed units for log hauling would be from rock surfaced roads for all-season haul, or from natural surface roads during the dry season (generally June 1 – Oct 15). Approximately 9.54 miles of the roads would require some renovation or improvement as described above (and as shown in **Table 2-5**). Hauling would be restricted where road surfaces have inadequate rock surface for wet season haul. During the dry season, there would be a negligible change in sediment delivery to streams as a result of haul on the proposed main haul routes and spurs. During the winter wet season, hauling activities have the potential to increase sediment delivered to stream channels.

The BLM would require design features listed in Chapter 2 to minimize the potential for increased sediment delivery from haul activities. These design features would be in place before winter haul and may include but are not limited to; applying an additional lift of rock to stream crossings if there is a

potential for road sediment delivery to a stream; containing any offsite movement of sediment from the road or ditch flow near streams with silt fence, straw bales, or sediment entrapping blankets; monitoring road conditions during winter use to prevent rutting of the rock surface; and suspending haul during very wet conditions. In addition, if the ground is already saturated from winter rains and more than 1 inch of precipitation is predicted in the project area over the next 24 hours, then winter haul would be suspended. Operations may resume after the 24-hour suspension, except when another storm (exceeding 1 inch) is forecasted.

Road maintenance during the life of the project would minimize road drainage problems and reduce the possibility of road failures and increased sediment delivery to streams. 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 in the road surface. To prevent sediment-laden water from entering the stream network, maintenance of roadway ditchline segments that drain directly into stream channels would be conducted only during the dry season; however, work on these ditchline segments could be conducted outside this period when appropriate protection of water quality and soils are applied to these specific sites. Road maintenance of the haul route across private lands would be performed by the BLM or adjoining private landowner depending on the road-use agreement.

The use of these roads is expected to be short term and limited by weather conditions as specified in the site specific project design features. Though some minor sedimentation may result from the additional operations, occurrence should only take place during prolonged rainfall events (until haul is suspended as noted above). Further, due to the steady level of private haul presently on these roads, additional amounts would be negligible and not outside levels that presently occur during such rainfall events.

Most of the gravel-surfaced haul-routes are under private control and may be used extensively throughout the year by private timber companies. The winter use of roads for the proposed project would be minimal, about five trips per day. Access to all units is limited by locked private industry gates thus limiting sediment delivery from other users. Therefore, the amount of fine sediment introduced to streams during haul activities would be indistinguishable beyond natural erosion processes occurring during winter rains.

Cumulative effects – Road connectivity

The cumulative effects of road connectivity and sedimentation are closely tied together because fine sediment is transported and delivered to streams by surface water flowing from the road network. Best Management Practices for maintaining water quality and soil productivity (USDI 1995, pp. D3–D4) and the implementation of design features would be used to limit excess sediment delivery from roads and construction areas to acceptable levels.

Table 3-17 (Road Area and Hydrologic Risk Level by Subwatershed) represents the cumulative effect of road connectivity from past actions. Using the GWEB method, the affected subwatersheds currently have a low risk (< 4 percent road area) of hydrologic impacts due to roads.

Table 3-20 (Risk of Hydrologic Impacts with New Road Construction) represents the cumulative effect of road connectivity from the new road construction. The project would result in a net increase of approximately 3.50 miles to the total 331 miles of road in the analysis area. The proposed project would decommission a total of 0.8 miles of road, which would disconnect some new road construction from the road network (Road No. 8-2.1. The BLM expects the amount of hydrologically connected road in the analysis area controlled by BLM will remain low in the foreseeable future.

Given the above analysis the project would have a low or immeasurable cumulative effect on water resources within the project area and subwatersheds beyond what is currently occurring.

Soils

Soils within the proposed harvest units have been classified into approximately 13 different soil types that developed mainly from late Jurassic meta sedimentary and volcanic rock of the Dothan Formation. Most of these soils are well suited for timber production. However, some of these soil types have a low resistance to compaction, especially when wet, or are easily erodible where steep (NRCS).

Some units have areas with slopes in excess of 65 percent that may be prone to erosion or landslides. Some of these steep areas within proposed units are classified by BLM as fragile soils, and a portion are so steep or rocky that they have been withdrawn from the timber base. A few areas, primarily in headwater stream channel areas, were buffered out of proposed units due to existing wet areas or slope instability

Most of the proposed harvest area was previously logged 50-125 years ago. Old skid trails are apparent in some units and caused some level of compaction. However, most of the area compacted by skid trails has largely recovered since the last harvest. Due to natural processes compaction is reduced over time by freezing-thawing, wetting-drying, growth of plant roots, soil organisms and other biological activity (Adams and Froehlich 1984).

No Action

Soil compaction from previous logging in the project area would continue to recover. Since the project area is within the Matrix LUA, timber harvest would occur sometime in the future. The effect to soils from future harvest and road building activities would be analyzed at that time.

Proposed Action

The primary forest management concern for soil resources is to maintain soil productivity for future tree growth. Adverse effects to soils from forest management can be caused by loss of soil through erosion or landslides or by a change in soil properties from intense burning or soil compaction.

Erosion from harvest activities would be minimized by limiting most soil-disturbing activities to the dry season only. These activities include road construction, renovation and ground-based harvest. Bare soil areas would be seeded and mulched, or protected with a cover of slash, before winter rains. Since overland flow is rare on un-compacted forest soils in the analysis area (Dietrich *et al.* 1982, Heilman *et al.* 1981, p. 232), erosion would be negligible except for that which typically occurs on compacted road surfaces during winter rains. Drainage and erosion control measures, including water barring of skid trails and yarding corridors where necessary, would be applied to bare soil areas following use and prior to winter rains (USDI 1995, p. D-5). Operators would block access points for skid trails with logging debris to prevent vehicle access after harvest operations are completed.

Design features for the proposed project would protect soils from increased landslide risk. As noted above, some areas with steep, unstable or fragile soils were withdrawn from harvest units to reduce landslide risk and soil loss. In the past, poor road building practices have also caused an increase in landslides. However, project design features for road construction would minimize soil disturbance and risk of slides. These project design features include construction during the dry season, avoiding unstable areas, end-haul of waste material to stable locations and ensuring proper road drainage.

Compaction can degrade pore spaces in soils, prevent infiltration of water and reduce productivity. Compaction of soils can also affect watershed function as soil properties affect the capture, storage and beneficial release of water. Typically, compaction is caused by road construction or poor ground-based harvest practices.

Approximately 0.02 percent of the harvest area would be compacted as a result of 3.50 miles of new road construction. Some additional compaction would be created by ground-based equipment during harvest. Ground-based equipment would be used to harvest approximately 44 acres or 20 percent. However, soil productivity would be protected by appropriate harvest technique and other project design features. In order to minimize compaction, ground-based equipment would be restricted to slopes less than 35 percent and would operate only during the dry season when soil moisture is below 25 percent. Ground-based equipment would not be allowed in no-treatment zones or in other small wet areas identified within units. The contracting officer would designate skidding trails with the objective of having less than 12 percent (5.28 acres of 44 total ground-based acres) of the ground-based harvest area affected by compaction. Existing skid trails would be used to the extent practical (USDI 1995, p. D-5). If available, ground-based logging operations would utilize slash layers created by the harvesting process to limit bare soil exposure and compaction. A skyline cable system capable of achieving one-end suspension would be permitted to operate during the wet season in ground-based areas.

There would be some soil disturbance from cable yarding but additional compaction would be negligible. Cable yarding would require one-end log suspension in cable yarding areas. Cable yarding on sites identified as fragile would require full suspension. If full suspension is not feasible, seasonal restrictions (yarding during dry season only) would be required. In general, no harvest would occur on very steep or rocky areas within units that have been withdrawn from the timber base. However, some trees may be cut to provide yarding corridors. Corridors would be a maximum of 12 feet wide and a 75-foot lateral yarding capability would be required. The location, number and width of corridors would be specified by the contract administrator prior to yarding, and natural openings would be used as much as possible (USDI 1995, p. D-5).

There would be some additional compaction and adverse effects to soils from mechanical piling and burning of slash. Mechanical and hand-piling would be used to reduce heavy fuel loads after harvest in some hardwood conversion units. However, project design features for fuels treatments would minimize adverse effects. Mechanical piling would be under the same restrictions and project design features as other ground-based equipment used for harvest. Equipment would not enter no-treatment zones, would be limited to 35 percent slope, and could only operate in the dry season when soil moisture was below 25 percent.

The proposed harvest would result in some additional compaction, but compacted area would remain well below the threshold recommended in the District ROD/RMP. The District ROD/RMP (USDI 1995, p. D-5) recommends the objective of having less than 12 percent of area compacted during harvest activities in order to minimize these adverse effects to soils.

Fuels Loading

A combination of site visits, GIS/map analysis, photo series analysis, and predictive modeling provided information for the fuels loading analysis. This analysis is focused on fuels (i.e., limbs, twigs, and foliage) up to 3 inches in diameter since this material is what influences fire behavior the most.

Current Conditions

Fuels within the project area are generally a mixture of moderate to heavy timber litter with some areas of moderate-load brush. The BLM estimates that dead fuel loading ranges from 30 to 60 tons per acre for all size classes, and from 6 to 9 tons per acre for material in the 0–3 inch diameter size classes (USDA 1980). For fire modeling purposes, fuel models TU5 and TL5 best represent the current conditions of stands located within the unit boundaries (Scott and Burgan 2005).

Fuel model TU5 is characterized by heavy forest litter with shrub or small tree understory. Fuel loading of smaller diameter dead fuel averages 11 tons per acre. Under typical summer conditions, fires would

exhibit moderate rates of spread (ROS) and moderate flame lengths (FL) in these brushy stands (up to 8 chains/hour ROS and 7 feet FL).

Fuel model TL5 is characterized by forest stands with light loads of slash or mortality fuel. Fuel loading of smaller diameter fuel averages 8 tons per acre. Under typical summer conditions, fire behavior in these timber stands would be slow burning surface fires with low flame lengths (up to 5 chains/hour ROS and 2 feet FL).

No Action Alternative

Under the No Action Alternative, the stand would continue on its current trajectory. In the absence of a large-scale disturbance, fuel loading would likely remain similar to current levels. As the overstory canopy continues to age, wind damage, disease, and insect infestations would cause periodic and irregular additions of small diameter fuel to the forest floor. Small diameter contributions would be short-lived as the vegetation decomposes at a relatively rapid rate. Trees that die from suppression or other disturbances would eventually break apart and fall to the surface contributing to widely scattered pockets of heavier fuels that would remain present on site for longer periods.

Proposed Action

If post-harvest conditions require, the BLM would conduct burning treatments to prepare sites for planting or reduce hazardous fuel loading. Untreated activity slash could hinder establishment of new trees and may contribute to extreme fire behavior in a wildfire event. Based on the FVS simulation developed for the Proposed Action (see the Forest Productivity section in this Chapter), harvest activities could add 12–29 additional tons of small-diameter slash per acre within the harvest boundaries. A wildfire with this amount of untreated slash could result in rates of spread up to 52 chains (66 feet = 1 chain) per hour and flame lengths of up to 13 feet during a typical summer day.

Actual post-harvest fuel loading within a given unit will vary based on several factors including pre-harvest stocking levels, understory (brush) density, and harvest methods used. Site preparation activities such as broadcast burning, hand pile and burning, or machine pile and burning may be used, either alone or in combination, throughout the project area. Prescribed fire planning would focus on environmental conditions that would achieve fuel reduction goals (50–90 percent reduction of small-diameter, harvest-generated fuels) while minimizing the risk of escape or potential damage from excessive heat or fuel consumption. The goal of all site preparation/hazard reduction activities for this project would be to provide adequate planting sites for reforestation activities (400 trees per acre).

Following site preparation activities and establishment of the new conifer stand, needle cast and small limbs that gradually accrue would contribute to an increase in surface fuel loading for a short period, but these fine fuels would quickly decompose. In the absence of the larger and continuous surface fuels necessary to contribute to extreme fire behavior and extreme fire weather conditions, it is unlikely that the conifer reproduction itself could support or sustain independent crown fire or other extreme fire behavior. Even individual tree torching is improbable without the benefit of heavier concentrated surface fuels burning underneath and preheating canopy vegetation.

<u>Broadcast Burning</u>

The BLM identified portions of three units as suitable for post-harvest broadcast burning (Units 3, 4 and 8), that total approximately 50 acres. These units are generally south facing and receive adequate solar exposure and heating that would dry targeted fuels (0–3 inches in diameter) earlier in the prescribed fire season.

Preferred conditions for burning include high soil moisture, high fuel moisture in fuels > 3 inches, and high fuel moisture in shaded fuels of all size classes. Broadcast burning effects under these conditions

would maintain soil productivity, result in less consumption of the litter and duff layers, and reduce consumption of coarse woody debris. Construction of fire lines and fuel pullback, as necessary, would protect reserve trees and Riparian Reserve from fire. There would be no risk to Riparian Reserve areas because Riparian Reserve tend to remain moist well into the summer and under normal conditions, they would not support active fire from a slop-over.

Hand/Machine Pile Burning

Up to 167 acres of hand and machine piling are possible within the project area. Pile burning would likely occur to some extent in all units. Accumulated slash piles would be located along roadsides, landings, and within some units. All piles would be covered with polyethylene sheeting that is 4 mil thick and black in color. The polyethylene sheeting provides protection from wetting rains allowing for ease of ignition and better consumption of piled fuels. Pile burning would take place in the fall and winter months when surrounding fuel and soil moisture is high and risk of escape is low. There would be no effects to reserve trees and Riparian Reserve as a result of pile burning because all piles would be at least 15 feet from reserve trees and Riparian Reserve.

Smoke Management

The Oregon Department of Forestry Smoke Management program (OAR 629-048) regulates burning of forest fuels. Daily instructions for burning are written or issued verbally by ODF Smoke Management forecasters and are designed to minimize the impacts of smoke to downwind human population centers called smoke sensitive receptor areas (SSRA).

Mop-up of broadcast burn areas would begin immediately following burning and would reduce the amount of lighter drift smoke produced during the cool down period. After the initial burn day, residual smoke is normally limited to a few smoldering stumps and logs and is quickly dispersed by local winds. Full extinguishment of a burned unit is typically completed within two to three days after burning takes place.

Climate Change

Considering information produced since the completion of the 1995 RMP, it is unequivocal[5] that global temperatures have increased (approximately 1°C since late 1800s); it is also likely that temperatures in the Pacific Northwest have increased by a similar amount (Clark *et al.* 2004, CIG 2004, IPCC 2007, and OCCRI 2010). Human influence on this climatic change, through production of greenhouse gasses, disturbance, and land cover change is likely (IPCC 2007). Scientists have predicted that temperature increases in the west over the next century may range from 2 ºC at the low end to 6 ºC at the upper end (IPCC 2007, Miles and Letternmaier 2007, OCCRI 2010). This increase is well outside of historic conditions (> 2 standard deviations). For context, the shift from the last ice age to the current climate was approximately 9 ºC. There have also been increases in winter precipitation since 1930 over much of the western U.S., although patterns vary in different regions within the west (Clark *et al.* 2004, Salathe *et al.* 2009). Predicted precipitation changes in the western U.S. over the next century are complex and more uncertain than temperature changes. Western states' precipitation may increase by as much as 6 percent by 2100 (CIG 2009, Hidalgo *et al.* 2009). This increase would be well within 20th century variability in precipitation (< 1 standard deviation from historic mean), and is expected to differ widely by region within the western U.S.

Scientists also predict indirect changes in western U.S. ecosystems attributable to changes in temperature and precipitation cycles; most modeled changes describe potential broad shifts in vegetation types (Millar *et al.* 2006, Lenihan *et al.* 2006), fire behavior (Rogers *et al.* 2011, CIG 2004, Mote *et al.* 2003), or hydrological cycle (Furniss *et al.* 2008, Hidalgo *et al.* 2009). These vegetation shifts are speculative at the

[5] Discussion in this section uses terminology for certainty developed in IPCC (2007, pg. 27).

scale of western Oregon and therefore would not likely be accurate for the local conditions at the scale of the analysis area.

There is uncertainty in climate change model predictions due to uncertainty in climate science 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 regional climatic patterns (such as the El Nino-Southern Oscillation) and local topography (such as the Coast Range) (CIG 2009). Predictive models of temperature and precipitation exist for the Pacific Northwest, but do not exist specifically for the Coast Range Province or for the local analysis area. Application of larger-scale model results to the analysis area would induce bias and result in unreliable accuracy. Extrapolating such models to predict future vegetation or animal response would increase bias even further, and would have no utility for describing the cumulative effects of the proposed project or in differentiating between alternatives.

It is not possible with current science to estimate the effects of GHG (greenhouse gas) fluxes on the local affected environment. The U.S. Geological Survey summarized science regarding the effects of local actions on climate change in memo and concluded; "Difficulties remain in simulating and attributing observed temperature changes at smaller than continental scales…It is currently beyond the scope of existing science to identify a specific source of CO_2 emissions and designate it as the cause of specific climate impacts at an exact location" (USDI 2008b). This memorandum is incorporated by reference.

Secretarial Order #3226 (2001, amended 2009) directs all bureaus and offices within the Department of the Interior to "consider and analyze potential climate change impacts when undertaking long-range planning exercises." The 1994 RMP FEIS (USDI 1994, Appendix V, p. 217) considered climate change effects as part of long-term planning efforts at the plan-scale (western Oregon). Although the 1994 RMP 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). Even though more recent information exists than what the BLM presented in the 1994 FEIS, it is still not possible to reasonably foresee or quantify the specific nature or magnitude of changes in the affected environment. It is not speculative that changes in the affected environment would occur due to climate change; however, the specific nature or magnitude of the changes are not reasonably foreseeable (USDI 2008c, p. 488). Consideration of predicted changes in vegetation, fire, hydrological cycles, or other responses due to climate change would be speculative over the plan area; predictions at the scale of the proposed project's analysis area would be more uncertain. Therefore, this EA does not include potential changes within the analysis area attributable to climate change.

Carbon Stores and Carbon Flux

As an aid to decision-making, this analysis estimates carbon flux within the analysis area associated with the proposed project. Carbon flux is the rate of exchange of carbon (as CO_2) between pools (places where carbon is stored) and is used to define the net difference between carbon removal and carbon addition to a system. For the atmosphere, this refers to carbon removed by plant growth, mineralization, dissolution in the ocean, and other processes, balanced by carbon added through plant respiration, harvest/volatilization, concrete production, fossil-fuels burning, volcanic activity, and other processes. Forest harvest may lead to a flux of greenhouse gasses (GHGs) in addition to CO_2, principally N_2O and CH_4 (Sonne 2006, Jassal *et al.* 2008). Due to lack of scientific information and lack of adequate models on the effects of forest activities in the Pacific Northwest on non-carbon GHGs, and the (presumably) minor contribution of non-carbon GHGs associated with the proposed project in relation to total flux estimation error, non-carbon GHGs are not included in this analysis.

Proposed Action
The Proposed Action would result in a cumulative 50-year flux of CO_2 to the affected environment, approximately 19 thousand metric tons or megagrams (Mg) of CO_2 by 2065 (quantified and described below). At the scale of western Oregon, carbon stores are predicted to increase by 169 million Mg under the Northwest Forest Plan by 2106 because growth is expected to exceed harvest removals (USDI 2008c).

Carbon Flux of the Proposed Action
Estimates of carbon stores for the analysis area (New River Frontal and Sixes River watersheds) as a whole would be fraught with error, could complicate contrast between the alternatives, and would not facilitate decision-making. Instead, this analysis quantifies the net effect of the Proposed Action on CO_2 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 2010a). Specifically, this analysis estimates the carbon flux associated with implementation of the Proposed Action by comparing differences in carbon storage between alternatives fifty years from the present, incorporating:

a) Differences in carbon storage in live, dead, and organic soil carbon pools,
b) The intermediary flux from wood products produced by the Proposed Action through this period, and
c) Secondary carbon fluxes associated with logging and hauling systems[6].

Analysis of carbon flux associated with changes in live and dead pools attributable to the Proposed Action used relatively simple tree-/stand-scale models available with the Forest Vegetation Simulator (FVS) modeling package (http://www.fs.fed.us/fmsc/fvs/). This method considers changes due to succession and forest management in all major live and dead carbon pools within the unit boundaries. This FVS model does not directly incorporate microclimatic effects, dynamics of herb and shrub understory layers, stable soil pools, or the carbon flux associated with actual harvest equipment. Herb and shrub carbon pools are small when compared to total stores, and are similar between young and mature stands (USDI 2008c, Appendix C). Soil carbon represents 9–20 percent of total site carbon but is the most stable carbon store and the least likely to respond to disturbance. For example, 60-year old forests and 450-year-old forests have similar soil carbon storage (Harmon *et al.* 1990). Flux of carbon from merchantable wood products produced from the Proposed Action during the 50-year analysis window was estimated following synthesis in (USDI 2008c, Appendix C). Carbon emissions from forestry activities necessary to harvest these units (secondary emissions) were estimated using WRI 2010 and then added to FVS estimates (see below).

Carbon Stores of the Proposed Action
The BLM would treat approximately 217 acres of forest, which would: volatize some carbon; move carbon from live tree pools to detritus and wood products pools; and store carbon in forest products, residual trees, growing replacement trees. Making a set of very broad assumptions and using the FVS model and assumptions similar to those developed in the 2008 RMP FEIS, compared to the No Action Alternative the Proposed Action would result in a carbon flux of 17,007 Mg over the 50-year[7] time period from harvest until approximately 2065 GHG emissions. Forestry activities necessary to harvest these units (secondary emissions[8]) would result in approximately 0.1429 Mg CO_2/MBF. Applying this equation to the Proposed Action suggests an additional 1,682 Mg CO_2 release attributable to harvest activities; this is consistent with Sonne (2006) who predicted a relatively small carbon flux associated with harvest

[6] Secondary emissions are here defined as emissions from equipment consuming fuel employed to harvest, yard and load and haul logs to the mill, similar to WRI (2010).
[7] Data were normalized to 50-year period in Sonne (2006).
[8] Secondary emissions are here defined as emissions from equipment consuming fuel employed to harvest, yard and load and haul logs to the mill, similar to WRI (2010).

equipment. The sum of forest treatment and harvest system flux is roughly 19 thousand metric tons (**Table 3-21)**.

Because proposed units were not previously thinned, the units that are overstocked at the current age therefore more carbon is currently stored than is estimated in the replacement stand 50-years after harvest that was pre-commercially thinned. The difference in carbon between the action and no action alternatives would continue to decrease through time because the rate of carbon uptake decelerates after a stand reaches the age of culmination of mean annual increment. When analyzed over a 20-year instead of 50-year timeframe, the carbon flux is approximately 13 thousand metric tons.

Table 3-21 Proposed Action stored carbon (above/below-ground, live/dead pools) in Metric Tons.[9]

Present Stored Carbon	Proposed Action[10] in 50-yrs (PA)	Wood Products derived from Proposed Action after 50yrs[11] (C)	No Action 2064 (NA)	50 yr. Flux (NA-(PA+C in wood products))
17,618 (13.422 removable as wood products)	12,598	9,422	39,029	17,007 (18,689 w/ secondary emissions)

The total 50-year carbon flux of the Proposed Action compared to the No Action would not produce measurable change in global carbon storage considering current detection, modeling technologies, and associated uncertainty. To place this carbon flux in context, the total 50-year carbon flux associated with the Proposed Action would represent approximately:

- The average annual carbon footprint of 900 Americans (MIT 2009),
- Less than 0.01 percent of carbon stored on BLM-managed lands in western Oregon (USDI 2008c).[12] BLM-managed lands in western Oregon support approximately 1 percent of the carbon stored in the western U.S., and 0.02 percent of global carbon stores in vegetation, soil, and detritus (USDI 2008c).
- Below the indicative threshold (25,000 metric tons) set by the EPA under a mandatory reporting rule for non-forestry regulated entities (EPA 2009).
- From the EPA greenhouse gas equivalencies calculator, the yearly CO_2 equivalents of emission from 3,841 passenger vehicles, the energy use of 1,665 homes, or the emissions of 0.005 coal-fired power plants in one year. [13]

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 would necessitate harvest in another location (importation/transportation from other countries or regions) or substitution with other building materials (steel, aluminum, concrete, or etc.) resulting in a comparable (or larger) carbon flux. Because biological sequestration cannot guarantee permanent storage, it is difficult to define how such biological offsets "stack up" against permanent reductions. Forests grown this year for sequestration purposes, for instance, could be harvested in 30-years or could accidentally burn and release stored carbon as a result of natural processes (Marshall and Kelly 2010).

[9] Comparisons based upon 217 acres of proposed harvest.

[10] Model assumes the replacement stand has, on average, 347 trees per acre at age 10 and receive pre-commercial thinning to reduced stem density to 252 trees per acre in 2027 (12 years after harvest).

[11] USDI 2008c Appendix C (p.30) uses saw log carbon *emission* of 29.8 percent at 50 years, or conversely 70.2 percent *stored*. Most of the harvested wood volume is expected to be milled into dimension lumber.

[12] Note that the C flux associated with Proposed Action includes not just change in stores but flux due to direct emissions.

[13] http://www.epa.gov/cleanenergy/energy-resources/calculator.html (accessed 3/26/2013)

This EA is tiered to the 1994 RMP FEIS which considered carbon flux and climate change within its plan area. The 1994 RMP FEIS considered this speculative and did not consider the indirect effects of carbon flux on aspects of the affected environment including wildlife, economies, human health, and other resources (USDI 1994, Appendix V, pp. 217). The 1994 RMP FEIS concluded that with implementation of any of the alternatives analyzed within the plan area, "the overall impact on the global atmospheric carbon dioxide balance would be much less than 0.01 percent of the total" (USDI 1994, pp. 4–1). Based on the small, estimated permanent flux of carbon that would be associated with the cumulative effects of the proposed project following the 1995 RMP, the high uncertainty in any such estimate of carbon flux (and other sources of GHGs), and the response of global climate to these GHGs, the conclusions in the 1994 FEIS remain valid and applicable to the cumulative effects of the proposed project.

Cumulative Effects

At the scale of western Oregon, considering the cumulative effects of both forest succession (a carbon sink) and harvest (a carbon source) within the plan area of the Northwest Forest Plan, carbon stores would be predicted to increase by 2106, from 427 to 596 million metric tons (growth is expected to exceed harvest levels across all land-use allocations). This sequestration is less under a "No Harvest" scenario, but does represent a gain in carbon storage. U.S. annual CO^2 emissions (circa 2008) were approximately 6 billion metric tons. The flux of 19 thousand metric tons of carbon associated with the Proposed Action (over 50 years) would represent far less than 0.0003 percent 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 (USDI 2008c, p. 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 percent: USDI 2008c, p. 538). However, estimates of the magnitude and direction in carbon response are probably accurate, and these results may be instructive for comparing the effects of the alternatives on local (watershed-scale) carbon stores.

Components of the Aquatic Conservation Strategy

The Northwest Forest Plan describes four components to the Aquatic Conservation Strategy (ACS): Riparian Reserve, Key Watersheds, watershed analysis, and watershed restoration. An additional component of the ACS is the standards and guidelines for management activities located in the Coos Bay District RMP.

1. **Riparian Reserve:** The Riparian Reserve widths 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. A site-potential tree in the New River Frontal 5th field watershed is 200 feet and in the Sixes River 5th field watershed a site-potential tree is 180 feet.
2. **Key Watersheds:** The proposed project is not located within a Key Watershed.
3. **Watershed Analysis:** The proposed project is within watersheds evaluated in the Watershed Analysis of the Sixes and New River Area (USDI 2008d). Recommendations from this evaluation are incorporated into the Six Twigs proposed project, including road management, which would have positive, long-term effects on water quality.
4. **Watershed Restoration:** The Coos Bay RMP states that a main component of watershed restoration is control of road-related run-off and prevention of sediment production (USDI 1995 p.8). Proposed actions that would accomplish watershed restoration through control of road-related run-off and prevention of sediment production include road maintenance, road renovation, road improvement, road decommissioning, and temporary road closure.
5. **Management Actions/Direction:** The following is a list of management actions/directions for road management within Riparian Reserve applicable to the proposed project (USDI 1995 p.13).

Road Management:

- Reconstructing existing roads and associated drainage features that pose a substantial risk.
- Minimizing road locations in Riparian Reserve.
- Minimizing disruption of natural hydrologic flow paths, including diversion of streamflow and interception of surface and subsurface flow.
- Preparing road design criteria, elements, and standards that govern construction and reconstruction.
- Preparing operation and maintenance criteria that govern construction and reconstruction.

Existing Watershed Condition:

Existing conditions in the New River Frontal 5th field watershed include (USDI 2008d):

- The New River watershed drains approximately 99,371 acres. It is a combination of true frontal watersheds draining to the ocean and sixth field subwatersheds located further inland.
- Elevation in the watershed ranges from sea level to approximately 2,786 feet.
- The upper portion of the watershed is characterized by steeply sloped forested areas with narrow valleys. Tributary streams have moderately steep to very steep gradient.
- Over 95 percent of the watershed is in private ownership.

Existing conditions in the Sixes River 5th field watershed include (USDI 2008d):

- The Sixes watershed drains approximately 85,832 acres.
- Elevation in the watershed ranges from seal level to approximately 3,315 feet.
- The upper portion of the watershed is characterized by steeply sloped forested areas with narrow valleys. Tributary streams have moderately steep to very steep gradient.
- Approximately 69 percent of the watershed is in private ownership.

There are approximately 6,459 acres or 3.5 percent of BLM-managed lands in the Sixes and New River 5th field watersheds combined, which makes up the analysis area for the purposes. BLM lands contain 3,575 acres of Riparian Reserve or 2 percent of the Sixes and New River 5th field watersheds combined (USDI 2008d).

Aquatic Conservation Strategy Objectives

The landscape-scale features necessary to ensure the protection of the aquatic systems applicable to the Six Twigs EA include the forest stands located in riparian areas. These stands provide key functions such as "the maintenance of surface and ground water quality in aquatic systems; … maintenance of streambank and streambed stability; maintenance and protection of habitat structure for fish, wildlife, and vegetation; and maintenance of favorable microclimates for riparian-dependent species" (Everest and Reeves 2006).

Riparian area functions analyzed in this report include microclimate, water quality, streambank stability, sediment regimes, and habitat for riparian-associated species. The following lists ACS Objectives and explains how the Six Twigs project would meet these objectives. ACS Objective 1 addresses microclimate. Water quality issues are addressed under Objectives 2 and 4; sediment regimes and streambank stability under Objectives 3, 4, 5, 6, and 8; and providing habitat for riparian-associated species under Objectives 2, 4, 8 and 9.

The site scale for this analysis is the stream reaches within or adjacent to proposed treatment units or proposed road activity. The watershed scale is the 5th field watershed.

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 Analysis

Short Term/Long Term

Microclimates found in riparian areas are important components of watershed and landscape-scale features and are needed to ensure protection of aquatic systems. Brosofske *et al.* suggested that for the moderately steep, mature Douglas-fir/western hemlock dominated stream systems, buffers with a minimum of 148 feet on each side of a stream would be sufficient to maintain the majority of the microclimatic gradient surrounding stream centers. The Six Twigs proposed project would retain a 360- to 400- foot buffer adjacent to fish-bearing streams and a 180- to 200-foot buffer would be retained adjacent to perennial and intermittent streams. The Riparian Reserve buffers in Six Twigs would exceed the minimum buffer width recommended by Brosofske *et al.* (1997) and implementation of these project design features would maintain microclimate conditions adjacent to streams, where riparian and aquatic dependent species exist.

Proposed new road construction within the Riparian Reserve (Road No. 08-2) would not alter stream or riparian area microclimate because the road would be constructed to the minimum width necessary (clearing limit of less than 36 feet) and the road segment would be short in length, with only approximately 0.03 miles or 158 feet of new road construction in Riparian Reserve.

Unit 3 could require up three yarding corridors that would cross an intermittent stream. Yarding corridors would be spaced apart across the stand and would not exceed 12 feet, which would maintain the microclimate in the Riparian Reserve adjacent to Unit 3. Existing gaps in the tree canopy would be utilized where possible. Any trees that need to be cleared would be felled towards the stream channel and left on site. The closest corridor would be 0.13 miles from perennial streams, 0.3 miles from fish-bearing streams, and 3.5 miles from coho-bearing streams. The long distance from yarding corridors to occupied fish habitat, in combination with design features, would not result in effects to fish habitats.

5th Field Analysis

Short Term/Long Term

Microclimate would be maintained at the site scale and therefore no changes would occur at the 5th field scale. The overall condition of the watershed and landscape-scale features would remain unchanged at the 5th field scale.

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 Analysis

Short-Term/Long-Term

Maintaining the Riparian Reserve network would ensure the effectiveness of the spatial and temporal connectivity within and between watersheds at the site scale in the short- and long-term.

The yarding corridors would not affect the spatial or temporal connectivity within or between watersheds. Unit 3 may have up to three yarding corridors that would cross an intermittent stream. Existing gaps in the tree canopy would be utilized whenever possible. Any trees that need to be cleared would be felled towards the stream channel and left on site. The closest corridor would be 0.13 miles from perennial streams, 0.3 miles from fish-bearing streams, and 3.5 miles from coho-bearing streams. These corridors would utilize full suspension and would not result in effects to undergrowth or soils near the stream edge. These design features and distant proximity to aquatic species would result in no effect on watershed connectivity.

The proposed new road construction in Unit 8 (Road No. 08-2) would involve a new stream crossing on a non-fish-bearing stream and would maintain unobstructed routes for aquatic and riparian-dependent species. The culvert would be sized for a 100-year flood event and would be placed at stream grade. The culvert would be removed after operations were complete and the stream banks re-contoured to match pre-construction conditions and to create erosion resistance.

The proposed project does not include applying chemicals that could infiltrate into aquatic habitat. All operational activities would be subject to the State of Oregon Administrative Rule No. 340-108, Oil and Hazardous Materials and Spills and Releases, which 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. In addition, the Coos Bay District Hazardous Materials Contingency Plan applies when applicable to operations where a release threatens to reach surface waters or is in excess of reportable quantities.

5th Field Analysis

Short-Term/Long-Term

The spatial and temporal connectivity within and between watersheds at the 5th field would remain unchanged as a result of the proposed project. The small amount of BLM-administered lands (3.5 percent of analysis area) and the relatively small treatment area (approximately 0.30 percent of analysis area) would not result in an effect to spatial and temporal connectivity at this scale.

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

Site Scale Analysis

Short Term/Long Term

The BLM would maintain the physical integrity of the aquatic system including shorelines, banks, and bottom configurations at the site scale in the short-term and the proposed project would not adversely modify stream channels or aquatic habitat, nor remove any wood from stream channels.

The proposed new road construction in one Riparian Reserve would maintain the physical integrity of shorelines, banks, and bottom configurations because utilization of cross-drains and sediment control measures, as needed, would minimize the hydrologic connectivity to stream channels. The culvert would be: 1) installed following all applicable project design features and Best Management Practices; 2) sized for a 100-year flood event; and 3) installed at stream grade. In addition, the culvert would be removed after operations were complete.

The proposed yarding corridors in Riparian Reserve would maintain shorelines, banks, and bottom configurations because yarded logs would not enter stream channels and the corridors would not be hydrologically connected to stream channels. Yarding corridors that cross streams would utilize full suspension and would not have an effect on undergrowth or soils near the stream edge. Any trees that need to be cleared would be felled towards the stream channel and left on site.

5th Field Analysis

Short-Term/Long-Term

As there would be no noticeable effect to the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations at the site scale, there would be no change at the 5th field scale in the short- or long-term.

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 Analysis

Short Term/Long Term

Water quality necessary to support healthy riparian, aquatic, and wetland ecosystems would be maintained at the site scale in the short- and long-term. Water quality would remain within the natural range of variability, maintaining the biological, physical, and chemical integrity of streams.

The proposed harvest would not result in an increase to stream temperatures at the site scale in the short- or long-term because harvest would not occur in Riparian Reserve. The BLM would maintain Riparian Reserve buffers of two site-potential-tree heights on fish-bearing streams and one site-potential-tree height on intermittent and perennial streams. A detailed analysis of stream temperature is located under the Hydrology section in this chapter.

The proposed yarding corridors would maintain water temperature conditions because of minimal width (12 feet) and locations would be spread out across the landscape, and be discontinuous. Unit 3 may have up to three yarding corridors that would cross an intermittent stream. These corridors would utilize full suspension and would not result in effects to undergrowth or soils near the streambank. Existing gaps in the tree canopy would be utilized whenever possible. Any trees that need to be cleared would be felled towards the stream channel and left on site potentially providing a future benefit to fish habitat. The closest corridor (Unit 3) would be 0.13 miles from perennial streams, 0.3 miles from fish-bearing streams, and 3.5 miles from coho-bearing streams. The large distance from yarding corridors to aquatic habitats utilized by fish, in combination with project design features, would result in no effect to fish habitats.

Slight increases in turbidity could occur in the short-term in some localized areas as a result of road activities, but would not measurably alter water quality. Implementation of the project design features would minimize the amount and duration of sediment entering stream channels by limiting haul to the summer season and halting operations during heavy rains on dirt surface roads. Any increase in turbidity would not measurably alter the biological, physical, or chemical integrity of streams. Aquatic and riparian-dependent species' survival, growth, reproduction, and migration would be maintained at the site scale in the short- and long-term. The proposed road renovation, improvement, maintenance, decommissioning, and road closures would result in a net reduction in turbidity in stream channels in the long-term.

The proposed new road construction through the Riparian Reserve located in Unit 8 (Road No. 8-2) would maintain water quality because the road and culvert would be constructed following all applicable project design features and Best Management Practices. The BLM would design the road to the minimum width necessary with a clearing limit of less than 36 feet and the segment in the Riparian Reserve would be short in length at only 0.03 miles (158 feet).The culvert would be removed after operations were complete leaving the banks in an erosion resistant condition.

The proposed project does not include applying chemicals that could get infiltrate into aquatic habitat. All operational activities would be subject to the State of Oregon Administrative Rule No. 340-108, Oil and Hazardous Materials and Spills and Releases, which 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. In addition, the Coos Bay District Hazardous Materials Contingency Plan applies when applicable to operations where a release threatens to reach surface waters or is in excess of reportable quantities.

5th Field Analysis

Short Term/Long Term

As there would be no noticeable effect to water quality at the site scale, there would be no change in water quality at the 5th field scale in the short- or long-term as a result of the proposed project.

5. *Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.*

Site Scale Analysis

Short Term

Short-term sediment movement may occur as a result of the proposed road related activities; however, The project design features and Best Management Practices would minimize if not eliminate sediment input to stream channels. The sediment input to streams resulting from road activities would be indiscernible beyond natural erosion processes. Refer to the sediment discussions in the Soils, Hydrology, and Fisheries sections in this chapter for a more detailed discussion of sediment.

The proposed new temporary stream crossing (Road No. 08-2.1) may result in a short-term negligible amount of sediment reaching fish habitat. Sediment entering stream channels would be minimized because the road construction would follow all applicable project design features and the closest stream crossing would be more than a mile from fish habitat. Road drainage features would be designed so that any sediment-laden surface water would quickly infiltrate into forest soils. The new road constructed in the Riparian Reserve would be decommissioned and left in an erosion resistant condition.

Long-Term

The proposed road renovation, improvement, maintenance, decommissioning, and temporary closure would result in a net reduction in sediment delivery to stream channels at the site scale in the long-term. Some existing roads within the proposed project area are currently contributing sediment to stream channels from surface erosion, inadequate drainage, inadequate stream crossings or unstable cutbanks and fill slopes. The proposed project would improve these roads by restoring adequate drainage features and thus reducing sediment delivery to streams.

The proposed new temporary stream crossing (Road No. 08-2) would not have any long-term effects to sediment input because it would be removed after harvest. Road fill would be removed from the crossing and stream bank slopes would be pulled back to match natural contours, treated with grass seed and mulch and left in an erosion resistant condition.

5th Field Analysis

Short-Term/Long-Term

As there would be no noticeable effect to the elements of sediment regime at the site scale, there would be no noticeable effect to the elements of sediment regime at the 5th field scale in the short- or long-term as a result of the proposed project.

Given the small amount of BLM-administered lands (3.5 percent of watersheds area) compared to privately-owned lands and the relatively small size of the project (0.30 percent of watersheds area), the proposed project would provide a negligible benefit of reduced sediment delivery to stream channels at the 5th field scale.

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 Analysis

Short-Term/Long-Term

In-stream flow sufficient to create and sustain riparian, aquatic and wetland habitat would be maintained at the site scale in the short- and long-term. Patterns of sediment, nutrient and wood routing in addition to the timing, magnitude, duration, and spatial distribution of peak and low flows would also be maintained at this scale in the short- and long-term.

The Hydrology section details the methods used for assessing the potential risk of the proposed project's ability to change stream flows. The Hydrology analysis found there would be no effect to peak flows as a result of the proposed project. The hydrology analysis determined the proposed harvest would result in a slight increase in water yield. A slight increase in water yield would not result in channel changes. A slight increase in water yield during the summer months could be beneficial to aquatic species.

5th Field Analysis

Short-Term/Long-Term

There would be no changes at the 5th field scale because sufficient in-stream flows as well as the timing magnitude, duration, and spatial distribution of peak, high, and low flows would be maintained at the site scale in the short- and long-term. There would be no change in water yield in the short or long-term at the 5th field scale given that the proposed project area makes up only 0.12 percent of the summed watersheds area. Refer to the Hydrology section in this chapter for a more detailed description of the hydrologic analysis.

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

Site Scale Analysis

Short-Term/Long-Term

The timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands would not be affected by the proposed project at the site scale in the short- or long-term. The interaction of water with wetlands and meadows would not be affected. There are no known meadows or wetlands within any proposed units. If meadows or wetlands were discovered during unit layout, they would be avoided and potentially buffered according to management direction in the Coos Bay RMP. The project does not include water diversions or well drilling, activities usually associated with lowering water tables.

5th Field Analysis

Short-Term/Long-Term

There would be no change at the 5th field watershed scale in the short- or long-term because there would be no effects at the site scale to these components.

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 Analysis

Short-Term/Long-Term

Species composition and structural diversity of plant communities in riparian areas and wetlands would be maintained at the site scale in the short and long term because full Riparian Reserve buffers would be retained adjacent to and within the proposed harvest units.

The proposed new road construction and yarding corridors in Riparian Reserve would not affect species composition and structural diversity of plant communities. Plant communities in Riparian Reserve would maintain the ability to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion (additional discussion under ACS Objective 3), and channel migration.

An adequate amount and distribution of coarse woody debris sufficient to sustain physical complexity and stability would be maintained following the proposed new road construction and yarding corridors in Riparian Reserve. The road would be constructed to the minimum width necessary, with a clearing limit of less than 36 feet and a 16-foot running surface. The corridors would be limited to 12 feet in width. Trees felled for yarding corridors in the Riparian Reserve would be felled toward the stream channel and left on site. The amount of trees cut in the Riparian Reserve would not result in changes to the physical complexity or stability of stream channels. A detailed discussion of the effects of the proposed project on large wood recruitment to stream channels is located in the Fish section of this chapter.

5th Field Analysis

Short-Term/Long-Term

There would be no change at the 5th field watershed scale because species composition and structural diversity of plant communities in riparian and wetland areas would be maintained at the site scale.

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

Site Scale Analysis

Short Term/Long Term

Habitat needed to support riparian-dependent species (including plants, invertebrates, and vertebrates) would be maintained at the site scale in the short- and long-term.

Full Riparian Reserve widths would be maintained adjacent to and within the proposed harvest units. The Riparian Reserve would provide habitat for riparian-dependent plants, invertebrates, and vertebrate species.

The proposed new road construction in Riparian Reserve would not alter habitat needed to support populations of native plant, invertebrate, and vertebrate riparian-dependent species because the road would be constructed to the minimum width necessary with a clearing limit of less than 36 feet, road segments in Riparian Reserve would be short lengths, and would only include approximately 0.03 miles or 158 feet of new road construction in Riparian Reserve.

The proposed yarding corridors would maintain habitat for riparian-dependent species because of minimal width (12 feet) and locations would be spread out across the landscape, and be discontinuous. Unit 3 may have up to three yarding corridors that would cross an intermittent stream. These corridors would utilize full suspension and would not affect undergrowth or soils within 100 feet of the channel (i.e., full suspension would be used). Existing gaps in the tree canopy would be utilized whenever possible. Any trees that would need to be cleared would be felled towards the stream channel and left on site. Utilization of existing gaps, minimal widths and the dispersed nature of corridors would maintain riparian habitat.

5th Field Analysis

Short Term/Long Term

There would be no change at the 5th field watershed scale in the short- or long-term because there would be no noticeable adverse effects to habitat for riparian-dependent species at the site scale.

Resources not Analyzed in Detail

Air Quality

All prescribed burning would comply with the guidelines established by the Oregon Smoke Management Plan, (OAR 629-43-043), as addressed in the RMP. In addition, burning typically takes place during cooler, wetter times of year and that reduces the likelihood of a large-scale escaped wildfire. Removal/reduction of hazardous fuel loadings could also reduce the likelihood of ignition of a large-scale wildfire and subsequent smoke emissions. Smoke from prescribed fire activities would have little contribution to particulate emissions into the surrounding air shed.

Cultural Resources

The BLM did not conduct pre-harvest surveys within the analysis area; however, there are no known cultural resource sites within or near the vicinity of the proposed timber sale units. Pre-harvest survey is not an effective method for discovery of prehistoric cultural resources in the Coast Range due to the scarcity of cultural resources and the heavy vegetation cover, which makes ground visibility difficult (Teopel and Oetting 1992). For this reason, the agreement between the BLM and the Oregon State Preservation Officer (SHPO) specifies that the BLM conduct cultural resource survey on Coast Range timber sale units post-harvest (USDI 2015b). If archaeological resources are discovered prior to or during harvest activities, all activities in the vicinity would cease immediately and the Authorized Office and a BLM cultural resource specialist would be notified. Work would proceed only after authorization from the BLM.

Drinking Water Protection Act

Under the requirements and guidelines of the Federal Safe Drinking Water Act, ODEQ prepares Source Water Assessments for public water supplies in Oregon. The drinking water source for the Langlois Water District is Floras Creek. Some of the proposed harvest units are located within the headwaters of the Floras Creek and North Fork Floras subwatersheds and are, therefore, part of the Drinking Water Protection Area (DWPA) for Langlois.

Managed forest lands in the DWPA are listed as one of the potential contaminant sources in the Source Water Assessment (ODEQ 2015). Activities listed that could have potential impacts are cutting and yarding of trees, improper use of pesticides or fertilizers, road building and maintenance, and road usage. No pesticides or fertilizers are proposed for this project. The other potential impacts are analyzed by alternative under Water Quality/Sediment.

Environmental Justice

The Six Twigs proposed project is located behind locked gates with no public access. The BLM does not know the Six Twigs project area to be used by, or proportionately used by minority or low-income populations for specific cultural activities 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 project area. 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 from implementing the project.

Hazardous Materials

Activities resulting from the proposed project would be subject to State of Oregon Administrative Rule No. 340-108, Oil and Hazardous Materials and 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. Normal contract administration would also include site monitoring for solid and hazardous waste. When needed, the BLM would apply the Coos Bay District hazardous

materials contingency and spill plan for riparian operations when a release threatens to reach surface waters or is in excess of reportable quantities.

Port-Orford-cedar

The Six Twigs project area is within the range of Port-Orford-cedar; therefore, all management activities would conform to the guidelines specified in the 2004 Final Supplemental Environmental Impact Statement (FSEIS) for Management of Port-Orford-Cedar in Southwest Oregon where applicable (USDA and USDI 2004).

Areas within 50 feet of streams or roads were determined to be at high risk of infection, and those areas greater than 50 feet away from roads and streams were determined to be at low risk of infection by Port-Orford-cedar root disease (*Phytophthora lateralis*). The answer to all three questions in the risk key provided in the 2004 FSEIS (p. 2-18) which gives direction for assessing risk and controlling spread of P. lateralis, was "no" (**Appendix C**). Because of this low risk, there is no requirement for additional Port-Orford-cedar management practices.

Noxious Weeds

The BLM is required to develop a noxious weed risk assessment when it is determined that an action may introduce or spread noxious weeds or when known habitat exists (USDI 2007). **Appendix I** contains the completed Six Twigs assessment. Prevention measures identified as a result of this assessment not already applied on district lands as part of routine activities (USDI 1997) have been incorporated into the project design features to minimize the potential for introducing weeds to the project area and/or spreading existing weed infestations.

Water Rights

According to information from the Oregon Water Resources Department, there are no surface water rights for private domestic use within one mile downstream of sale units in the proposed project.

Wildland Urban Interface (WUI)

The National Fire Plan addresses WUI criteria. Six Twigs proposed harvest units are located within the WUI. Following the National Fire Plan guidance, the BLM would require implementation of all appropriate mitigating measures to protect and provide for public health, and safety.

Unaffected Resources

None of the following critical elements of the human environment is located in the project area or within a distance to be affected by implementation of either alternative:

- Areas of Critical Environmental Concern
- Farmlands, Prime or Unique
- Wetlands
- Flood Plains (as described in Executive Order 11988)
- Wild and Scenic Rivers

Chapter 4 - List of Agencies and Individuals Contacted

The BLM informed the public of the planned EA through the Coos Bay District's planning update. Notices informing interested parties of scoping, and later the EA and unsigned FONSI, were mailed to many interested parties directly; all notices and documents were also posted to the District's website. The BLM contact list for the Six Twigs EA included the following:

All adjoining landowners
Numerous private citizens
American Forest Resources Council
Association of O&C Counties
Cascadia Wildlands
Coast Range Association
Curry County Board of Commissioners
Coquille Indian Tribe
Confederated Tribes of Lower Rogue
Division of State Lands
Douglas Timber Operators
Governor's Natural Resource
Klamath-Siskiyou Wildlands Center
Kalmiopsis Audubon Society
NW Environmental Defense Council
Oregon Department of Environmental Quality
Oregon Department of Fish and Wildlife
Oregon Coastal Management Program
U.S. Representative Peter DiFazio
Oregon State Water Resources Department
Oregon Department of Forestry
Oregon Wild
Pacific West Timber
Plum Creek Timber
Umpqua Watersheds
U.S. Fish & Wildlife Service

Chapter 5 - List of Preparers

Matt Wells	Project Lead/Timber Sale Plans Forester
Racheal Jones	Team Lead/Planning Coordinator
Tim Rodenkirk	Botanist
Stephan Samuels	Cultural Resource Specialist/District Archaeologist
Aimee Hoefs	Editor
Jeffrey Jackson	Fish Biologist
Stephanie Messerle	Fish Biologist
Nicholas Scheidt	Fish Biologist
Chris Schumacher	Forester
Jay Flora	GIS Specialist
Tristan Holland	GIS Specialist
Teague Mercer	Hydrologist
Colleen Holland	Wildlife Biologist
Mike Blow	Wildlife Biologist

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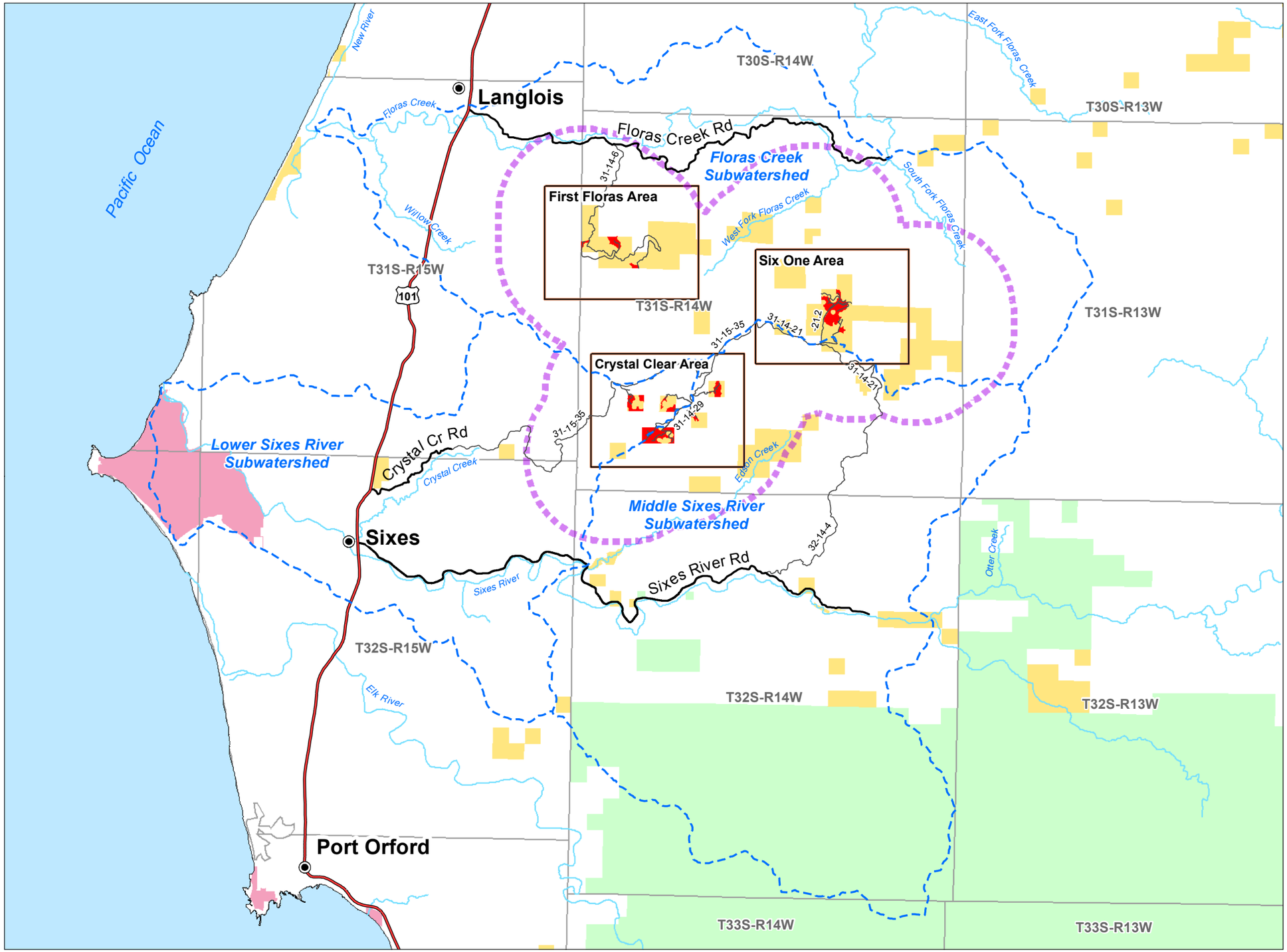
Chapter 7 - Maps

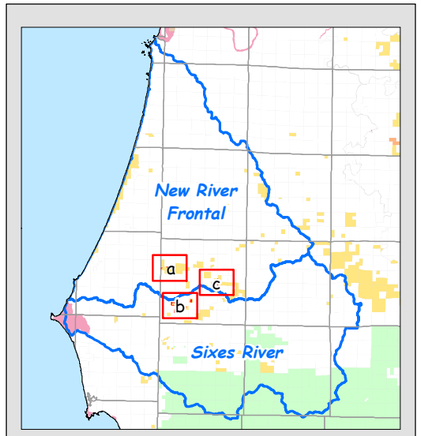
Six Twigs DOI-BLM-ORWA-C040-2013-0003-EA

Map 1: Vicinity Map



Map Features

- BLM Administered Land
- U.S. Forest Service
- State of Oregon Lands
- Private or Other Lands
- County Road
- Primary Access Roads
- Sale Area Detail Maps
- 6th Field Subwatersheds
- 5th Order and Larger Stream
- Six Twigs EA Units
- Wildlife Analysis Area



5th Field Watersheds

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Bureau of Land Management

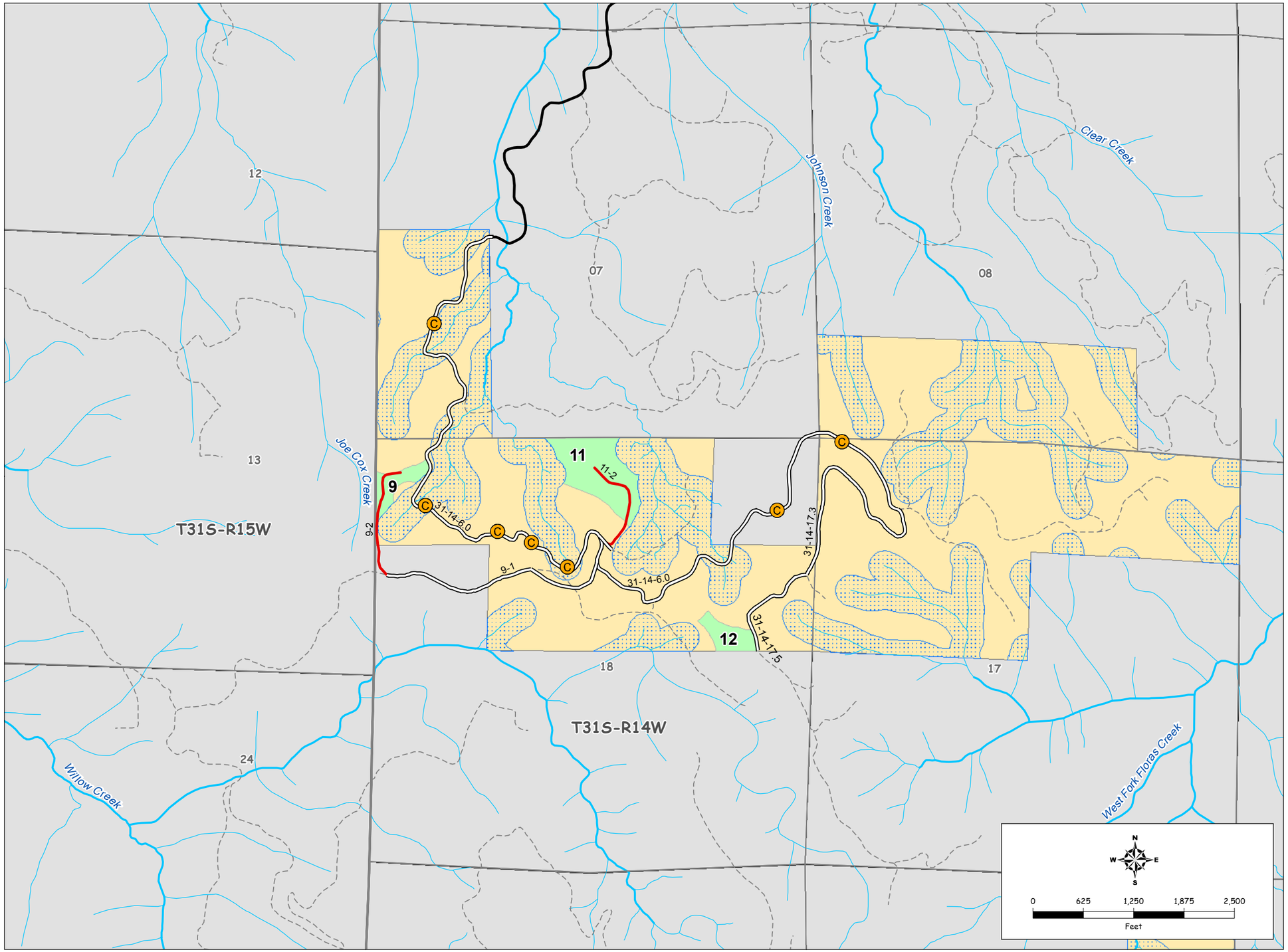
Coos Bay District Office
Myrtlewood Field Office
1300 Airport Lane
North Bend, OR 97459

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data.

- All EA Units are in Curry County -

Six Twigs DOI-BLM-ORWA-C040-2013-0003-EA

Map #2a - First Floras Associated Roadwork



(Not all Map Features shown below will be present on all maps)

Map Features

- New or Replacement Culvert
- Intermittent Stream
- Perennial Stream

Associated Road Work

- Major Road
- Renovation
- Improvement
- New Construction
- Decommission
- Other Roads
- Riparian Reserves
- Planned Unit
- BLM Administered Land
- Private or Other Ownership

5th Field Watersheds

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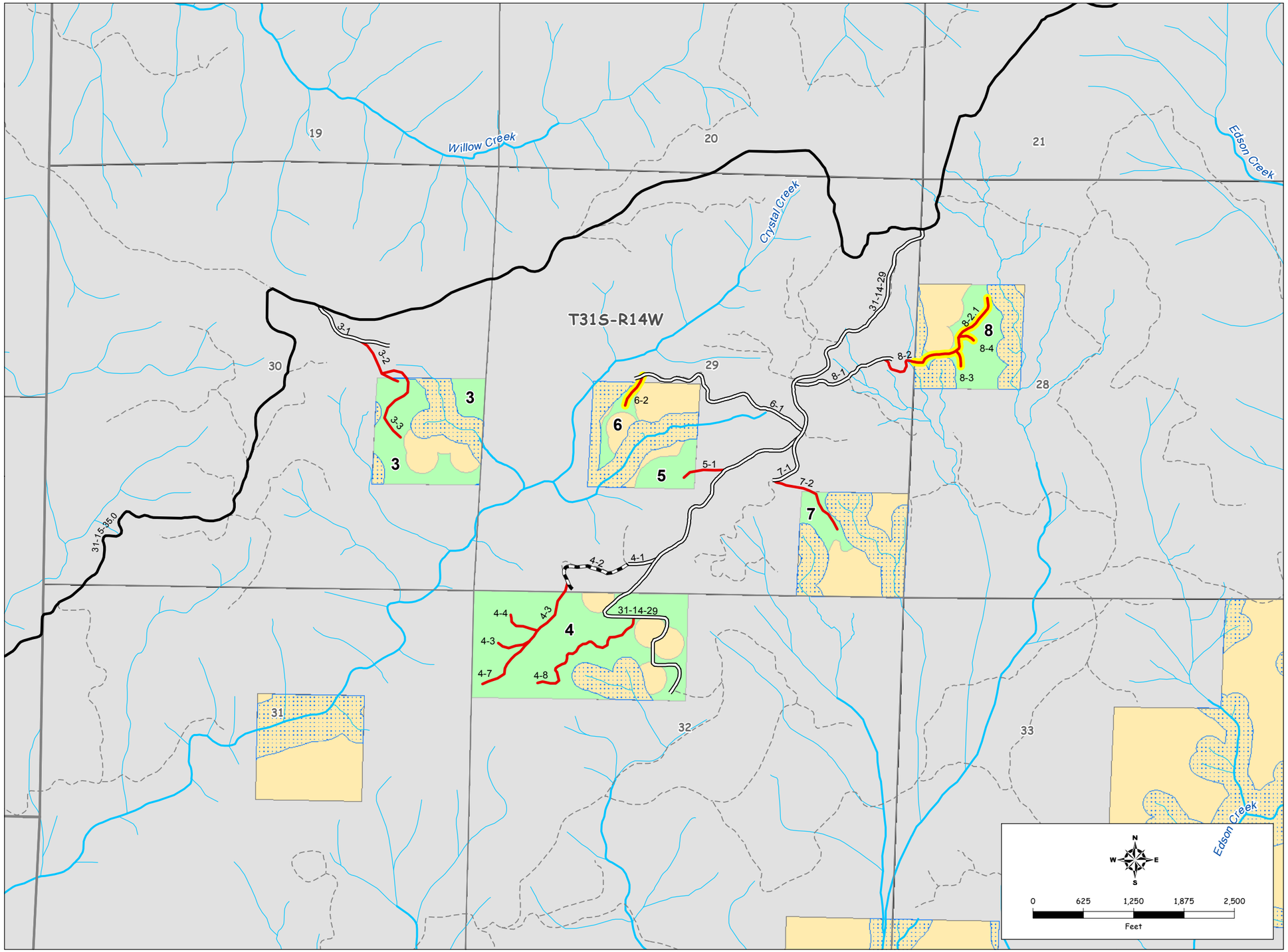
Map #2b - Crystal Clear Associated Roadwork



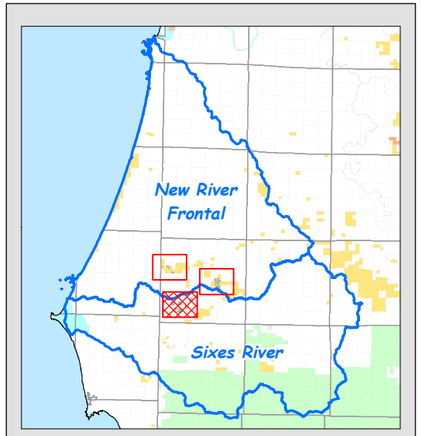
(Not all Map Features shown below will be present on all maps)

Map Features

- New or Replacement Culvert
- Intermittent Stream
- Perennial Stream

Associated Road Work

- Major Road
- Renovation
- Improvement
- New Construction
- Decommission
- Other Roads
- Riparian Reserves
- Planned Unit
- BLM Administered Land
- Private or Other Ownership



5th Field Watersheds

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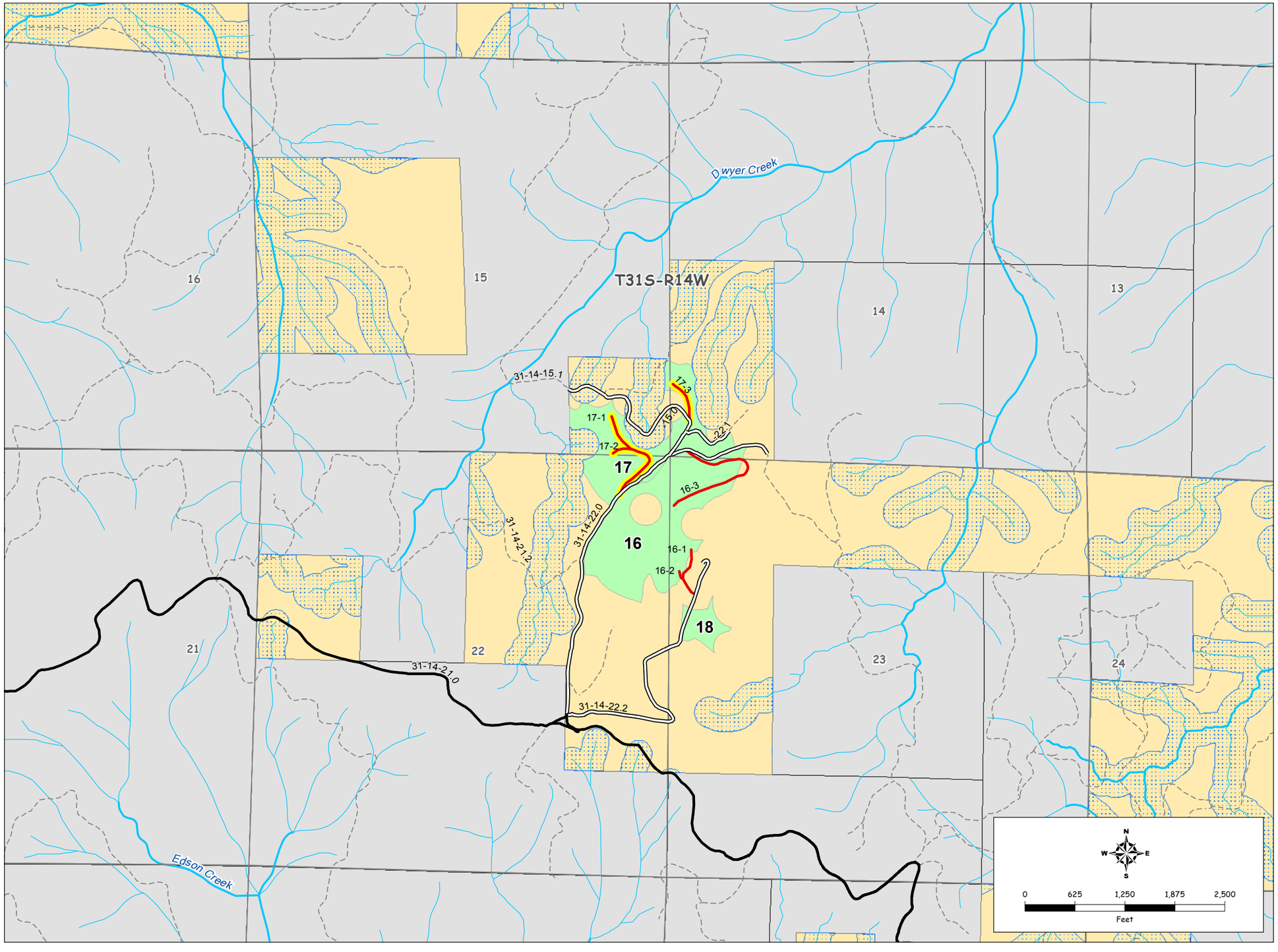
Six Twigs DOI-BLM-ORWA-C040-2013-0003-EA

Map #2c - Six One Associated Roadwork



(Not all Map Features shown below will be present on all maps)

Map Features

- New or Replacement Culvert
- Intermittent Stream
- Perennial Stream

Associated Road Work

- Major Road
- Renovation
- Improvement
- New Construction
- Decommission
- Other Roads
- Riparian Reserves
- Planned Unit
- BLM Administered Land
- Private or Other Ownership

5th Field Watersheds

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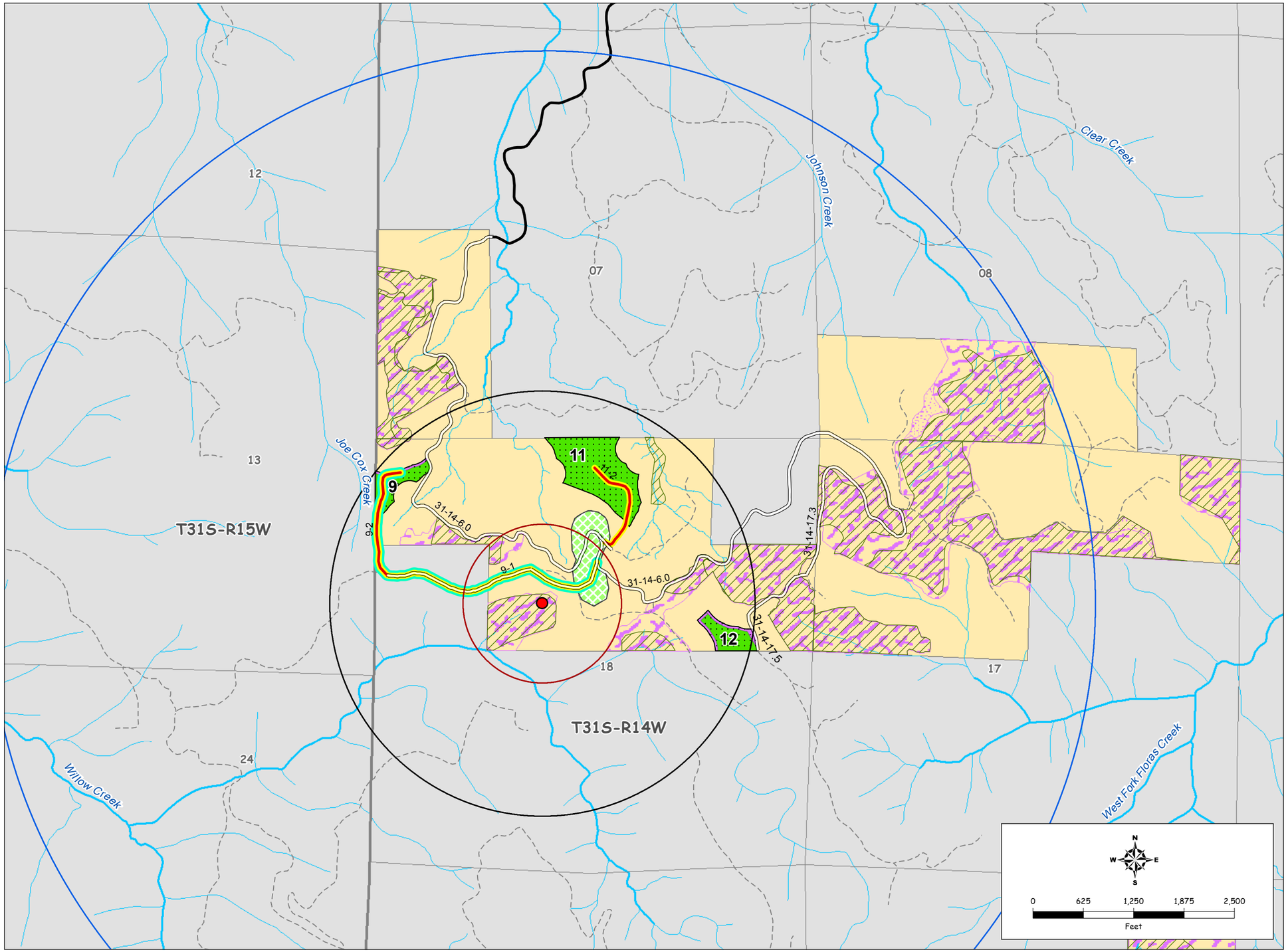
Map #3a - First Floras Wildlife Seasonal Restrictions



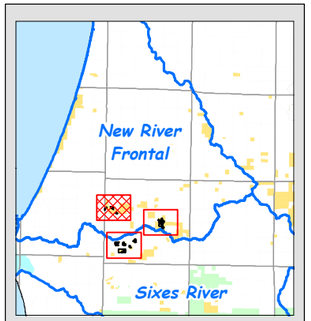
(Not all Map Features shown below will be present on all maps)

Map Features

- Murrelet Seasonal Restrictions
- NSO Seasonal Restrictions
- Planned Harvest Unit Boundary

Associated Road Work

- Major Road
- Renovation
- Improvement
- New Construction
- Seasonal Restriction Construction (NSO)
- Seasonal Restriction Haul/Construction (Murrelet)
- Seasonal Restriction Construction (Murrelet)
- Other Roads
- 6th-Field Subwatersheds
- Intermittent Stream
- Perennial Stream
- NSO Temporary Site
- NSO Nest Patch - 300 meters
- NSO Core Area - 0.5 mile
- NSO Home Range - 1.3 miles
- NSO Habitat
- Murrelet Occupied Sites
- Murrelet Suitable Nesting Habitat
- Red Tree Vole Management Area
- BLM Administered Land
- Private / Other Ownership



5th Field Watersheds

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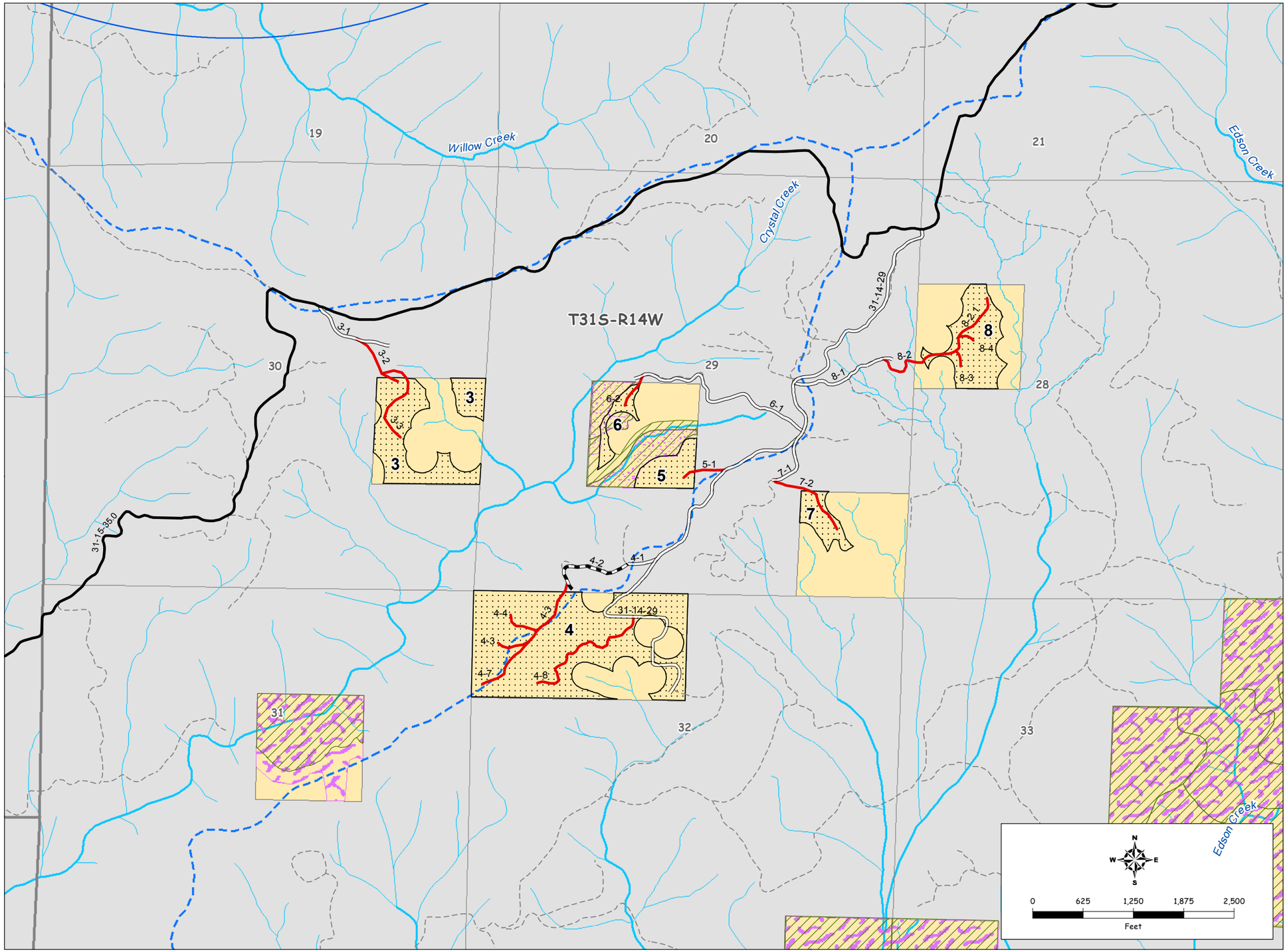
- All EA Units are in Curry County -

Six Twigs DOI-BLM-ORWA-C040-2013-0003-EA

Map #3b - Crystal Clear Wildlife Seasonal Restrictions



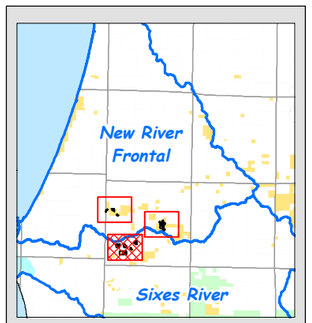
(Not all Map Features shown below will be present on all maps)

Map Features

- Murrelet Seasonal Restrictions
- NSO Seasonal Restrictions
- Planned Harvest Unit Boundary

Associated Road Work

- Major Road
- Renovation
- Improvement
- New Construction
- Seasonal Restriction Construction (NSO)
- Seasonal Restriction Haul/Construction (Murrelet)
- Seasonal Restriction Construction (Murrelet)
- Other Roads
- 6th-Field Subwatersheds
- Intermittent Stream
- Perennial Stream
- NSO Temporary Site
- NSO Nest Patch - 300 meters
- NSO Core Area - 0.5 mile
- NSO Home Range - 1.3 miles
- NSO Habitat
- Murrelet Occupied Sites
- Murrelet Suitable Nesting Habitat
- Red Tree Vole Management Area
- BLM Administered Land
- Private / Other Ownership



5th Field Watersheds

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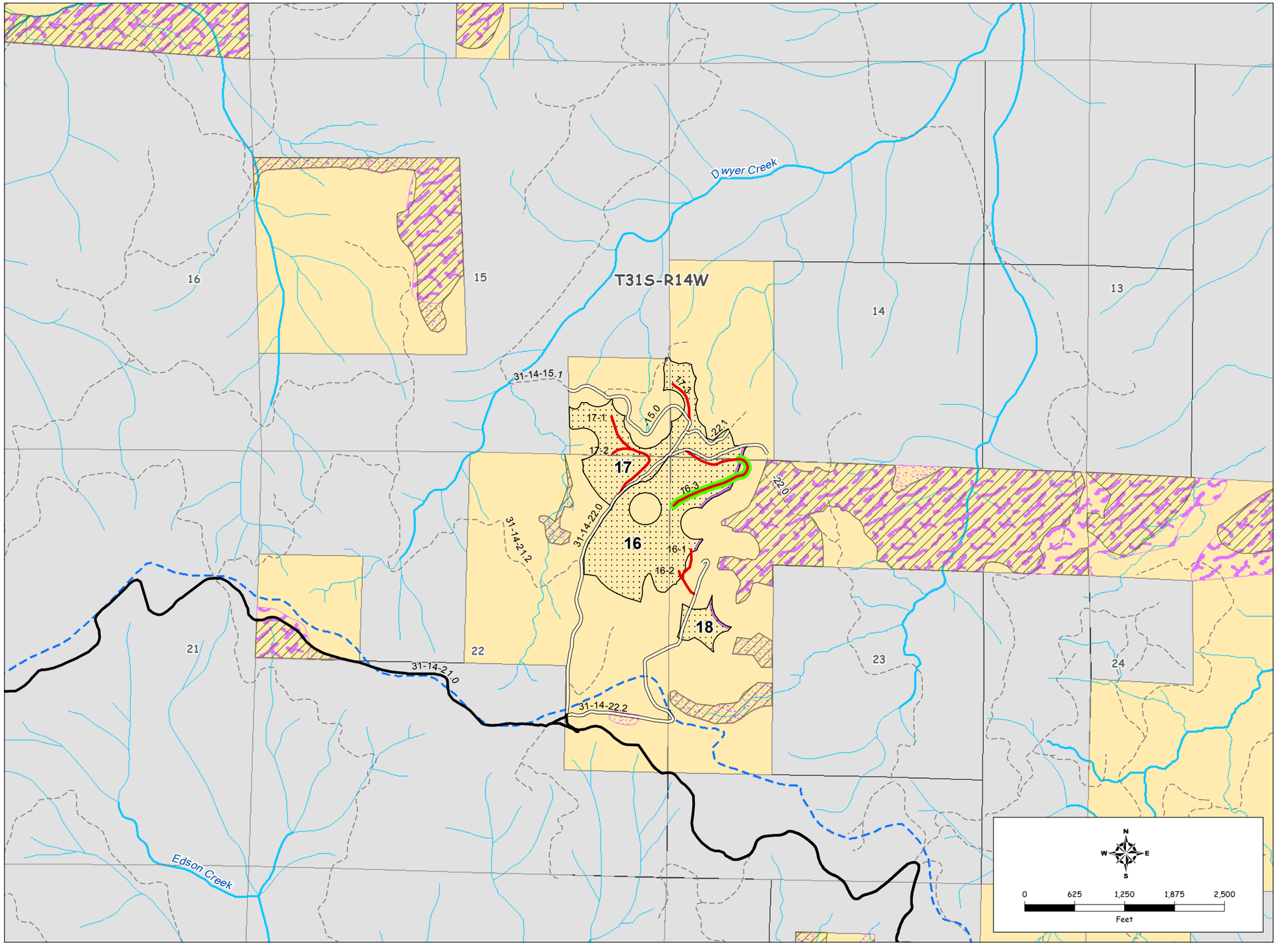
Six Twigs DOI-BLM-ORWA-C040-2013-0003-EA

Map #3c - Six One Wildlife Seasonal Restrictions



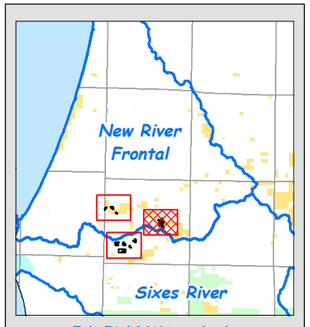
(Not all Map Features shown below will be present on all maps)

Map Features

- Murrelet Seasonal Restrictions
- NSO Seasonal Restrictions
- Planned Harvest Unit Boundary

Associated Road Work

- Major Road
- Renovation
- Improvement
- New Construction
- Seasonal Restriction Construction (NSO)
- Seasonal Restriction Haul/Construction (Murrelet)
- Seasonal Restriction Construction (Murrelet)
- Other Roads
- 6th-Field Subwatersheds
- Intermittent Stream
- Perennial Stream
- NSO Temporary Site
- NSO Nest Patch - 300 meters
- NSO Core Area - 0.5 mile
- NSO Home Range - 1.3 miles
- NSO Habitat
- Murrelet Occupied Sites
- Murrelet Suitable Nesting Habitat
- Red Tree Vole Management Area
- BLM Administered Land
- Private / Other Ownership



5th Field Watersheds

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- All EA Units are in Curry County -

Appendix A – Alternatives Considered but not Analyzed in Detail

Scoping respondents and comments received during public review of the EA and unsigned FONSI indicated a preference for commercial thinning treatments over regeneration harvest for the stands located within the Six Twigs proposed project area and requested the BLM to include thinning as alternative analyzed in detail. The ID Team considered thinning treatments for stands in the stem exclusion stage (Franklin *et al.* 2002) of stand development (ages 30–80 years) under the Edson Thin EA (2008) and again for the design of the Six Twigs proposed project.[1,2] Both projects considered stands near to each other in distance and located within the New River Frontal and Sixes River 5th field watersheds.

The BLM determined the most appropriate treatment options based on field review, stand data, and interpretation of the stand conditions influencing treatment. One purpose of the Matrix land use allocation is to provide a sustainable supply of timber to the local community. Foresters use mean annual increment (MAI) as a tool for determining stand productivity. Culmination of mean annual increment (CMAI) occurs when the periodic annual increment (PAI) value equals or falls below the MAI. The BLM can achieve optimal productivity for a patch of ground through multiple rotations when stands are harvested at the culmination age. Each proposed unit has achieved CMAI or is overstocked, negatively affecting productivity. Units proposed for regeneration as part of the Six Twigs project have not had any previous density reductions.

Trees grown at high densities have limited capacity to respond to thinning treatments due to small crown/root biomass and are more susceptible to wind damage due to the loss of adjacent trees to buffer wind forces (Oliver and Larson 1996). Because the area is exposed to strong winds, in excess of 90 mile per hour during severe winter storms, topographic exposure was one of six factors determining the proposed treatments.

The following analysis was conducted comparing stand conditions based on the *a priori* treatment designations. An initial set of seven silvicultural characteristics suspected to be important in the treatment classification where selected. Discriminate analysis (using R statistical software) identified the following six of seven variables as important ($p<0.05$) in discriminating between regeneration harvest (RH) and commercial thinning (CT) treatments. The six characteristics that accounted for most of the difference between the treatment sets are as follows [axis loading value in brackets]:[3]

1. Estimated stand age [0.165] - average breast height age plus additional years to reach breast height.
2. Topographic wind risk [0.473] - a subjective rating based on the potential topographic exposure to strong storm winds (values 1-5).
3. Change in MAI [1.531] - describes change in the mean annual increment (mean growth rate) between culmination age and current age divided by the time to reach culmination. This characteristic is intended to compare the remaining growth potential of the proposed untreated units.
4. PAI-MAI [-0.007] - the difference between the periodic annual increment (yearly growth) and the mean annual increment. It can be interpreted as a growth vector. It is an indirect measure of the current slope of growth curve.
5. Treatment change in MAI [-0.099] - same as number 3, but after a modeled thinning treatment.

[1] Edson Thin EA OR128-07-02

[2] This analysis was originally completed in 2009 using SPS (Stand Projection System) and PC-ORD, software packages the BLM no longer uses. The BLM recreated the analysis with updated stand data, the FVS (Forest Vegetation Growth Model) growth model (USDA) and R statistics package (R project for statistical computing). The 2009 results were influential in preliminary planning; the updated analysis reinforced previous conclusions.

[3] Loadings can be interpreted such that one standard deviation increase in estimated *age* would result in a 0.165 standard deviation increase in the predicted values on discriminant function axis. The same is true using the load value for each variable.

6. Treatment PAI-MAI [-0.007] - same as number 4, but after a modeled thinning treatment.

- All of these variables were statistically significant when considered singly in predicting (discriminating) silvicultural treatment (univariate tests).
- A multivariate discriminant model with these variables was highly significant (Wilk's Lamda 0.18; p <0.0001).
- The model had a low posterior probability error rate (0.03 percent), with the classification rates and Average Posterior Probabilities shown in **Table 1**.

Table 1 Model posterior probability error rate.

a priori designation		Predicted	
		CT	RH
CT n=15		14	1
	(posterior probability)	(0.933)	(0.067)
RH n=17		1	16
	(posterior probability)	0.059	0.941

Linear Discriminate Analysis was used to collapse variation from the multiple variables into a single composite axis. Canonical scores on this axis were used to depict similarities between units (stands) in "silvicultural trait space", and to illustrate relationships between units and treatments. The silvicultural trait space is depicted in **Figure 1** and illustrates where each of the units falls within the trait space.

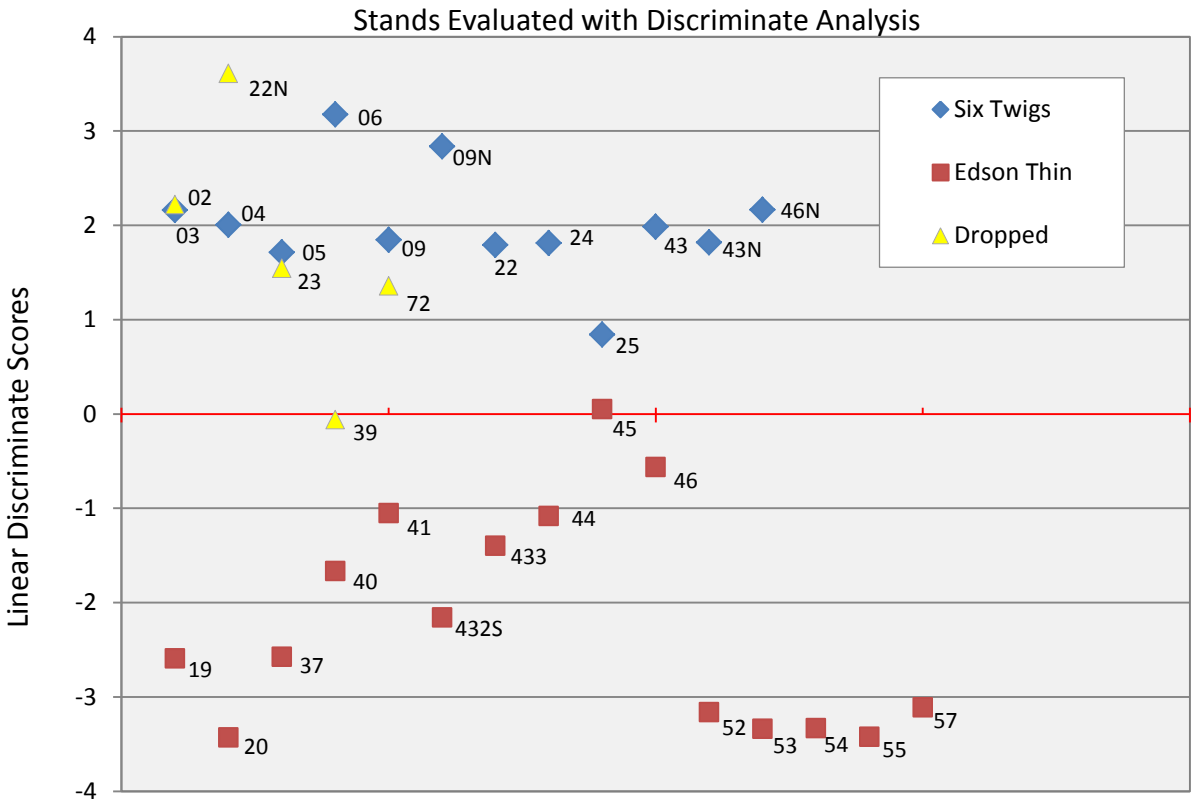

Figure 1 Lineal discriminant analysis. This ordination depicts closeness of units in "trait space" across a single (reduced dimensional) axis. Units were assigned *a priori* to regeneration harvest (RH) treatment (blue diamond) or commercial thinning (CT) treatment (red square). Units dropped (yellow diamond) from detailed analysis would not receive treatment as part of the Six Twigs proposed project.

Using the trait space of stand level growth curve characteristics, there is a clear separation of the two treatment types. It indicates that there was a consistent interpretation of stand characteristics that determined the treatment for the given site conditions. All but one of the CT units (Edson Thin EA Unit 45) was accurately predicted based on these characteristics. No proposed RH units were predicted to occur in the commercial thinning trait space. Unit 45 does not meet the 60-year minimum harvest age limit and is more similar to the RH treatment units in growth characteristics. The unit required additional design measures to reduce topographic wind risk (exclusions and lower intensity treatment). There was evidence, even before treatment, of moderate wind throw along the windward edge of the unit adjacent to a recent private clear-cut. This unit was recently thinned as part of the Ocean View CT timber sale but BLM foresters have yet to evaluate the effectiveness of the design elements intended to reduce wind throw risk.

Height to diameter ratio, one of the seven factors initially considered, was not found to be an important factor in discriminating the above treatment decisions in the analysis. Where CT and RH occur in the same wind risk category, it appears that CT designated stands appear to have lower height to diameter ratios than the RH designated stands. This may indicate that height to diameter ratios are more dependent on relative conditions than absolute height diameter values. There are insufficient stand/treatment type combinations in each risk category to establish a local trend or test the assertion statistically. The raw data is provided in **Table 2**.

The Myrtlewood Field Office has gained considerable experience in thinning over the past decade under the Northwest Forest Plan. The above analysis indicates that there was a consistent interpretation of stand characteristics that determined the treatment for the given site conditions. Age, wind risk, current/future growth, and response to treatment were shown to be important in explaining the proposed treatments. It may be possible to thin the proposed stands in such a way as to mitigate the wind risk; however, the thinning would have to be of such low intensity that the operation would be non-commercial and would not result in an adequate growth response to justify the treatment cost or the delay in volume provided. Thinning would greatly increase risk of post-treatment wind damage while providing a minimal return in growth response; this is not the intended purpose of the Matrix land use allocation. Based on this analysis, subsequent conclusions, and experience within the Coos Bay District BLM timber program under the 1995 RMP, the BLM does not consider a commercial thinning alternative a reasonable alternative; therefore, the BLM did not propose a commercial thinning alternative for analysis in the Six Twigs EA.

Table 2 Data used in the Canonical Discriminate Analysis.

Evaluated Stands	Rx	Proposed Six Twigs Unit[1]	Estimated Age	Topographic Wind Risk	Change in MAI	PAI-MAI	Treatment Change in MAI	Treatment PAI-MAI
02	RH	No	65	4	0.050	12	0.000	-38.2
03	RH	Yes	68	4	0.444	62	0.400	64.1
04	RH	Yes	66	4	0.280	55	0.200	15.7
05	RH	Yes	62	4	0.000	-12	0.000	-23.5
06	RH	Yes	66	4	0.000	-83	0.000	-61.9
09N	RH	Yes	66	4	0.000	-121	-1.556	43.2
09	RH	Yes	67	3	0.200	20	-2.219	46.5
19	CT	No	42	2	1.636	187	1.169	112.2
20	CT	No	39	2	0.708	88	0.800	69.1
22N	RH	No	78	3	0.114	17	0.000	8.3
22	RH	Yes	65	4	0.556	88	0.300	45.7
23	RH	No	60	5	0.491	73	0.225	34.1
24	RH	Yes	65	4	0.540	96	0.300	31.6
25	RH	Yes	55	5	0.240	28	0.200	10.0
37	CT	No	45	1	0.533	56	0.400	23.4
39	RH	No	50	4	0.000	-17	0.000	-46.1
40	CT	No	49	2	0.760	90	1.200	56.8
41	CT	No	55	2	0.800	135	0.600	79.3
432S	CT	No	50	1	0.567	74	0.520	66.5
433	CT	No	53	1	0.150	29	0.000	-4.5
43N	RH	Yes	65	2	-0.267	-96	0.000	-71.2
43	RH	Yes	64	5	0.133	28	0.400	31.4
44	CT	No	44	4	0.920	84	0.400	44.1
45	CT	No	49	5	0.250	34	0.000	-18.3
46	CT	No	48	4	0.267	31	0.000	-14.9
46N	RH	Yes	66	4	0.380	44	0.000	28.4
52	CT	No	40	1	1.429	148	0.800	80.9
53	CT	No	38	2	0.900	95	0.780	67.1
54	CT	No	38	2	1.086	121	0.822	78.5
55	CT	No	38	1	0.720	78	0.200	1.6
57	CT	No	37	2	1.133	97	0.686	61.8
72	RH	No	66	2	0.360	45	0.000	4.7
02	RH	No	65	4	0.050	12	0.000	-38.2
03	RH	No	68	4	0.444	62	0.400	64.1
04	RH	No	66	4	0.280	55	0.200	15.7
05	RH	No	62	4	0.000	-12	0.000	-23.5
06	RH	No	66	4	0.000	-83	0.000	-61.9
09N	RH	No	66	4	0.000	-121	-1.556	43.2
09	RH	No	67	3	0.200	20	-2.219	46.5
19	CT	No	42	2	1.636	187	1.169	112.2
20	CT	No	39	2	0.708	88	0.800	69.1
22N	RH	No	78	3	0.114	17	0.000	8.3
22	RH	No	65	4	0.556	88	0.300	45.7
23	RH	No	60	5	0.491	73	0.225	34.1

[1] Units not included as part of the Six Twigs proposed project were included for analysis under the Edson Thin EA or dropped from further consideration for various reasons.

Appendix B – Sample Tree Falling

Background

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 BLM offers the sale (43 CFR 5420.0-6). The BLM would sell the timber within Six Twigs project areas as lump-sum timber sales. In a lump-sum sale, timber cruisers assess the standing timber and give it a specific value. This value becomes the BLM cruise estimate and is the minimum bid for the removal of the timber in the advertised sale. The winning bidder pays the exact amount of the winning bid to the BLM.

Conversely, the Forest Service in western Oregon normally uses a log-scale sale process. The Forest Service does provide prospective purchasers an appraisal of the timber; however, they make a bid on the average stumpage. The Forest Service removes logs from a sale, scales, and then assesses a value using the average stumpage bid by the purchaser. The final price of the sale is determined **after** cutting the trees (Howard and DeMars 1985).

The Forest Service does not use sample tree falling, because they do not need as accurate a cruise before they offer a timber sale because they use the log-scaling process. However, the Forest Service has used validation falling in the past. The BLM needs a more accurate cruise to prepare the best appraisal for the minimum lump-sum bid price, **before** the sale advertisement.

It is in the public interest that the BLM maintains accurate and reliable timber cruises. Sample tree falling maintains accurate and reliable timber cruises; the practice provides statistically reliable data available in no other way. It helps ensure the public receives fair market value for the timber sold as required by Congress through the FLPMA.

Other Cruise Methods

The BLM has frequently used visual timber cruises but this technique does not allow the BLM to check the accuracy of the final cruise. The pure ocular cruising method makes many assumptions about the trees measured:

- 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 which are subject to inherent measurement bias.

Accuracy of Sample Tree Falling

Conducting sample tree falling removes the measurement bias inherent in making visual estimates. Through checking measurements directly by felling a sample tree, cruisers can make corrections to their estimates. This is because sample tree falling provides the direct measurement of form class, bark thickness, taper, defect, breakage, volume and value without bias. This is a statistically valid sampling methodology (Bell and Dilworth 1997 (Revised), Iles 2003, USDI 1989) where cruisers select a portion of the cruise trees 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, it eliminates the measurement bias created through ocular estimation. Cruisers can apply the measurements gained by felling, such as form class,

bark thickness, and stump to DBH ratio, to the remaining standing trees and incorporate that information into district databases.

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. The following minimum number of 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.”

Because of the statistically valid cruise design, cruisers can reliably extrapolate the sample results to the rest of the unit.

Sample Tree Falling as a Connected Action

The BLM includes sample tree falling in the Six Twigs EA as a project design feature and thus analysis of the Proposed Action includes the effects of sample tree felling. There is no CEQ requirement that a Federal agency must issue a single decision for actions considered and analyzed in the same EA document. Sample tree felling is a ground-disturbing activity that must occur prior to the offering of a timber sale.

All of the proposed timber sales could proceed without sample tree falling. In addition, sample tree falling does not depend on the larger action (the timber sales) for its justification. Sample tree falling can proceed without taking other actions. The BLM might not choose to offer these sales. However, the BLM could use these volume tables gained from conducting sample tree falling to assess the final cruise volume in sales that occur within the same watershed and have similar stand characteristics.

The BLM conducts many activities in preparation of a timber sale before the Authorized Officer decides to offer a timber sale. These activities include tree marking, flagging of sale boundaries, surveying property lines, and biological surveys. Unlike sample tree falling, these activities are not ground disturbing and occur as part of routine timber sale preparation. Like sample tree falling, these activities do not justify that a timber sale goes forward. The BLM has conducted many of these activities for a sale and the sale has never gone forward. Issuing a decision to conduct sample tree falling does not itself constitute a decision to offer a timber sale.

Appendix C – Port-Orford-Cedar Risk Key

The following contains site-specific analysis to help determine where the BLM would apply risk reduction management practices:

> **1a.** Are there uninfected POC within, near (25-50 ft.), or downstream (100-200 ft.) of the activity area whose ecological, Tribal, or product use or function measurably contributes to meeting land and resource management plan objectives?
>
> **1b**. Are there uninfected POC within, near (25-50 ft.) or downstream (100-200 ft.) of the activity area that, were they to become infected would likely spread infection to trees whose ecological, Tribal, or product use or function measurably contributes to meeting land and resource management plan objectives?
>
> **1c**. Is the activity within an uninfested 7th field watershed as defined in Attachment 1?
>
> **2.** Will the proposed project introduce appreciable additional risk of infection to these uninfected POC.

The answers to 1a, 1b, 1c, and 2 are no. According to stand exam data, merchantable Port-Orford-cedar is extremely rare within the project area and therefore does not meet the "measurably contributes to" definition (1a and 1b) or "appreciable additional risk" meaning (1c). In addition, the project area is within an infected watershed. Because the answers to questions 1a, 1b, 1c, and 2 are no, the risk is low and no POC management practices are required; however to maintain POC on the landscape, the BLM would replant POC with disease resistant POC seedlings and locate seedlings greater than 50 feet from the road.

Plant Species Survey and Site Management Summary

Project Name: Six Twigs EA
Project Type: Regeneration Harvest
Location: T. 31S., R.14W., Secs. 7, 14, 15, 18, 22, 23, 28, 29, 30, 32. WM.
Prepared By: Colleen Holland, Wildlife Biologist
Date: April 2016
S&M List Date: 2003 Annual Species Review

Table A. Survey & Manage Wildlife Species. Species listed below were compiled from the December 2003 Annual Species Review update to the 2001 Record of Decision and Standard and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measure Standards and Guidelines, with the 2001 status for the red tree vole, and include those species whose known or suspected range is within the wildlife analysis area—

- Survey Protocol for the Red Tree Vole, *Arboriumus longicaudu*, Version 3.0,
- Management Recommendations for the Oregon Red Tree Vole,
- Field Guide to Survey and Manage Terrestrial Mollusk Species from the Northwest Forest Plan, and
- BLM Conservation Assessments.

Surveys completed for the red tree vole followed methodology described in the Survey Protocol for the Red Tree Vole.

One recently active red tree vole nest was discovered during surveys. A habitat management area was created around this nest site per the standards outlined in the Management Recommendations for the Oregon Red Tree Vole. Proposed harvest within this habitat management area was dropped from the final proposed project.

Species	Survey and Manage Category	Survey Triggers			Survey Results			Site Management
		Within Range of the Species?	Project Contains Suitable habitat?	Project will affect species/ habitat?	Surveys Required?	Survey Dates	Sites Found?	
VERTEBRATES								
Oregon Red Tree Vole (mesic) (*Arborimus longicaudus*)	C	Yes	Yes	Yes	Yes	1/2015	1	Yes[1]

[1]Site managed per the Management Recommendations for the Oregon Red Tree Vole.

Statement of Compliance

The Coos Bay BLM District applied the 2003 Annual Species Review List, with the 2001 status for the red tree vole, to the Six Twigs EA project area, completing pre-disturbance surveys and management of known sites, required by Survey Protocols and Management Recommendations to comply with the *2001 Record of Decision and Standard and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measure Standards and Guidelines*.

/s/ Colleen Holland
Colleen Holland, Wildlife Biologist
Myrtlewood Field Office

4/11/2016
Date

Appendix E – Special Status Species—Wildlife

Special Status Species documented (D) and suspected (S) to occur on the Coos Bay District, but not analyzed in detail (Dec. 2011 ISSSP List). Species were excluded for one of the following reasons:

1. The project is outside of the species' known range;
2. Key habitat features are not within the reach of project impacts; or
3. The species is unlikely to be present because key habitat features are lacking.

Species Name*	Key Habitats / Species Notes / Range	Reason Not Analyzed
California Slender Salamander (D)	Late-seral forests, large down logs (especially class 3-4). Somewhat coastal. Tightly associated with down wood. Documented in Lower Hunter Cr. & N. Fork Chetco watersheds. Surveys for Del Norte salamander on District did not find them north of the Rogue River.	1
Foothill Yellow-Legged Frog (D)	**Require permanent (and some types of intermittent), low-gradient, medium size streams (4th-6th order).**	**2**
Aleutian Canada Goose (D)	Coastal grasslands- stages in spring in New River bottoms; also a fall migrant.	1
American Peregrine Falcon (D)	Nests along coastal and inland cliffs.	3
Bald Eagle (D)	Nests mainly in large trees close to open water habitats.	3
Black Swift (D)	Nests in small colonies at sites behind waterfalls, in caves or deep gorges, or sea cliffs and sea caves. Confirmed site on the Umpqua National Forest.	3
California Brown Pelican (D)	Rests on coastal beaches, headlands, harbors, bays, docks, and pilings. Feeds on fish in bays, estuaries, and marine near shore. Non-breeder along the entire Oregon coast.	1
Dusky Canada Goose (S)	Nests in south central Alaska and migrates along the Pacific Coast, and winters in southwestern Washington and western Oregon. Uses coastal grasslands and wet meadows. -Uncommon to rare on District.	1
Harlequin Duck (D)	Primarily breeds in white water streams in the eastern and western slopes of the Cascade Mountains. Only one breeding location, on the Nestucca River in Tillamook County, has been found in the Coast Range. Regular winter migrant to the Oregon Coast.	1
Horned Grebe (D)	Breeds primarily in Canada on small to moderate-sized, shallow freshwater ponds and marshes. Common winter species on District, rare during the summer.	1
Oregon Vesper Sparrow (D)	Grasslands on or adjacent to the coast. Small breeding population on private ranchland in Curry County. Has bred at New River ACEC, also. Otherwise a rare migrant.	1
Red-necked Grebe (D)	Breeds primarily in Canada on shallow freshwater lakes, bays of larger lakes, marshes, and other inland bodies of water. Winters on open ocean or on large lakes. Uncommon throughout the year on Coos Bay District. Primarily a winter species.	1
Snowy Egret (D)	Along small ponds and the shoreline. Uncommon in spring, fall, and winter. Rare during the summer. No confirmed breeding on Coos Bay District.	1
Streaked Horned Lark (D)	Coastal dunes and grasslands; open beach; open ground with short grass or scattered bushes. Rare migrant.	1
Tule Greater White-Fronted Goose (S)	Occasional stopover migrant. Breeds in Alaska and winters in California.	1
Western Snowy Plover (D)	Open coastal sand, sand spits, dune-backed beaches, flats or deflation plains east of foredunes, and dredge spoils. Nests at New River ACEC and Coos Bay North Spit.	1
White-tailed Kite (D)	Open areas in coastal and valley lowlands, especially along river valleys with scattered trees for perching and nesting. Nests in the Coquille Valley and Dean Creek Elk Viewing Area.	1
California Shield-Backed Bug (S)	Tall grass prairie specialist inhabits high elevation (*e.g.* 900 m) natural balds and meadows.	1
Green Sideband (D)	**Documented in Sixes River Recreation Site and is primarily a Curry County, Oregon species**	**2**

Hoary Elfin (S)	Closely associated with kinnikinnik (Arctostaphylos uva-ursi). Coastal species.	1
Insular Blue Butterfly (S)	Open areas, clover. Coastal species.	1
Johnson's Hairstreak (D)	Old-growth obligate species. Host: is *Arceuthobium* species of dwarf mistletoe. Documented in Hunter Creek ACEC.	3
Mardon Skipper (D)	Grass openings with native grasses and serpentine. Documented in Hunter Creek ACEC.	1
Newcomb's Littorine Snail (D)	Areas of *Salicornia virginica* (pickleweed/glasswort) along tidal line in Coos Bay on District lands.	1
Oregon Shoulderband (S)	Rocky & talus substrates. Many mollusk surveys, but no Coos Bay District records. Current known range is Douglas, Jackson, and Josephine Counties.	1
Pacific Walker (D)	Southwest Oregon and northwest California coastal endemic with very limited potential range. Very small, semi-aquatic snail. Characteristically found among wet leaf litter and vegetation beside flowing or standing water in shaded situations where humidity remains high.	1
Robust Walker (S)	Southwest Oregon and northwest California coastal endemic with very limited potential range. Very small, semi-aquatic snail.	1
Rotund Lanx (S)	A large freshwater limpet confined essentially to the main stem Rogue and Umpqua Rivers and one large tributary of the former, in southwestern Oregon.	1
Siuslaw Sand Tiger Beetle (D)	Open sand. Documented at New River ACEC.	1
Western Bumblebee (S)	Important pollinators of wild flowering plants and crops. As generalist foragers, they do not depend on any one flower type.	1
Western Ridged Mussel (S)	Broadly distributed in Washington, Oregon, California, Idaho, Nevada, possibly Montana. Occurs on the benthos of streams, rivers and lakes with substrates that vary from gravel to firm mud, and include at least some sand, silt or clay.	2
Pacific Fisher (D)	**Late-seral forests. Dens in snags and down wood. Photo documented via remote cameras in the southern portion of the district.**	**1**
Pallid Bat (S)	Much of the American west, up and down the coast from Canada and Mexico. Arid regions with rocky outcroppings, to open, sparsely vegetated grasslands. Water must be available close by to all sites.	1
Steller Sea Lion (S)	Cool coastal waters of the North Pacific. When not in the water, Steller sea lions gather on rookeries and haulouts which are secluded rocky islands.	1
Pacific Pond Turtle (D)	Lentic water (ponds, slow sections of rivers). Nests in open areas adjacent to water. Can overwinter in forest. Documented in New River and along the Rogue River.	1

*Species in bold include additional discussions below, as the species could be found within the EA analysis area.

The foothill yellow-legged frog (*Rana boylii*) is often associated with large streams with coarse substrates; however, they also have been found in smaller tributaries, and in areas with relatively fine substrates or in areas with bedrock. It occurs primarily in 4th to 6th order streams, but has been documented from 1st to 8th order streams. Suitable stream substrates are often coarse and may include larger cobbles, gravel bars and bedrock. Breeding is documented in the larger streams and not smaller tributaries (Olson 2009). Edson Creek Campground has a known population of yellow-legged frogs. The campground is within the analysis area (watershed scale), but not the wildlife analysis area. There are no 4th order streams adjacent to harvest units. The proposed Riparian Reserve road construction follow project design features designed to minimize negative impacts to streams, thereby no effects are anticipated to the foothill-yellow legged frog and the species is not analyzed in detail.

The green sideband (*Monadenia fidelis beryllica*) is the dominate *Monadenia* on the west side of the Coast Range from the Pistol River to the Winchuck River. The green sideband is generally found in stands with deciduous trees and brush, in wet, relatively undisturbed forest. (Frest and Johannes, 2000) The proposed harvest units have a minimal hardwood component, reducing the likelihood stands are occupied by the green sideband. One green sideband has been recorded at the Sixes Recreation site, within the EA analysis area. The detection is approximately 5 miles, and up-stream from the proposed harvest units. For these reasons the green sideband is not analyzed in detail.

Appendix F – Special Status Plant Species

List of all Bureau Sensitive plant species possibly occurring on the proposed timber harvest units in the Six Twigs EA. Low ≤ 2 known sites, Moderate 3–9 sites, and High ≥10 sites on the Coos Bay District. For species with known sites nearby the project area likelihood is increased; species with sites 10+ miles away from the project area are primarily in the coastal zone, likelihood has been decreased.

Scientific and Common Name	Documented (D) or Suspected (S) on Coos Bay District	Likelihood of Occurring in the Project Area
VASCULAR PLANTS		
Adiantum jordanii (California maidenhair fern)	D	Low. Only one known site on Coos Bay BLM.
Erigeron cervinus (Siskiyou daisy)	S	Low. Preferred habitat is scarce in proposed harvest units.
Iliamna latibracteata (California globe mallow)	D	Low. Preferred habitat is scarce in proposed harvest units.
Pellaea andromedifolia (Coffee fern)	D	Low. Preferred habitat is scarce in proposed harvest units.
Polystichum californicum (California sword fern)	D	Low. Rare on district but could potentially show up almost anywhere in forested habitat.
Romanzoffia thompsonii (Thompson's mist maiden)	D	Low. Preferred habitat is scarce in proposed harvest units.
Scirpus pendulus (drooping bulrush)	S	Low. Preferred habitat is scarce in proposed harvest units.
Trillium kurabayashii (=*T. angustipetalum*)(giant purple trillium)	D	Low. Rare on district but could potentially show up almost anywhere in forested habitat in Curry County.
LICHENS		
Bryoria subcana	D	High. Has been found on nearby BLM lands.
Calicium adspersum	S	Low. Scattered legacy trees provide habitat in proposed harvest units.
Heterodermia leucomela	D	Low. All District sites found on immediate coast so far.
Hypotrachyna revoluta	D	High. Has been found on nearby BLM lands.
Leptogium cyanescens	S	Low. No known sites on District.
Niebla cephalota	D	Low. All District sites on immediate coast but could be found inland.
BRYOPHYTES		
Codriophorus depressus (*Racomitrium depressum*)	S	Low. Scattered legacy trees provide habitat in some proposed harvest units.
Cryptomitrium tenerum	S	Low. No known sites on District.
Metzgeria violacea	D	High. Multiple sites on District.
Porella bolanderi	S	Low. No known sites on District.
Schistostega pinnata	S	Low. No known sites on District.
Tetraphis geniculata	S	Low. No known sites on District.
FUNGI (surveys not practical)		
Arcangeliella camphorata	D	Moderate. Three sites have been found in forested areas on District.
Boletus pulcherrimus	S	Low. Recent site from Blacklock Point area of Curry County.
Cortinarius barlowensis (=C. azureus)	S	Low. No known sites on District.
Phaeocollybia californica	D	High. Multiple sites known from District.
Rhizopogon exiguus	S	Low. Site near Mapleton on Siuslaw N.F.

Plant Species Survey and Site Management Summary

Project Name: Six Twigs EA
Project Type: Regeneration Harvest
Location: T. 31S., R.14W., Secs. 7, 14, 15, 18, 22, 23, 28, 29, 30, 32. WM.
Prepared By: Tim Rodenkirk, Botanist
Date: April 2015
S&M List Date: 2003 Annual Species Review

Table A. Survey & Manage Plants Species. Species listed below were compiled from the December 2003 Annual Species Review update to the *2001 Record of Decision and Standard and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measure Standards and Guidelines* and include those species whose known or suspected range includes the Coos Bay District according to—

- "Survey Protocols for Survey and Manage Component 2 Bryophytes, Version 2.0" (BLM-Information Bulletin No. OR-98-051);
- "Survey Protocols for Seven Protection Buffer Fungi, Version 1.3" (BLM-Instruction Memorandum Number OR-2000-018);
- "Survey Protocols for Component 2 Lichens, Version 2.0" (BLM-Instruction Memorandum Number OR-98-38), and
- BLM Conservation Assessments.

Survey methodology involves using the intuitive controlled method where high likelihood habitats are surveyed more intensively than other areas within the project. This protocol is detailed in the publications listed above.

Nine Survey and Manage lichen sites were found during lichen/bryophyte special status plant surveys within the original proposed units in the Six Twigs EA. In addition, 14 fungal sites were found incidentally during these surveys.

Species[1]	Survey and Manage Category	Survey Triggers			Survey Results			Site Management[2]
		Within Range of the Species?	Project Contains Suitable habitat?	Project will affect species/ habitat?	Surveys Required?	Survey Dates	Sites Found?	
Chaenotheca chrysocephala	B	N/A	N/A	N/A	No	N/A	1	Yes
Hypotrachnya revoluta*	E	N/A	N/A	N/A	No	N/A	4	Yes
Peltigera pacifica	E	N/A	N/A	N/A	No	N/A	4	Yes
Phaeocollybia attenuata	D	N/A	N/A	N/A	No	N/A	2	Yes
Phaeocollybia fallax	D	N/A	N/A	N/A	No	N/A	1	Yes
Phaeocollybia kauffmanii	D	N/A	N/A	N/A	No	N/A	2	Yes
Phaeocollybia pseudofestiva	B	N/A	N/A	N/A	No	N/A	1	Yes
Phaeocollybia spadicea	B	N/A	N/A	N/A	No	N/A	2	Yes
Ramaria araiospora	B	N/A	N/A	N/A	No	N/A	3	Yes

Ramaria rubella var. blanda*	B	N/A	N/A	N/A	No	N/A	1	Yes
Ramaria stuntzii	B	N/A	N/A	N/A	No	N/A	2	Yes
FUNGI								
Bridgeoporus nobililssimus	A	Yes	No	N/A	No	N/A	No	N/A
LICHENS								
Bryoria pseudocapillaris	A	No	N/A	N/A	No	N/A	No	N/A
Bryoria spiralifera	A	No	N/A	N/A	No	N/A	No	N/A
Cladonia norvegica	C	Yes	Yes	Yes	Yes	Nov 2014-Feb 2015	No	N/A
Hypogymnia duplicata	C	No	N/A	N/A	No	N/A	No	N/A
Leptogium cyanescens	A	Yes	Yes	Yes	Yes	Nov 2014-Feb 2015	No	N/A
Lobaria linita	A	Yes	Yes	Yes	Yes	Nov 2014-Feb 2015	No	N/A
Nephroma occultum	A	No	N/A	N/A	No	N/A	No	N/A
Niebla cephalota	A	No	N/A	N/A	No	N/A	No	N/A
Pseudocyphellaria perpetua	A	Yes	Yes	Yes	Yes	Nov 2014-Feb 2015	No	N/A
Teloschistes flavicans	A	No	N/A	N/A	No	N/A	No	N/A
BRYOPHYTES								
Schistostega pennata	A	Yes	Yes	Yes	Yes	Nov 2014-Feb 2015	No	N/A
Tetraphis geniculata	A	Yes	Yes	Yes	Yes	Nov 2014-Feb 2015	No	N/A
VASCULAR PLANTS								
Bensoniella oregana	A	No	N/A	N/A	No	N/A	No	N/A
Eucephalis vialis	A	No	N/A	N/A	No	N/A	No	N/A

[1] Species with an * are also Bureau Sensitive species.
[2] All Survey and Manage species would have a one hectare (185 foot radius) no-cut buffer left around the site in order to protect the microclimate such that the species would persist at the site (Heithecker and Halpern, 2007).

Statement of Compliance

The Coos Bay BLM District applied the 2003 Annual Species Review List to the Six Twigs EA project area, completing pre-disturbance surveys and management of known sites, required by Survey Protocols and Management Recommendations to comply with the 2001 Record of Decision and Standard and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measure Standards and Guidelines.

Each of the twenty-three known Survey and Manage sites would be buffered with a one-hectare aggregate (approximately a 185 foot radius no-cut buffer) around the site to protect the microclimate. Research suggests that one-hectare aggregates are sufficiently large to contain areas with light, temperature, and soil moisture that are comparable to those in undisturbed forest and suitable, in the short term, for persistence of forest-dependent species (Heithecker and Halpern 2007). In addition, the site and buffered area would not be harvested.

/s/ Tim Rodenkirk
Tim Rodenkirk, Botanist
Myrtlewood Field Office

4/11/2016
Date

Appendix H – Fungi

This list of Special Status and Survey and Manage Fungi that are known or suspected within the units originally identified for analysis (proposed regeneration harvest units and acres considered but eliminated from detailed analysis, which are presented in **Table 2-8**). **Table G-1** includes an effects summary from the 2000 Final SEIS for Amendment to the Survey & Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines.

Table G-1 Special Status and Survey and Manage Fungal species list for the Six Twigs project.

Species	Bureau Sensitive Species	Survey and Manage Category	Number of Occurrences Within Units Originally Identified for Analysis	Environmental Consequences from 2001 FSEIS (p.241-252)
Albatrellus avellaneus	Yes	B	0	Alternatives would not provide adequate habitat to maintain this species.
Albatrellus caeruleoporus	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Albatrellus ellisii	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Arcangeliella camphorata	Yes	B	0	Alternatives would not provide adequate habitat to maintain this species.
Arcangeliella crassa	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Arcangeliella lactarioides	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Asterophora lycoperdoides	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Asterophora parasitica	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Balsamia nigrans	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Boletus pulcherrimus	Yes	B	0	Alternatives would not provide adequate habitat to maintain this species.
Bondarzewia mesenterica	No	B	0	All alternatives would provide sufficient habitat to allow this species to stabilize in a pattern similar to their reference distributions.
Catathelasma ventricosa	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Chalciporus piperatus	No	D	0	All alternatives would provide habitat sufficient to allow this species to stabilize in a pattern different from their reference distribution.
Chamonixia caespitosa	Yes	B	0	Alternatives would not provide adequate habitat to maintain this species.
Choiromyces venosus	Yes	N/A	0	Alternatives would not provide adequate habitat to maintain this species.
Cortinarius barlowensis	Yes	N/A	0	Insufficient information in any alternative to determine how they would affect distribution and stability of this species.
Chrysomphalina grossula	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Clavariadelphus ligula	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Clavariadelphus occidentalis	No	B	0	All alternatives would provide sufficient habitat to allow this species to stabilize in a pattern similar to their reference distributions.
Clavariadelphus sachalinensis	No	B	0	Alternatives would not provide adequate habitat to maintain this species.

Clavariadelphus subfastigiatus	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Clavariadelphus truncatus	No	D	0	All alternatives would provide sufficient habitat to allow this species to stabilize in a pattern similar to their reference distributions.
Clavulina castanopes var. *lignicola*	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Clitocybe senilis	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Clitocybe subditopoda	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Collybia bakerensis	No	F	0	Alternatives would not provide adequate habitat to maintain this species.
Collybia(Dendrocollybia) racemosa	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Cordyceps ophioglossoides	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Cortinarius barlowensis	No	B	0	There is insufficient information to determine how any alternative would affect distribution and stability of this species.
Cortinarius boulderensis	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Cortinarius cyanites	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Cortinarius depauperatus	No	B	0	There is insufficient information to determine how any alternative would affect distribution and stability of this species.
Cortinarius olympianus	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Cortinarius valgus	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Cortinarius wiebeae	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Cudonia monticola	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Cyphellostereum laeve	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Dermocybe humboldtensis	Yes	B	0	Alternatives would not provide adequate habitat to maintain this species.
Endogone oregonensis	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Entoloma nitidum (Rhodocybe nitida)	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Fayodia bisphaerigera	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Galerina atkinsoniana	Yes	N/A	0	Alternatives would not provide adequate habitat to maintain this species.
Galerina heterocystis	No	E	0	There is insufficient information to determine how any alternative would affect distribution and stability of this species.
Gasteroboletus turbinatus	No	B	0	All alternatives would provide sufficient habitat to allow this species to stabilize in a pattern similar to their reference distributions.
Gomphus clavatus	No	F	1	All alternatives would provide habitat sufficient to allow this species to stabilize in a pattern different from their reference distribution.
Gomphus kauffmanii	No	E	0	All alternatives allow this species to stabilize in a pattern different from their reference distribution.
Helvella elastic	No	B	0	Alternatives would not provide adequate habitat to maintain this species.

Hydnotrya inordinata	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Hydropus marginellus	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Hypomyces luteovirens	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Leucogaster citrinus	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Leucogaster microsporus	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Macowanites chlorinosmus	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Mycena quiniaultensis	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Mycena tenax	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Neolentinus adhaerens	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Nivatogastrium nubigenum	No	B	0	All alternatives would provide sufficient habitat to allow this species to stabilize in a pattern similar to their reference distributions.
Otidea leporina	No	D	0	Alternatives would not provide adequate habitat to maintain this species.
Otidea smithii	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Phaeocollybia attenuata	No	D	2	All alternatives would provide sufficient habitat to allow this species to stabilize in a pattern similar to their reference populations.
Phaeocollybia californica	Yes	B	0	Alternatives would not provide adequate habitat to maintain this species.
Phaeocollybia dissiliens	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Phaeocollybia fallax	No	D	1	All alternatives would provide sufficient habitat to allow this species to stabilize in a pattern similar to their reference distributions.
Phaeocollybia gregaria	Yes	B	0	Alternatives would not provide adequate habitat to maintain this species.
Phaeocollybia kauffmanii	No	D	2	All alternatives would provide sufficient habitat to allow the species to stabilize in a pattern similar to their reference distributions.
Phaeocollybia olivacea	No	F	0	All alternatives would provide sufficient habitat to allow this species to stabilize in a pattern similar to their reference distributions.
Phaeocollybia oregonensis	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Phaeocollybia piceae	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Phaeocollybia pseudofestiva	No	B	1	Alternatives would not provide adequate habitat to maintain this species.
Phaeocollybia scatesiae	No	B	0	There is insufficient information to determine how any alternative would affect distribution and stability of this species.
Phaeocollybia spadicea	No	B	2	Alternatives would not provide adequate habitat to maintain this species.
Phellodon atratus	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Pholiota (Stropharia) albivelata	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Podostroma alutaceum	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Polyzellus multiplex	No	B	0	Alternatives would not provide adequate habitat to maintain this species.

Pseudaleuria quinaultiana	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Ramaria abietina	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Ramaria ariospora	No	B	3	Alternatives would not provide adequate habitat to maintain this species.
Ramaria aurantiisiccescens	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Ramaria celerivirescens	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Ramaria conjunctipes var. *sparsiramosa*	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Ramaria cyaneigranosa	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Ramaria gelatiniaurantia	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Ramaria gracilis	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Ramaria largentii	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Ramaria rainierensis	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Ramaria rubella var. *blanda*	Yes	B	1	Alternatives would not provide adequate habitat to maintain this species.
Ramaria rubribrunnescens	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Ramaria rubrievanescens	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Ramaria rubripermanens	No	D	0	All alternatives would provide sufficient habitat to allow this species to stabilize in a pattern similar to their reference distributions.
Ramaria stuntzii	No	B	2	Alternatives would not provide adequate habitat to maintain this species.
Ramaria suecica	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Rhizopogon abietis	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Rhizopogon brunneiniger	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Rhizopogon exiguus	Yes	B	0	Alternatives would not provide adequate habitat to maintain this species.
Rhizopogon flavofibrillosus	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Rhizopogon truncatus	No	D	0	There is insufficient information to determine how any alternative would affect distribution and stability of this species.
Rickenella swartzii	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Sarcodon fuscoindicus	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Sowerbyella rhenana	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Sparassis crispa	No	D	0	Alternatives would not provide adequate habitat to maintain this species.
Spathularia flavida	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Thaxterogaster pavelekii	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Tremiscus(Guepinia) helvelloides	No	D	0	All alternatives would provide habitat sufficient to allow this species to stabilize in a pattern different from their reference distribution.

Tuber asa	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Tuber pacificum	No	B	0	Alternatives would not provide adequate habitat to maintain this species.
Tylopilus porphyrosporus	No	D	0	All alternatives would provide sufficient habitat to allow this species to stabilize in a pattern similar to their reference distributions.

Appendix I – Noxious Weed Risk Assessment

Noxious Weed Risk Assessment

Does suitable habitat for noxious weeds exist in the planning area? **Yes.** If so, what are these areas? **Primarily road sides, landings, and areas of disturbed soil.**

May the actions proposed in the Lone Pine EA introduce or spread noxious weeds within the planning area? **Yes.** What is the level of risk for spreading weeds via project activities**? Low to Medium.** The specific prevention measures listed below will reduce the risk of spreading or introducing weeds within the planning area.

What are the primary actions / conditions / vectors that may pose a risk of spreading weeds within the planning area? **Vehicle travel along forest roads and soil disturbance associated with project activities.**

What are the primary weeds of concern that may be found within or introduced to the planning area? **Scotch broom, French broom, gorse, and Himalayan blackberry.**

Can actions be taken to avoid or minimize weed spread associated with project activities? **Yes.**

What actions can be taken to prevent or minimize the spread of weeds within the planning are? **See the specific prevention measures listed below.**

Have any high-risk sites been identified for treatment prior to project implementation? **No. Weed inventories and treatments are conducted by field office personnel on an annual basis. If any high-risk sites are identified, they will be treated using integrated pest management techniques as deemed necessary to prevent the spread or introduction of weeds within the planning area prior to project implementation.**

Are there any additional conditions or circumstances that need to be considered in relation to weed management within the planning area? **None have been identified.**

The specific prevention measures referred to above that are not already being implemented through other ongoing policies and land management activities, have been incorporated into the project design features located in Chapter 2, under Noxious Weeds.