Bureau of Land Management
South River Resource Area – Roseburg District

# REVISED

# *Myrtle Creek Harvest Plan Environmental Assessment*

Bureau of Land Management
Roseburg District Office
South River Field Office
DOI-BLM-OR-R050-2013-0003-EA

U.S. Department of the Interior, Bureau of Land Management
Roseburg District Office
777 NW Garden Valley Blvd.
Roseburg, Oregon 97471

This **revised** environmental assessment analyzes proposed timber harvest designed in conformance with management direction provided in the 1995 Roseburg Record of Decision and Resource Management Plan (ROD/RMP), as amended prior to December 30, 2008.

**The BLM provided a 30-day period for public review and comment on the Myrtle Creek Harvest Plan Environmental Assessment (EA), and accepted comments from June 4, 2014 until the close of business on July 3, 2014. Since the EA was issued, surveys for red tree voles have been completed. The Myrtle Creek Harvest Plan was revised subsequent to completed red tree vole surveys to incorporate results of the surveys and to incorporate an evaluation for non-high priority site designation for 29 acres of variable retention harvest and 321 acres of thinning. The non-high priority site designation evaluation has been added to the EA as Appendix F and the evaluation is summarized on pages 83-84 of this Revised EA.**

**The BLM is providing an additional 15-day comment period for public review of the *revised portions (primarily Appendix F)* of this document and will accept comments pertaining to this revision until the close of business (4:30 PM, PDT) on August 26, 2015. Revised text is printed in Arial Bold font.**

Before including your address, phone number, e-mail address, or other personal identifying information in your comment be advised that your entire comment, including your personal identifying information, may be made publicly available at any time. While you can ask us in your comment to withhold from public review your personal identifying information, we cannot guarantee that we will be able to do so. If you choose to submit any written comments, they should be directed to Steven Lydick, South River Field Manager, at the above address.

In keeping with Bureau of Land Management policy, the Roseburg District posts Environmental Assessments, Environmental Impact Statements, Findings of No Significant Impact, and Decision Records/Documentations on the district web page under **Plans & Projects** at http://www.blm.gov/or/districts/roseburg/plans/index.php on the same day on which an electronic notice of availability is transmitted to those individuals and organizations on the District's NEPA mailing list who have expressed an interest in project planning and analysis. Individuals desiring a paper copy of such documents will be provided one upon request. Individuals with the ability to access these documents on-line are encouraged to do so. Internet use reduces paper consumption and administrative costs associated with copying and mailing.

# TABLE OF CONTENTS

**CHAPTER ONE – Purpose and Need for Action**

I. Background ..... 1
II. Purpose and Need for Action ..... 2
III. Proposed Action ..... 4
IV. Decisions Factors ..... 5
V. Scoping ..... 5
VI. Issues for Analysis ..... 10
VII. Issues Considered but Not Analyzed in Detail ..... 11
VIII. Conformance ..... 16

**CHAPTER TWO – Alternatives**

I. Alternative 1 – No Action ..... 18
II. Alternative Two – The Proposed Action ..... 18
III. Alternative Three – Thinning Only ..... 31
IV. Project Design Features of the Action Alternatives ..... 32
V. Resources not Present or Unaffected by the Alternatives ..... 36
VI. Comparison of Alternatives ..... 36

**CHAPTER THREE – Affected Environment and Environmental Consequences**

I. Timber Resources ..... 37
A. Affected Environment ..... 37
B. Environmental Consequences ..... 45
II. Wildlife ..... 61
A. Affected Environment ..... 61
B. Environmental Consequences ..... 71
III. Fish, Aquatic Habitat and Water Resources ..... 91
A. Affected Environment ..... 91
B. Environmental Consequences ..... 96
IV. Soils ..... 109
A. Affected Environment ..... 109
B. Environmental Consequences ..... 111
V. Fuels Management/Fire Risk and Air Quality ..... 117
A. Affected Environment ..... 117
B. Environmental Consequences ..... 118
VI. Carbon Storage and Release ..... 121
A. Affected Environment ..... 121
B. Environmental Consequences ..... 122
VII. Cumulative Effects ..... 125
VIII Monitoring ..... 137

**CHAPTER FOUR**

I. List of Agencies/Persons Contacted ..... 138
II. Agencies, organizations, and individuals notified of completion of the **Revised** EA ..... 138
II. Contributors/Preparers ..... 139
IV. References and Literature Cited ..... 139

**TABLES**

Table 1-1 Location of Completed Cultural Resource Inventories ..... 14
Table 1-2 Location of Planned Cultural Resource Inventories ..... 15

Table 2-1 Proposed Treatments in Northern Spotted Owl Critical Habitat ..... 19
Table 2-2 Proposed Treatments Outside of Northern Spotted Owl Critical Habitat ..... 20
Table 2-3 Proposed Road Construction ..... 26
Table 2-4 Proposed Road Decommissioning ..... 27
Table 2-5 Proposed Roads Improvements ..... 27
Table 2-6 Alternative Comparison by Management Activity ..... 36
Table 2-7 Alternative Comparison by Purpose and Need ..... 36

Table 3-1 Land Ownership in the Analysis Area ..... 38
Table 3-2 Analysis Area 10-Year Age Class Distribution for BLM Managed Lands ..... 38
Table 3-3 Analysis Area 10-Year Age Class Distribution for BLM Managed Lands in GFMA ..... 39
Table 3-4 Analysis Area Age Class Distribution for BLM Lands in GFMA ..... 39
Table 3-5 Summary of Current Stand Conditions in Proposed Harvest Units ..... 41
Table 3-6 Predicted Attributes of Selected Stands in 2013, 2033 and 2063 ..... 46
Table 3-7 Stand Conditions in Reference Unit 29-8-9A (Less than 50 Years Old), With and Without Uniform Thinning Treatment in Years 2013, 2033 and 2063 ..... 48
Table 3-8 Stand Conditions in Reference Unit 29-3-3A (Greater than 50 Years Old), With and Without Uniform Thinning Treatment in Years 2013, 2033 and 2063 ..... 49
Table 3-9 Stand Conditions in Reference Unit 28-9-3A (Less than 50 Years Old), With and Without Variable Density Thinning Treatment in Years 2013, 2033, and 2063 ..... 52
Table 3-10 Stand Conditions in Reference Unit 28-9-9A (Greater than 50 Years Old), With and Without Variable Density Thinning Treatment in Years 2013, 2033, and 2063 ..... 52
Table 3-11 Reference Unit 29-4-13B Conditions for No Treatment Compared to Variable Retention Harvest Immediately After Harvest, and in 2033 and 2063 ..... 58
Table 3-12 Percent Seral Stage Distribution in the Myrtle Creek Analysis Area GFMA ..... 60
Table 3-13 Habitat Conditions in Analyzed Northern Spotted Owl Home Ranges ..... 63
Table 3-14 Recent Occupancy in Analyzed Northern Spotted Owl Home Ranges ..... 64
Table 3-15 Wildlife Analysis Indicators ..... 71
Table 3-16 Activities Proposed in Northern Spotted Owl Dispersal and Suitable Habitat ..... 75
Table 3-17 Summary of Effects to Northern Spotted Owl Dispersal and Suitable Habitat ..... 76
Table 3-18 Activities in Suitable Habitat in Northern Spotted Owl Home Ranges Below the Suitable Habitat Viability Threshold ..... 78
Table 3-19 Federal Ownership and Recent Occupancy in Northern Spotted Owl Home Ranges Below Suitable Habitat Viability Threshold ..... 78
Table 3-20 Proposed Treatments within Northern Spotted Owl Core Areas ..... 79
Table 3-21 Activities in Northern Spotted Owl Dispersal and Suitable Habitat in Critical Habitat ..... 81
Table 3-22 Activities in Northern Spotted Owl Dispersal and Suitable Habitat in Core Areas ..... 88
Table 3-23 Hydrologic Units within the Aquatic Resources Analysis Area ..... 91
Table 3-24 Road Management in Riparian Reserves ..... 106
Table 3-25 Equivalent Clear-cut Area in the Analysis Area by Subwatershed ..... 108
Table 3-26 Alternative One Comparison with Alternative Two Variable Retention Harvest Effects on Carbon Release and Storage ..... 124
Table 3-27 Cumulative Effects on GFMA Age Class Distribution ..... 127

## FIGURES

Figure 3-1 Computer Generated Depiction of Typical Stand Conditions in Thinning Units ..... 43
Figure 3-2 Photograph of Representative Stand Conditions in Thinning Units ..... 43
Figure 3-3 Computer Generated Depiction of Typical Stand Conditions in Variable Retention Harvest Units ..... 44
Figure 3-4 Photographs of Representative Stand Conditions in Variable Retention Harvest Units ..... 44
Figure 3-5 Anticipated Mortality and Structural Conditions in 2033, No Thinning ..... 46
Figure 3-6 Anticipated Mortality and Structural Conditions in 2063, No Thinning ..... 47
Figure 3-7 Projected Stand Conditions, Post-Harvest, Uniformly-Spaced Thinning ..... 49
Figure 3-8 Photograph of Uniformly-Spaced Thinning, Post-Harvest ..... 49
Figure 3-9 Projected Stand Conditions, 20 Years Post-Harvest, Uniformly-Spaced Thinning ..... 50
Figure 3-10 Photograph of Uniformly-Spaced Thinning, 20 Years Post-Harvest ..... 50
Figure 3-11 Projected Stand Conditions, 50 Years Post-Harvest, Uniformly-Spaced Thinning ..... 51
Figure 3-12 Projected Stand Conditions, Post-Harvest, Variable Density Thinning ..... 53
Figure 3-13 Photograph of Variable Density Thinning, Post-Harvest ..... 53
Figure 3-14 Projected Stand Conditions, 20 Years Post-Harvest, Variable Density Thinning ..... 54
Figure 3-15 Photograph of Variable Density Thinning, 20 Years Post-Harvest ..... 54
Figure 3-16 Projected Stand Conditions, 50 Years Post-Harvest, Variable Density Thinning ..... 55
Figure 3-17 Aerial View of Aggregated Retention ..... 57
Figure 3-18 Aerial View of Aggregated and Dispersed Retention ..... 57

## APPENDICES

**Appendix A Maps ..... 154**
Vicinity Map ..... 156
Alternative Two Detail Maps ..... 157
Alternative Three Detail Maps ..... 167
Northern Spotted Owl Critical Habitat and Analyzed Home Ranges ..... 177
Coho Salmon Distribution Map ..... 178
**Appendix B Botany ..... 179**
Table B-1 Pin Lichen Survey Results ..... 180
Table B-2 Botanical Species Not Analyzed in Detail ..... 181
**Appendix C Wildlife ..... 187**
Table C-1 Wildlife Species Not Analyzed in Detail ..... 187
Table C-2 Wildlife Species Analyzed in Detail ..... 190
**Appendix D Consistency of the Proposed Action with Aquatic Conservation Strategy Objectives ..... 191**
**Appendix E Carbon Storage and Release Analytical Methodology ..... 197**
Table E-1 Forest Ecosystem Carbon (Excluding Live Trees) By Structural Stage ..... 198
Table E-2 Fraction of Carbon Remaining or Captured as an Alternative Energy Source ..... 199
Table E-3 Decay Rates of Carbon from Douglas-fir Slash ..... 200
Table E-4 Fossil Fuel Consumption during Harvest Operations ..... 201
**Appendix F Red Tree Vole Non-High Priority Site Evaluation ..... 202**

# Chapter One – Purpose and Need for Action

This chapter provides a description of the purpose and need for the proposed action, a brief description of the proposed action, the decisions to be made, the scope of the analysis, issues expressed, and conformance with management direction and applicable laws and regulations.

## I. Background

The analysis area includes lands managed by the South River Field Office of the Roseburg District, Bureau of Land Management (BLM) in the Myrtle Creek 10th-field watershed[1], as well as the Upper Deer Creek, Days Creek, and Roberts Creek 12th-field subwatersheds. These 10th- and 12th-field watersheds cover approximately 144,231 acres. Approximately 42,800 acres (30 percent) of the lands are administered by the BLM. Proposed activities would occur in General Forest Management Area (GFMA), Connectivity/Diversity Block (C/D), and Riparian Reserves land use allocations. There are no mapped Late-Successional Reserves in the analysis area.

Management of BLM-administered lands and resources in the analysis is subject to the requirements of the O&C Lands Act, Federal Land Policy and Management Act, Endangered Species Act, and Clean Water Act as discussed in the Roseburg District *Record of Decision and Resource Management Plan* (USDI/BLM 1995a; ROD/RMP, p. 15). The O&C Lands Act requires the Secretary of the Interior to manage suitable O&C timber lands for permanent forest production in accordance with the principles of sustained yield (ROD/RMP, p. 15).

Matrix lands, consisting of the GFMA and C/D land use allocations, were designated as lands suitable for timber production by the Northwest Forest Plan. Specifically, "Most timber harvest and other silvicultural activities would be conducted in that portion of the matrix with suitable forest lands, according to standards and guidelines."(USDA/USDI 1994, p. C-39) The Roseburg District *Record of Decision and Resource Management Plan* (USDI/BLM 1995a; ROD/RMP, p. 33) adopted the Matrix allocations as suitable for producing a sustainable supply of timber and other forest commodities.

The ROD/RMP (p. 60) directs that timber resources be managed to provide a sustainable supply of timber and other forest products, and that developing stands on available lands are to be managed to promote tree survival and growth and to achieve a balance between wood volume production, quality of wood, and timber value at harvest, by implementing actions that include regeneration harvest, commercial thinning, and density management. Specifically:

- In the GFMA, schedule regeneration harvest to assure that, over time, harvest will occur in stands at or above the age of volume growth culmination which occurs between 80 and 110 years old (ROD/RMP, p. 61),
- In the GFMA, regeneration harvest may be scheduled in stands as young as 60 years, in order to develop a desired age class distribution across the landscape (ROD/RMP, p. 61).
- In the GFMA, commercial thinning would be programmed in stands under 80 years old and would be designed to assure high levels of timber volume productivity (ROD/RMP, p. 151);

[1]The U.S. Geological Survey implemented a new numbering/naming convention for hydrologic units (HUs). 5th-field watersheds are now designated as 10th-field HUs, and 6th-field subwatersheds as 12th-field HUs.

- In the C/D, thinning would be undertaken in stands up to 120 years old and usually designed to assure high levels of timber volume productivity (ROD/RMP, p. 153).
- In Riparian Reserves, apply silvicultural practices to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives (ROD/RMP, p. 25).

The interdisciplinary team identified 3,142 acres for potential silvicultural treatment based on stand age in Forest Operations Inventory records. Field reconnaissance and stand exams were used to refine the pool of candidate units, resulting in elimination of approximately 1,130 acres for one or more of the following reasons:

- Stands had resource concerns that conflicted with proposed harvest.
- Stands were too young and would not be developmentally ready for treatment.
- Site conditions, tree stocking and species composition are such that the stands would not support a commercially viable harvest entry at this time.
- Stands were isolated and could not be practically combined with other stands to form a logical and economically viable timber sale.
- Stands had no suitable access and insufficient volume to off-set road construction costs.
- Stands were older than 150 years and structurally complex or RA 32.

A description of the historic condition of natural resources is provided in the *Myrtle Creek Watershed Analysis and Water Quality Restoration Plan* (USDI/BLM 2002a), *South Umpqua Watershed Analysis and Water Quality Restoration Plan* (USDI/BLM 2001a) and *Lower South Umpqua Watershed Analysis* (USDI/BLM 2000). Except for forest seral stages which can be rapidly changed by timber harvest and natural events such as wildfire, windstorms, widespread disease or insect infestations, the characterization of resources contained in the watershed analyses is generally representative of present conditions.

Throughout this document, analysis figures and maps depict unit and road locations as closely as possible using GIS mapping techniques. However, GIS projections are subject to refinement during the implementation phase. Unit size and shape, and road length and location may change slightly based on field findings during layout.

# II. Purpose and Need for Action

The proposed action would thin 45 units (1,578 gross acres[2]) in the Matrix and associated Riparian Reserve land use allocations and apply variable retention harvest in 14 units (434 gross acres) in Matrix and associated Riparian Reserve land use allocations. An alternative to the proposed action would thin 59 units (2,012 gross acres) in the Matrix and associated Riparian Reserve land use allocations. The purpose of the proposed action is to: 1) produce forest products from the Matrix, 2) promote tree survival, tree growth and forest health in the Matrix, 3) promote habitat diversity in Matrix, 4) manage the GFMA for a balanced distribution of age classes, and 5) increase habitat diversity in Riparian Reserves.

[2]Gross acres are derived from the "total unit acres" column in Tables 2-1 and 2-2 and include treated and untreated Riparian Reserves within the units.

The need for action was generated from the differences between existing conditions and desired conditions. Analysis of the existing conditions was used to identify opportunities to shift the analysis area toward desired conditions.

There is a need for forest products. The Roseburg District's declared annual allowable sale quantity (ASQ) reflects the O&C Act requirements to manage suitable timber lands in the analysis area for sustainable timber production. Timber volume generated would contribute toward the socio-economic benefits envisioned in the *Roseburg District Proposed Resource Management Plan/Environmental Impact Statement* (USDI/BLM 1994, PRMP/EIS Vol. 1, p. xii).

There is a need to promote tree survival, tree growth, and forest health. Thinning would remove suppressed trees in densely stocked stands that would redistribute sunlight, nutrients, and water to the remaining trees, causing an increase in tree growth and vigor. The ROD/RMP directs the District to maintain forest health by managing for conditions that support native species (pp. 15 and 18). The ROD/RMP objectives include managing timber stands to reduce the risk of stand loss from fires, animals, insects, and diseases (p. 60). In the Matrix, resilience to insects, disease, and fire and can be maintained by reducing vegetation density to promote tree vigor in the largest and healthiest retained trees while reducing risk of stand loss from fires by removing ladder fuels.

There is a need to promote diversity in the Matrix, especially in previously harvested stands. Proposed variable density thinning and variable retention harvest would be used to diversify forest conditions. The ROD/RMP (p. 33) objectives for the Matrix include: 1) providing habitat for a variety of organisms associated with both late-successional and younger forests, 2) 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 such as down logs, snags, and large trees, and 3) providing early-successional habitat. The ROD/RMP (pp. 151 and 153) directs that thinning in the Matrix should retain patches of denser habitat where desired to meet wildlife habitat criteria.

There is a need for the GFMA to have a balanced distribution of age classes. Proposed variable retention harvest would help establish a desired age class distribution in the analysis area while maintaining desired species composition and structural characteristics. Lack of regeneration harvest on BLM lands over the past 20 years has caused a trend toward mature and older forests. Consequently, there are few young stands on BLM-administered lands resulting in an unbalanced age class distribution. The ROD/RMP (p.61) specifies application of silvicultural systems that are planned to produce, over time, forests which have desired species composition, structural characteristics, and distribution of seral or age classes, as set forth in Appendix E of the ROD/RMP. Appendix E objectives include managing the GFMA for a balance of age classes (ROD/RMP, p. 150).

There is a need for diverse habitats in Riparian Reserves. Management of Riparian Reserves is intended to aid in the attainment of Aquatic Conservation Strategy (ACS) objectives of restoring and maintaining the ecological health of watersheds and aquatic ecosystems on public lands (ROD/RMP, p. 19). Silvicultural practices are to be applied to control stocking, reestablish and manage stands, and acquire desired vegetative characteristics (ROD/RMP, pp. 25). Density management in Riparian Reserves would reduce canopy cover that is suppressing shade-intolerant conifers and deciduous trees, resulting in a reduction in species diversity. Density management would maintain ecological health, allow the release and accelerated growth of selected trees that would maintain or restore structural diversity of plant communities in the riparian zone, and maintain coarse woody debris for future in-stream recruitment (ROD/RMP, pp. 19 and 20).

Prospective thinning units in the GFMA and C/D land use allocations are located in Sections 31 and 32, T. 28 S., R. 2 W.; Sections 17, 20, 21, 28, 29, 31, 32, 33, 35 and 36, T. 28 S., R. 3 W.; Sections 2, 3, 9, 10, 17, 18, 19, 21, 25, 29 and 35, T. 28 S., R. 4 W.; Section 27, T. 28 S., R. 5 W.; Section 8, T. 29 S., R. 2 W.; Sections 3, 5, 7, 9 and 15, T. 29 S., R. 3 W.; and Sections 3, 11, 13 and 15, T. 29 S., R. 4 W., Willamette Meridian (W.M.) (see maps in Appendix A). These activities would contribute forest products, promote tree survival and growth, maintain forest health, and increase diversity in Riparian Reserves.

Proposed variable retention harvest in Section 32, T. 28 S., R. 2 W.; Sections 31, 35, & 36, T. 28 S., R 3 W.; Sections 17 & 29, T. 28 S., R. 4 W.; Sections 3, 5, 9, & 15, T. 29 S., R. 3 W.; and Sections 3 & 11, T. 29 S., R. 4 W., W.M. (see maps in Appendix A) would produce forest products and contribute to establishing a balanced age-class or seral stage distribution in the GFMA in the analysis area.

# III. Proposed Action _____

The actions proposed to meet the previously described needs are listed below. Chapter Two includes a detailed description of proposed activities and maps in Appendix A display the activities:

- Uniform commercial thinning (529 acres) of heavily stocked stands to increase growth and yield, and provide forest products
- Variable density thinning (1,005 acres) of heavily stocked or closed canopy forest to increase growth and yield, provide forest products and manage Riparian Reserves to attain Aquatic Conservation Strategy objectives
- Variable retention harvest (334 acres) to adjust age-class distribution and provide forest products
- Reforestation and stand maintenance (334 acres) in variable retention harvest areas
- Construction of 5.5 miles of road needed to implement proposed activities
- Decommissioning temporary road (2.6 miles) unneeded for long-term management
- Road improvement (0.9 miles) to maintain long-term road use, reduce sediment production, and improve drainage
- Road maintenance (102 miles) to maintain long-term road use, improve road safety and reduce sediment production
- Road renovation (7.5 miles) to maintain long-term road use, improve road safety and reduce sediment production
- Road daylighting (up to 74 miles) to maintain long-term road use and reduce sediment production from wet roads
- Road 29-5-11.0 Slump Repair to reduce sediment delivery to streams and maintain long-term road use and road safety
- Fuels treatment (436 acres) to reduce fuel loading and allow reforestation
- Subsoiling (20 acres) to decrease compaction and redistribute displaced top soil

# IV. Decisions Factors

The Responsible Official for this project is South River Field Manager Steven Lydick. In making his decision, he will review the purpose and need, the proposed action and other alternatives, the environmental consequences, compliance with applicable planning documents, laws and regulations, and public comments prior to deciding:

- The manner in which the described needs would be addressed, including harvest location, prescription and method, activity fuels reduction, and means of access.
- The design features and/or mitigation measures that should be applied.
- How to provide timber resources in support of local industry, and revenue to the Federal and County governments from the sale of resources while reducing short and long-term costs of managing the lands in the analysis area.

# V. Scoping

## A. Internal Scoping

An interdisciplinary team (IDT) was assembled at initiation of the project analysis on December 5, 2012. Issues identified for analysis were determined based on ROD/RMP management direction for utilization and protection of natural resources; circumstances and concerns identified through field reconnaissance; comments from external groups, and requirements set forth in laws, regulations, policy and court rulings.

## B. External Scoping

A notice of project initiation was published in the Roseburg District Quarterly Planning Update (December 4, 2012), informing the general public of the nature of the proposed action. Letters were sent to landowners with property adjacent to BLM-administered lands where timber harvest is proposed, those whose property lies beside or astride identified haul routes, and those with registered surface water rights for domestic use located within one mile downstream of any proposed units in September 2013. They were encouraged to share any concerns or special knowledge of the project area that they may have.

In September 2013, letters were sent to the Confederated Tribes of Grand Ronde, Confederated Tribes of Siletz Indians, and Cow Creek Band of Umpqua Indians requesting identification of any special interests or legal rights pertaining to the lands being analyzed. No responses were received.

A formal scoping period is not required for the preparation of an environmental assessment. Informal scoping comments were received from two individuals and one organization, however, and were given due consideration in this analysis. Some comments were of a generic or philosophical nature that would not guide the development of alternatives. Some comments raised issues that are routinely addressed in environmental assessments for timber management activities. A smaller subset of comments was identified that might refine alternatives and project design. The comments are in italics and addressed below.

*"The EA should include the cumulative impacts of regeneration harvests…"*

Cumulative impacts are addressed in the environmental assessment.

*"Regeneration harvest of critical habitat, average 75 years old, would adversely modify those forests, which is not allowed by the Endangered Species Act. The EAs [sic] should consider an alternative that does beneficial thinning instead."*

Potential effects to critical habitat are addressed in the environmental assessment. Alternative Three (thinning only) was developed to address concerns with variable retention harvest. An adverse modification determination is one that resides with the U.S. Fish and Wildlife Service, and in such an event the BLM would drop the project, modify the project to reduce the effects and avoid the adverse modification call, or apply reasonable and prudent measures and their implementing terms and conditions put forth by the U.S. Fish and Wildlife Service.

*"The EA should…consider the impacts of continued OHV use along the stream next to road 35.1, and the wetlands further north on 35.1."*

Existing off-highway vehicle (OHV) use was considered when describing the existing conditions for streams and wetlands in Chapter Three of this document. The EA and any decisions that may be derived from it pertain to timber management and are not intended to authorize any OHV use beyond that already set forth in the RMP.

*"The EA should consider an alternative that makes temporary roads narrower."*

Best management practices (BMPs) limit the amount of road construction to what is necessary to manage the land. Roads are expensive to construct. Road systems would be planned in a manner that meets resource objectives and minimize resource damage. Roads would be located in areas that minimize mass soil movement, erosion, and sedimentation. Roads would be designed to the lowest standard of road consistent with use objectives and resource protection needs.

*"The EA should consider ALL rural families adjacent to harvest units in the spirit the BLM RMP intended for rural interfaces…"*

Management direction for Rural Interface Areas contained in the ROD/RMP (p. 54) states that BLM will:

> "Consider the interests of adjacent and nearby rural land owners, including residents, during analysis, planning, and monitoring related to managed rural interface areas. These interests include health and safety, improvements to property and quality of life. Determine how land owners might be affected by activities on BLM-administered lands."

Managed rural interface areas, as identified by the ROD/RMP (p. 54), encompass approximately 8,522 acres of BLM-administered lands within ¼-mile of private lands zoned for 1-5 acre lots located throughout the district. Map 6 from the ROD/RMP identifies four rural interface areas in the analysis area. The first is Section 21, T. 29 S., R. 5 W., N ½; the second is NW ¼ Section 9, T 20 S., R. 4 W.; the third is Section 19, T. 29 S., R. 4 W., NE ¼; and the fourth is SE ¼ Section 23, T. 29 S., R. 4 W. None of these parcels are within ¼ mile of proposed harvest units.

Project notification letters were mailed in September of 2013 to all landowners adjacent to harvest units or along the haul route and to those with registered water rights within one mile downstream of the proposed harvest units. We received comments from one landowner conveying specific concerns about proposed activities in Unit 29-3-3A. Specific concerns were addressed through project design features.

*"The spotted owl recovery plan recommends protecting occupied habitat, and a regeneration harvest [specifically Unit 29-3-3A] does not comply with that recommendation."*

Compliance with the Revised Northern Spotted Owl Recovery Plan (USDI/FWS 2011a) is addressed in Chapter Three of this document. The Revised Recovery Plan (USFWS 2011) recommends active management of northern spotted owl habitat (II-11, III-10, III-11, III-13, III-17, III-42).

*"The EA should be clear about how diversity will be protected and restored in the project area."*

BLM strives to achieve a tree species mix indicative of native stands in the analysis area. In thinning projects this is principally accomplished by reserving minor species, where available, in numbers reflecting historical percentages in native stands documented in decades of timber cruises. Douglas-fir is the numerically superior species in forests across most of the Roseburg District, comprising upwards of 75 percent of stands. Pines, cedars, and western hemlock generally account for one to three percent, individually.

Thinning in the Connectivity/Diversity Block and Riparian Reserve land use allocations would utilize variable density prescription that includes skips, gaps, retention of under-represented species regardless of spacing, and retention of small clumps of trees.

Variable retention harvest prescriptions in the General Forest Management Area land use allocation would include skips, gaps, aggregate retention and dispersed retention as described in Chapter Two of this document.

*"We are always concerned about any forest management activities which might impact the integrity of our water source and waterline."*

Unit 29-3-3A, which is adjacent to the commenter's property, would be designed to protect water quality and quantity, and the existing water line. The commenter's water source is upstream and outside of Unit 29-3-3A. Aquatic resources are analyzed in Chapter Three of this document.

*"We know from our long experience in this area that the soil on these slopes is notoriously unstable, and that upslope logging is extremely conducive to future landslides."*

Soil stability is analyzed in Chapter Three of this document. Areas of unstable or potentially unstable soils were identified and would be considered for tree retention when designing the treatment.

*"We would be alarmed at the prospect of spraying of herbicides or other chemicals on harvest sites or roadsides near to our watersource [sic], or to our property and our food supply."*

The BLM is not proposing any herbicide spraying in the vicinity of the commenter's water source. The BLM is only authorized to use herbicides for noxious weed control that generally involves the treatment of individual plants, does not allow for aerial application, and employs additional protective measures in proximity to bodies of water.

*"As responsible forest dwellers, we are always alert about fire danger. Broadcast burning and slash burns at harvest sites would be of great concern to us."*

Broadcast burning would not be used in the unit (Unit 29-3-3A) adjacent to the commenter's property. The harvest unit is uphill from the private property which reduces the risk of fire spreading from BLM lands. The timber from this unit would be yarded to a spur road in the center of the unit. The unit would be whole tree yarded to minimize residual fuels. Landing piles created from harvest activities would be burned in the late fall or early winter when fire would not spread beyond the edge of the covered piles.

*"We are extremely troubled about both short-term and long-range threats to our security if a new access road is created into Lot 1 from White Rock Road…No one has ever been able to drive a motorized vehicle down what was once an old logging track. Harvest activity would change that, and create new vulnerability for us. It could lead to increased fire danger from careless public use, as well as unwanted intrusion, including from ATVs that would be able to traffic throughout the logged unit and could readily enter our property."*

At the time individual temporary roads are decommissioned, they would be evaluated to determine the manner of decommissioning essential to meet resource needs. At a minimum, decommissioning would stormproof the roads and take reasonable measures to discourage unauthorized use. The road referred to by the commenters is Road 29-3-3.A which would be approximately 0.2 miles long. This road would be surfaced with rock (gravel) and decommissioned after use.

*"Specifically, we would like you to show the necessity of regeneration harvests when managing for a sustainable supply of timber by illustrating the age-class distribution in the project area Matrix land today, and what it will look like with the proposed regeneration harvest and without the proposed regeneration harvests."*

Age-class distribution is presented in the Vegetation section in Chapter Three of this document. The description of the affected environment includes a discussion of age class distribution in the analysis area. The "Purpose and Need" for the project was discussed above. Regeneration harvest is an activity planned and authorized under the RMP, and the short- and long-term projections of seral stage distribution are illustrated in Figures 4-4 and 4-5 in the PRMP/EIS (USDI/BLM 1994, pp. 4-26 and 4-27).

*"So AFRC would like to request that this purpose and need include not only restoration goals, but also the production of a sustainable supply of timber…There are five objectives in your RMP for Matrix land, and we think your purpose and need should stick to those five objectives."*

The purpose and need described above includes objectives to produce forest products.

*"[W]e would like to see an alternative or reference analysis that proposes regeneration treatments in the older [>120 years] age class as well."*

There is no issue that drives the development of an alternative that regenerates stands older than 120 years old.

*"Thinning should not occur in any stand when NSO suitable habitat in the home range is below 40% on federal lands. Units with residual older trees near owls should not be thinned. The EAs should disclose not only where owl activity centers are, but also the actual foraging locations. If foraging locations are within units, those units should be dropped from thinning at this time – and not reconsidered for thinning until the spotted owls have recovered in the short-term."*

As described in the Wildlife section in Chapter Three, the northern spotted owl generally inhabits forest stands older than 80 years with multiple shrub and canopy layers, and accumulations of coarse woody debris. Large snags and trees with broken tops, bole cavities, or platforms provide nesting structures. A few scattered remnant trees in younger stands do not constitute suitable nesting, roosting and foraging habitat, especially if the older trees stand well above the canopy of the younger stand cohort.

Thinning in a northern spotted owl home range below the viability threshold of 40 percent suitable habitat has not been linked to any adverse effect. It is acknowledged, however, that thinning in a core area with suitable habitat below the viability threshold of 50 percent, and thinning in a nest patch are considered by the U.S. Fish and Wildlife Service as likely to result in incidental take. Thinning under the latter two scenarios is generally avoided as is thinning in known owl activity centers.

In a provincial home range of thousands of acres it would be impossible to identify every location in which northern spotted owls might forage. We do know that during the nesting season activity is concentrated in the 500-acre core area.

*"Do not allow mature and old growth trees to be used for guy line and tail hold trees. Before any live tree is used, the operator must be required to first try to tie to parked equipment, or tie to large stumps, or if a live tree is necessary, not to use a dominate [sic] or old growth tree. If it is necessary to use a live tree, tree protection bands must be required. Notching any length of the tree diameter is not necessary and should not be allowed. If a tree is damaged, and if it needs to be cut down, it should remain on site."*

Cable yarding requires the use of trees outside of harvest unit boundaries for tailholds and guyline anchors. Sound stumps or access for mechanical anchors may or may not exist. Tailhold trees seldom require cutting, and contract provisions require that purchasers obtain written approval before attaching logging equipment to any tree in the timber reserve and take appropriate measures to protect against undue damage, which could include use of tree plates, straps or cribbing.

Guyline trees are selected based on appropriate placement of guylines to distribute haulback forces evenly in order to avoid snapping guylines and endangering operator safety. Anchor trees are generally cut because they are located in the guyline radius of cable yarding equipment and constitute a hazard to equipment and personnel. Cutting tailhold and guyline trees is subject to Occupational Safety and Health Administration (OSHA) regulations which are outside of BLM control. Severely damaged trees in the Matrix allocations would be removed, while similarly damaged trees in Riparian Reserves would be left on site as they are assigned other values for fish and wildlife.

*"The Roseburg BLM must do surveys for the survey and manage component of the Northwest Forest Plan. Red Tree Vole surveys must be done using BLM standards and policies. Regeneration harvests in stands under 80 years are not exempt from surveys."*

The BLM would conduct surveys in suitable habitat for required 2001 Survey and Manage species in all stands greater than 80 years of age and all variable retention harvest units. Surveys would be conducted using accepted protocols. The Survey and Manage section in Chapter Three of this EA provides more information.

Red tree vole surveys would be conducted in stands subject to habitat disturbing activities that meet the following criteria: 1) Minimum quadratic mean diameter (QMD) is 18 inches or larger, and 2) Stand age is 80 years old or older *or* the stand has at least two superdominant trees per acre that have suitable habitat characteristics such as large limbs, palmate branches, broken tops or forked trunks (USDA/FS-USDI/BLM 2012). All of the units (six) with QMD greater than 18 inches are over 80 years old and require red tree vole surveys if an action alternative is selected (see Table 3-5).

# VI. Issues for Analysis

Through internal scoping, and consideration of informal external scoping comments, the interdisciplinary team identified the following issues for analysis.

## A. Timber Resources

- How would the alternatives meet requirements of the O&C Act for sustainable timber production on lands allocated to the General Forest Management Area and Connectivity/Diversity Blocks?
- How would the alternatives meet the objective of maintaining the health and vigor of individual trees and forest stands?
- How would the alternatives affect development of species diversity and habitat structure in Riparian Reserves?

## B. Wildlife

- What would be the direct and indirect effects of the alternatives on the Federally-threatened northern spotted owl in terms of disturbance and modification of habitat?
- What would be the direct and indirect effects of the alternatives on designated critical habitat for the Federally-threatened northern spotted owl?
- What would be the direct and indirect effects of the alternatives on Bureau Sensitive species, and to habitat provided by BLM-managed lands in the project area?
- What would be the direct and indirect effects of the alternatives on landbirds and habitat provided by BLM-managed lands in the project area?
- What would be the direct and indirect effects of the alternatives on Survey and Manage species and habitat provided by BLM-managed lands in the project area?

## C. Fish, Aquatic Habitat and Water Resources

- What would be the direct and indirect effects of the alternatives on the Federally-threatened Oregon Coast coho salmon and other fish species that inhabit streams in proximity to proposed timber harvest units?
- What effects would the alternatives have on aquatic habitat conditions, including critical habitat designated for the Oregon Coast coho salmon and Essential Fish Habitat designated for Oregon Coast coho and Chinook salmon?
- What effects would the alternatives have on water quality, specifically temperature and shade, and sediment and turbidity in streams in the project area?
- What effects would the alternatives have on the timing and quantity of stream flows in the project area?

## D. Soils

- What would be the consequences of the proposed actions on soil displacement and compaction?
- What would be the consequences of the proposed actions on soil erosion and reductions in site productivity caused by soil displacement and compaction?
- What would be the consequences of the proposed actions on slope stability and risk of slope failures and landslides?

## E. Fuels Management and Air Quality

- What direct and indirect effects would the proposed actions have on present and future risk of fire within the proposed harvest units?
- What would be the effects of fuels reduction implemented as part of the proposed action on air quality?

## F. Carbon Storage and Release

- What effects would the alternatives have on release of carbon as carbon dioxide ($CO_2$) at the project scale and in comparison to annual national and global $CO_2$ emissions, and future carbon sequestration by the forested stands proposed for timber harvest?

# VII. Issues Considered but Not Analyzed in Detail _____

## A. Environmental Justice

The proposed action is consistent with Executive Order 12898 which addresses Environmental Justice in minority and low-income populations. The BLM has not identified potential impacts to low-income or minority populations, internally or through the public involvement process.

## B. Recreation

The China Ditch Auto Tour Route, China Ditch Interpretive Trail, and Red Top Pond are located in the project vicinity but not inside any of the units included in this project. The China Ditch Route and Trail experience low visitation and were developed to highlight the contributions of Chinese laborers to the mining industry that flourished locally in the late 1800s. Red Top Pond is used heavily by dispersed campers and hunters in the fall. Use is light to moderate during spring and summer and consists of day use anglers and dispersed campers. Other recreational activities are generally dispersed; and may include off-highway vehicle use on existing roads and trails, hiking, hunting, rock climbing, and wildlife viewing.

Proposed activities would not measurably impair or interfere with the recreation opportunities in the analysis area because no changes to the recreation objectives and opportunities detailed on pages 55 and 56 in the 1995 ROD/RMP are proposed by this EA. Although some areas may be temporarily unavailable, no long-term changes would occur.

## C. Off-Highway Vehicle Use

Off-highway vehicle (OHV) use is limited to existing roads and trails by the 1995 ROD/RMP (p. 58). OHV use has been noted in T28S R3W Sections 21, 22, 25, 26, 27, 28 and T28S R2W Sections 31, 32, and 33 with Yellow Jacket Spring being a focus for use in the White Rock area. None of the proposed alternatives would affect current opportunities for OHV recreational use because this EA does not propose or authorize any new use, restrict use, or change the existing direction given for OHV use contained in the 1995 ROD/RMP. Although some areas may be temporarily unavailable, no long-term changes in availability are proposed or authorized by this EA. Access provided by 11 segments (2.6 miles total; Table 2-3) of new permanent road would not change current OHV opportunities because the segments are short ($\leq$ 0.6 miles) and do not lead to destination areas or provide loop opportunities. Roads not planned for retention would be decommissioned, to discourage unauthorized OHV use. It is recognized that unauthorized OHV use can and does occur on the landscape. However, the timing and location of any such activities cannot be reasonably foreseen, so the effects of the alternatives on this activity cannot be projected.

## D. Visual Resources

The objective of Visual Resource Management (VRM) is to manage public lands in a manner which will protect the quality of the scenic (visual) values of these lands (BLM Manual 8400.02). Visual Resource Management includes an inventory of all district lands and their corresponding management level classes, which are ranked I-IV. The VRM class IV objective is to..."provide for management activities which require major modifications to the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention." (BLM Handbook 8410-1, p. 7) All of the units in this analysis area are rated VRM Class IV. None of the alternatives would impact VRM Class IV visual (scenic) values due to the acceptably high levels of visual modification allowed in BLM-managed lands ranked as Class IV.

## E. Botany

Seventy-two **Threatened, Endangered or Bureau Sensitive special status fungi, lichen and plant species** are known or suspected to occur on the Roseburg District: 12 species of fungi, 6 species of lichens, 4 species of liverworts, 11 species of moss, and 39 species of vascular plants.

Three **Bureau Sensitive fungi** species (*Dermocybe humboldetensis*, *Phaeocollybia californica*, and *Ramaria rubella* var. *blanda*) occur in the analysis area (BLM GeoBOB database). None of the known sites coincide with proposed units or road locations. Implementation of an action alternative would have no effects on these known populations.

There are 207 species of fungi, 50 species of lichens, 16 non-vascular plants species, and 10 vascular plant species identified by the **Survey and Manage** standards and guidelines that are assumed to be present on the Roseburg District.

Surveys for botanical species were completed in all proposed harvest units in 2012. During these surveys, no populations of any Federally listed Threatened or Endangered, or Bureau Sensitive botanical species were identified. Table B-2, *Appendix B – Botany* summarizes completed survey results. However, required botanical surveys in proposed harvest units and locations of proposed road construction are incomplete. Surveys for Survey and Manage botanical species were performed in 23 units in 2012 and 2013. Additional surveys are scheduled in 2014 and would be performed prior to a decision involving proposed road construction (0.8 miles) outside of the proposed harvest units and the following units: 28-3-36A, 28-4-21A, 29-3-09C, 29-3-09E, 29-4-3C, 29-4-11A, 29-4-11B, 29-4-11C and 29-4-15A. Identified Survey and Manage botanical species would be avoided; therefore proposed activities in the action alternatives would have no effects.

Surveyors identified occupied habitat for two **Survey and Manage pin lichen** species within proposed harvest units during 2012 and 2013 surveys. *Chaenotheca chrysocephala* was located in 11 units and *C. ferruginea* was located in 13 units. No other botanical Survey and Manage species were identified. Table B-1, *Appendix B – Botany* summarizes completed survey results.

The removal of any isolated trees occupied by pin lichens in a variable retention harvest unit or greater than 25 percent of occupied trees within a site (defined as occupied trees located within 300-feet of each other) would require approval by the Responsible Official, or his representative, and the Resource Area Botanist.

Logging corridors would be sited to maintain a 25-foot avoidance area from occupied trees, unless this avoidance distance would result in a safety risk, cause unacceptable damage to other resources as determined by the Responsible Official or his representative in consultation with appropriate Resource Specialists, or would preclude the establishment of critical infrastructure (including landings, logging corridors, or roads) needed to implement the selected alternative. Where a 25-foot avoidance area is unfeasible, the location would require site specific approval by the Responsible Official, or his representative, and the Resource Area Botanist.

In thinning units, a 25-foot avoidance area around trees with known Survey and Manage pin lichens would be maintained. Within VRH units, excluding trees removed for logging corridors, the following no cut buffers would be maintained around occupied retention trees:

- A 100-foot buffer for occupied trees located on aspects between 135 and 270 degrees
- A 50-foot buffer for occupied trees located on aspects of 0-134 and 271-360 degrees

As designed, implementation of action alternatives would not reduce the probability of pin lichen site persistence. Avoidance would protect the extant populations and occupied substrate from physical damage and changes in microclimate would be minimized by maintaining at least 40 percent average canopy cover within thinning units (Heithecker and Halpern 2006) and adhering to buffer distances around occupied trees in variable retention harvest units (Heithecker and Halpern 2007).

## F. Noxious Weeds and Invasive Non-Native Plants

There are infestations of noxious weeds in the proposed harvest units and along access roads. The most common species present are spotted knapweed, Himalayan blackberry and Scotch broom.

In the absence of any proposed timber harvest, actions taken to contain, control and eradicate existing infestations of noxious weed and non-native invasive plants would still be implemented under the *Roseburg District Integrated Weed Control Plan* (USDI/BLM 1995b). These actions include inventory of infestations, assessment of risk for spread, and application of control measures in areas where other management actions are proposed or planned. Control measures may include release of biological control agents, mowing, hand-pulling, and limited use of approved herbicides.

BLM herbicide application treats individual plants. Application methods are limited to truck-mounted sprayers, backpack and hand sprayers, and wick wipers. Time and location of application is also restricted based upon forecast weather conditions, proximity to live water and riparian areas, and proximity to residences or other places of human occupation.

In the event a decision is made to implement an action alternative, preventative measures would be implemented that focus on minimizing the risk of introducing new weed infestations or spreading existing ones, and would include:

- Steam cleaning or pressure washing equipment used in logging and road construction to remove soil and materials that could transport weed seed or root fragments.
- Scheduling work in uninfested areas prior to work in infested areas.
- Seeding and mulching disturbed areas with native grass seed; or revegetating with native plant species where natural regeneration is unlikely to prevent weed establishment.
- Any new infestations would be treated and periodically monitored to determine whether further treatments or alternative treatments are indicated.

Given that regular weed treatments would continue, there would be negligible changes in noxious weed populations in the analysis area under the action alternatives.

## G. Cultural and Historical Resources

Cultural resource inventories within proposed harvest units and locations of proposed road construction are incomplete. The project areas that have been surveyed are listed in Table 1-1.

**Table 1-1: Location of Completed Cultural Resource Inventories**

| Township | Range | Sections |
|---|---|---|
| 28S | 3W | 21, 27-28, 32 E½, 33, 35-36 |
| 28S | 4W | 9-10, 17 NE¼ |
| 29S | 3W | 3, 5, 7, 9 |
| 29S | 4W | 13-14 |

These efforts have been documented in CRS# SR1302, SR1303, SR1304, and SR1305. The remaining areas of the project are scheduled to be surveyed in 2014 and are listed in Table 1-2.

**Table 1-2: Location of Planned Cultural Resource Inventories**

| Township | Range | Sections |
|---|---|---|
| 28S | 2W | 31-32 |
| 28S | 3W | 17, 20, 29, 31, 32, NW ¼ |
| 28S | 4W | 2-3, 17 NW ¼, 18-19, 21, 25, 29 |
| 28S | 5W | 27 |
| 29S | 2W | 8 |
| 29S | 3W | 4, 15 |
| 29S | 4W | 3, 11, 15 |

To date, three documented (35DO86, 35DO111, 35DO737) and three previously undocumented sites (OR-10-317, OR-10-318, and OR-10-319) are located within the analysis area.

Four of the sites have not been formally evaluated and are assumed to be eligible for listing on the National Register of Historic Places (NRHP). Three of the unevaluated sites have been excluded from the project area through unit boundary modification and would not be affected by the proposed activities. The remaining unevaluated site, OR-10-318, is scheduled to be formally evaluated in 2014.

Two other sites are ineligible to be listed on the NRHP, including 35DO737 which was evaluated prior to this analysis. The other site, OR-10-319, is a previously undocumented roadside dump that was intensively recorded, but not found to meet the requirements of eligibility due to lack of integrity. Both of these sites require no further consideration.

Any cultural resources that are located through future surveys would be appropriately managed either through avoidance or mitigation designed by the District Archeologist. In this way, no cultural resources would be affected by this project. Consequently, the BLM is in compliance with Section 106 of the National Historic Preservation Act under the guidance of the 2012 National Programmatic Agreement and the 1998 Oregon Protocol. In accordance with BLM policy and legal requirements, the locations of these sites are not disclosed in public documents in order to diminish the potential for violations of the Archaeological Resources Protection Act.

If any objects of cultural value (e.g. historic or prehistoric ruins, graves, fossils, or artifacts) are found during the implementation of the selected alternative, operations would be suspended until the materials and site(s) have been evaluated to determine any appropriate mitigation action.

## H. Native American Religious or Ceremonial Sites

No Native American religious concerns have been identified by the interdisciplinary team or through correspondence with tribal governments having historic interests in the area.

## I. Wildlife Species Considered but Not Analyzed in Detail

A number of wildlife species, including the marbled murrelet and several species designated as Bureau Sensitive, would not be affected by proposed activities because habitat is not present in the analysis area, habitat would be created or improved by proposed activities, the species is not reasonably expected to occur in the analysis area, the analysis area is outside of the known distribution of the species or proposed activities may benefit the species while having negligible or no effects at the population level. Table C-1, *Appendix C – Wildlife* lists these species and briefly explains why they were excluded from detailed study.

# VIII. Conformance

## A. Applicable Planning Documents

Effects of natural resource management, including timber management, were analyzed in the Roseburg District Proposed Resource Management Plan Environmental Impact Statement (RMP/EIS 1994). This EA considers environmental consequences of no action and the proposed actions to determine if there would be impacts exceeding those analyzed in the PRMP/EIS, precluding a Finding of No Significant Impact and requiring preparation of a Supplemental Environmental Impact Statement. Additional information and analysis provided by the following documents is incorporated by reference.

- *Final Supplemental Environmental Impact Statement* (FSEIS) *on Management of Habitat for Late-Successional and Old-Growth Related Species Within the Range of the Northern Spotted Owl* (USDA/FS-USDI/BLM 1994a);
- FSEIS *for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* (USDA/FS-USDI/BLM 2000);
- FSEIS *to Remove or Modify the Survey and Manage Mitigation Measures Standards and Guidelines* (USDA/FS-USDI/BLM 2004a);
- *Final Supplement to the 2004 Supplemental Environmental Impact Statement to Remove or Modify the Survey and Manage Mitigation Measures Standards and Guidelines* (USDA/FS-USDI/BLM 2007); and
- *Final Environmental Impact Statement for the Revision of the Resource Management Plans for the Western Oregon Bureau of Land Management* (USDI/BLM 2008a (2008 FEIS)).

Implementation would conform to management direction from the 1995 Roseburg District ROD/RMP as amended by the following:

- *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* (USDA/FS-USDI/BLM 1994b); and
- *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* (USDA/FS-USDI/BLM 2001).

## B. Applicable Laws and Regulations

Design and implementation of the proposed action would conform to applicable laws, regulations and Executive Orders that include but are not limited to:

- **The Oregon and California Act of 1937:** Section 1 of the Act stipulates that suitable commercial forest lands revested by the government from the Oregon and California Railroad are to be managed for the sustained production of timber.
- **The Federal Land Policy and Management Act (FLPMA):** Section 302 at 43 U.S.C. 1732(a), directs that "The Secretary shall manage the public lands...in accordance with the land use plans developed by him under section 202 of this Act when they are available..."
- **National Historic Preservation Act, 2012 National Programmatic Agreement and 1998 Oregon State Historic Preservation Office Protocols:** Protection of resources of historic or cultural value.
- **Clean Water Act:** Section 313 and Executive Order 12088 require federal agencies with all programs and requirements for controlling water pollution from nonpoint sources.
- **Clean Air Act:** Directs federal agencies to maintain and enhance air quality.
- **The Endangered Species Act:** Section 7(a) (2) directs that each Federal agency shall, in accordance with and with the assistance of the Secretary, insure that any action authorized, funded, ort carried out by such agency is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined by the Secretary to be critical.
- **Migratory Bird Treaty Act and Executive Order 13186:** Protection of migratory birds.
- **Lacey Act, Federal Noxious Weed Act and Executive Order 13112:** Minimize the risk of establishment or spread of noxious weeds and invasive non-native plants.
- **Bald Eagle Protection Act:** Protects bald eagles and golden eagles by prohibiting take, possession and commerce of such birds.

# Chapter Two – Alternatives

This chapter describes the basic features of three alternatives being analyzed in detail. Units of measurement and map representations are approximate. Comparison tables summarizing the differences between the alternatives are provided at the end of this chapter.

## I. Alternative One – No Action

This alternative describes a baseline against which the effects of proposed action alternatives can be compared (36 CFR 1502.14) and is considered a viable management option. It discusses the consequences of not taking any action and assumes that current resource trends will continue into the future.

No timber management would occur. Forest stands would continue to develop under generally dense and overstocked conditions characterized by high levels of canopy cover and live-crown recession.

There would be no road construction needed to provide access for yarding and timber hauling. Road renovation and improvements designed to reduce erosion, correct drainage deficiencies, improve water quality, and provide for user safety would not be undertaken. Decommissioning of roads surplus to long-term transportation and management needs would not occur. Roads would be maintained on an as needed basis to provide resource protection, accommodate reciprocal users, and protect the government's infrastructure investments.

No activity fuels would be generated that would require treatment to reduce risk of fire. Fire suppression would continue.

Selection of the No Action Alternative would not constitute a decision to reallocate these lands to non-commodity uses. If the decision maker chooses this alternative, the proposed action would be dropped and the National Environmental Policy Act (NEPA) process ended. Future activities in the area would not be precluded and could be analyzed in subsequent NEPA documents.

## II. Alternative Two – Thinning and Variable Retention Harvest

Issues presented in Chapter One and management direction from the ROD/RMP were used to design Alternative Two. The harvest units are allocated as General Forest Management Area (GFMA), Connectivity/Diversity (C/D) Block, and associated Riparian Reserves.

Alternative Two would treat 59 harvest units: 45 units of thinning and 14 units of variable retention harvest along with associated road management, fuels treatments, reforestation, stand maintenance, and subsoiling. Activities included in Alternative Two are described below.

Treatment prescriptions to meet the purpose and need were determined primarily by land use allocation, stand age and condition, past management, and critical habitat for the northern spotted owl. The proposed harvest units are described in Tables 2-1, 2-2, and 3-5. Table 2-6, at the end of this Chapter, summarizes timber management activities by alternative. *Appendix A* includes detailed maps of proposed timber and road management.

**Table 2-1: Proposed Treatments in Northern Spotted Owl Critical Habitat**

| Unit ID | Land Use Allocation[1] | Total Unit Acres | Age as of 2013 | Upland Treatment Type[2] | | Upland Acres | VDT in Riparian Reserves Acres | Untreated Riparian Reserve Acres | Fuels Management Method | | | Harvest Method Percent Ground-Based vs. Cable |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Alt. 2 | Alt. 3 | | | | Hand Pile | Machine Pile | Broadcast Burn[3] | |
| 28-2-31A | GFMA | 26 | 55 | VDT | VDT | 15 | 8 | 3 | x | x | | 30/70 |
| 28-2-32A | GFMA | 10 | 100 | VRH | VDT | 9 | 1 | 0 | | x | | 100/0 |
| 28-3-17A | C/D | 28 | 52 | VDT | VDT | 18 | 10 | 0 | x | x | | 0/100 |
| 28-3-17B | C/D | 28 | 47 | CT | CT | 28 | 0 | 0 | x | x | | 0/100 |
| 28-3-20A | GFMA-C/D | 19 | 41 | VDT | VDT | 1 | 11 | 7 | x | x | | 0/100 |
| 28-3-21A | GFMA | 22 | 46 | CT | CT | 21 | 1 | 0 | x | x | | 50/50 |
| 28-3-21B | GFMA | 35 | 49 | VDT | VDT | 22 | 13 | 0 | x | x | | 0/100 |
| 28-3-26A | C/D | 20 | 85 | VDT | VDT | 16 | 2 | 2 | | x | | 75/25 |
| 28-3-28A | C/D | 23 | 37 | CT | CT | 20 | 3 | 0 | x | x | | 0/100 |
| 28-3-28B | C/D | 26 | 40 | CT | CT | 17 | 8 | 1 | x | x | | 0/100 |
| 28-3-28C | GFMA-C/D | 60 | 80 | VDT | VDT | 8 | 32 | 20 | x | x | | 0/100 |
| 28-3-29A | GFMA-C/D | 29 | 41 | CT | CT | 28 | 1 | 0 | x | x | | 0/100 |
| 28-3-31A | GFMA | 13 | 69 | VRH | VDT | 13 | 0 | 0 | x | x | | 100/0 |
| 28-3-31B | GFMA | 23 | 44 | CT | CT | 9 | 8 | 6 | x | x | | 0/100 |
| 28-3-32A | C/D | 11 | 53 | VDT | VDT | 11 | 0 | 0 | | x | | 20/80 |
| 28-3-32B | C/D | 21 | 72 | VDT | VDT | 18 | 2 | 1 | | x | | 20/80 |
| 28-3-32C | GFMA-C/D | 65 | 75 | VDT | VDT | 29 | 26 | 10 | x | x | | 5/95 |
| 28-3-33A | GFMA | 26 | 41 | CT | CT | 15 | 7 | 4 | x | x | | 0/100 |
| 28-3-35A | GFMA | 78 | 78 | VRH | CT | 37 | 33 | 8 | x | x | | 0/100 |
| 28-3-36A | GFMA | 15 | 86 | VRH | CT | 7 | 5 | 3 | | x | | 100/0 |
| 28-4-02A | GFMA | 78 | 43 | VDT | VDT | 68 | 8 | 2 | x | x | | 15/85 |
| 28-4-03A | GFMA | 33 | 45 | VDT | VDT | 32 | 1 | 0 | x | x | | 60/40 |
| 28-4-03B | GFMA | 16 | 38 | VDT | VDT | 16 | 0 | 0 | x | x | | 100/0 |
| 28-4-25B | C/D | 37 | 43 | CT | CT | 13 | 18 | 6 | | x | | 0/100 |
| 28-4-25C | C/D | 12 | 37 | CT | CT | 11 | 1 | 0 | x | x | | 0/100 |
| 29-2-08A | GFMA | 11 | 53 | CT | CT | 7 | 2 | 2 | | x | | 0/100 |
| 29-2-08B | GFMA | 46 | 42 | VDT | VDT | 27 | 11 | 8 | | x | | 0/100 |
| 29-3-03A | GFMA | 49 | 73 | VRH | CT | 41 | 6 | 2 | | x | | 0/100 |
| 29-3-07A | C/D | 38 | 67 | VDT | VDT | 38 | 0 | 0 | | x | | 35/65 |
| 29-3-15A | GFMA | 35 | 52 | CT | CT | 22 | 8 | 5 | x | x | | 45/65 |
| 29-3-15B | GFMA | 20 | 68 | VRH | CT | 19 | 1 | 0 | | x | | 0/100 |
| 29-3-15C | GFMA | 30 | 57 | VRH | VDT | 26 | 4 | 0 | | x | | 20/80 |
| Total | | 983 | | | | 662 | 231 | 90 | | | | |

[1] GFMA = General Forest Management Area, C/D = Connectivity/Diversity Block
[2] CT = Commercial Thinning; VDT = Variable Density Thinning; VRH = Variable Retention Harvest
[3] Alternative Two only

**Table 2-2: Proposed Treatments Outside of Northern Spotted Owl Critical Habitat**

| Unit ID | Land Use Allocation[1] | Total Unit Acres | Age as of 2013 | Upland Treatment Type[2] | | Upland Acres | VDT in Riparian Reserves Acres | Untreated Riparian Reserve Acres | Fuels Management Method | | | Harvest Method Percent Ground-Based vs. Cable |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Alt. 2 | Alt. 3 | | | | Hand Pile | Machine Pile | Broadcast Burn[3] | |
| 28-4-09A | C/D | 114 | 103 | VDT | VDT | 92 | 17 | 5 | x | x | | 5/95 |
| 28-4-09B | C/D | 20 | 103 | VDT | VDT | 20 | 0 | 0 | | x | | 0/100 |
| 28-4-10A | C/D | 31 | 99 | VDT | VDT | 30 | 1 | 0 | | x | | 0/100 |
| 28-4-10B | C/D | 39 | 99 | VDT | VDT | 35 | 3 | 1 | x | x | | 20/80 |
| 28-4-17A | GFMA | 76 | 48 | CT | CT | 67 | 6 | 3 | | x | | 5/95 |
| 28-4-17B | GFMA | 35 | 124 | VRH | CT | 29 | 4 | 2 | | x | | 0/100 |
| 28-4-18A | GFMA | 17 | 47 | CT | CT | 17 | 0 | 0 | | x | | 60/40 |
| 28-4-19A | GFMA | 46 | 54 | CT | CT | 46 | 0 | 0 | | x | | 10/90 |
| 28-4-19B | GFMA | 64 | 74 | VDT | VDT | 52 | 9 | 3 | x | x | | 20/80 |
| 28-4-21A | C/D | 10 | 82 | VDT | VDT | 10 | 0 | 0 | | x | | 100/0 |
| 28-4-21B | C/D | 22 | 40 | CT | CT | 19 | 2 | 1 | x | x | | 0/100 |
| 28-4-29A | GFMA | 40 | 72 | VRH | CT | 33 | 4 | 3 | | x | x | 0/100 |
| 28-5-27A | GFMA | 111 | 118 | CT | CT | 92 | 11 | 8 | | x | | 0/100 |
| 29-3-05A | GFMA | 21 | 68 | VDT | CT | 21 | 0 | 0 | | x | | 15/85 |
| 29-3-09B | GFMA | 24 | 79 | VDT | CT | 10 | 11 | 3 | x | x | | 0/100 |
| 29-3-09C | GFMA | 27 | 74 | VDT | VDT | 14 | 11 | 2 | x | x | | 0/100 |
| 29-3-09D | GFMA | 26 | 66 | VDT | VDT | 13 | 10 | 3 | | x | | 0/100 |
| 29-3-09E | GFMA | 5 | 70 | VRH | CT | 5 | 0 | 0 | | x | | 0/100 |
| 29-4-03A | GFMA | 57 | 47 | CT | CT | 42 | 9 | 6 | x | x | | 0/100 |
| 29-4-03C | GFMA | 39 | 59 | VRH | CT | 27 | 7 | 5 | x | x | | 0/100 |
| 29-4-11A | GFMA | 23 | 82 | VDT | VDT | 13 | 8 | 2 | x | x | | 15/85 |
| 29-4-11B | GFMA | 17 | 80 | CT | CT | 14 | 3 | 0 | x | x | | 25/75 |
| 29-4-11C | GFMA | 8 | 71 | VRH | CT | 8 | 0 | 0 | | x | | 0/100 |
| 29-4-13A | GFMA | 71 | 77 | VRH | VDT | 64 | 6 | 1 | x | x | | 20/80 |
| 29-4-13B | GFMA | 18 | 82 | VRH | CT | 16 | 2 | 0 | x | x | | 0/100 |
| 29-4-15A | GFMA | 20 | 86 | VDT | VDT | 2 | 12 | 6 | x | x | | 80/20 |
| 29-4-15B | GFMA | 48 | 53 | CT | CT | 41 | 7 | 0 | | x | | 0/100 |
| Total | | 1,029 | | | | 832 | 143 | 54 | | | | |

[1] GFMA = General Forest Management Area, C/D = Connectivity/Diversity Block
[2] CT = Commercial Thinning; VDT = Variable Density Thinning; VRH = Variable Retention Harvest
[3] Alternative Two only

# A. Timber Management

## 1. Upland Uniform Commercial Thinning (529 acres)

Objectives of uniform thinning include reducing the risk of stagnation, stand replacement fire, insect mortality, and future blow down and snow break. All uniform thinning treatments would primarily remove trees from suppressed and intermediate canopy classes, though some co-dominant and dominant trees could be removed to meet specific density and spacing objectives. The healthiest and best-formed conifers would be retained. Trees selected for retention would generally have a live crown ratio of at least 30 percent in order to increase the likelihood of increased growth after treatment.

Generally well-managed stands in the GFMA would be managed for full site occupancy to increase future timber volume, by thinning on a generally uniform spacing to a target relative density[3] of 0.35 to 0.40. Uniform commercial thinning would retain 80 to 110 trees per acre and basal area[4] would be 100 to 140 square feet per acre. Canopy cover[5] would be 70 to 80 percent.

Uniform commercial thinning in C/D Block land use allocation and unmanaged stands in the GFMA land use allocation would have a target relative density of 0.25 to 0.30. Due to high variability in tree size and number of trees between stands, the number of trees and basal area retained would have high variability. Thinning would retain 40 to 140 trees per acre and basal area would be 90 to 180 square feet per acre. Average canopy cover would be above 40 percent on all units except units 28-3-17B, 28-3-31B, 29-4-3A, 29-4-11B and 29-3-5A (Alternative Three only), where canopy cover would be above 60 percent based on proximity to northern spotted owl sites. The treatment would reduce densities slightly below full site occupancy, but would improve overall stand health.

The Roseburg District ROD/RMP directs that regeneration harvests not be scheduled before 120 years of age in C/D Blocks (ROD/RMP, p. 152). Proposed uniform commercial thinning in C/D Blocks would put stands on a trajectory to achieve culmination of mean annual increment at approximately 120 years of age.

The C/D Blocks and unmanaged stands in the GFMA land use allocation typically have high stem counts, low crown ratios, high height to diameter ratios, or high relative densities. Most of the stands proposed for uniform commercial thinning have been managed, but not for several decades.

---

[3] Relative density characterizes the level of competition among trees in a forest stand relative to some theoretical maximum based on tree size and species composition. The current values in this document are derived from site specific field data calculated by the Organon growth and yield model. Self-thinning (onset of suppression related mortality) begins at RD = 0.60 on a scale of 0.00 to 1.00 (Hann and Wang 1990).

[4] Basal area is the cross-sectional area of a single tree stem, including bark, measured at breast height, or the sum of the cross-sectional areas of all stems in a stand measured at breast height and expressed per unit of land area (Avery and Burkhart 2002).

[5] Canopy cover, also referred to as crown cover, is the ground area covered by the crowns of trees or woody vegetation as delimited by the vertical projection of crown perimeters, commonly expressed as a percentage of total ground area (Helms 1998). Canopy cover figures in this analysis are average values on a unit basis.

### 2. Variable Density Thinning (Uplands 631 acres; Riparian Reserves 374 acres)

***Upland Variable Density Thinning*** – A variable density thinning prescription would be applied using a combination of basal area and number of trees per acre to encourage development of structural and species diversity, increase structural heterogeneity, and introduce fine scale variation into the project stands. This would be achieved by varying the density and spacing of reserve trees and by creating small canopy openings (gaps) and small areas of no treatment (skips).

Canopy gaps and skips, up to 0.25 acres in GFMA, and up to 0.5 acres in C/D Blocks, would be located based on structural and habitat components such as snags, patches of hardwood trees, trees with unique structure, sensitive soils, and deposits of down wood where ever practical as to protect or promote the development of these types of features. The acres in gaps and skips should be approximately equal on a per unit basis. The area in skips and gaps would not exceed 20 percent of the total unit area.

Objectives of this treatment include increasing the health, vigor and resilience of stands and reducing the risk of stagnation. Stands with increased health and vigor are more resilient to potential stand replacement fire, insect mortality, future blow down, and snow break. Although basal area within treated stands may vary from 20 to 180 square feet per acre in any given location, average target relative density, on a unit basis, would be approximately 0.20 to 0.30. Average canopy cover would be above 40 percent on all units except units 28-3-28C, 28-3-32B, 29-3-5A (Alternative Two only), 29-3-9C, 29-3-9D and 29-4-11A where average canopy cover would be above 60 percent based on proximity to northern spotted owl sites.

Trees would be removed from all diameter classes greater than six inches diameter breast height, excluding older remnant trees. Dominant and co-dominant hardwoods would generally be retained in the stands. Snags would be marked and retained where practicable and likely to survive thinning. Where practicable downed woody material present in the stands would be left and protected with no treatment areas.

In unit 28-3-32B, the portion northwest of BLM Road No. 28-3-32.0, is specifically designated for a sugar pine restoration treatment. Variable density thinning would be used to reduce tree density near selected sugar pine to reduce competition for sunlight, water, and nutrients; increase the health and vigor of the sugar pine trees; and decrease risk of mortality from white pine blister rust.

***Riparian Reserve Variable Density Thinning (Density Management)*** – Variable density thinning in the Riparian Reserves outside of the "no-treatment" area would be similar to upland variable density thinning, with the exception that canopy gaps and skips would be a maximum of one and a half acres in size and minimum canopy cover of 50 percent, on average, would be retained to maintain stream shading.

In Riparian Reserves, selection of trees for retention would include trees with broken or deformed boles and crowns, as a means of promoting greater structural diversity. Hardwood trees greater than ten inches diameter breast height would be prioritized for retention where present and considered likely to survive thinning operations.

### 3. Legacy Tree and Snag Retention in All Thinning Units

Stand exam data indicates the presence of older remnant trees, primarily Douglas-fir, in some of the proposed units. Older remnant trees and large snags that may be present are not the focus of the proposed treatments and would be retained to the greatest degree practicable. Cutting remnant trees and large snags would be limited to clearing road rights-of-way, yarding corridors, and landings, and providing for safe operations.

Existing snags may be protected by clumping trees around individual scattered snags and establishing aggregate retention (skips) around concentrations of snags. It is assumed that additional snags would be created by yarding damage to retention trees and wind breakage.

### 4. Variable Retention Harvest (334 acres)

Variable retention harvest (VRH) is based on ecological forestry and restoration described by Franklin and Johnson (2009). It retains ecologically beneficial forest components such as large down wood, snags, and legacy trees, where present. Units would be designed to retain at least 20 to 30 percent of the pre-harvest stand basal area through a combination of aggregates and dispersed retention trees. The majority of the retention would be aggregates (skips) one half acre or larger, while the remainder would be in the form of dispersed retention represented by scattered individual trees, or groups and clumps of trees less than one half acre. Tree retention in VRH areas would be comparable to U.S. Forest Service Matrix management as described in the Northwest Forest Plan Standards and Guidelines (USDA/FS-USDI/BLM 1994, pp. C-41 and C-42).

Candidate areas for aggregates would include but are not limited to the following:

- Representative patches of the pre-harvest forest stand;
- Structurally complex forest clumps;
- Concentrations of trees that are older and larger than the prevailing stand conditions;
- Trees with unique characteristics (e.g., deformed boles, cavities, etc.);
- Concentrations of large down wood;
- Concentrations of snags;
- Unique habitats such as seeps, rock outcrops, and areas of ecological diversity;
- Riparian Reserves extending into the interior of the harvest unit, in contrast to Riparian Reserves that border a unit;
- Patches dominated by hardwood trees; and
- Areas of unstable or potentially unstable soils greater than one-half acre. Yarding corridors would be allowed in some retained aggregates, where the yarding corridors would not be expected to increase the risk of slope failures.

Aggregates would be well distributed throughout the proposed harvest units, although the type of harvest system to be used, specifically cable yarding, could constrain the potential location of the aggregates. For a given level of retention, there would also be tradeoffs between aggregate size and distributional objectives, e.g., focusing on distribution may require creating more small aggregates rather than a few large ones.

Dispersed retention would focus on predominant, dominant and co-dominant trees, some of which would be expected to provide snags and large down wood in the harvested area. Operational considerations could affect placement of dispersed retention.

Candidates for dispersed retention would include but are not limited to the following:

- Legacy hardwood and conifer trees;
- Trees with unique structure;
- Trees with defect that would provide wildlife habitat or be expected to become snags in a relatively short period;
- Minor species;
- Green trees protecting snags or groups of snags;
- Trees or groups of trees retained that are proposed for snag creation;
- Areas of unstable or potentially unstable soils less than one-half acre; and
- Trees that are expected to be long lived that would provide long-term legacy components. These trees would have high crown ratios and low height to diameter ratios.

Green tree retention required by the ROD/RMP would be met at the unit scale by summing qualifying trees in the aggregate and dispersed retention outside of Riparian Reserves. All proposed variable retention harvest units are located in the GFMA. At least six to eight green conifers per acre in the GFMA would be reserved, averaged over the entire unit acreage, consisting of individual trees, small clumps, or stringers (ROD/RMP, p. 64). Selection of trees would reflect the existing conifer species composition of the stands and full range of diameter classes greater than 20 inches diameter at breast height. Entries into younger stands would reserve the largest six to eight trees per acre as defined in the ROD/RMP (pp. 150-151).

### 5. Legacy Tree, Snag, and Large Down Wood Retention in VRH Units

As previously stated, many proposed units have older remnant trees and large snags that are not the focus of the proposed harvest treatments. Older remnant trees and large snags would be retained to the greatest degree practicable while providing for safe operations.

Existing snags may be protected by establishing aggregate retention around concentrations of snags and clumping trees around individual scattered snags. It is assumed that additional snags would be created by yarding damage to retention trees, wind breakage, and mortality caused by burning, such that snag numbers would exceed the required minimum. If necessary, however, additional snags could be created by mechanical means where post-harvest assessment indicates an insufficient numbers of snags.

Due to differing site conditions, the number and size of existing snags may vary between units. Snags of all sizes would be considered for retention though larger snags would be prioritized over smaller ones. Snags 20 inches or greater in diameter breast height would contribute toward achieving the analytical assumption of providing a minimum of 1.2 snags per acre averaged across the harvest unit (PRMP/EIS, Chapter 4-43) to support cavity nesting birds (ROD/RMP, pp. 34, 64, Appendix E). Where present and practicable more than an average of 1.2 snags per acre would be marked for retention.

At a minimum, an average of 120 linear feet per acre of large down wood in Decay Classes 1 and 2 would be provided, initially described in the ROD/RMP (p. 65) as pieces greater than or equal to 16 inches in diameter and 16 feet long. Plan maintenance in the 1997 Roseburg District Annual Program Summary (USDI/BLM 1998 p. 26) describes a range of scenarios by which this requirement may be met.

In addition to natural events such as windfall, there is an allowance for logs to be retained on site from felling breakage that are greater than 30 inches in diameter and greater than ten feet in length, logs in excess of 16 inches in diameter and greater than 25 cubic feet in volume, or the largest material available. Existing large down wood in Decay Classes 3, 4 and 5 would also be reserved under contract provisions.

### 6. Reforestation and Stand Maintenance (334 acres)

Reforestation would utilize artificial (planting) and natural regeneration. Reforestation prescriptions would be designed to postpone full canopy closure until the stands reach approximately 30 years old by reducing planting densities and implementing early precommercial thinning treatments, if necessary. The reforestation prescription would not include using herbicides except on individual or small infestations of invasive plants to allow native shrub species to co-dominate the site. Herbicide application would be done as described on page 14 of this EA. Aerial broadcasting of herbicides is not authorized. Site conditions and expected survival and growth of seedlings would be used to determine planting densities. Planting densities would be variable with an objective to provide full tree canopy cover at stand age 30. Planting would also be used to create desired species composition. It is expected that natural regeneration would supplement stocking over time. The composition of natural regeneration would depend on tree species adjacent to harvested areas, seed bed conditions, timing and abundance of seed crops, seed predation, and weather conditions.

Treatments to maintain survival of tree species would include mulching to reduce competition from grasses, protection from herbivory (browsing), and very limited conifer release from competing shrubs and hardwoods if necessary. Treatment types and timing would be determined from follow-up evaluation exams conducted over the first 15 years following harvest.

## B. Road Management

### 1. Road Construction (5.5 miles)

Road construction is intended to move landings off of roads that are heavily traveled to avoid user conflict, or to access landing locations that provide satisfactory yarding deflection or corridor alignment for environmentally responsible yarding. There would be 3.3 miles of new road retained for long-term use and 2.2 miles of temporary road to be decommissioned after use (Table 2-3). Most of the new road would be within proposed harvest units. Approximately 0.8 miles would be outside of the units.

Primary access would be provided by roads under BLM control and/or private roads over which the BLM has rights of use under the terms of reciprocal rights-of-way agreements, supplemented by construction of approximately 5.5 miles of new road, as illustrated in Table 2-3. Roads would be sited on ridge tops and stable side slope locations and disconnected from the road drainage network where practicable. On gradients less than seven percent, roads would be out-sloped for drainage in lieu of ditches and cross drains. Otherwise, road surfaces would be crowned and culverts installed at short intervals to quickly and evenly disperse run-off to the forest floor.

Cleared rights-of-way would be a minimum of 25-feet wide under the most favorable of circumstances to provide a minimum horizontal clearance of five feet on either side of roads, and a minimum overhead clearance of ten feet. Factors requiring wider rights-of-way would include slope steepness, turnouts, and a safe line-of-sight on approaches to curves. The intent is to construct, use and decommission temporary roads in the same operating season. If not possible because of events such as extended fire closure or need for site preparation or planting, the roads would be winterized prior to the onset of autumn rains for use the following year.

**Table 2-3: Proposed Road Construction**

| Road Number | Proposed Surface | Post-Project Disposition | Length (miles) | Road Number | Proposed Surface | Post-Project Disposition | Length (miles) |
|---|---|---|---|---|---|---|---|
| 28-2-31.B | Rock | Retain | 0.1 | 28-4-9.B | Rock | Decommission | 0.1 |
| 28-3-28.B | Rock | Decommission | 0.1 | 28-4-9.C | Rock | Decommission | 0.1 |
| 28-3-31.A | Native | Decommission | 0.1 | 28-5-27.A | Rock | Decommission | 0.1 |
| 28-3-32.B | Rock | Decommission | 0.2 | 28-5-27.B | Rock | Decommission | 0.3 |
| 28-3-32.C | Native | Decommission | 0.1 | 29-3-15.A | Rock | Decommission | 0.1 |
| 28-3-35.C | Rock | Retain | 0.3 | 29-3-15.B | Rock | Retain | 0.1 |
| 28-4-17.A | Rock | Decommission | 0.1 | 29-3-3.A | Rock | Decommission | 0.2 |
| 28-4-17.B | Rock | Decommission | 0.1 | 29-3-5.A | Rock | Retain | 0.4 |
| 28-4-19.A | Rock | Retain | 0.3 | 29-3-9.B | Native | Decommission | 0.1 |
| 28-4-19.B | Rock | Decommission | 0.1 | 29-3-9.D | Rock | Retain | 0.1 |
| 28-4-2.A | Native | Decommission | 0.2 | 29-4-11.A | Rock | Retain | 0.4 |
| 28-4-2.B | Native | Decommission | 0.1 | 29-4-11.B | Rock | Retain | 0.1 |
| 28-4-28.A | Rock | Retain | 0.3 | 29-4-13.A | Rock | Retain | 0.6 |
| 28-4-9.A | Rock | Retain | 0.6 | 29-4-15.A | Rock | Decommission | 0.1 |
| | | | | | | **Total** | **5.5** |

### 2. Road Decommissioning (5.1 miles)

Roads to be decommissioned include 2.2 miles of proposed temporary road, 2.5 miles of renovated road, and 0.4 miles of improved road (Table 2-4). Road decommissioning would be accomplished in a variety of ways, based upon evaluation of circumstances specific to each road. At a minimum, decommissioning would include water-barring and blocking the road(s) to vehicular use. It may also include removing drainage structures, sub-soiling the roadbed, mulching with straw and seeding with native grasses, or mulching with logging slash to further discourage off-highway vehicle use. Landings on temporary roads may be subsoiled in conjunction with road decommissioning. Actual decommissioning may be subject to agreement by holders of reciprocal rights-of-way, easements or other legal interests, such as pre-1983 roads constructed using plough-back funds from the O&C Counties.

**Table 2-4: Proposed Road Decommissioning**

| Road Number | Proposed Road Treatment | Miles to be Decommissioned | Road Number | Proposed Road Treatment | Miles to be Decommissioned |
|---|---|---|---|---|---|
| 28-3-28.B | Temporary Road Construction | 0.1 | 29-3-3.A | Temporary Road Construction | 0.2 |
| 28-3-31.A | Temporary Road Construction | 0.1 | 29-3-9.B | Temporary Road Construction | 0.1 |
| 28-3-32.B | Temporary Road Construction | 0.2 | 29-4-15.A | Temporary Road Construction | 0.1 |
| 28-3-32.C | Temporary Road Construction | 0.1 | 29-2-8.A | Road Improvement | 0.3 |
| 28-4-17.A | Temporary Road Construction | 0.1 | 29-4-3.C | Road Improvement | 0.1 |
| 28-4-17.B | Temporary Road Construction | 0.1 | 27-4-35.4 | Road Renovation | 0.3 |
| 28-4-19.B | Temporary Road Construction | 0.1 | 28-2-31.A | Road Renovation | 0.2 |
| 28-4-2.A | Temporary Road Construction | 0.2 | 28-3-28.A | Road Renovation | 0.2 |
| 28-4-2.B | Temporary Road Construction | 0.1 | 28-3-35.1 | Road Renovation | 0.3 |
| 28-4-9.B | Temporary Road Construction | 0.1 | 28-3-35.A | Road Renovation | 0.4 |
| 28-4-9.C | Temporary Road Construction | 0.1 | 28-3-36.A | Road Renovation | 0.2 |
| 28-5-27.A | Temporary Road Construction | 0.1 | 28-4-2.1 | Road Renovation | 0.5 |
| 28-5-27.B | Temporary Road Construction | 0.3 | 29-3-9.A | Road Renovation | 0.4 |
| 29-3-15.A | Temporary Road Construction | 0.1 | | | |
| | | | | Total | 5.1 |

### 3. Road Improvement (0.9 miles)

Improvements are proposed on approximately 0.9 miles of existing system and uninventoried roads (jeep trails and way-roads) as detailed below in Table 2-5. Improvements would consist primarily of placing rock on native surfaced roads, or applying additional rock on previously surfaced roads. Additional drainage structures may also be installed.

**Table 2-5: Proposed Road Improvements on Native Surfaced Roads**

| Road Number | Proposed Surface | Post-Project Disposition | Length (miles) | Road Number | Proposed Surface | Post-Project Disposition | Length (miles) |
|---|---|---|---|---|---|---|---|
| 28-3-32.D | Rock | Retain | 0.1 | 29-3-9.2 | Rock | Retain | 0.1 |
| 28-4-19.0 | Rock | Retain | 0.3 | 29-4-3.C | Rock | Decommission | 0.1 |
| 29-2-8.A | Rock | Decommission | 0.3 | | | | |
| | | | | | | **Total** | **0.9** |

### 4. Road Maintenance/Renovation (110 miles)

Road maintenance/renovation would occur on approximately 110 miles of BLM and non-BLM roads to be used as haul routes associated with the proposed projects. Road maintenance/renovation includes road work to bring an existing road back to its original design. Examples of this work may include such actions as brushing, ditch cleaning, surface grading, slump removal, replacing or installing drainage structures, and/or adding additional rock surfacing where needed (i.e. spot rock). Typically, roads that are currently capable of supporting log haul require "maintenance" whereas roads that cannot currently support log haul require "renovation".

### 5. Road Daylighting (Up to 74 miles)

The purpose of daylighting is to reduce shade on roadway surfaces because continual shading can inhibit road surfaces from drying out, causing development of undesirable road conditions, rock wear or sedimentation. Daylighting prolongs the life expectancy of the road by reducing leaves and needles that contaminate the road surface. Daylighting may also increase public and firefighter safety along roadways for ingress or egress. Additionally, reducing the fuels near the roads may improve the viability of using the road as a fuel break during fire suppression. Roads targeted for daylighting are haul routes and regularly traveled roadways. Daylighting treatments include clearing shrubs and trees and/or thinning trees less than 24 inches diameter breast height where overstory tree canopy shades the roadway surface. Daylighting would occur up to 33 feet from center line of existing roads.

Daylighting treatments in suitable northern spotted owl habitat would not impair its function, nor impair the function of the primary constituent elements of northern spotted owl critical habitat by avoiding the removal of the following components (USDI BLM 2013):

- Known nest trees, trees with nesting structure for northern spotted owls or trees adjacent to nest trees or potential nest trees that provide habitat function; and
- Trees over 24 inches diameter at breast height.
- Trees between 16 and 24 inches diameter at breast height within stands considered to meet Recovery Action 32 for northern spotted owls may be felled but would be left on-site as coarse woody debris.

To avoid disturbing nesting northern spotted owls, daylighting operations would be subject to seasonal operating restrictions as described in Project Design Feature four (4) below. A wildlife biologist would assist in designing potential daylighting treatments in critical habitat.

Daylighting would not occur within pre-established Riparian Reserve "no-treatment" areas except where a hydrologist or fisheries biologist determines that site specific characteristics warrant the need for daylighting to mitigate sediment transport to the stream network while meeting Aquatic Conservation Strategy objectives.

### 6. Repair Road 29-5-11.0

Approximately 50 feet of BLM Road 29-5-11.0 has been undermined by Rock Creek, a tributary to Bilger Creek, creating a safety hazard, as well as releasing sediment into a fish bearing stream. Repairing this failure could include such measures as installation of retaining walls or road realignment.

## C. Fuels Management

### 1. Machine and Hand Piling and Burning (Approximately 434 acres)

***Hand Piling*** – Material ranging from three to six inches diameter would be hand-piled within 50 feet of selected roadways in the Wildland Urban Interface or popular rural roadways. Piling would not occur in Riparian Reserves. Piles would be covered with plastic or thick paper to ensure to insure that the core of the piles remains dry, and good consumption of the pile is achieved when burned while minimizing generation of particulates. Fine fuels generated by thinning operations would generally remain scattered throughout the thinned units.

***Machine Piling*** – Ground-based yarding areas may be machine piled along primary skid trails or at landings to reduce activity fuels. Total exposed mineral soil resulting from primary skid trails and mechanical site preparation activities would be less than ten percent of ground based harvest units (USDI/BLM 2005, p. 59). Activity fuels would be machine-piled in a manner that is consistent with restrictions on ground-based harvest operations. There would be no dozer piling. Machinery would be restricted to slash mats, existing skid trails or existing roads outside of Riparian Reserves.

In cable yarding areas, machine piling of activity fuel would occur at landings and along roads. Machinery would build the piles from the roadway or landing surface which would not influence the area of soil compaction in the harvest units.

For all machine piling, displacement of duff and topsoil into piles would be avoided to the greatest extent practicable (USDI/BLM 2001, p. 66)

***Pile Burning*** – Burning ground-based machine piles, landings and hand piles would occur during the late autumn and early winter when soil and duff moisture is high (ROD/RMP, p. 139) to protect soils but prior to persistent rain. In some of the variable retention harvest areas, ground-based machine piles would be burned when the fuels are dry enough to burn within the piles and potentially carry between piles at a low intensity, commonly referred to as jackpot burning. Piles in cable yarding areas would be burned under wet conditions when fire would not carry outside of the piles. Jackpot burning in ground-based areas would be allowed to back into Riparian Reserves.

In areas with moderate soil sensitivity (Category 2) and low soil sensitivity (Category 3), the maximum amount of bare mineral soil exposed by broadcast burning would be 30 percent and 40 percent, respectively (USDI/BLM 1988, pg. 41-42).

Pile burning would be accomplished consistent with the recommendations and requirements of the Oregon Smoke Management Plan. Requirements include writing a burn plan, obtaining a burn permit, burning under conditions that encourage complete combustion of smaller fuels within the initial burn period, and burning under conditions that would not generate impact to Smoke Sensitive Receptor Areas, Class 1 airsheds or other areas sensitive to smoke.

***Fire Trail Construction*** – Where needed, hand or machine fire trails approximately three to eight feet in width would be constructed around the perimeters of the jackpot burn areas. Fire trail construction on the perimeter of Riparian Reserves would be avoided as much as feasible. In the event of escapement, no fire retardant chemicals would be utilized in Riparian Reserves to prevent water contamination. All fire trails would be rehabilitated by constructing water bars, where deemed necessary, and mulching with logging slash where available.

### 2. Broadcast Burning (16-24 acres)

***Broadcast Burning*** – If necessary, logging slash in portions of Unit 28-4-29A would be broadcast burned to reduce fire risk and prepare the area for planting. This unit is located within the Wildland Urban Interface as described in the Douglas County Community Wildfire Protection Plan. Light to moderate burn intensity would be prescribed to minimize consumption of duff and large woody debris. Broadcast burning by hand ignition would occur in the fall, winter, or spring depending on conditions conducive to achieving burn objectives and when soil and duff moisture is high and moisture content of large fuels is high. There would be no ignition within the Riparian Reserves to avoid potential spillage of fuel, but if operationally possible, fire would be allowed to back into the Riparian Reserves to enhance biological diversity.

Broadcast burning in Category 1 soils would be avoided to the extent practicable. Whole-tree yarding, piling and pile burning would be used to avoid broadcast burning in areas of sensitive soils (Category 1). Cable-yarded variable retention harvest units with Category 1 soils would be whole-tree yarded except when other resource concerns require otherwise. In areas with moderate soil sensitivity (Category 2) and low soil sensitivity (Category 3), the maximum amount of bare mineral soil that is exposed from burning would be 30 percent and 40 percent, respectively (USDI/BLM 1988, pg. 41-42).

A representative of the BLM would attempt to contact adjacent land owners prior to broadcast burning, in order to apprise them of the planned burn and what conditions would be expected.

Broadcast burning would be accomplished consistent with the recommendations and requirements of the Oregon Smoke Management Plan as described above.

***Fire Trail Construction*** – Where needed, hand or machine fire trails approximately three to eight feet in width would be constructed around the perimeters of the broadcast burn area. Fire trail construction on the perimeter of Riparian Reserves would be avoided as much as feasible. In the event of escapement, no fire retardant chemicals would be utilized in Riparian Reserves to prevent water contamination. All fire trails would be rehabilitated by constructing water bars, where deemed necessary, and mulching with logging slash where available.

## D. Subsoiling (20 acres)

Subsoiling would be completed in ground-based harvested areas, on compacted and displaced soil areas in main and secondary skid trails, equipment areas and on some native surfaced landing areas free of logging slash. Subsoiling includes decompacting the affected areas, water barring as needed, replacing some topsoil on the treated areas to provide innoculum, and placing slash on the decompacted areas as mulch and a deterrent to unauthorized OHV use. Current tilling practices specify that slash, other organic debris and topsoil cover at least 50 percent of the subsoiled areas, where available. Subsoiling is usually performed after the ground base operations are completed in a logging unit or in a timber sale in the dry season, up through the fall season, before the onset of substantial rain.

# III. Alternative Three – Thinning Only

Alternative Three was developed to address concerns about the effects of applying variable retention harvest. Under this alternative, uniform thinning would be applied to approximately 782 acres and variable density thinning prescription would be utilized on approximately 712 acres in the GFMA and C/D Block land use allocations. Variable density thinning would be applied to approximately 374 acres of Riparian Reserves (see Tables 2-1 and 2-2).

Establishment of Riparian Reserves in the matrix allocations, designation of no-treatment areas in Riparian Reserves, and the thinning prescriptions would be as described for Alternative Two.

Alternative Three would implement the following activities as described in Alternative Two:

## A. Timber Management

*Upland Uniform Commercial Thinning (782 acres)*

*Variable Density Thinning (Uplands 712 acres; Riparian Reserves 374 acres)*

## B. Road Management

*Road Construction (5.5 miles)*

*Temporary Road Construction followed by Decommissioning (2.6 miles)*

*Road Improvement (0.9 miles)*

*Road Maintenance/Renovation (110 miles)*

*Road Daylighting (up to 50 miles)*

*Repair Road 29-5-11.0*

## C. Fuels Management

*Machine and Hand Piling and Burning (Approximately 409 acres)*

There would be no broadcast burning or fire trail construction under Alternative Three.

## D. Subsoiling (20 acres)

# IV. Project Design Features of the Action Alternatives

**A. Riparian Reserves** would be established based on site-potential tree heights determined for each watershed in the analysis area. These heights were calculated from the average site index of inventory plots throughout each watershed, on the lands capable of supporting commercial timber stands. The calculated site-potential tree height for the watersheds involved is 160 feet.

On intermittent and perennial non-fish-bearing streams, Riparian Reserve would be one site-potential tree height in width, slope distance, measured from the top of the stream bank. On all fish-bearing streams, perennial or intermittent, Riparian Reserves would be two site-potential tree heights in width (320 feet on each side of the stream), slope distance, measured from the top of the stream bank.

Riparian Reserve "no-treatment" areas would be established based upon the nature of individual streams. On intermittent, non-fish-bearing streams a minimum "no-treatment" area, measured from the top of the stream bank, would be a minimum of 35 feet in width, slope distance. In areas where Oregon Coast coho are present, the "no-treatment" area would be a minimum of 100 feet. On all other streams the "no-treatment" area would be a minimum of 60 feet in width, slope distance on each side of the stream. "No-treatment" areas may be extended to include areas with unique geologic and hydrologic features or concerns, and to maintain unique structural and vegetation species diversity in the existing streamside forest.

**B. Ground-based Yarding**[6]

1. Operations would be restricted to the dry season, typically mid-May through mid-October, when soils are least susceptible to compaction. This operational period may be extended if spring and late-autumn conditions are dry, or shortened in the event of abnormally wet weather.
2. Operators would use harvest equipment on pre-designated trails or existing trails to the greatest degree practicable, with operations generally limited to slopes of 35 percent or less. Operations on steeper pitches between gentler benches could be authorized where appropriate.
3. Equipment operators would avoid using equipment in perennially wet areas.
4. Processors and harvesters (which do not stay on designated skid trails) would travel over a slash mat created from cutting and limbing the harvested trees.
5. After the timber harvest, selected primary and secondary skid trails and native surfaced landings free of slash material would be subsoiled. In primary skid trails, slash and some top soil would be placed over tilled sections. Compacted soils having very gravelly or very cobbly layers would not be candidates for subsoiling, since tilling would bring the rock fragments to the surface. Main trails and landings suitable but not yet subsoiled would be inventoried for future tilling at a later entry.

[6] USDI/BLM 2001, pp. 66-67; USDI/BLM 2002, pp. 70-71

## C. Cable Yarding[7]

1. Equipment would be capable of maintaining a minimum one-end log suspension and have a minimum of 100 feet of lateral yarding capability. If necessary, contract requirements may specify the type of logging carriage used and/or require intermediate support. Maximum tower height would be 40 feet and maximum power rating would be 225 horsepower, these requirements may be waved in variable retention harvest units.
2. Full suspension yarding would be required over perennial streams where practicable.
3. Yarding corridors would be pre-designated and a maximum of 20-feet in width.
4. Landings would be located at least 200 feet apart, to the extent practicable.
5. Yarding to and hauling off of native surfaced roads would be restricted to the dry season, typically mid-May through mid-October, subject to circumstances described above.
6. Cable yarding typically requires use of trees outside of unit boundaries for tailholds and guyline anchors. Contract provisions require purchasers obtain written approval before attaching logging equipment to any tailhold tree in the timber reserve and take measures to protect against undue damage through use of tree plates, straps or cribbing. Guyline trees are generally cut because they are located in the guyline radius of cable yarding equipment and are subject to state safety regulations.

## D. Yarding Wedges

Yarding wedges originating from a landing located outside of a unit would occur where a logical road location cannot be constructed with the unit. Yarding wedges may be identified during the analysis process but more typically are identified during the final unit layout and are frequently located on private land owned by parties with rights of reciprocal use. Yarding wedges usually are needed to facilitate cable yarding, but may also be used for ground-based yarding. Yarding wedges are the minimum size needed to facilitate yarding, generally less than two acres in size. For units in this analysis, up to 20 acres of yarding wedges may be necessary.

## E. Seasonal Wildlife Restrictions on Harvest Operations

1. Removal of suitable nesting, roosting and foraging habitat or broadcast burning within one-quarter mile of known northern spotted owl sites, or unsurveyed suitable habitat would be prohibited from March 1 to September 30, both dates inclusive.

   This restriction could be waived until March 1 of the following year, following implementation of the northern spotted owl survey protocol (USDI/FWS 2012a). If two years of protocol surveys covering all spotted owl habitat within the survey area indicate no resident single owls, territorial owl pairs, or pairs/two owls of unknown status and no activity centers are known to occur in the survey area and no barred owls are detected in the survey area then spot checks in the third and fourth years are not required (USDI/FWS 2012).
2. Activities within applicable disruption threshold distances of known northern spotted owl sites or unsurveyed suitable habitat would be prohibited from March 1 to July 15, both dates inclusive. This restriction may also be waived, in the circumstances described above.

[7] USDI/BLM 2001, pp. 66-67; USDI/BLM 2002, pp. 70-71

3. **Golden Eagle**: Implement a seasonal restriction from January 1 to August 15 for all activities within 660 feet of occupied sites (USDI/FWS 2007). Seasonal restrictions would be waived if searches document the units are unoccupied.

**F. Wildlife Habitat and Survey Requirements**

1. Where appropriate, feathered thinning may be used on units adjacent to suitable northern spotted owl habitat to minimize edge effects.
2. Conduct surveys in suitable habitat for **chace sideband snail**, **Crater Lake tightcoil snail** and **Oregon shoulderband snail** following Survey and Manage Program guidance (Duncan et al. 2003) in stands requiring surveys.

   Known sites of these three species would be protected by retaining habitat features and environmental conditions by following existing Conservation Assessment guidelines (Duncan 2004a; Duncan 2004b, Duncan 2005). The interdisciplinary team would determine proper conservation measures for all identified sites.
3. Conduct **great gray owl** protocol surveys in suitable habitat in units 28-4-19A, 28-4-29A and 28-5-27A (USDA/FS-USDI/BLM 2004). Surveys are scheduled in 2014 and 2015. Identified nest sites would be protected by providing a no-harvest buffer of 300 feet around meadows and natural openings and establishing a ¼-mile protection zone around the nest site (ROD/RMP, p. 44).
4. **Red Tree Vole**
   - Conduct surveys along approximately 0.1 miles of road in a stand that is older than 80 years and in six stands that meet habitat conditions based on protocol standards (Huff et al. 2012): 28-4-9A, 28-4-9B, 28-4-10A, 28-4-10B, 28-4-17B and 28-5-27A. Surveys are scheduled in 2014 and 2015.
   - Manage identified sites according to the *2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines* (USDA/FS-USDI/BLM 2001**), which provides options for site protection or non-high priority site designation (USDA/FS-USDI/BLM 2001). The non-high priority site evaluation is addressed in Appendix F.**
5. **Golden Eagle**
   - Conduct a search for evidence of nesting prior to harvest in the following units: 28-4-9A, 28-4-9B, 28-4-10A and 28-4-10B. Occupied sites would be protected as described below.
   - Retain trees with large nests and associated trees in the treatment areas. In variable retention harvest treatments, avoid removal of overstory trees within 330 feet of occupied nest trees (USDI/FWS 2007).

**G. Road Sedimentation Control Measures**

1. Use of native surfaced roads for timber hauling would be limited to the dry season, typically mid-May through mid-October.
2. Ground covering vegetation in ditchlines in Riparian Reserves would be retained, except where sediment deposition or other obstructions require maintenance.
3. Following road renovation actions, but prior to wet season haul, areas of potential sediment delivery (stream crossings) would be inspected by fisheries, hydrology, and/or engineering staff to determine if additional sediment control measures are warranted. These measures

could include seasonal suspension of haul, or installation of such devices as silt fences, straw bales, geofabric rolls, or similar.

4. Road conditions within Riparian Reserves and/or critical habitat for coho salmon would be periodically inspected by a fisheries biologist, hydrologist, and/or engineer to evaluate the effectiveness of sediment control measures. If improvements are required to increase their effectiveness, these actions would be implemented as soon as practicable.
5. The contract administrator would suspend operations before and after periods of rainfall that would result in road surface degradation or delivery of sediment generated from log haul to Riparian Reserves and/or critical habitat for coho salmon.

**H. Soils**

In addition to the project design features listed for ground-based yarding and cable yarding, and described in the fuels treatment and aggregate retention sections, the following unit-specific measures would be applied to further minimize soil disturbance to maintain soil stability.

1. *Features Specific to Unit 28-3-35A* – The northwest edge of Unit 28-3-35A is adjacent to several shallow, partially vegetated slides below an existing landing. The slides (0.1 acre) are surrounded by one half acre of steep slopes, 70-74 percent, on shallow, erosive soils. The failed slide material was deposited outside of the unit about 400 feet downslope from the initial failure site and is partially to fully vegetated.

   The slide area and adjacent steep slopes (about 0.75 acre) are not within the unit. However, the existing landing would be used and is the location where approximately eight cable corridors converge. The cable corridors would cross about 1.5 acres of steep slopes below the landing. A combination of the following measures would be used, if necessary, to reduce the possibility of a landing or slope failure resulting from harvest activities:

   - Pull back accumulated slash away from the landing edge, and off the over-steepened slopes below the landing, so that the slash pile can be burned away from the landing edge.
   - Recontour the landing edge itself when yarding is completed, to reduce the over-steepened side slope angle below the landing edge.
   - Spread slash or mulch material in the disturbed soil areas, as necessary, in the yarding corridors for erosion control.

2. *Features Specific to Unit 29-3-15B* – An old headwall or slide with steep slopes is just off the ridge adjacent to an existing landing and proposed road location. To maintain slope stability, retention trees in the headwall have been flagged. The following additional measures would be used to reduce the possibility of a landing and slope failure from the harvest activities:

   - Avoid disturbing or yarding through the old headwall area to maintain slope stability.
   - Spread slash or mulch material in the disturbed soil areas on steep slopes, as necessary, in the yarding corridors to control erosion.

# V. Resources not Present or Unaffected by the Alternatives

Areas of Critical Environmental Concern, prime or unique farmlands, parklands, wilderness, and Wild and Scenic Rivers are absent from the project area, and hence would be unaffected by any alternative. Wetlands would be protected by establishment of Riparian Reserves.

# VI. Comparison of Alternatives

This section summarizes the differences between each alternative by comparing management activities (Table 2-6) and fulfillment of the purpose and need for action (Table 2-7).

**Table 2-6: Alternative Comparison by Management Activity**

| Management Activity | Alternative One | Alternative Two | Alternative Three |
|---|---|---|---|
| Upland Uniform Commercial Thinning (acres) | 0 | 529 | 782 |
| Upland Variable Density Thinning (acres) | 0 | 631 | 712 |
| Upland Variable Retention Harvest (acres) | 0 | 334 | 0 |
| Riparian Reserve Variable Density Thinning (acres) | 0 | 374 | 374 |
| Reforestation and Stand Maintenance (acres) | 0 | 334 | 0 |
| Road Construction (miles) | 0 | 5.5 | 5.5 |
| Road Decommissioning (miles) | 0 | 5.1 | 5.1 |
| Road Maintenance/Renovation (miles) | 0 | 110 | 110 |
| Road Daylighting (miles) | 0 | up to 74 | up to 74 |
| Repair BLM Road 29-5-11.0 | No | Yes | Yes |
| Machine and Hand Piling and Burning (acres) | 0 | 434 | 409 |
| Broadcast Burning Fuels Management (acres) | 0 | up to 24 | 0 |
| Subsoiling (acres) | 0 | 20 | 20 |
| Yarding Wedge (acres) | 0 | up to 20 | up to 20 |

**Table 2-7: Alternative Comparison by Purpose and Need**

| Purpose and Need | Alternative One | Alternative Two | Alternative Three |
|---|---|---|---|
| **Purpose and Need: Produce Forest Products** | | | |
| Estimated Harvest Volume (mmbf) | 0 | 25.1 | 22.4 |
| **Purpose and Need: Promote Tree Survival, Tree Growth and Forest Health** | | | |
| Reduce Tree Density (acres thinned) | 0 | 1534 | 1868 |
| **Purpose and Need: Promote Diversity in the Matrix** | | | |
| Upland Variable Density Thinning (acres) | 0 | 631 | 712 |
| Variable Retention Harvest (acres) | 0 | 334 | 0 |
| **Purpose and Need: Manage GFMA for a Balanced 10-Year Age Class Distribution** | | | |
| Early-seral (0-30) | 21.6% | 23.1% | 21.6% |
| Mid-seral (40-80) | 27.3% | 26.0% | 27.3% |
| Mature or older (≥90) | 49.5% | 49.3% | 49.5% |
| Non-Forest | 1.6% | 1.6% | 1.6% |
| **Purpose and Need: Increase Diversity in Riparian Reserves** | | | |
| Variable Density Thinning in Riparian Reserves (acres) | 0 | 374 | 374 |

# Chapter Three – Affected Environment and Environmental Consequences

This chapter summarizes the current condition of specific resources present or with a reasonable potential to be present in the analysis area that could be affected by the proposed project. It addresses anticipated short-term and long-term effects that may result from implementation of the alternatives, including those effects that are direct, indirect and cumulative. The chapter concludes with a "Monitoring" section.

The discussion is organized by resource, addressing the interaction of the effects of timber and road management with current conditions of this environment. The analysis describes potential effects, how they might occur, and the incremental result of those effects, focusing on direct and indirect effects with a realistic potential for cumulative effects, rather than those of a negligible or discountable nature.

The Council on Environmental Quality (CEQ) provided guidance on June 24, 2005, as to the extent to which agencies of the Federal government are required to analyze the environmental effects of past actions when describing the cumulative environmental effect of a proposed action in accordance with Section 102 of the National Environmental Policy Act (NEPA). The 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 decisionmaking regarding the proposed action." This is because a description of the current state of the environment inherently includes effects of past actions. Guidance further states that "[g]enerally, agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historic details of individual past actions."

## I. Timber Resources _____

### A. Affected Environment

The analysis area used to describe forest conditions includes BLM lands in Myrtle Creek 10$^{th}$-field watershed (76,206 acres), Roberts Creek 12$^{th}$-field watershed (16,201 acres), Days Creek 12$^{th}$ field watershed (22,011 acres), and Upper Deer Creek 12$^{th}$ field watershed (29,813 acres). Approximately 42,800 acres (30 percent) of the lands are administered by the BLM.

Land ownership (Table 3-1) and current forest condition on BLM lands (Tables 3-2, 3-3, 3-4 and 3-5) were analyzed in ArcMap 10 using the Roseburg BLM Forest Operation Inventory data. Information on age class distribution on private lands is limited. It is assumed that large industrial owners will continue to manage primarily for timber production on a rotation of 40 to 65 years. It is also assumed that industrial harvesting will follow the Oregon Forest Practices Act, and stands will likely remain in early- and mid-seral stages across the landscape.

**Table 3-1: Land Ownership in the Analysis Area**

| Land Owner | Analysis Area | | Myrtle Creek 10th-field watershed | | Roberts Creek 12th-field watershed | | Days Creek 12th field watershed | | Upper Deer Creek 12th field watershed | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Acres | % | Acres | % | Acres | % | Acres | % | Acres | % |
| BLM | 37,914 | 26 | 25,810 | 34 | 404 | 3 | 6,848 | 31 | 4,851 | 16 |
| Forest Service | 6,217 | 4 | 5,079 | 7 | 0 | 0 | 1,138 | 5 | 0 | 0 |
| Small Private | 32,688 | 23 | 20,276 | 26 | 189 | 1 | 8,548 | 39 | 3,675 | 12 |
| Private Industrial | 67,412 | 47 | 25,040 | 33 | 15,609 | 96 | 5,477 | 25 | 21,287 | 72 |
| **Total** | **144,231** | | **76,206** | | **16,201** | | **22,011** | | **29,813** | |

**Table 3-2: Analysis Area 10-Year Age Class Distribution for BLM Managed Lands[8]**

| 10 Year Age Class | Analysis Area | | Myrtle Creek 10th-field watershed | | Roberts Creek 12th-field watershed | | Days Creek 12th field watershed | | Upper Deer Creek 12th field watershed | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Acres** | **%** | Acres | % | Acres | % | Acres | % | Acres | % |
| 0 | 259 | 1 | 259 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10 | 618 | 1 | 419 | 1 | 0 | 0 | 199 | 2 | 0 | 0 |
| 20 | 3,605 | 8 | 2,453 | 8 | 53 | 13 | 755 | 9 | 344 | 10 |
| 30 | 4,509 | 11 | 3,453 | 11 | 0 | 0 | 733 | 9 | 323 | 10 |
| 40 | 3,854 | 9 | 2,629 | 8 | 44 | 11 | 590 | 7 | 591 | 18 |
| 50 | 3,585 | 8 | 2,275 | 7 | 9 | 2 | 607 | 8 | 694 | 21 |
| 60 | 1,847 | 4 | 1,333 | 4 | 0 | 0 | 458 | 6 | 56 | 2 |
| 70 | 1,600 | 4 | 1,369 | 4 | 0 | 0 | 228 | 3 | 3 | 0 |
| 80 | 867 | 2 | 610 | 2 | 0 | 0 | 250 | 3 | 7 | 0 |
| 90 | 612 | 1 | 610 | 2 | 0 | 0 | 0 | 0 | 2 | 0 |
| 100 | 283 | 1 | 174 | 1 | 0 | 0 | 109 | 1 | 0 | 0 |
| 110 | 2,247 | 5 | 1,871 | 6 | 7 | 2 | 369 | 5 | 0 | 0 |
| 120 | 871 | 2 | 725 | 2 | 0 | 0 | 61 | 1 | 85 | 3 |
| 130 | 1,363 | 3 | 965 | 3 | 169 | 42 | 192 | 2 | 37 | 1 |
| 140 | 1,794 | 4 | 1,079 | 3 | 29 | 7 | 542 | 7 | 144 | 4 |
| 150+ | 14,132 | 33 | 10,219 | 33 | 4 | 1 | 2,880 | 36 | 1,029 | 31 |
| Non-Forest | 767 | 2 | 646 | 2 | 92 | 23 | 1 | 0 | 28 | 1 |
| **Total** | **42,813** | | **31,089** | | **407** | | **7,974** | | **3,343** | |

[8] A 10 year age class brakes stand age into intervals of 10 years for classification purposes with multiples of ten as the median value. For example stands between the ages of 56 and 65 years of age comprise the 60 year age class.

**Table 3-3: Analysis Area 10-Year Age Class Distribution for BLM Managed Lands in GFMA**

| 10 Year Age Class | Analysis Area | | Myrtle Creek 10th-field watershed | | Roberts Creek 12th-field watershed | | Days Creek 12th field watershed | | Upper Deer Creek 12th field watershed | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Acres | % | Acres | % | Acres | % | Acres | % | Acres | % |
| 0 | 259 | 1 | 259 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10 | 563 | 2 | 415 | 2 | 0 | 0 | 148 | 3 | 0 | 0 |
| 20 | 2,317 | 8 | 1,488 | 7 | 53 | 13 | 446 | 10 | 330 | 11 |
| 30 | 2,825 | 10 | 2,132 | 10 | 0 | 0 | 409 | 9 | 284 | 10 |
| 40 | 2,700 | 9 | 1,686 | 8 | 44 | 11 | 445 | 10 | 525 | 18 |
| 50 | 2,551 | 9 | 1,617 | 8 | 9 | 2 | 293 | 6 | 632 | 21 |
| 60 | 1,390 | 5 | 1,176 | 5 | 0 | 0 | 160 | 3 | 54 | 2 |
| 70 | 1,140 | 4 | 1,060 | 5 | 0 | 0 | 77 | 2 | 3 | 0 |
| 80 | 641 | 2 | 603 | 3 | 0 | 0 | 32 | 1 | 6 | 0 |
| 90 | 418 | 1 | 416 | 2 | 0 | 0 | 0 | 0 | 2 | 0 |
| 100 | 277 | 1 | 168 | 1 | 0 | 0 | 109 | 2 | 0 | 0 |
| 110 | 1,900 | 6 | 1,593 | 7 | 7 | 2 | 300 | 6 | 0 | 0 |
| 120 | 373 | 1 | 258 | 1 | 0 | 0 | 61 | 1 | 54 | 2 |
| 130 | 1,192 | 4 | 796 | 4 | 169 | 41 | 190 | 4 | 37 | 1 |
| 140 | 1,544 | 5 | 839 | 4 | 29 | 7 | 533 | 11 | 143 | 5 |
| 150+ | 9,003 | 30 | 6,693 | 31 | 5 | 1 | 1,455 | 31 | 850 | 29 |
| Non-Forest | 471 | 2 | 350 | 2 | 92 | 23 | 1 | 0 | 28 | 1 |
| **Total** | 29,564 | | 21,549 | | 408 | | 4,659 | | 2,948 | |

**Table 3-4: Analysis Area Age Class Distribution for BLM Managed Lands in GFMA**

| Age Class | Desired Condition (%) | Analysis Area (%) | Myrtle Creek 10th-field watershed (%) | Roberts Creek 12th-field watershed (%) | Days Creek 12th field watershed (%) | Upper Deer Creek 12th field watershed (%) |
|---|---|---|---|---|---|---|
| 0-30 year age class | 33 | 20.2 | 19.9 | 13.0 | 21.5 | 20.8 |
| 40-80 years age class | 33 | 28.5 | 28.5 | 13.0 | 21.6 | 41.4 |
| 90+ year age class | 33 | 49.7 | 49.9 | 51.5 | 56.8 | 36.8 |
| Non-Forest | N/A | 1.6 | 1.6 | 22.5 | 0.0 | 0.9 |

## 1. Analysis Area Vegetation Potential

The vegetative potential for forest development is characterized by plant series. This classification is based on the concept of potential natural vegetation. Series is based on the dominant, most shade tolerant regenerating tree species on the site (USDA 1996). The analysis area includes the Western Hemlock, Douglas-fir, and White Fir Series.

***Western Hemlock Series:*** As a result of frequent natural disturbances in southwestern Oregon, the overstory of forests in the western hemlock series is dominated by Douglas-fir, an early-successional species. In terms of numbers, western hemlock is, or has the potential to be, the dominant tree species in the understory, and is particularly abundant in older stands with a low frequency of disturbance. In wetter areas of the Cascades, western redcedar is present, and at higher and cooler elevations white fir or Pacific silver fir is typically present. Salal is widespread throughout the series. Pacific rhododendron is common, but less so than salal, and tends to reflect less productive areas. Golden chinquapin and whipple-vine are present on dry, rocky sites (USDA 1996).

***Douglas-fir Series:*** The overstory is dominated by Douglas-fir. Many other species, conifer and hardwoods alike, will be found in the overstory. The understory is dominated by Douglas-fir, with common occurrences of Pacific madrone. Canyon live oak, incense-cedar and sugar pine occur occasionally. As in the overstory, many other species, conifer and hardwoods alike, may be present. Common shrubs include creambrush ocean-spray, California hazel, poison oak, Pacific blackberry, creeping snowberry, baldhip rose, dwarf Oregongrape, hairy honeysuckle and salal.

***White Fir Series:*** As a result of the frequent disturbance in southwestern Oregon, Douglas-fir, an early seral species, is the dominant overstory tree in the White Fir Series. White fir is dominant tree species in the understory, and is particularly abundant in older stands with a low frequency of disturbance. In wetter areas of the Cascades and Siskiyous, western hemlock is present. Dwarf Oregon grape and common prince's-pine are widespread throughout the Series. Pacific rhododendron and salal are common in moist, high productivity areas. Incense-cedar, golden chinquapin, ponderosa pine and whipple vine are present on dry sites.

## 2. Timber Conditions in the Proposed Units

Timber stand exams were conducted in 2010, 2011, and 2012 using the BLM Ecosurvey Stand Exam Program, for data collection. The Organon growth and yield model version 8.3 (Hann *et al.* 2009) was used to analysis current stand conditions, estimate future stand growth, development, and characteristics such as trees per acre, diameter breast height, relative density, canopy closure, mortality and stand volume. Table 3-5 summarizes current stand conditions.

Approximately 70 percent of the 42,823-acre analysis area is allocated as General Forest Management Area (GFMA) with associated Riparian Reserves. The other 30 percent consists of Connectivity/Diversity (C/D) Block and associated Riparian Reserves.

In 2013, the analysis area seral stage distribution of forest lands under the administration of the South River Field Office was approximately 787 acres (2%) non-forest; 9,220 acres (22%) of early-seral forest (0 to 30 year age class); 11,295 acres (26%) of mid-seral forest (40-80 years age class); and 21,521 acres (50%) of late-seral forest (90 year age class and greater).

***Age:*** Stands proposed for treatment range in age from 37 to 124 years of age. Stands 65 years of age and younger were largely established following regeneration harvest. Most were broadcast burned for site preparation and re-planted primarily to Douglas-fir, although some natural regeneration of other conifers also occurred. Stands over the age of 65 were generally established after overstory removal or fire, and were reforested by natural regeneration.

***Species Composition:*** Stands are generally dense and even-aged, with few older remnant trees that predate the current stands. Commonly conifer species include Douglas-fir, grand fir, western redcedar, western hemlock, ponderosa pine and sugar pine, and incense cedar. Pacific madrone, bigleaf maple, golden chinkapin, and red alder are the most common hardwoods.

***Relative stand densities*** range from about 42 to 100 (Curtis Relative Density (Curtis 1982)), averaging 77. Live crown ratios remain above 30 percent, a level important for maintaining or increasing the health and vigor of individual trees, and the stand as a whole. In most stands ground cover and understory development is patchy and sparse as a result of 100 percent canopy cover. In general, shade-intolerant hardwood species are being overtopped by conifers and succumbing to suppression mortality. Trees that are six inches or larger diameter breast height range in number

from about 82 to 390 per acre, with a mean of 230. Quadratic mean diameters of the stands range from 9.9 to 24.0 inches, with a mean of approximately 13.4 inches. Basal area ranges from 113 to 380 square feet, with an average basal area of 210 square feet. Table 3-5 provides a general description of current conditions in individual units.

**Table 3-5: Summary of Current Stand Conditions in Proposed Harvest Units**

| Unit ID | Land Use Allocation | Age as of 2013 | Total Trees/Acre | Trees/Acre >6" DBH | Basal Area[1] ($ft^2$/acre) | Relative Density Index[2] | Quadratic Mean Diameter (Trees >6" DBH) | Percent Canopy Cover |
|---|---|---|---|---|---|---|---|---|
| 28-2-31A | GFMA | 55 | 617 | 298 | 197 | 0.82 | 11.0 | 100 |
| 28-2-32A | GFMA | 100 | 801 | 276 | 245 | 0.88 | 12.8 | 100 |
| 28-3-17A | C/D | 52 | 517 | 305 | 164 | 0.67 | 9.9 | 94 |
| 28-3-17B | C/D | 48 | 266 | 238 | 223 | 0.71 | 13.1 | 95 |
| 28-3-20A | GFMA-C/D | 41 | 370 | 280 | 188 | 0.67 | 11.1 | 94 |
| 28-3-21A | GFMA | 47 | 321 | 221 | 207 | 0.71 | 13.1 | 94 |
| 28-3-21B | GFMA | 49 | 303 | 166 | 181 | 0.64 | 14.1 | 87 |
| 28-3-26A | C/D | 85 | 686 | 148 | 175 | 0.78 | 14.7 | 82 |
| 28-3-28A | C/D | 37 | 247 | 164 | 187 | 0.61 | 14.5 | 95 |
| 28-3-28B | C/D | 40 | 318 | 232 | 174 | 0.60 | 11.7 | 92 |
| 28-3-28C | GFMA-C/D | 80 | 359 | 265 | 252 | 0.84 | 13.2 | 97 |
| 28-3-29A | GFMA-C/D | 41 | 499 | 289 | 197 | 0.76 | 11.2 | 96 |
| 28-3-31A | GFMA | 69 | 604 | 323 | 222 | 0.84 | 11.2 | 94 |
| 28-3-31B | GFMA | 44 | 286 | 203 | 173 | 0.60 | 12.5 | 89 |
| 28-3-32A | C/D | 53 | 1105 | 109 | 113 | 0.66 | 13.8 | 66 |
| 28-3-32B | C/D | 72 | 571 | 196 | 225 | 0.86 | 14.5 | 88 |
| 28-3-32C | GFMA-C/D | 75 | 749 | 224 | 215 | 0.91 | 13.3 | 95 |
| 28-3-33A | GFMA | 41 | 379 | 198 | 149 | 0.57 | 11.7 | 82 |
| 28-3-35A | GFMA | 78 | 643 | 308 | 216 | 0.88 | 11.3 | 96 |
| 28-3-36A | GFMA | 86 | 846 | 271 | 240 | 1.00 | 12.7 | 92 |
| 28-4-02A | GFMA | 43 | 197 | 144 | 122 | 0.42 | 12.5 | 77 |
| 28-4-03A | GFMA | 45 | 289 | 224 | 187 | 0.64 | 12.4 | 92 |
| 28-4-03B | GFMA | 38 | 364 | 259 | 164 | 0.55 | 10.8 | 91 |
| 28-4-09A* | C/D | 103 | 160 | 127 | 380 | 0.99 | 23.4 | 95 |
| 28-4-09B* | C/D | 103 | 160 | 127 | 380 | 0.99 | 23.4 | 95 |
| 28-4-10A* | C/D | 99 | 198 | 147 | 347 | 0.96 | 20.8 | 93 |
| 28-4-10B* | C/D | 99 | 198 | 147 | 347 | 0.96 | 20.8 | 93 |
| 28-4-17A | GFMA | 48 | 276 | 127 | 147 | 0.52 | 14.6 | 84 |
| 28-4-17B* | GFMA | 124 | 390 | 106 | 323 | 1.00 | 23.7 | 90 |
| 28-4-18A | GFMA | 47 | 279 | 219 | 174 | 0.60 | 12.1 | 89 |
| 28-4-19A | GFMA | 54 | 273 | 198 | 208 | 0.68 | 13.9 | 90 |
| 28-4-19B | GFMA | 74 | 282 | 240 | 329 | 0.99 | 15.8 | 94 |
| 28-4-21A | C/D | 82 | 308 | 176 | 286 | 0.92 | 17.2 | 92 |
| 28-4-21B | C/D | 40 | 231 | 231 | 157 | 0.52 | 11.2 | 89 |
| 28-4-25B | C/D | 43 | 383 | 154 | 140 | 0.54 | 12.9 | 81 |
| 28-4-25C | C/D | 37 | 1165 | 169 | 140 | 0.71 | 12.3 | 87 |
| 28-4-29A | GFMA | 72 | 602 | 268 | 214 | 0.87 | 12.1 | 94 |
| 28-5-27A* | GFMA | 118 | 86 | 82 | 258 | 0.64 | 24.0 | 79 |
| 29-2-08A | GFMA | 53 | 865 | 390 | 240 | 1.00 | 10.6 | 100 |
| 29-2-08B | GFMA | 42 | 268 | 186 | 155 | 0.55 | 12.3 | 76 |
| 29-3-03A | GFMA | 73 | 561 | 240 | 232 | 0.91 | 13.3 | 92 |
| 29-3-05A | GFMA | 68 | 682 | 244 | 250 | 0.99 | 13.7 | 91 |

**Table 3-5 continued: Summary of Current Stand Conditions in Proposed Harvest Units**

| Unit ID | Land Use Allocation | Age as of 2013 | Total Trees/Acre | Trees/Acre >6" DBH | Basal Area[1] ($ft^2$/acre) | Relative Density Index[2] | Quadratic Mean Diameter (Trees >6" DBH) | Percent Canopy Cover |
|---|---|---|---|---|---|---|---|---|
| 29-3-07A | C/D | 65 | 873 | 279 | 186 | 0.86 | 11.0 | 90 |
| 29-3-09B | GFMA | 79 | 990 | 303 | 189 | 0.96 | 10.7 | 92 |
| 29-3-09C | GFMA | 74 | 496 | 196 | 166 | 0.68 | 12.5 | 85 |
| 29-3-09D | GFMA | 66 | 588 | 326 | 258 | 0.99 | 12.1 | 96 |
| 29-3-09E | GFMA | 70 | 322 | 172 | 219 | 0.75 | 15.2 | 88 |
| 29-3-15A | GFMA | 52 | 495 | 295 | 212 | 0.81 | 11.5 | 96 |
| 29-3-15B | GFMA | 68 | 752 | 379 | 249 | 0.85 | 11.0 | 100 |
| 29-3-15C | GFMA | 57 | 561 | 308 | 195 | 0.78 | 10.8 | 91 |
| 29-4-03A | GFMA | 47 | 280 | 221 | 160 | 0.56 | 11.5 | 87 |
| 29-4-03C | GFMA | 59 | 354 | 204 | 195 | 0.70 | 13.2 | 90 |
| 29-4-11A | GFMA | 82 | 548 | 211 | 202 | 0.68 | 13.2 | 89 |
| 29-4-11B | GFMA | 80 | 815 | 322 | 230 | 0.99 | 11.4 | 97 |
| 29-4-11C | GFMA | 71 | 289 | 233 | 240 | 0.77 | 13.7 | 92 |
| 29-4-13A | GFMA | 77 | 622 | 229 | 186 | 0.79 | 12.2 | 85 |
| 29-4-13B | GFMA | 82 | 607 | 232 | 255 | 1.00 | 14.2 | 91 |
| 29-4-15A | GFMA | 86 | 425 | 235 | 185 | 0.85 | 15.3 | 88 |
| 29-4-15B | GFMA | 53 | 325 | 243 | 177 | 0.62 | 11.2 | 89 |

[1] Basal area expressed in square feet per acre is defined as the sum of the cross-sectional area, including bark, of all stems measured at breast height.

[2] Quadratic mean diameter is defined as the mean diameter of all stems measured at breast height.

* Stand requires red tree vole pre-disturbance surveys based on stand age over 80 years and QMD over 18 inches. No other stands have suitable habitat that may potentially contribute to a reasonable assurance of persistence of red tree voles. See the Wildlife section for more information regarding red tree voles and other Survey and Manage species.

Figure 3-1 is a depiction of conditions typical of stands proposed for thinning that was generated using Organon v. 8.2 for Southern Oregon and depicted using Stand Visualization System ver. 3.36 (McGaughey 2002). Figure 3-2 is a photograph of conditions typical of the stands proposed for thinning. Figure 3-3 and Figure 3-4 depict conditions typical of stands proposed for variable retention harvest.

**Figure 3-1: Computer Generated Depiction of Typical Stand Conditions in Thinning Units**

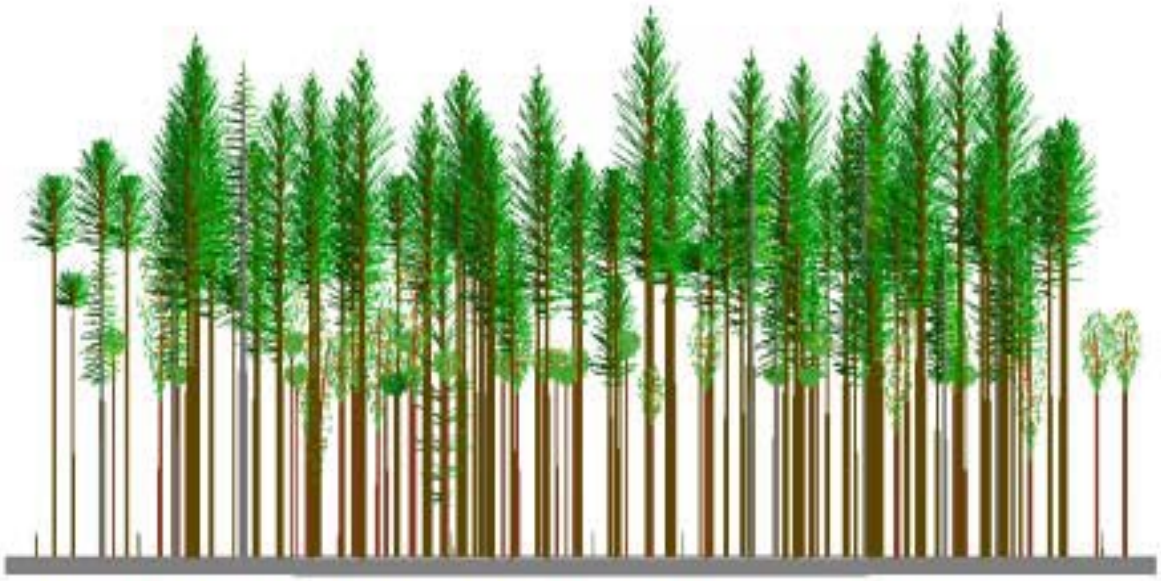


**Figure 3-2: Photograph of Representative Stand Conditions in Thinning Units**

**Figure 3-3: Computer Generated Depiction of Typical Stand Conditions in Variable Retention Harvest Units.**

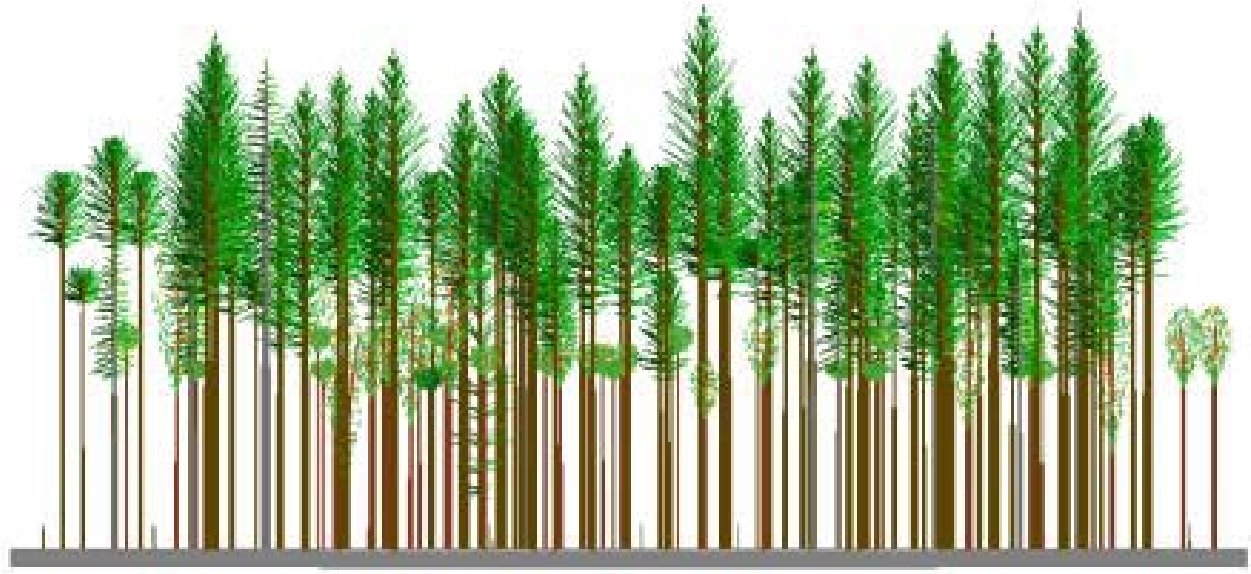


**Figure 3-4: Photographs of Representative Stand Conditions in Variable Retention Harvest Units**

## B. Environmental Consequences

The desired conditions would trend the landscape toward increased ecological resistance and resilience to reasonably expected disturbances (e.g., fire, insects, disease, and weather). The analysis indicator, age class distribution, is the same for direct, indirect, and cumulative effects. Current conditions reflect all past natural disturbances and management activities, and while this discussion considers those current conditions, it only specifically addresses the effects of the analyzed alternatives.

### 1. Alternative One (No Action)

***Stand Development***

Crowns of less competitive trees would continue to recede (Chan *et al.* 2006), resulting in increased suppression mortality and decreased diameter growth as trees compete for water, nutrients, and sunlight (Oliver and Larson 1990). Height growth, less affected by stand density, would continue but with little corresponding diameter increase resulting in individual trees becoming unstable and more susceptible to wind damage (Wonn and O'Hara 2001, Wilson and Oliver 2000).

Inter-tree suppression or regular-mortality would occur primarily in the smaller size-classes. Suppression mortality and the potential for growth stagnation would increase as live crowns recede. Hardwood trees and shade intolerant conifers would gradually be eliminated as stand components. Establishment and growth of shade intolerant shrubs and herbaceous plants would be largely precluded. As stands age, regular mortality declines and irregular mortality factors become more important (Oliver and Larson 1990). Non-suppression or irregular-mortality from insects, disease, windthrow, and stem breakage could occur across all crown classes at any age.

As depicted in Table 3-6, canopy closure remains near 100 percent and relative densities increase to more than 0.80. Suppression mortality increases, as illustrated by the declining number of trees per acre, with a corresponding decline in the health and vigor of individual live trees as crown ratios fall below 30 percent. Increased tree mortality would also substantially increase dead fuel accumulation on the forest floor. Long-term, shrubs and shade-tolerant tree species would gradually increase in numbers as receding overstory crowns and increasing tree mortality allow increased light in the understory (Oliver and Larson 1990). Without substantial disturbance, conditions in stands with few shade tolerant species would become more conducive to their establishment and growth.

This process would be a slow, gradual process unlikely to support understory development sufficient to shift the stands from single-storied to two-storied or multi-layered structure within 100 years (Oliver and Larson 1990; Munger 1940).

**Table 3-6: Predicted Attributes of Selected Stands in 2013, 2033 and 2063**

| Year | Total Trees/Acre | Trees/Acre > 6" DBH | Basal Area ($ft^2$/acre) | Quadratic Mean Diameter (Tree > 6" DBH) | Curtis Relative Density | Percent Canopy Cover | Percent Live Crown |
|---|---|---|---|---|---|---|---|
| Representative Stand Less than 50 Years of Age (28-3-29A) | | | | | | | |
| 2013 | 499 | 289 | 197 | 11.2 | 0.76 | 95 | 34 |
| 2033 | 365 | 364 | 270 | 13.5 | 0.88 | 100 | 27 |
| 2063 | 280 | 235 | 338 | 16.1 | 1.00 | 100 | 22 |
| Representative Stand More than 50 Years of Age (29-3-3A) | | | | | | | |
| 2013 | 561 | 240 | 253 | 13.3 | 0.91 | 92 | 24 |
| 2033 | 360 | 240 | 301 | 14.9 | 0.96 | 98 | 26 |
| 2063 | 237 | 211 | 352 | 17.5 | 1.00 | 97 | 23 |
| Stand Less than 50 Years of Age (28-4-3A) | | | | | | | |
| 2013 | 289 | 224 | 187 | 12.4 | 0.64 | 93 | 32 |
| 2033 | 201 | 187 | 258 | 15.9 | 0.76 | 94 | 28 |
| 2063 | 149 | 147 | 329 | 20.3 | 0.86 | 93 | 22 |
| Representative Stand More than 50 Years of Age (28-4-9A) | | | | | | | |
| 2013 | 160 | 127 | 380 | 23.4 | 0.99 | 95 | 39 |
| 2033 | 114 | 110 | 422 | 26.5 | 1.00 | 95 | 39 |
| 2063 | 88 | 88 | 450 | 30.6 | 1.00 | 93 | 37 |
| Representative Stand (29-4-13B) | | | | | | | |
| 2013 | 607 | 232 | 284 | 14.2 | 1.00 | 100 | 27 |
| 2033 | 402 | 309 | 238 | 15.1 | 1.00 | 97 | 32 |
| 2063 | 251 | 197 | 348 | 17.8 | 1.00 | 97 | 31 |

Figures 3-5 and 3-6 depict the anticipated mortality and structural condition of a selected stand in the year 2033 and 2063, absent thinning.

**Figure 3-5: Anticipated Mortality Structural Conditions in 2033, No Thinning**

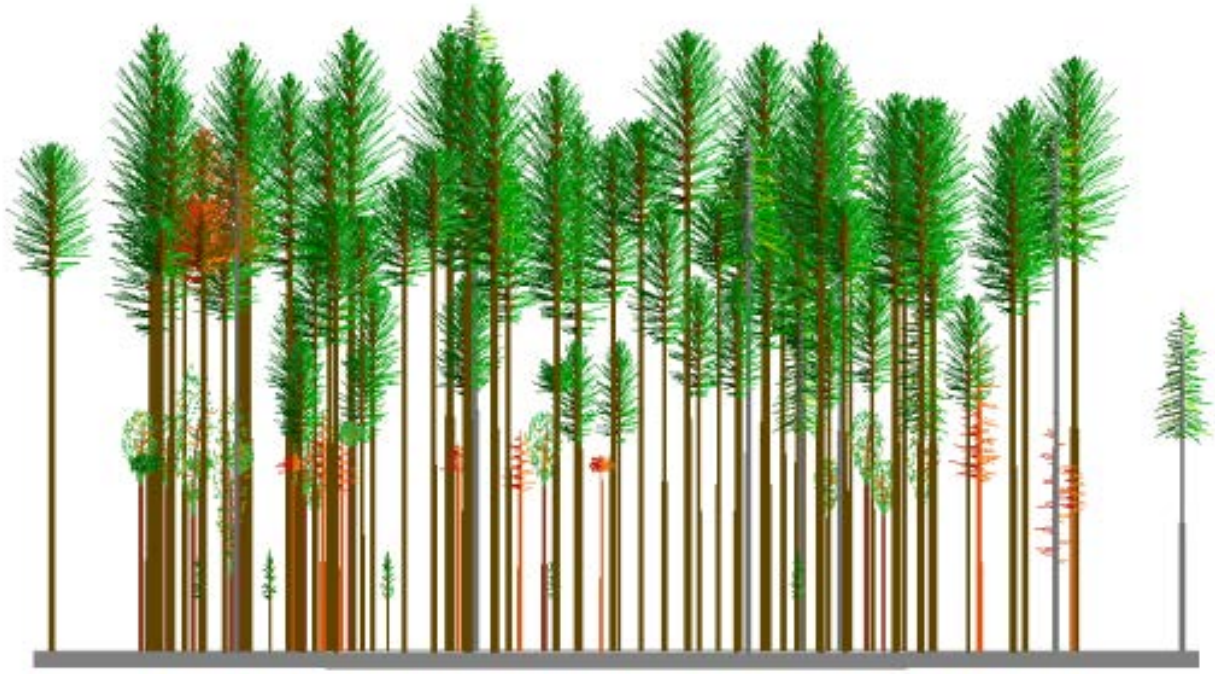
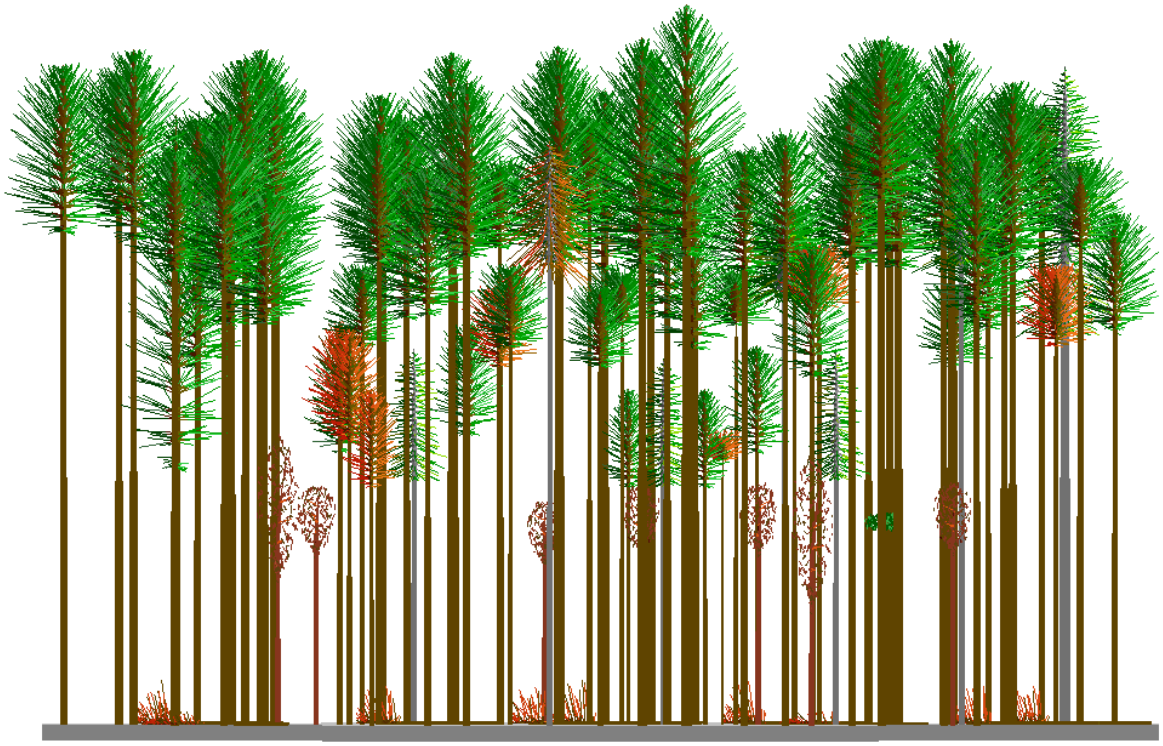


**Figure 3-6: Anticipated Mortality Structural Conditions in 2063, No Thinning**



This would not meet objectives described in Chapter One of managing developing stands in the GFMA and C/D Block allocations to promote tree survival and growth to achieve a balance between volume production, wood quality, and timber value at harvest. Age class distribution in GFMA would not change and there would continue to be a deficit in the acres of early seral in GFMA in the analysis area defined in current conditions.

This alternative would not meet the objectives for Riparian Reserves of controlling stocking levels, and establishing and managing non-conifer vegetation to consistent with Aquatic Conservation Strategy objectives.

***Management of Private Forest Lands***

Most of these lands are intensively managed to produce wood fiber on harvest rotations of between 40 and 65 years. This management includes herbicide use to exclude competing vegetation and hasten conifer canopy closure.

It is assumed that most late-seral forest stands on private timber land have been converted to early-seral forest conditions and harvest of mid-seral stands is ongoing, a trend that is expected to continue in the foreseeable future.

## 2. Alternative Two

### *Uniform Thinning*

Well managed stands in GFMA would be managed for full site occupancy to increase future timber volume, by thinning on a generally uniform spacing to a target relative density of 0.35 to 0.40. The changes in relative stand density and canopy cover would reduce competition among remaining trees for available water, light and nutrients, and result in increased growth rates that are expected to persist for 15 to 20 years, at which time canopies would again close. Thinning would not alter the seral stage of the stand or change the seral stage distribution of BLM-managed lands.

Depending on stand conditions, thinning to a relative density of between 0.35 and 0.40, would leave between 60 and 140 trees after thinning. Basal area would be reduced to between 120 and 150 square feet per acre. The treatment would generally be a thinning from below leaving the larger trees resulting in an increase of QMD and average crown ratio of the stand. The relative density is expected to stay below 0.55 for the first 20 years after treatment, keeping the stand out of the stem exclusion stage which generally starts at relative density of approximately 0.55.

A moderate uniform thinning treatment would typically be prescribed in unmanaged stands in the GFMA land use allocation and in managed and unmanaged stands in the C/D Block land use allocation. Stands would be thinned on a generally uniform spacing to a relative density of between 0.25 and 0.30. This treatment would reduce the risk of stagnation, stand replacement fire, insect mortality and improve the growth rates on individual trees. Effects would be similar to that described above, but densities would be reduced slightly below full site capacity, which would increase the time until culmination when compared to managing stands for full site capacity. Though time to culmination would increase, the overall stand health would be improved.

Thinning would meet the objective of assuring high levels of timber productivity and quality wood production by increasing average stand diameter growth. Selecting the best formed co-dominant and dominant trees for retention, and promoting accelerated growth by releasing these trees from competition would aid in maintaining the health and vigor of the stands.

Tables 3-7 and 3-8 compares the modeled stand characteristics and development anticipated for Reference Units 29-8-9A and 29-3-3A with and without thinning at present, and at intervals of 20 and 50 years from present.

**Table 3-7: Stand Conditions in Reference Unit 29-8-9A (Less than 50 Years Old), With Uniform Thinning Treatment and Without Treatment in Years 2013, 2033 and 2063.**

| Stand Treatment | Year | Total Trees/Acre | Trees/Acre >6" DBH | Basal Area ($ft^2$/acre) | Quadratic Mean Diameter (Tree >6"DBH) | Curtis Relative Density Index | Percent Canopy Cover | Percent Live Crown Ratio |
|---|---|---|---|---|---|---|---|---|
| Unthinned | 2013 | 499 | 289 | 197 | 11.2 | 0.76 | 95 | 34 |
| Thinned | | 131 | 131 | 132 | 13.6 | 0.40 | 74 | 35 |
| Unthinned | 2033 | 365 | 364 | 270 | 13.5 | 0.88 | 100 | 27 |
| Thinned | | 122 | 122 | 191 | 17.0 | 0.54 | 80 | 28 |
| Unthinned | 2063 | 280 | 235 | 338 | 16.1 | 1.00 | 100 | 22 |
| Thinned | | 111 | 111 | 255 | 20.5 | 0.66 | 84 | 21 |

**Table 3-8: Stand Conditions in Reference Unit 29-3-3A (Greater than 50 Years Old), With Uniform Thinning Treatment and Without Treatment in Years 2013, 2033 and 2063.**

| Stand Treatment | Year | Total Trees/Acre | Trees/Acre >6" DBH | Basal Area ($ft^2$/acre) | Quadratic Mean Diameter (Trees >6" DBH) | Curtis Relative Density Index | Percent Canopy Cover | Percent Live Crown Ratio |
|---|---|---|---|---|---|---|---|---|
| Unthinned | 2013 | 561 | 240 | 253 | 13.3 | 0.91 | 92 | 24 |
| Thinned | | 68 | 68 | 155 | 20.4 | 0.40 | 66 | 35 |
| Unthinned | 2033 | 360 | 240 | 301 | 14.9 | 0.96 | 98 | 26 |
| Thinned | | 66 | 66 | 192 | 23.1 | 0.48 | 72 | 31 |
| Unthinned | 2063 | 237 | 211 | 352 | 17.5 | 1.00 | 97 | 23 |
| Thinned | | 63 | 63 | 233 | 26.1 | 0.55 | 75 | 26 |

Figure 3-7 is a computer-generated depiction of stand conditions following uniformly spaced thinning, using Organon v. 8.2 for Southern Oregon and depicted using Stand Visualization System ver. 3.36 (McGaughey 2002). Figure 3-8 is a photograph of conditions typical of uniformly-spaced thinning in stand less than 50 years of age.

**Figure 3-7: Projected Stand Conditions, Post-Harvest, Uniformly-Spaced Thinning**

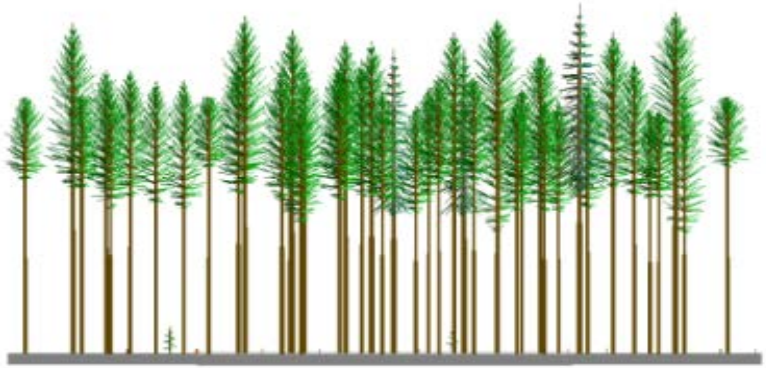


**Figure 3-8: Photograph of Uniformly-Spaced Thinning, Post-Harvest**

Figure 3-9 is a computerized depiction of stand conditions 20 years after uniformly spaced thinning, using Organon v. 8.2 for Southern Oregon and depicted using Stand Visualization System ver. 3.36 (McGaughey 2002). Figure 3-10 is a photograph of typical conditions. Figure 3-11 depicts anticipated conditions 50 years after thinning.

**Figure 3-9: Projected Stand Conditions, 20 Years Post-Harvest, Uniformly-Spaced Thinning**

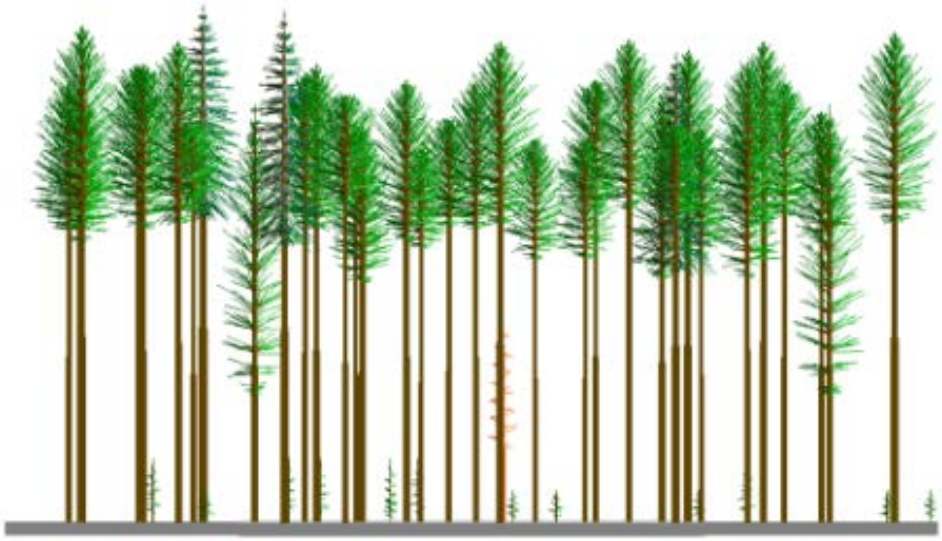


**Figure 3-10: Photograph of Uniformly-Spaced Thinning, 20 Years Post-Harvest**

**Figure 3-11: Projected Stand Conditions, 50 Years Post-Harvest, Uniformly-Spaced Thinning**

***Variable Density Thinning***

*Uplands*

Stands selected for this treatment would generally be unmanaged stands, in northern spotted owl critical habitat, or stands that are greater than 60 years of age. Variable density thinning initiates and promotes tree regeneration, shrub growth, and development of multi-storied stands even when focused on management of overstory tree density (Bailey and Tappeiner 1998). Thinning in conjunction with creation of openings and retention of unthinned areas would alter current developmental trajectory, enhancing structural and biological diversity, and providing conditions favorable for development of late-successional forest characteristics. Variable density thinning would not alter the seral stage of the stands, change the seral stage distribution of BLM-managed lands or preclude future stand development consistent with land use allocation objectives.

Variable density thinning would remove smaller trees that would normally die from suppression. This would have the effect of reducing the numbers of smaller diameter trees available for recruitment as snags and coarse down wood in the short term, and would also reduce the overall numbers of trees available for snag and coarse down wood recruitment over the longer term. Physical damage to existing down wood would also occur from felling and yarding operations.

It is expected that additional coarse woody debris and snags would be provided in the short term by: continuing suppression mortality in unthinned areas or skips, non-merchantable wood left in the units following thinning operations, mechanical damage to reserve trees, snow break and windfall, and snags felled for safety reasons. Additional trees would also be reserved in the marking prescription to provide additional short-term snag and coarse wood sources.

Initially, the creation of openings would allow sufficient light to reach the forest floor to allow for the natural regeneration of conifer and hardwood species that are less shade tolerant. Gaps and openings would also promote the establishment and growth of herbaceous plants, forbs and shrubs that would provide organic nutrients, and shelter and forage for an array of birds, mammals, and invertebrate species. These conditions would be expected to persist for a period of approximately 20 years.

Over the longer term, these gaps would allow for the growth of larger trees adjacent to the openings, with full crowns and large limbs more typical of open-growth conditions. The increased growth rates, expected to persist for 30 years or longer, would aid in differentiation of tree sizes and crown characteristics associated with mature and late-successional forest more quickly than if left untreated. Tables 3-9 and 3-10 compare stand growth and development for no treatment and variable density thinning over the next 50 years using Organon. Figure 3-12 is a computer generated depiction of stand conditions after applying variable density thinning and Figure 3-13 is a photograph of a completed variable density thinning unit. Figures 3-14 and 3-15 show conditions 20 years after variable density thinning and Figure 3-16 shows a computer generated depiction of conditions 50 years after variable density thinning.

**Table 3-9: Stand Conditions in Reference Unit 28-4-3A (Less than 50 Years Old), With and Without Variable Density Thinning Treatment in Years 2013, 2033 and 2063.**

| Stand Treatment | Year | Total Trees/Acre | Trees/Acre >6" DBH | Basal Area ($ft^2$/acre) | Quadratic Mean Diameter (Trees >6" DBH) | Curtis Relative Density Index | Percent Canopy Cover | Percent Live Crown Ratio |
|---|---|---|---|---|---|---|---|---|
| Unthinned | 2013 | 289 | 224 | 187 | 12.4 | 0.64 | 93 | 32 |
| Thinned | | 89 | 81 | 94 | 15.0 | 0.28 | 53 | 39 |
| Unthinned | 2033 | 201 | 187 | 258 | 15.9 | 0.76 | 94 | 28 |
| Thinned | | 80 | 77 | 151 | 19.5 | 0.41 | 63 | 33 |
| Unthinned | 2063 | 149 | 147 | 329 | 20.3 | 0.86 | 93 | 22 |
| Thinned | | 72 | 72 | 214 | 23.8 | 0.53 | 68 | 24 |

**Table 3-10: Stand Conditions in Reference Unit 28-4-9A (Greater than 50 Years of Age), With and Without Variable Density Thinning Treatment in Years 2013, 2033 and 2063.**

| Stand Treatment | Year | Total Trees/Acre | Trees/Acre >6" DBH | Basal Area ($ft^2$/acre) | Quadratic Mean Diameter (Trees >6" DBH) | Curtis Relative Density Index | Percent Canopy Cover | Percent Live Crown Ratio |
|---|---|---|---|---|---|---|---|---|
| Unthinned | 2013 | 160 | 127 | 382 | 23.4 | 0.99 | 95 | 39 |
| Thinned | | 34 | 32 | 155 | 33.0 | 0.34 | 42 | 41 |
| Unthinned | 2033 | 114 | 109 | 422 | 26.5 | 1.00 | 95 | 39 |
| Thinned | | 33 | 32 | 186 | 36.0 | 0.39 | 45 | 38 |
| Unthinned | 2063 | 88 | 88 | 450 | 30.6 | 1.00 | 93 | 37 |
| Thinned | | 32 | 31 | 220 | 39.1 | 0.45 | 48 | 37 |

**Figure 3-12: Projected Stand Conditions, Post-Harvest, Variable Density Thinning**

**Figure 3-13: Photograph of Variable Density Thinning, Post-Harvest**

**Figure 3-14: Projected Stand Conditions, 20 Years Post-Harvest, Variable Density Thinning**

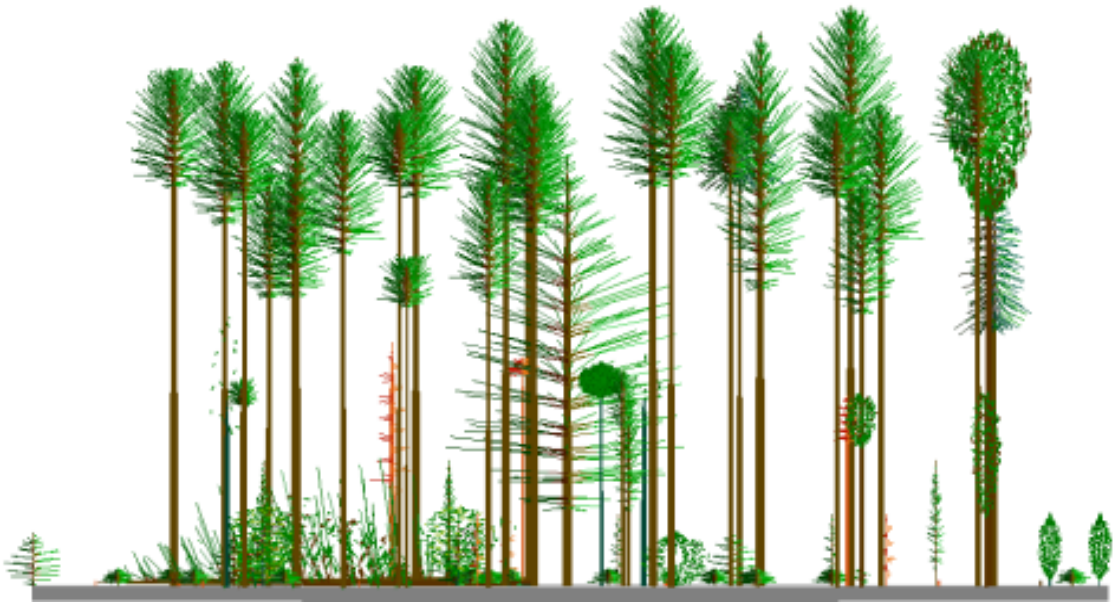
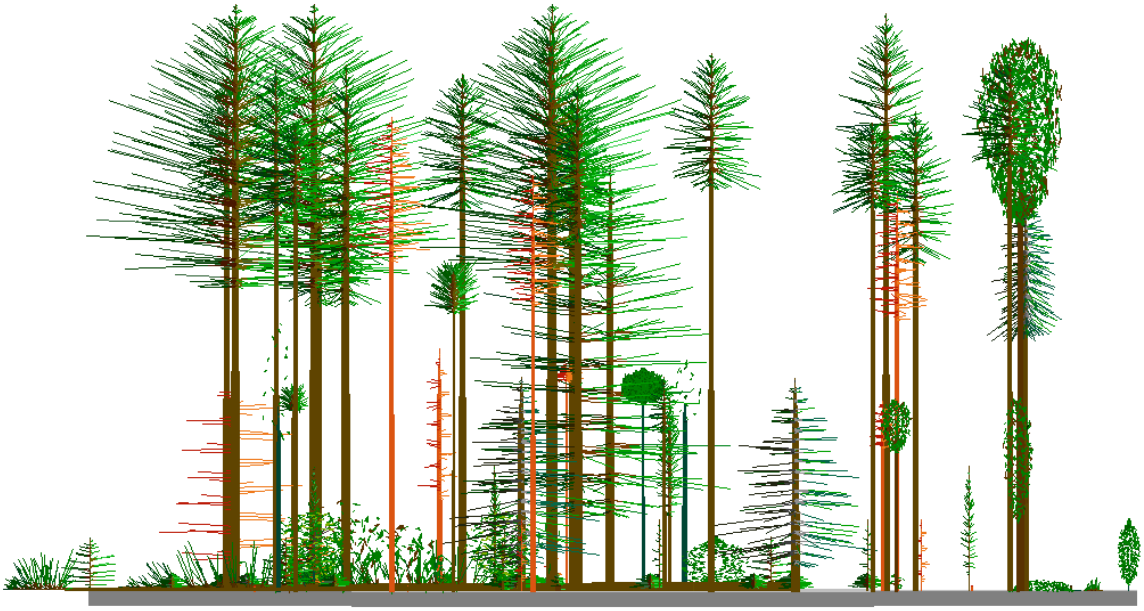


**Figure 3-15: Photograph of Variable Density Thinning, 20 Years Post-Harvest**

**Figure 3-16: Projected Stand Conditions, 50 Years Post-Harvest, Variable Density Thinning**



Trees in treated stands would eventually reach a relative stand density where mortality suppression would once again occur, resulting in the generation of larger snags and large down wood that would persist for longer periods of time. Future entries, which would be subject to future analysis, may be needed to maintain or further enhance structural diversity.

*Riparian Reserves*

"No-treatment" areas within the Riparian Reserves would provide for natural differentiation in the size of trees. In the thinned portions of the Riparian Reserves, lower stand densities and canopy gaps would allow sufficient light for regeneration of more shade tolerant conifers. This would eventually lead to development of multiple canopy layers and conditions more akin to late-successional forest. Creating gaps and releasing selected trees would also allow for accelerated tree growth that would provide larger wood for future in-stream recruitment, retention of hardwood species, and establishment of shrubs, forbs, grasses and herbaceous plants on the forest floor. Effects would mirror those expected in uplands (pp. 51-52). Thinning in portions of Riparian Reserves would aid in the attainment of Aquatic Conservation Strategy objectives by promoting plant species diversity and structural diversity that would support diverse populations of native plants and wildlife species.

***Variable Retention Harvest***

*Stand Development*

It is common, with application of different treatments to a stand, to view each treatment area as a separate entity. Ecologically, it is more useful to view a treatment, consisting of both harvested and unharvested areas, as a functional stand consisting of a mosaic of structural units (Franklin *et al.* 2002). The effects analysis uses the concept of a synergism between treatments, although common effects are described separately for each treatment type.

*Aggregate Retention Areas*

Within areas of aggregated retention, tress would be subject to the same processes of growth and development, including regular and irregular mortality previously discussed under Alternative One. Since trees would not be removed, aggregates would produce the greatest amount of dead wood through passive recruitment, compared to the treated areas.

Aggregates with low edge to area ratios greater than or equal to 2.5 acres in extent would be expected to support core areas with micro-climates indistinguishable from undisturbed forest, and also ameliorate microclimate in adjacent harvested areas (Heithecker and Halpern 2007).

Weather-induced tree mortality and damage from wind and snow would be expected to occur along the edges of aggregates and along the edges of untreated stands bordering harvested areas (Maguire *et al.* 2006).

*Dispersed Retention Areas and Understory Development*

Harvest would change current vegetation structure and composition to one resembling early-seral stage (ROD/RMP p. 112). The composite effects of harvest types and distribution suggest that over the next 50 to 100 years, many attributes found in unmanaged mature and old-growth forest stands would be maintained or created, trending from stand establishment with structural legacies to mature, multiple, canopy structure.

Dispersed retention trees would provide short and long-term live and dead structural legacies. Mortality of dispersed retention trees has been quantified by several recent studies (Buermeyer and Harrington 2002; Busby *et al.* 2006; Maguire *et al.* 2006; Garber *et al.* 2011). On an annualized basis, these studies report mortality rates ranging from about 0.6 to 2.2 percent for dispersed retention trees within the range of retention levels expected for the proposed project. Causes of mortality include windthrow, wind-topping, logging damage, and “thinning shock”.

Areas of dispersed retention would follow a developmental sequence similar to that reported by Schoonmaker and McKee (1988) for similar sites clearcut in the western Cascades. Aggregate retention areas and dispersed retention trees would, however, affect vegetative development due to shading and other retention affects (North *et al.* 1996).

Figure 3-17 illustrates a variable retention harvest with features such as blocks, peninsulas, aggregates, and stringers of aggregate retention. Figure 3-18 is a photograph showing aggregated and dispersed retention.

**Figure 3-17: Aerial View of Aggregated Retention**

**Figure 3-18: Aerial View of Aggregated and Dispersed Retention**

Natural regeneration has often proven undependable for reforestation in a prompt manner (Stein 1955). However, some natural regeneration is likely to survive within the harvested units on undisturbed areas (Dyrness 1973). Establishment of natural regeneration from adjacent aggregates and dispersed retention trees is likely, but not considered a reliable regeneration option for meeting reforestation goals (Ketchum and Tappeiner 2005).

Planted commercial conifer species would enhance the potential for the development of a conifer dominated forest stand (Tappeiner *et al.* 2007).

Table 3-11 compares and summarizes projected stand conditions immediately after harvest, 20 years after harvest, and 50 years after harvest versus no action using the Organon growth model.

**Table 3-11: Reference Unit 29-4-13B, Conditions for No Treatment Compared to Variable Retention Harvest Immediately After Harvest, and in 2033 and 2063**

| Total Trees/Acre | Trees/Acre >6" DBH | Basal Area ($ft^2$/acre) | Quadratic Mean Diameter (Trees >6" DBH) | Curtis Relative Density | Percent Canopy Cover | Percent Live Crown Ratio |
|---|---|---|---|---|---|---|
| **Immediately Post-Harvest** | | | | | | |
| No Treatment | | | | | | |
| 607 | 232 | 284 | 14.2 | 1.00 | 100 | 27 |
| Dispersed Retention Areas | | | | | | |
| 5 | 5 | 29 | 32.7 | 0.06 | 8 | 41 |
| Aggregate Retention Areas | | | | | | |
| 607 | 232 | 284 | 14.2 | 1.00 | 100 | 27 |
| **20 Years Post-Harvest** | | | | | | |
| No Treatment | | | | | | |
| 402 | 238 | 310 | 15.1 | 1.00 | 97 | 32 |
| Dispersed Retention Areas | | | | | | |
| 255 | 5 | 42 | 35.6 | 0.19 | 36 | 86 |
| Aggregate Retention Areas | | | | | | |
| 402 | 238 | 310 | 15.1 | 1.00 | 97 | 32 |
| **50 Years Post-Harvest** | | | | | | |
| No Treatment | | | | | | |
| 251 | 197 | 348 | 17.8 | 1.00 | 97 | 31 |
| Dispersed Retention Areas | | | | | | |
| 217 | 180 | 116 | 10.6 | 0.40 | 87 | 59 |
| Aggregate Retention Areas | | | | | | |
| 251 | 197 | 348 | 17.8 | 1.00 | 97 | 31 |

Schoonmaker and McKee (1988) reported that post-harvest cover of understory species found in pre-harvest stands was initially low, but rapidly increased over time. Residual species accounted for almost 40 percent of total species composition at age five and up to 97 percent at age 40.

The degree of harvest induced ground disturbance and intensity of prescribed burning can influence vegetative development. Dyrness (1973) documented vegetative changes within western Cascades clearcuts for seven years post-harvest with stands exhibiting a mosaic of post-harvest/post-burn conditions. All units studied were prescribed burned after harvest, but only about 50 percent of the area was affected by fire, 34 percent disturbed by harvest but not burned, and the remaining 16 percent harvested without ground disturbance.

In Dyrness (1973), plant cover within the harvested area on undisturbed ground would be dominated by residual species; disturbed but unburned areas would be characterized by a large number of species, both invaders and residuals; and cover on burned areas was dominated by both herbs and invading shrubs. Dyrness (1973) also found residual herbs were present in numbers substantially lower in burned verses unburned areas. He also found few residual shrubs and trees were present on severely burned areas five years after logging, but were more abundant in lightly burned areas. Similar patterns of understory development would be expected to occur on the proposed project units.

Species heterogeneity and composition peaked between 15 to 20 years and declined to the lowest values by 40 years. Conifer dominance is achieved within 20 to 30 years. After 40 years, absolute cover was 53 percent herbs, 57 percent shrubs, and 82 percent conifers. Compared to this clearcut development scenario, it is possible that dispersed retention harvest areas may exhibit a higher diversity and more variable species composition than that found in clearcuts (North *et al*. 1996).

The rate at which forest canopy recloses depends on individual site productivity and the density of tree regeneration. Closure is most rapid on more productive sites; while some low productivity forest stands never achieve canopy closure (Franklin *et al*. 2002).

Regeneration growth rates substantially less than those found with clearcut harvesting would be expected due to the effects of competition for light, moisture and nutrients from both aggregated and dispersed retention (Acker *et al*. 1998; Lam and Maguire 2011).

Individual species growth would differ based on inherent growth capability and differences in response to shading and root competition from retention trees and other vegetation, and herbivory (Harrington 2006). Growth rate reductions of regeneration compared to full potential would be in the range of 30 to 50 percent based on the amount and distribution of green-tree retention in individual units (Di Lucca *et al.* 2004). Non-tree vegetation is also assumed to grow at rates below full potential caused by shading, and competition with other vegetation. Subsequent to canopy closure at understory tree age 30-years or older, stand development would be similar to the processes occurring in aggregates.

The seral stage distribution would shift slightly under this alternative. Table 3-12 shows how the proposed variable retention harvest would change the seral distribution in the analysis area compared the current conditions. The tables take into account the active variable retention harvest sales in the analysis area. Due to fire exclusion and the limited amount of regeneration harvest in the analysis area for the past two decades (approximately 140 acres of openings), there has been an overall decline in the abundance of early-seral forest with a roughly equal increase in mid-seral forest and a gradual increase in mature and late-seral forest.

**Table 3-12: Percent Seral Stage Distribution in the GFMA in Myrtle Creek Analysis Area**

| Age Class | Desired Condition (%) | Alternative One (%) | Alternative Two (%) | Alternative Three (%) |
|---|---|---|---|---|
| **Analysis Area** | | | | |
| 0-30 years | 33 | 20.2 | 21.6 | 20.2 |
| 40-80 years | 33 | 28.5 | 27.1 | 28.5 |
| 90+ years | 33 | 49.7 | 49.6 | 49.7 |
| Non-Forest | | 1.6 | 1.6 | 1.6 |
| **Myrtle Creek 10th-field watershed** | | | | |
| 0-30 years | 33 | 19.9 | 21.6 | 19.9 |
| 40-80 years | 33 | 28.5 | 26.8 | 28.5 |
| 90+ years | 33 | 49.9 | 49.9 | 49.9 |
| Non-Forest | | 1.6 | 1.6 | 1.6 |
| **Roberts Creek 12th-field watershed** | | | | |
| 0-30 years | 33 | 13.0 | 13.0 | 13.0 |
| 40-80 years | 33 | 13.0 | 13.0 | 13.0 |
| 90+ years | 33 | 51.5 | 51.5 | 51.5 |
| Non-Forest | | 22.5 | 22.5 | 22.5 |
| **Days Creek 12th-field watershed** | | | | |
| 0-30 years | 33 | 21.5 | 22.2 | 21.5 |
| 40-80 years | 33 | 21.6 | 21.0 | 21.6 |
| 90+ years | 33 | 56.8 | 56.8 | 56.8 |
| Non-Forest | | 0.0 | 0.0 | 0.0 |
| **Upper Deer Creek 12th-field watershed** | | | | |
| 0-30 years | 33 | 20.8 | 22.0 | 20.8 |
| 40-80 years | 33 | 41.4 | 41.4 | 41.4 |
| 90+ years | 33 | 36.8 | 35.7 | 36.8 |
| Non-Forest | | 0.9 | 0.9 | 0.9 |

Under Alternative Two, variable retention harvest would convert approximately 431 acres to the 0-30 year age class. Approximately 396 acres would shift from the 40-80 year age class to the 0-30 year age class. Also, 35 acres would shift from the 90 and greater year age class to the 0-30 year age class. These shifts make a small contribution toward achieving the desired balanced age class distribution.

## 3. Alternative Three

Under Alternative Three uniform thinning or variable density thinning would be applied to units proposed for variable retention harvest under Alternative Three. Units in Alternative Two proposed for thinning treatments would also be proposed as thinning treatments under Alternative Three.

The effects of thinning would mirror those described under uniform thinning and variable density thinning under Alternative Two. Age class distribution in the GFMA would not change and the existing deficiency in the amount of early seral conditions in the GFMA would continue.

# II. Wildlife Resources _____

Three principle categories of wildlife species receive special consideration in the planning and implementation of BLM management actions.

*Special Status Species*

Special Status Species addressed in this environmental assessment include Federally-listed Threatened or Endangered species, candidate species or species proposed for listing by the U.S. Fish and Wildlife Service, under the Endangered Species Act (ESA); and Special Status Species managed under BLM Manual 6840 policy which includes species eligible for Federal or State listing, species with candidate status under the ESA and Bureau Sensitive species. Three species covered by this program are also designated for management under the Survey and Manage program and are discussed there, as they are subject to other management considerations.

Twenty-two Bureau sensitive wildlife species known or suspected to occur on the Roseburg District were considered in this environmental assessment. Fourteen of the species are eliminated from detailed discussion for reasons documented in Table C-1, *Appendix C - Wildlife*. The remaining eight species were analyzed in detail and are listed in Table C-2, *Appendix C – Wildlife*.

*Survey and Manage*

The second category consists of wildlife species designated for protection under the Survey and Manage Standards and Guidelines established in the Northwest Forest Plan (USDA/FS-USDI/BLM. 1994b). This project applies the 2001 ROD (USDA/FS-USDI/BLM 2001) species list.

*Land Birds*

The third category consists of bird species subject to protection under the Migratory Bird Treaty Act of 1918, as amended; the Bald and Golden Eagle Protection Act; focal species identified by Partners In Flight in the *Conservation Strategy for Landbirds in Coniferous Forests of Western Oregon and Washington*; and "Birds of Conservation Concern" and "Game Birds Below Desired Condition," as defined by the U.S. Fish and Wildlife Service. "Game Birds Below Desired Condition" are included in *Appendix C – Wildlife*, Table C-1.

## A. Affected Environment

### 1. Threatened and Endangered Species

The **northern spotted owl** (*Strix occidentalis caurina*) is a threatened species, present throughout the Roseburg District. It is the only threatened or endangered terrestrial species in the analysis area.

*Northern Spotted Owl Habitat Requirements*

The northern spotted owl generally inhabits forests older than 80 years old that provide habitat for nesting, roosting and foraging. Stands that fulfill all three of these needs are commonly referred to as suitable habitat.

*Suitable habitat* for nesting, roosting and foraging typically consists of multi-layered, multi-species canopies dominated by large overstory trees greater than 20 inches in diameter breast height; canopy cover of 60-to-80 percent; open spaces within and below the canopy of the dominant overstory; presence of trees with large cavities and deformities such as broken tops and dwarf mistletoe infections; numerous large snags; and large amounts of down wood (Thomas *et al.* 1990; Forsman *et al.* 1984; Hershey 1997; USDI/FWS 1990). The analysis area contains approximately 23,734 acres of suitable habitat. All or portions of ten units proposed for treatment function as suitable habitat.

*Dispersal habitat* is typically represented by forest stands 40 to 79 years old. These stands usually lack habitat components suitable for nesting. Function is limited to providing some roosting and foraging opportunities as well as habitat for dispersal (USDI/FWS 2008a). Dispersal habitat is essential to the movement of juvenile and non-territorial (e.g. single birds) northern spotted owls enabling territorial vacancies to be filled, and providing adequate gene flow across the range of the species (USDI/FWS 2008a).

Dispersal habitat is defined as conifer-dominated forest stands with canopy closure exceeding 40 percent, and an average diameter breast height of 11 inches or greater (Thomas *et al*. 1990). Dispersal habitat may contain snags, coarse woody debris, and prey sources that allow owls to move and forage between blocks of suitable habitat (USDI/FWS 2009). The analysis area contains approximately 7,619 acres of dispersal habitat.

A known northern spotted owl site is defined as a location with evidence of continued use. Habitat condition is generally assessed by evaluating available suitable and dispersal habitat at three analytical scales: home range, core area, and nest patch.

The *Home Range* is represented as a circle centered on a nest site, representing the area northern spotted owls are assumed to use for nesting, roosting, and foraging when occupying the site. Home ranges frequently overlap, and habitat may be shared by adjacent resident and dispersing northern spotted owls (USDI/FWS 2009).

Home range size varies by physiographic province. In the Klamath Province a home range has a radius of 1.3 miles, encompassing approximately 3,340 acres, while in the Cascades West Province the radius is 1.2 miles encompassing approximately 2,955 acres (USDI/FWS 2008b). The suitable habitat threshold considered essential to maintain northern spotted owl life functions is 40 percent of the total home range acres (USDI/FWS 2008b). The threshold is 1,336 acres in the Klamath Province and 1,182 acres in the Cascades West Province.

Known owl activity centers (KOACs) are areas (approximately 100 acres) of the best northern spotted owl habitat near a nest sites known as of January 1, 1994 (ROD/RMP, p. 34, 48). They are managed as Late-Successional Reserves (ROD/RMP, p. 29) and timing restrictions for activities within 0.25 miles are applied to eliminate disturbance to nesting owls (ROD/RMP, p. 48). Proposed units do not overlap any known owl activity centers (KOACs). However, proposed units do overlap 26 northern spotted owl home ranges. Table 3-13 illustrates that currently available suitable habitat is below viability thresholds in 16 of the 26 home ranges.

**Table 3-13: Habitat Conditions in Northern Spotted Owl Home Ranges Analyzed[1, 2]**

| Northern Spotted Owl Site Number | Province | Existing Habitat Acres in Owl Sites[1] | | | | | |
|---|---|---|---|---|---|---|---|
| | | Home Range | | Core Area | | Nest Patch | |
| | | Suitable | Dispersal | Suitable | Dispersal | Suitable | Dispersal |
| 0242O | Klamath | 450 | 400 | 150 | 98 | 61 | 0 |
| 0256O | Cascade | 1,887 | 335 | 413 | 32 | 70 | 0 |
| 0258O | Cascade | 810 | 171 | 141 | 11 | 11 | 0.3 |
| 0292O | Cascade | 908 | 400 | 171 | 117 | 39 | 24 |
| 0293A | Cascade | 945 | 447 | 244 | 50 | 42 | 8 |
| 0294C | Cascade | 604 | 221 | 133 | 62 | 43 | 5 |
| 0295O | Cascade | 1,747 | 825 | 429 | 95 | 61 | 9 |
| 0361A | Klamath | 657 | 61 | 150 | 25 | 42 | 10 |
| 0361B | Klamath | 679 | 49 | 149 | 22 | 57 | 0 |
| 0362A | Klamath | 364 | 305 | 75 | 62 | 39 | 0 |
| 0362B | Klamath | 334 | 255 | 172 | 103 | 51 | 9 |
| 1363B | Cascade | 373 | 341 | 57 | 94 | 12 | 39 |
| 1800O | Klamath | 504 | 564 | 58 | 59 | 37 | 0 |
| 1811O | Cascade | 1,421 | 652 | 272 | 85 | 66 | 0 |
| 1814A | Cascade | 1,559 | 267 | 338 | 46 | 54 | 11 |
| 2291O | Cascade | 1,506 | 808 | 328 | 98 | 57 | 9 |
| 2293O | Cascade | 1,614 | 220 | 350 | 11 | 67 | 0 |
| 2294O | Klamath | 564 | 39 | 176 | 0 | 61 | 0 |
| 2295O | Cascade | 2,052 | 224 | 401 | 56 | 55 | 14 |
| 2381O | Cascade | 2,132 | 160 | 488 | 0 | 69 | 0 |
| 3097D | Klamath | 734 | 471 | 135 | 50 | 19 | 13 |
| 4046O | Cascade | 1,585 | 503 | 367 | 43 | 55 | 0 |
| 4576O | Cascade | 479 | 343 | 164 | 146 | 38 | 27 |
| 4589O | Cascade | 1,109 | 715 | 189 | 238 | 55 | 15 |
| 4613C | Cascade | 1,467 | 319 | 317 | 0 | 56 | 0 |
| 4613D | Cascade | 1,105 | 230 | 344 | 23 | 63 | 2 |

[1] BLM acres only
[2] Gray shading indicates the amount of nesting, roosting and foraging habitat is above the viability threshold.

The *Core Area* is represented by a 0.5-mile radius circle centered on the nest tree, encompassing an area of approximately 500 acres that is the most heavily used area during the nesting season. Core areas are defended by territorial northern spotted owls and generally do not overlap the core areas of other home ranges (USDI/FWS 2008a). The suitable habitat threshold considered essential to maintain northern spotted owl life functions is 50 percent (250 acres) of total core area acres (USDI/FWS 2008b). Table 3-13 shows 15 core areas associated with the 26 home ranges overlapping the analysis area are below viability the threshold. Proposed harvest units overlap eleven core areas; three of the eleven sites where proposed units overlap core areas (shaded gray in Table 3-13) have been unoccupied since 2011.

The 70-acre *Nest Patch* is centered within the core area and represented by a circle with a 300-meter radius that is centered on the nest tree. Management actions that modify suitable and dispersal habitat within the nest patch are considered likely to affect reproductive success (USDI/FWS 2008b). Table 3-13 illustrates that 25 of the 26 nest patches in home ranges overlapping the proposed units have less than 70 acres of suitable habitat. Thinning is proposed in the nest patch of site 0292O. Recent occupancy of the site is shown in Table 3-13.

*Northern Spotted Owl Site Occupancy*

Sixteen units (752 gross acres) are completely outside of known northern spotted owl home ranges (Table 3-13, *Appendix A- Maps*). The northern spotted owl site occupancy analysis focuses on the 26 known northern spotted owl sites that overlap proposed harvest units and considers only the most recent occupancy data. Table 3-14 provides a six-year summary of occupancy status and nesting activity for the analyzed northern spotted owl sites that overlap proposed harvest units.

**Table 3-14: Recent Occupancy Summary for Analyzed Northern Spotted Owl Sites[1]**

| NSO Site Number | Northern Spotted Owl Pair and Breeding Summary[2] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Last Year of Pair Status | Last Year Nesting | Last Year Reproducing | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
| 0242O | 2009 | 2009 | None | UP | Pair | NO | UP | Single | X |
| 0256O | 2010 | 2006 | 2009 | Pair | Pair | Pair | UP | NO | X |
| 0258O | 2012 | 2012 | 2011 | SDNE | SDNE | Single | Pair | Pair | MTA |
| **0292O** | **2010** | **2010** | **2003** | **NO** | **NO** | **Pair** | **NO** | **NO** | **UP** |
| 0293A | 2000 | 2000 | 2000 | NO | Single | NO | NO | NO | NO |
| 0294C | 2013 | 2010 | 2010 | SDNE | SDNE | Pair | Pair | Pair | Pair |
| 0295O | 2005 | 2004 | 2004 | UP | NO | X | NO | NO | NO |
| 0361A | 2008 | 2008 | None | Pair | MTA | MTA | MTA | MTA | NO |
| 0361B | 2011 | 2010 | 2009 | SDNE | Pair | Pair | Pair | UP | NO |
| 0362A | 2005 | 2004 | 2004 | MTA | MTA | NO | NO | X | MTA |
| 0362B | 2013 | 2007 | 2006 | NO | Single | NO | UP | NO | Pair |
| 1363B | 2011 | 2006 | None | UP | UP | Single | Pair | NO | NO |
| 1800O | 2012 | 2012 | 2012 | Pair | Pair | Pair | Pair | Pair | Single |
| 1811O | 1995 | 1995 | None | NO | X | Z | NO | NO | NO |
| 1814A | 2013 | 2010 | 2007 | X | Pair | UP | Pair | UP | Pair |
| 2291O | 1990 | 1990 | None | NO | X | X | Single | X | Single |
| 2293O | 2002 | 1995 | 2002 | NO | NO | NO | NO | NO | NO |
| 2294O | 1991 | None | None | NO | NO | NO | NO | NO | NO |
| 2295O | 2011 | 2011 | 2001 | Single | Single | Pair | NO | NO | NO |
| 2381O | 1994 | None | None | NO | NO | NO | NO | NO | NO |
| 3097D | 2010 | 2010 | None | MTA | MTA | Pair | UP | NO | NO |
| 4046O | 2000 | None | None | NO | NO | NO | NO | NO | NO |
| 4576O | 2012 | 2010 | 2010 | Pair | MTA | Pair | UP | MTA | NO |
| 4589O | 2013 | 2002 | None | X | NO | NO | NO | Single | Pair |
| 4613C | 2007 | 2007 | 2007 | Single | NO | X | UP | MTA | MTA |
| 4613D | 2012 | 2012 | 2012 | SDNE | SDNE | SDNE | SDNE | Pair | X |

[1] Sites with harvest in the core area are shaded gray and the site with thinning in the nest patch is in **bold type.**

[2] **Single** – A single bird is detected at least two times during the year and there is no detection of the opposite sex; **X** – At least one owl detected on one of the visits; usually a single response; **UP** – Resident bird detected but pair status unknown; **Pair** – Resident pair by protocol standards; **Z** – Unknown occupancy, low survey effort; **SDNE** – Site did not exist; **MTA** – Pair or single bird moved to another site; **NO** – Unoccupied

*Northern Spotted Owl Prey Species*

Northern spotted owls prey primarily on small mammals like woodrats, flying squirrels, and voles (Forsman et al. 1984, Forsman et al. 2004). In the Central Cascades, which includes the analysis area, Forman et al. (2004) found flying squirrels comprise about 46 percent of the northern spotted owl prey biomass. Flying squirrels are associated with stands possessing high canopy cover, large trees, snags, coarse woody debris, understory cover, and availability of fungi (Wilson, 2008). Woodrats and other prey species of the northern spotted owl, such as red-backed voles, rabbits, Douglas squirrels, chipmunks, and deer mice are associated with early-and mid-seral forest habitat (Maser *et al*. 1981, Sakai and Noon 1993, Carey *et al*. 1999) and comprise nearly 50 percent of the prey biomass (Forsman et al. 2004).

Some units have well developed understories with groups of hardwoods and shrubs, and show signs of use by flying squirrels, dusky-footed woodrats and bushy-tailed woodrats, which are common on the Roseburg District.

*2012 Northern Spotted Owl Critical Habitat*

In 2012, the U.S. Fish and Wildlife Service published the latest version of critical habitat for the northern spotted owl (USDI/FWS 2012b), identifying four critical habitat units (CHUs) with multiple subunits on the Roseburg District. The proposed harvest units are located in the Klamath East subunit 2 (KLE-2). The Roseburg District has 40,993 acres of suitable habitat and 11,670 acres of dispersal habitat within the KLE-2 subunit. Table 2-1 shows 32 units (983 gross acres) are located within the KLE-2 subunit.

The primary function of the KLE-2 subunit is to facilitate northern spotted owl movements between the western Cascades and coastal Oregon and the Klamath Mountains and demographic support (USDI/FWS 2012b).

*Principle Threats to the Northern Spotted Owl*

The two main threats to the northern spotted owl's continued survival are; habitat loss from timber harvest and catastrophic fire, and competition from the barred owl for habitat and prey (USDI/FWS 2011a, I-6 through I-9).

Lint (2005) indicated that the Northwest Forest Plan recognized wildfire as an inherent part of managing northern spotted owl habitat in certain portions of the range. He further noted that loss of northern spotted owl habitat did not exceed the rate expected under the Northwest Forest Plan, and that habitat conditions were no worse, and perhaps better than expected. In particular, the percent of existing northern spotted owl habitat removed by harvest during the first decade was considerably less than expected.

Courtney *et al.* (2004) also identified the primary source of habitat loss as catastrophic wildfire. Although the total amount of habitat affected by wildfires has been small, there is concern for potential losses associated with uncharacteristic wildfire in a portion of the species range. Courtney *et al*. (2004) noted that the risk to northern spotted owl habitat from uncharacteristic stand replacement fires is sub-regional, confined to the dry eastern and to a lesser extent the southern fringes of the northern spotted owl range. Wildfires accounted for 75 percent of the natural disturbance loss of habitat estimated for the first decade of Northwest Forest Plan implementation.

Courtney *et al.* (2004) also indicated that models of habitat growth suggested significant in-growth and development of habitat throughout the federal landscape.

The barred owl (*Strix varia*) is considered a threat to the northern spotted owl because it is a direct competitor for prey and habitat. Growing evidence suggests that northern spotted owl populations decline in areas where barred owls move into their range (Wiens et al 2014). The probability that a pair of northern spotted owls would occupy a territory after occupancy by a barred owl declined 12 percent in the Coast Range Study Area and 15 percent in the Tyee Study Area (USDI/BLM 2010a).

Detection of barred owls within northern spotted owl home ranges within the analysis area has increased from one in 1990 to 23 in 2012. In 2012, there were also 38 detections outside of home ranges.

Independent of the proposed alternatives, the barred owl would remain in the analysis area and is expected to continue increasing its distribution and numbers displacing northern spotted owls. There is no data indicating a relationship between forest treatments or lack of treatments and an increase or decrease in the distribution of the barred owl.

## 2. Bureau Sensitive Species

The **American peregrine falcon** (*Falco peregrinus anatum*) typically nests on cliff ledges and rock outcrops but they are also known to use remnant common raven and raptor nests (White *et al.* 2002). There is one peregrine site (occupied 1995-2013) in the analysis area. The site is 0.65 miles from Unit 28-3-36A and 0.8 miles from Unit 28-2-31A. Monitoring data indicates that the peregrines use the immediate 1-2 miles surrounding the nest site for foraging and roosting.

The **Crater Lake tightcoil snail** *(Pristiloma arcticum crateris),* **Chace sideband snail** (*Monadenia chaceana*) and **Oregon shoulderband snail** *(Helminthoglypta hertleini)* are Bureau Sensitive and Survey and Manage mollusk species with potential habitat in the proposed units. See the Survey and Manage section below for more information.

The **fringed myotis** (*Myotis thysanodes*), **Pacific pallid bat** (*Antrozous pallidus pacificus*) and **Townsend's big-eared bat** (*Corynorhinus townsendii*) are insectivorous bats found in the Pacific Northwest (reviewed in Verts and Carraway 1998).

Hibernacula and roost sites include caves, mines, buildings, large snags and hollow trees (Weller and Zabel 2001, Lewis 1994, Fellers and Pierson 2002). No caves or mines are known to be present in the harvest units. Some units contain trees and snags that may provide roosting opportunities.

These species are known to forage in open areas, including forest edges and roads (Christy and West 1993) and along streams and in riparian zones (Cross and Waldien 1995, Marshall 1996, Verts and Carraway 1998, Fellers and Pierson 2002).

Small ponds, marshy areas, and other riparian areas are expected to provide foraging habitat. Dense forest stands generally do not provide quality foraging habitat as they are less open making navigation difficult, and poor understory development does not support abundant populations of insects that bats feed upon. Open stands with a well-developed understory supporting diverse and abundant populations of insects that provide high quality foraging conditions.

Data from the GeoBob database (USDI BLM 2013) shows these species are present in the analysis area. None of the known locations coincide with proposed harvest units or road construction locations.

## 3. Survey and Manage

In ruling on Conservation Northwest *et al.* v. Mark E. Rey *et al.* on December 12, 2009, Judge Coughenour in the U.S. District Court for Western Washington set aside the 2007 Record of Decision eliminating the Survey and Manage mitigation measures, but deferred issuing a remedy until further proceedings.

The plaintiffs and Federal Agencies entered into settlement negotiations in April 2010, and the Court filed approval of the resulting Settlement Agreement on July 6, 2011. The Defendant-Intervenor subsequently appealed the 2011 Settlement Agreement. On April 25, 2013, the Ninth Circuit Court of Appeals invalidated the 2011 Survey and Manage Settlement Agreement and remanded the case back to the District Court. On February 18, 2014, the District Court vacated the 2007 RODs which returned the BLM to the status quo in existence prior to the 2007 RODs, which includes the use of the Pechman exemptions.

The Pechman Order dated October 11, 2006 directs: "Defendants shall not authorize, allow, or permit to continue any logging or other ground-disturbing activities on projects to which the 2004 ROD applied unless such activities are in compliance with the 2001 ROD (as the 2001 ROD was amended or modified as of March 21, 2004), except that this order will not apply to:

a. Thinning projects in stands younger than 80 years old;

b. Replacing culverts on roads that are in use and part of the road system, and removing culverts if the road is temporary or to be decommissioned;

c. Riparian and stream improvement projects where the riparian work is riparian planting, obtaining material for placing in-stream, and road or trail decommissioning; and where the stream improvement work is the placement of large wood, channel and floodplain reconstruction, or removal of channel diversions; and

d. The portions of project involving hazardous fuel treatments where prescribed fire is applied. Any portion of a hazardous fuel treatment project involving commercial logging will remain subject to the survey and management requirements except for thinning of stands younger than 80 years old under subparagraph (a) of this paragraph."

Under the current guidance described above, all of the proposed thinning units under 80 years of age are exempt from complying with the 2001 ROD (as amended in March 21, 2004). Tables 2-1 and 2-2 document the 1,116 acres that are exempt from survey requirements under Alterative Two and 1,469 acres are exempt from survey requirements under Alternative Three as stated in Pechman exemption 'a'.

Alternative Two proposes to thin 465 acres that are 80 years old and older and would apply variable retention harvest to 334 upland acres that do not meet the Pechman exemption criteria. Alternative Three proposes to thin 543 acres that are 80 years old or older. Both action alternatives would construct approximately 0.1 miles of road in a stand that is older than 80 years of age. Protocol surveys would be conducted where necessary using the 2001 Survey and Manage ROD species list.

**Great gray owl** (*Strix nebulosa*) detections are documented at 24 locations in the analysis area but only one nest site is known in the South River Resource Area, more than 1.5 miles from the nearest unit (GeoBob 2013). None of the proposed units or road locations coincide with the documented great gray owl locations in the analysis area.

Great gray owls do not construct nests and depend on abandoned nests built by other species and will nest in suitable nesting structures like broken–top snags, dwarf-mistletoe brooms, and branch/tree bole deformities (USDA/FS-USDI/BLM 2004). In general, the stands proposed for thinning do not qualify as nesting habitat.

All or portions of three proposed harvest units (28-4-19A, 28-4-29A and 28-5-27A) have potential nesting habitat that is located within 600 feet of natural meadows or openings greater than 10 acres in size that would provide foraging opportunities for the great gray owl. Protocol surveys (USDA/FS-USDI/BLM 2004) are scheduled for these areas in 2014 and 2015. During field review squirrel nests and tree deformities were noted but no potential nests or great gray owls were observed.

The **Oregon red tree vole** (*Arborimus longicaudus;* RTV) is an arboreal rodent endemic to moist coniferous forests of western Oregon and extreme northwest California. It nests, forages, and travels through the canopies of conifers (Forsman and Swingle 2007, Carey 1991). Red tree voles primarily feed on the needles and bark of Douglas-fir, and use materials such as twigs, needles, and lichens for nest building (Maser 1998; Verts and Carraway 1998). Red tree voles have limited home ranges, from 0.26 to 0.42 acres (Swingle 2005). Forest canopy gaps (<100 feet wide) should not greatly impair tree vole movement, as RTVs were known to cross 100 feet wide canopy gaps (Biswell and Meslow 1996).

The RTV analysis area is located in the mesic zone of the RTV's range and includes four 6th-field watersheds (Appendix F Table 2 and Figure 1). These 6th-field watersheds were selected as the analysis area because they contain the high quality RTV habitat affected by proposed actions or are immediately adjacent to them; the RTV sites are centrally located in the analysis area; they allow for appropriate analysis of habitat connectivity and habitat distribution; and when combined they approximate the size of a 5th-field watershed. The analysis area is not located within the area covering the North Oregon Coast distinct population segment identified as a candidate for Federal ESA protection in October 2011 (USDI/FWS. 2011c).

The "Survey Protocol for the Red Tree Vole (*Arborimus longicaudus*), Version 3.0 (Huff *et al.* 2012, pp. 5-10)" was used to determine if pre-disturbance surveys were required; six units (Table 3-4; 28-4-9A, 28-4-9B, 28-4-10A, 28-4-10B, 28-4-17B, 28-5-27A) with high quality habitat required surveys. Ground surveys for red tree voles and climbing active nest trees were completed in 2015. All portions of the six units (339 acres) were surveyed including "aggregate retention" areas and "no-treatment" areas in Riparian Reserves.

The proposed harvest would occur in three blocks of habitat (Appendix F Figures 2-7) that are located on the periphery of BLM-administered land in the analysis area. These blocks are located in the valley margin, separated from large areas of contiguous federal ownership (White Rock block) by at least four miles.

Analysis Block 1 (Appendix F Figures 2 and 5) is 371 acres of federally owned land and includes units 28-4-9A, 28-4-9B, 28-4-10A and 28-4-10B (204 acres; Appendix F Figures 3 and 6). Block 1 is separated from other federal lands by at least 0.25 miles of non-federal land (Appendix F Figure 5) and includes 249 acres (67 percent) of high quality RTV habitat. Surveyors identified all or portions of eight active RTV sites[9] in Block 1.

[9] RTV sites have been defined based upon ground transects and the climbing of those potential nest trees identified. Intensive 100 meter surveys have not been completed around the active nest trees.

Analysis Block 2 (Figures 3 and 6) is 629 acres of federally owned land and includes Unit 28-4-17B (35 acres) (Figures 4 and 7). There are 273 acres of high quality RTV habitat in the block. Block 2 is adjoined on three sides by private land, but BLM land to the west side provides connectivity to adjacent high quality habitat (Figure 6). Three active RTV sites have been identified in Block 2.

Analysis Block 3 (Figures 4 and 7) is comprised of 279 acres of federally owned land and includes Unit 28-5-27A (111 acres). Block 3 is surrounded by private lands, separating it from other federal lands by a minimum of 0.25 miles. There are 164 acres of high quality RTV habitat in Block 3 and four active RTV sites have been identified in the block (Figures 1 and 10).

The **Oregon shoulderband snail** (*Helminthoglypta hertleini*) is endemic to northwestern California and southwestern Oregon (Burke 2013), using interstices in rock-on-rock habitat, talus, soil fissures, the interior of large woody debris, herbaceous vegetation, or deciduous hardwood leaf litter as refugia from desiccation during dry periods (Weasma 1998a, 1998b; Frest and Johannes 2000, Duncan *et al*. 2003, Duncan 2004). There are eight known sites in the analysis area (GeoBOB 2013). None of the sites coincide with propose harvest units or road locations. Required protocol surveys in suitable habitat are incomplete and are scheduled for completion in 2014 and 2015. All occupied sites would be protected as described in the Project Design Feature E section in Chapter Two.

The **Chace sideband snail** (*Monadenia chaceana*) is an endemic to northwestern California and southwestern Oregon. This snail utilizes the same habitat as the Oregon shoulderband snail. In the Oregon Cascades Province the species is associated with down wood where rock substrates occur (Duncan 2005) but can be found in areas without rocky substrates (GeoBob 2012). There are 28 known sites in the analysis area. One of the sites coincide with proposed harvest Unit 28-3-21B. Required protocol surveys in suitable habitats are incomplete and are scheduled for completion in 2014 and 2015. All occupied sites would be protected as described in the Project Design Feature E in Chapter Two.

The **Crater Lake tightcoil snail** (*Pristiloma articum crateris*) is found above 2000 feet throughout the Oregon Cascades associated with perennial moist conditions in mature conifer forests and meadows where rushes, moss, other vegetation is present and under rocks and woody debris close to open water in wetlands, springs, seeps, and streams (Duncan 2004). The species has not been found in the analysis area but habitat is present. Riparian Reserve "no-treatment" areas would protect suitable habitat associated with known perennial moist sites. No activities would occur in meadows. Protocol surveys are incomplete and are scheduled for completion in 2014 and 2015. All occupied sites would be protected as described in the Project Design Feature E in Chapter Two.

## 4. Landbirds

Guidance for meeting agency responsibilities under the Migratory Bird Treaty Act and Executive Order 13186, "Responsibilities of Federal Agencies to Protect Migratory Birds" is provided by Instruction memorandum OR-2008-050 (USDI/BLM 2008c). The guidance identifies lists of "Game Birds Below Desired Condition" and "Birds of Conservation Concern" to be addressed during environmental analysis of agency actions and plans. "Game Birds Below Desired Condition" are included in *Appendix C – Wildlife*, Table C-1.

The most recent "**Birds of Conservation Concern**" list (USDI/FWS 2008c) identifies thirty-two species of concern in Region 5 (North Pacific Rainforest). Habitat for one of these species is present in the analysis area and may be affected by proposed activities: peregrine falcon and purple finch. The peregrine falcon is discussed under Bureau Sensitive Species.

**Purple finches** (*Haemorhous purpureus*) are residents of southwestern Oregon (Wootton 1996, Csuti *et al.* 1997), preferring open areas or edges of low to mid-elevation mixed coniferous/hardwood forests (Csuti *et al.* 1997). Altman and Hagar (2006) indicate the purple finch is closely associated with closed canopy sapling to small tree (up to 6 inches in diameter) habitats. Purple finches primarily nest in Douglas-fir, pine or spruce but may use oak, maple, and fruit trees. They feed on seeds, buds, blossoms, nectar, tree fruits and occasionally insects (Wootton 1996). They have been documented in the analysis area.

The **Conservation Strategy for Landbirds in Coniferous Forests of Western Oregon and Washington** (Altman 1999) provides information on habitat used by species native to the Pacific Northwest, and is used as a guide by the BLM. Pacific wren, hermit warbler, and golden eagle are focal species being analyzed in detail for this analysis.

The **Pacific wren** (*Troglodytes pacificus*), also known as the winter wren, is a resident species associated with forests with complex vegetative structure on the forest floor and is frequently associated with streams (Altman and Hagar 2006, Hejl et al. 2002, Altman 1999, McGarigal and McComb 1992). Territory sizes range between 0.35 acres and 15 acres and are variable based on season, habitat conditions and region (Hejl et al. 2002). Pacific wren nests are located in concealed cavities in root wads, stumps and downed logs, foraging for insects on the ground and in low understory vegetation. Associated species include the orange-crowned warbler, and rufous hummingbird. Pacific wrens are generally absent in areas lacking complex understory vegetation and structure. Pacific wrens are a common species in the analysis area.

The **hermit warbler** (*Dendroica occidentalis*) is a canopy dwelling neo-tropical migrant associated with young (35-79 years old) and mature (80-200 years old) conifer forests and is common in Douglas-fir dominated stands, where dense canopy provides foraging and nesting habitat (Pearson 1997, Altman 1999). The analysis area contains approximately 15,000 acres or potentially suitable young forest and approximately 21,600 acres older forest habitat. Territories in southern Washington range between 0.4 acres and 1.8 acres (Pearson 1997). All of the proposed units are characterized by closed canopy, and hermit warblers are known to be present in many of them.

**Golden eagles** (*Aquila chrysaetos*) are resident birds in southwestern Oregon that are protected under the Migratory Bird Treaty Act and under the Bald Eagle Protection Act. They nest in a variety of conifer and hardwood trees (Kochert et al. 2002) in the vicinity of open areas where they hunt (Csuti et al. 1997). In the analysis area, nesting occurs in forest stands greater than 80 years old within one mile of early-seral stands or open foraging areas. There are approximately 22,252 acres of potential golden eagle nesting habitat in the analysis area but only 337 acres of foraging habitat. Conversely, nesting habitat is generally not available on private lands while foraging habitat is abundant. There is one known golden eagle sites in the analysis area. The site is approximately 0.6 miles from the nearest harvest unit.

## B. Environmental Consequences

The 42,800-acre analysis area was used to assess environmental consequences to wildlife resources. The desired conditions would provide a wide range of habitats for wildlife species in the analysis area. The analysis indicators for wildlife resources are displayed in Table 3-15 and were used to assess direct and indirect effects. Current conditions reflect all past natural disturbances and management activities, and while this discussion considers those current conditions, it only specifically addresses the effects of the analyzed alternatives.

**Table 3-15: Wildlife Resources Analysis Indicators**

| Species | Analysis Indicator |
|---|---|
| Northern Spotted Owl | Acres of suitable habitat modified/removed |
| | Acres of dispersal habitat modified/removed |
| | Number of NSO home ranges/core areas/nest patches affected |
| | Acres of critical habitat modified/removed |
| American Peregrine Falcon | Forest habitat modified within 1 mile of known site |
| Fringed Myotis<br>Pacific Pallid Bat<br>Townsend's Big-eared Bat | Roosting habitat modified |
| | Roosting habitat removed/foraging habitat created |
| Great Gray Owl | Nesting habitat modified |
| | Nesting habitat removed |
| Red Tree Vole | Suitable habitat surveyed and identified sites managed according to the *2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines*), which provides options for site protection or non-high priority site designation (USDA/FS-USDI/BLM 2001). The non-high priority site evaluation is addressed in Appendix F. |
| Oregon Shoulderband<br>Chase Sideband<br>Crater Lake Tightcoil | Suitable habitat surveyed and identified sites protected. |
| Purple Finch | Habitat removed |
| Pacific Wren | Habitat acres removed |
| Hermit Warbler | Habitat quality modified |
| Golden Eagle | Habitat acres modified/removed within 0.5 miles of known site |
| | Potential nesting habitat modified |

### 1. Alternative One (No Action)

There would be no direct, indirect or cumulative effects to wildlife species in the analysis area if the proposed actions were not undertaken. Stand development would proceed along trajectories described in the Timber Resources section (pp. 45-47).

At the unit-scale, habitat conditions would remain generally unchanged in the short-term unless a major disturbance such as fire, wind, ice, insects, or disease occurred. Otherwise, the primary influence on long-term habitat development would be the growth and mortality of overstory trees.

Overstocked conditions in younger stands would result in relatively slow growth rates that would prolong crown differentiation. Eventually some trees would become dominant and shade out suppressed trees. These smaller trees would stand as snags and ultimately fall, but would not create

openings because of their small size. The crowns of dominant trees would soon expand into the newly-available growing space, limiting opportunities for conifer regeneration and the ability of understory vegetation to become established in response to the temporary increase in available light. Multiple waves of suppression mortality would be necessary before dominant tree densities would be low enough to allow sufficient light for understory initiation. This growth trajectory would be unfavorable to development of mature and late-successional forest attributes.

Private timber lands in the project watersheds are largely made up of early and mid-seral forests managed for production of wood fiber on forest rotations between 40 and 50 years. It is expected that any remaining late-seral forests on private timber lands will be converted to early-seral forest over the next 20 to 30 years, and that the private lands will cease to support species dependent on older forest habitat.

Private land management would emphasize conifer dominance. For species dependent on early-successional habitat, private lands are not expected to provide quality habitat because of intensive management practices such as heavy replanting and repeated herbicide application that are intending to exclude competing vegetation including flowering plants, shrubs and hardwoods.

## a. Threatened and Endangered Species

### Northern Spotted Owl

*Effects on Northern Spotted Owl Habitat*

No habitat modification or removal would occur that could affect the present viability of home ranges and core areas. Forest conditions would be as described in Alternative One in the Vegetation section. Forest development would proceed along trajectories described in the Timber Resources section (pp. 45-47).

Early seral forest diversity and complexity would decrease as a result of stem exclusion. In the short-term, the amount of dispersal habitat would remain unchanged, but over the next 10 to 15 years the representation of existing shrubs (currant sp., huckleberry, ocean spray, etc.) and hardwoods (alder, big-leaf maple, chinquapin, and oaks) would decline in abundance, diminishing the quality of dispersal habitat.

As stand structure begins to diversify, suppression mortality would be replaced by irregular mortality due to insects, disease, windthrow and stem breakage, which could occur across all crown classes at any age. Multi-layered tree canopy would be evident at about 100 years (Oliver and Larson 1990; Munger 1940), but development of habitat features such as nesting platforms, large diameter trees and snags, and large down wood would be delayed until approximately 160 years of age. Canopy cover in suitable habitat would remain high (80-90 percent) and tree size would slowly increase. Scattered and isolated legacy trees would continue to provide habitat diversity.

This alternative would not maintain the health and vigor of the stands, or increase habitat diversity.

*Effects on the Northern Spotted Owl and Current Site Occupancy*

Current northern spotted owl occupancy and home range viability would not be directly affected by proposed activities, but may be affected by harvest on private timber lands that may disrupt nesting owls and reduce available habitat, rendering some home ranges unable to support northern spotted owl life functions.

*Effects on Northern Spotted Owl Prey Species*

Populations of northern spotted owl prey species, such as northern flying squirrels, would remain near existing levels and existing habitat would be subject to natural processes. Woodrats would be indirectly affected by a decline in forage and habitat as shade intolerant hardwoods and shrubs would be suppressed and eventually die.

*Effects on 2012 Northern Spotted Owl Critical Habitat*

There would be no direct effect on critical habitat for the northern spotted owl, but the development of habitat characteristics necessary to support and sustain the northern spotted owl would likely be delayed by decades.

*Consistency with the 2011 Northern Spotted Owl Recovery Plan*

This alternative would be inconsistent with recommendations of the 2011 Northern Spotted Owl Recovery Plan for habitat management in forest stands to implement disturbance based management within the range of the northern spotted owl designed to maintain and restore forest ecosystem structure, composition and processes that are sustainable under current and future climate conditions (USDI/FWS 2011a, p. III-13). Stands lacking diversity would continue to have simple stand structure and development of these structural features would be delayed.

## b. Bureau Sensitive Species

### Peregrine Falcon

Absent timber harvest, there would be no potential for disturbance from management activities to nesting peregrine falcons occupying the known aerie in the analysis area.

### Fringed Myotis, Pacific Pallid Bat, and Townsend's Big-eared Bat

Tree growth would continue, though at reduced rates, extending the period of time in which large trees with deeply fissured bark are available as roosting habitat during foraging periods.

Stands would continue to support insect populations that the bats forage upon, but as stands become less diverse in composition, specifically with respect to hardwood trees and flowering plants, prey diversity and abundance would eventually decline.

## c. Survey and Manage

### Great Gray Owl

Disturbance to great gray owls during the nesting season, and great gray owl habitat removal or habitat modification would not occur in the analysis area under this alternative.

### Red Tree Vole

Suitable red tree vole habitat would not be modified or removed within the analysis area, but the development of larger trees with deep crowns providing higher quality habitat would be delayed as described above.

### Oregon Shoulderband Snail, Chace Sideband Snail, Crater Lake Tightcoil Snail

Absent any timber harvest or major natural disturbance, snail habitat would remain constant. Large down wood, leaf litter, rock outcrops, rock fissures, talus, and rock-on-rock habitats would remain available as refuge sites.

## d. Landbirds

### "Birds of Conservation Concern"

#### *Purple Finch*

The purple finch would not be directly affected because existing nesting habitat would continue to be available. Future habitat would be created by natural processes that create young forest such as wind, insects and disease. Forest succession and wildfire suppression are factors that limit suitable young forest habitat in the analysis area.

### Partners In Flight "Focal Species"

#### *Pacific Wren (aka. Winter Wren)*

Pacific wrens would continue to avoid the stands proposed for treatment because of the lack of a well-developed understory of shrubs and ferns resulting from closed canopy conditions. Riparian areas with greater vegetative complexity and diversity would likely continue to support Pacific wrens.

#### *Hermit Warbler*

The hermit warbler would be generally unaffected as current forest conditions in the analysis area that provide habitat for nesting and foraging would not be altered.

#### *Golden Eagle*

Absent timber harvest, there would be no potential for disturbance from management activities to nesting golden eagles in the analysis area. Potential nesting habitat would remain available on federal lands and foraging habitat would remain abundant on private lands.

## 2. Alternative Two

Treatment would increase stand diversity by creating gaps, increasing establishment and growth of understory vegetation, and allowing for more than one vegetation layer to exist in the forest stand. Creating approximately 334 upland acres early-successional habitat by applying variable retention harvest would benefit species of pollinators, and resident and migratory birds. It would also benefit small mammals that inhabit and/or forage in the forest understory, and those species that prey upon them.

### a. Threatened and Endangered Species

#### Northern Spotted Owl

*Effects on Northern Spotted Owl Habitat*

Alternative Two treatments in dispersal and suitable habitat are presented in Table 3-16.

**Table 3-16: Activities Proposed in Northern Spotted Owl Suitable and Dispersal Habitat**

| Harvest Treatment | Northern Spotted Owl Habitat | Alternative One Acres | Alternative Two Acres | Alternative Three Acres |
|---|---|---|---|---|
| Uniform Commercial Thinning | Dispersal | 0 | 370 | 494 |
| | Suitable | 0 | 159 | 288 |
| Variable Density Thinning | Dispersal | 0 | 697 | 705 |
| | Suitable | 0 | 308 | 381 |
| Variable Retention Harvest | Dispersal | 0 | 132 | 0 |
| | Suitable | 0 | 202 | 0 |
| Road Construction | Dispersal | 0 | 13 | 13 |
| | Suitable | 0 | 14 | 14 |
| Road Daylighting | Dispersal | 0 | 17 | 17 |
| | Suitable | 0 | 55 | 55 |

Thinning may reduce use of the stands by northern spotted owls because of increased exposure to weather and increased risk of predation from other raptors as they move across the landscape, which would persist until the stands return to pre-thinning levels of canopy cover. Northern spotted owls use lightly thinned areas at moderate to high degrees (Lee and Irwin 2005), and continue to use thinned stands for foraging when the average canopy cover remains above 50 to 60 percent (Forsman 1994, Hanson et al. 1993). Canopy cover would remain above 50 percent on 706 treated acres, therefore use be northern spotted owls is expected to continue.

Post-harvest canopy cover would be below 50 percent on 1,162 acres. In heavily thinned stands northern spotted owl use may shift to untreated areas (Forsman et al. 1984). Meiman et al. (2003) found that northern spotted owls tended to expand nonbreeding home range size, reduce use of thinned areas, and shift foraging and roosting away from thinned areas near the nest tree. Expanding the home range size would require owls to expend greater amounts of energy in foraging, as owls would be travelling longer distances in search of prey. This would in turn reduce reproductive fitness (Meiman et al. 2003).

Thinning dispersal habitat would diversify forest conditions and promote development of suitable habitat while maintaining dispersal habitat function. In core areas with less than 50 percent suitable habitat, and in nest patches, dispersal habitat plays an important role in allowing owls to move between patches of suitable habitat and forage. Thinning under these circumstances may decrease site capability to support reproducing pairs. Thinning in suitable habitat would modify forest conditions to improve long-term habitat quality by promoting tree growth, habitat diversity, and resilience to fire, insects and disease.

Table 3-17 summarizes the amount of dispersal and suitable habitat that would be modified or removed by proposed treatments.

**Table 3-17: Summary of Effects to Northern Spotted Owl Habitat**

| | Alternative One Acres | Alternative Two Acres | Alternative Three Acres |
|---|---|---|---|
| Dispersal Habitat Modified and Maintained by Thinning | 0 | 1,067 | 1,199 |
| Dispersal Habitat Removed by VRH | 0 | 132 | 0 |
| Dispersal Habitat Removed by Road Construction | 0 | 5.8 | 5.8 |
| Suitable Habitat Modified and Maintained by Thinning | 0 | 113 | 288 |
| Suitable Habitat Downgraded to Dispersal by Thinning | 0 | 354 | 381 |
| Suitable Habitat Removed by VRH | 0 | 202 | 0 |
| Suitable Habitat Removed by Road Construction | 0 | 14 | 14 |
| Habitat Modified by Road Daylighting | 0 | 72 | 72 |
| Habitat Restored by Road Decommissioning | 0 | 13 | 13 |

Thinning in dispersal habitat would promote development of suitable habitat in 40 to 50 years. Canopy cover would not fall below 40 percent in dispersal habitat, a value widely used as a threshold to maintain habitat function (Thomas et al. 1990). However, northern spotted owls may utilize thinned stands less than unthinned stands until canopy cover returns to pre-project.

Thinning in 113 acres of Suitable habitat would maintain structural elements important for spotted owls and canopy cover above the 60 percent threshold necessary to maintain habitat function (Thomas et al. 1990), so the function of suitable habitat would be maintained. Due to canopy cover reduction below 60 percent, thinning would downgrade 354 acres of suitable habitat to dispersal habitat. The downgraded habitat is outside of critical habitat in the GFMA land use allocation. Initially, northern spotted owls would utilize thinned suitable stands less than unthinned suitable habitat until canopy cover returns to 60 percent.

Uniform commercial thinning would result in more uniform growth at the stand level, with little height and diameter differentiation among the dominant and co-dominant canopy classes. Uniform thinning would promote some growth of grasses, forbs, shrubs, and hardwoods in the understory, but this would be of limited duration persisting until full canopy closure is reached again and the understory is again suppressed. In general, development of habitat components providing nesting, roosting and foraging habitat would occur in 30 to 50 years.

Variable density thinning with gaps and openings would focus on the growth of selected trees, rather than on uniform growth across a stand. This would lead to crown expansion and differentiation in dominant trees, release of shade tolerant species, and development of multi-layered, multi-species stand configurations which would accelerate the development of suitable northern spotted owl habitat

characteristics by up to 20 years. The increase in vegetative diversity, structural heterogeneity and fine scale variation would promote development of high quality dispersal and suitable habitat. Treated dispersal habitat would develop into suitable habitat as canopy closure surpasses 60 percent.

Variable density thinning and gap creation would also foster understory development, including establishment of grasses, forbs, shrubs and hardwoods that would persist for up to 20 years as a result of increased sunlight, and a longer period of time until full canopy closure is reached again. This would accentuate habitat conditions by increasing tree growth, crown development, understory flower and fruit production for prey species, maintaining more canopy connectivity, woody plant diversity, and spatial variability (Carey in Courtney *et al.* 2004; Carey 1995; Carey 2000).

Variable retention harvest would create retention aggregates interspersed with concentrated harvest with dispersed retention. Canopy closure outside of the retention aggregates would be reduced to 10 to 20 percent. Although important components of suitable habitat (snags, down wood, hardwood, legacy conifers and residual green trees) would be retained, variable retention harvest would create conditions that would not support northern spotted owl use.

In variable retention harvest units, retained habitat components would contribute to future development of suitable habitat; providing the necessary habitat diversity such as multi-layered canopy, large trees and snags. Development of suitable habitat would occur as the stands regenerate. Treated areas would begin functioning as dispersal habitat in approximately 40 years. Suitable habitat would develop in approximately 60-80 years.

Variable retention harvest would create larger openings where northern spotted owls moving through the stands would be subject to a greater risk of predation from other raptors until the replacement stands begin to function as dispersal habitat in approximately 40 years.

Road construction outside of harvest units would remove approximately two acres of habitat in nine road segments. Due to the limited opening size created by the constructed roads outside of harvest units, the function of adjacent stands is expected to be maintained. Movement of northern spotted owls through the landscape would continue. Road decommissioning would be beneficial because it would initiate development of suitable habitat on 13 acres.

Road daylighting would modify of up to 55 acres of suitable habitat and 17 acres of dispersal habitat. Function of the roadside habitat for foraging would be reduced but would not inhibit the ability of the northern spotted owl from dispersing across the landscape.

Effects of nesting season disruptions from fuels management would be minimized by using timing restrictions (Chapter Two Project Design Feature D).

*Effects on Northern Spotted Owl and Current Site Occupancy*

Forty-three of the proposed units (1,260 gross acres) overlap 26 northern spotted owl home ranges, 11 core areas, and one nest patch (Table 3-14, *Appendix A - Maps*).

No effects from potential disturbance of nesting birds or their young would be anticipated because seasonal restrictions, described in Chapter Two Project Design Feature D, would be applied where proposed harvest, road management and fuels management activities would occur within applicable disruption thresholds.

Ten of the 26 home ranges are above the suitable habitat threshold considered important to maintain life functions for the spotted owl (Table 3-13). Post-harvest, these home ranges would continue to support occupancy and provide habitat for the northern spotted owl. The suitable habitat viability status of the home ranges would not change.

Five spotted owl sites below the minimum suitable habitat threshold at the home range scale would have treatment in suitable habitat. Two harvest units (29-4-13B, 29-3-3A) would remove suitable habitat, affecting four home ranges (Table 3-18). Suitable habitat removed by variable retention harvest would be entirely outside of the nest patches and core areas. Thinning in suitable habitat would modify three home ranges, but the function of the suitable habitat would be maintained because at least 60 percent canopy cover would be retained and treatments are designed to improve long-term habitat quality. Implementation of proposed activities would not change the viability status of any home ranges. In the two home ranges with recent occupancy, owls may avoid treated areas but use of these home ranges is expected to continue. Federal ownership in two home ranges is insufficient to achieve the suitable habitat viability threshold on federal land (Table 3-19).

**Table 3-18: Suitable Habitat Treated in Home Ranges below the Suitable Habitat Viability Threshold**

| Unit | Critical Habitat Treated | Alt. 2 Prescription[1] | Alt. 3 Prescription[1] | Home Range | Acres Treated within Home Range (outside of Core Area and Nest Patch) |
|---|---|---|---|---|---|
| 28-3-32B | Yes | VDT | VDT | 0293A | 21 |
| | | | | 4589O | 21 |
| 29-3-3A | Yes | VRH | CT | 1363B | 1 |
| | | | | 4589O | 46 |
| 29-3-5A | No | VDT | CT | 1363B | 21 |
| 29-4-13B | No | VRH | CT | 0362B | 17 |
| | | | | 3097D | 17 |

[1]CT = Uniform Commercial Thinning; VDT = Variable Density Thinning; VRH = Variable Retention Harvest

**Table 3-19: Federal Ownership and Recent Occupancy in Home Ranges below Suitable Habitat Viability Threshold**

| Home Range | BLM Ownership (%) | Non-Federal Ownership (%) | Recent Occupancy Summary |
|---|---|---|---|
| 0293A | 57 | 43 | Unoccupied 2010-2013 |
| 0362B | 34 | 66 | Unoccupied 2012; Pair 2013 |
| 1363B | 33 | 67 | Unoccupied 2012-2013 |
| 3097D | 46 | 54 | Unoccupied 2012-2013 |
| 4589O | 82 | 18 | Single 2012; Pair 2013 |

Seven of the eleven **core areas** affected by thinning are below the 50 percent suitable habitat threshold (Tables 3-13). Thinning would improve long-term habitat quality of suitable habitat by promoting development of large trees and multiple canopies. Although dispersal habitat function would be maintained, thinning 217 gross acres of dispersal habitat within these seven core areas would temporarily reduce habitat quality in areas that are currently insufficient to assure the successful survival and reproduction of the northern spotted owl at these sites. Northern spotted owls using sites below the threshold would be most vulnerable to the effects from thinning described above.

To reduce the potential effects of thinning within northern spotted owl core areas, at least 60 percent canopy cover would be retained in ten units of dispersal habitat, as described in Chapter Two (pp. 21 and 22) and displayed in Table 3-20.

Thinning dispersal habitat in the core area of four sites currently above the core area threshold would not alter the viability of the home ranges because the amount of suitable habitat would remain unchanged and the function of treated dispersal habitat would be maintained.

Modification of dispersal habitat within a nest patch would impair its ability to contribute the amount and quality of habitat necessary to meet the nesting and reproduction requirements of the northern spotted owl (USDI/FWS et al. 2008). To accelerate development of suitable habitat, 14 acres of dispersal habitat would be modified by uniform commercial thinning (Unit 28-3-17B) within the nest patch of site number 0292O. Canopy cover in Unit 28-3-17B would remain above 60 percent, as described in Chapter Two (p. 21), which would maintain habitat function.

Variable retention harvest Unit 28-2-32A overlaps the core area of site number 2291O, which has been occupied with a single bird since 2009. One acre of suitable habitat would be removed in the site which has suitable habitat above viability thresholds in both the core area and home range (Table 3-13, Table 3-20). The viability status of the site would not change.

Variable retention harvest Unit 29-4-11C overlaps the core area of site number 0362B, which was occupied by a pair of owls in 2013. Seven acres of dispersal habitat would be removed in the site which is below the core area and home range suitable habitat thresholds (Table 3-13, Table 3-20). The viability status of the site would not change.

**Table 3-20: Proposed Treatments Within Northern Spotted Owl Core Areas[1, 2]**

| Northern Spotted Owl Site | Unit | Northern Spotted Owl Habitat | Gross Acres of Treatment Within the Core Area | Alternative 2 Upland Treatment[3] | Alternative 3 Upland Treatment[3] | Minimum Canopy Cover (%) |
|---|---|---|---|---|---|---|
| 0292O | 28-3-17B | Dispersal | 14 | CT | CT | 60 |
| | 28-3-20A | Dispersal | 9 | VDT | VDT | 40 |
| 0293A | 29-3-05A | Dispersal | 2 | VDT | CT | 60 |
| | 28-3-31B | Dispersal | 23 | CT | CT | 70 |
| 0294C | 28-4-25B | Dispersal | 37 | CT | CT | 40 |
| | 28-4-25C | Dispersal | 2 | CT | CT | 40 |
| 0295O | 29-2-08A | Dispersal | 9 | CT | CT | 40 |
| | 29-2-08B | Dispersal | 20 | VDT | VDT | 40 |
| 0362A | 29-4-03A | Dispersal | 32 | CT | CT | 70 |
| 0362B | 29-4-11A | Dispersal | 23 | VDT | VDT | 60 |
| | 29-4-11B | Dispersal | 17 | CT | CT | 60 |
| | 29-4-11C | Dispersal | 7 | VRH | CT | 40* |
| 1363B | 29-3-09C | Dispersal | 17 | VDT | VDT | 60 |
| | 29-3-09D | Dispersal | 24 | VDT | VDT | 60 |
| 1811O | 28-3-28A | Dispersal | 1 | CT | CT | 40 |
| | 28-3-28B | Dispersal | 25 | CT | CT | 40 |
| | 28-3-28C | Dispersal | 4 | VDT | VDT | 60 |
| | 28-3-29A | Dispersal | 4 | CT | CT | 40 |
| | 28-3-32B | Suitable | 6 | VDT | VDT | 60 |
| | 28-3-32C | Dispersal | 1 | VDT | VDT | 40 |
| 2291O | 28-2-32A | Suitable | 1 | VRH | VDT | 40* |
| 2381O | 28-3-26A | Dispersal | 14 | VDT | VDT | 40 |
| 4589O | 28-3-33A | Dispersal | 17 | CT | CT | 40 |

[1] Gray shading indicates sites that are above the core area suitable habitat viability threshold (250 acres).
[2] Occupancy information is displayed in Table 3-13.
[3] CT = Uniform Commercial Thinning; VDT = Variable Density Thinning; VRH = Variable Retention Harvest
* Alternative Three only

*Effects on Northern Spotted Owl Prey Species*

Harvesting activities would initially reduce the cover of shrubs and herbaceous vegetation in units where it exists, but cover and plant diversity would increase post-thinning to levels exceeding those in existence pre-treatment (Chan *et al.*, 2006; Bailey and Tappeiner 1998).

Harvest operations would initially reduce habitat quantity and quality for prey species and may harm individuals. Flying squirrels are known to decline as a result of removing snags and tree cover (Wilson 2008). Retained habitat components important for flying squirrels would aid in population restoration in treated units, benefiting northern spotted owl in the long-term, although snags would be removed due to breakage during harvest and to address safety concerns. Thinning may benefit northern flying squirrel populations by accelerating the growth of large diameter trees, with full crowns and bole cavities that provide dens for nesting.

Other prey species would benefit from a rapid increase in understory development resulting from proposed treatments (Carey 2001, Carey and Wilson 2001). Many prey species like brush rabbits, woodrats, and other rodents that are found in early- and mid-seral forest habitat (Maser *et al.*, 1981; Sakai and Noon, 1993; Carey *et al.*, 1999) are expected to increase post-harvest in response to increased understory and shrub development, benefiting the northern spotted owl. Thinning would create habitat, most notably in the gaps created by variable density thinning, which would benefit prey species associated with early-successional habitats; increasing abundance of these prey species would benefit northern spotted owls.

Variable retention harvest would remove 334 upland acres of flying squirrel habitat, reducing the flying squirrel prey base for the northern spotted owl. Retention aggregates and adjoining stands would continue to provide habitat and the flying squirrel prey base.

For species like brush rabbits, woodrats, and other rodents that are found in early- and mid-seral forest habitat (Maser *et al.*, 1981; Sakai and Noon, 1993; Carey *et al.*, 1999), populations would be expected to increase from the creation of 334 upland acres of early-successional habitat with diverse communities of flowering and fruiting shrubs, herbs and grasses that would provide cover and abundant forage for northern spotted owl prey species, hence benefitting the owl.

Road daylighting would modify of up to 53 acres of suitable habitat and 15 acres of dispersal habitat. Function of the roadside habitat for foraging would be reduced. Northern spotted owls would continue to disperse across the landscape.

*Effects on Northern Spotted Owl 2012 Critical Habitat*

Thirty-two proposed units (893 gross acres) are within the northern spotted owl critical habitat (Table 2-1), designated to protect and develop primary constituent habitat elements, including suitable and dispersal habitats.

Within critical habitat, uniform commercial thinning would modify 191 acres of dispersal habitat (Table 3-21). Canopy cover would remain above 40 percent, thus maintaining habitat function and providing for northern spotted owl movement between the western Cascades, coastal Oregon, and the Klamath Mountains.

Within critical habitat, variable density thinning would modify 481 acres of dispersal habitat and 69 acres of suitable habitat (Table 3-21). Variable density thinning would accelerate development of nesting habitat and hardwoods that would support prey populations. Until canopy closure, created gaps would be large enough to allow growth of grass, forbs and shrubs used by prey species. Northern spotted owls may initially reduce use of thinned stands, but thinning would maintain habitat function and the critical habitat unit would continue to facilitate northern spotted owl movements between the western Cascades and coastal Oregon and the Klamath Mountains.

Variable retention harvest would remove 76 acres of dispersal habitat and 76 acres of suitable habitat within northern spotted owl critical habitat (Table 3-21). Federally-administered lands would continue to provide for dispersal and connectivity between critical habitat subunits. The BLM will consult with the U.S. Fish and Wildlife Service to ensure the function of KLE-2 would not be impaired by proposed actions.

**Table 3-21: Activities in Northern Spotted Owl Dispersal and Suitable Habitat in Critical Habitat**

| Treatment in Critical Habitat | Northern Spotted Owl Habitat | Alternative 1 (acres) | Alternative 2 (acres) | Alternative 3 (acres) |
|---|---|---|---|---|
| Uniform Commercial Thinning | Dispersal<br>Suitable | 0<br>0 | 191<br>0 | 228<br>67 |
| Variable Density Thinning | Dispersal<br>Suitable | 0<br>0 | 481<br>69 | 520<br>78 |
| Variable Retention Harvest | Dispersal<br>Suitable | 0<br>0 | 76<br>76 | 0<br>0 |
| Road Construction (Total) | Dispersal<br>Suitable | 0<br>0 | 3<br>2 | 3<br>2 |
| Road Construction Outside of Harvest Units | Dispersal<br>Suitable | 0<br>0 | 1<br>1 | 1<br>1 |

*2011 Recovery Plan*

The project and its effects would be consistent with the 2011 Northern Spotted Owl Recovery Plan recommendations to implement disturbance-based management within the range of the northern spotted owl with the goal of maintaining or restoring forest ecosystem structure, composition, and processes so they are sustainable under current and future climate conditions (USDI/FWS 2011a, p. III-13). It is also consistent with the Recovery Plan recommendations for the application of ecological forestry principles (USDI/FWS 2011a, pp. III 11-14 and 19).

Forest structural complexity in treated areas would develop at a faster rate than if left untreated. Variable density thinning would accelerate development of nesting habitat and create gaps large enough to allow growth of grass, forbs, shrubs, and hardwoods that would support prey populations.

## b. Bureau Sensitive Species

### Peregrine Falcon

Harvest-related noise would not directly impact the peregrine falcons because the topography and forest canopy between the units and the peregrine site would mitigate the noise and hide the harvest activity from direct view by the peregrines. The peregrine site would continue to be occupied and peregrine feeding, breeding or nesting behavior is expected to be unchanged (Fyfe and Olendorff 1976; Olsen and Olsen 1978; 1982 Pacific Coast American Peregrine Falcon Recovery Team). Similar harvest projects in similar locations and distances have not prevented the peregrine from using the site since its discovery in 1995.

Forty-one acres of forest would be altered within two miles of the known peregrine falcon site. Variable density thinning in Unit 28-2-31A (26 acres) would create habitat for prey species but for a shorter time than variable retention harvest in Unit 28-3-36A (15 acres). Variable retention harvest would create early successional conditions that would increase habitat for prey bird species in the vicinity of the peregrine site. Increased use of the open areas or movement through open areas by jays, ravens, woodpeckers would contribute to the available peregrine prey base.

### Fringed Myotis, Pacific Pallid Bat, and Townsend's Big-eared Bat

Thinning modifies forest stands by 1) increasing the openness of the forest stands such that interior portions of the thinning stands would be available for foraging and 2) retaining large remnant trees and suitable snags that would provide roosting habitat. Variable density thinning would promote development of early-successional plant communities in gaps and edge habitat that support greater insect populations which would increase prey for foraging bats.

Variable retention harvest would remove 334 upland acres of roosting habitat but would create the same amount of foraging habitat in the open, dispersed retention areas. The variable retention harvest treatment would create edge habitat coupled with early-successional conditions dominated by flowering shrubs, forbs and herbs, and sprouting hardwoods that would support greater insect populations on which bats feed. Larger trees in dispersed and aggregate retention areas would, over time, develop deeply fissured bark or die and become snags which would contribute to roosting habitat.

Road construction would remove potential roosting habitat along 14 acres of habitat in stands greater than 80 years old but would also contribute to edge habitat and open foraging habitat. Road construction through younger stands would also increase available edge and gaps in the proposed units and result in more foraging areas for bats.

## c. Survey and Manage

### Great Gray Owl

Timber harvest would not disturb the known great gray owls at one known site nor affect the site by removing or modifying suitable habitat near the known historic nest site because the closest units (29-4-13A and 29-4-15B) are over 1.5 miles away. Any new nest locations would be protected as described in Chapter 2 Project Design Feature E, so that effects to those sites would be eliminated.

Thinning would modify 153 acres of potential great gray owl nesting habitat. Initially, great gray owls may avoid thinned areas but the retention of remnant trees and large snags would contribute to improving habitat conditions and habitat recovery in 15-20 years. Retained trees and snags may potentially develop into nest trees. Thinning in the vicinity of existing opening would increase foraging habitat.

Variable retention harvest would remove potential nesting trees on approximately 33 acres (Unit 28-4-29A) of suitable great gray owl nesting habitat while creating foraging habitat until canopy closure occurs. The retention of the largest trees and dispersed aggregates would provide for roosting and foraging during the early successional stages after harvest.

Units 28-4-9A, 28-4-9B, 28-4-10A and 28-4-10B (177 acres) do not qualify as great gray owl habitat requiring protocol surveys because they are not within 600 feet of a natural meadow that is greater than 10 acres in size. However, these forest stands form a large block of habitat with an open understory, remnant trees, large down wood and roosting opportunities. For these reasons these stands may be used by great gray owls. Thinning would modify this habitat, but would maintain foraging and roosting opportunities and retention of the largest trees and snags would maintain potential nesting structures.

### Red Tree Vole

Block 1: Under both action alternatives, variable density thinning would modify approximately 204 acres of high quality RTV habitat in Block 1. Post-treatment, approximately 49 acres of high quality RTV habitat would remain in the western third of the block. "Skips" in VDT units would be approximately 0.25 acres, approximately the home range size of RTVs and may support RTVs post-harvest. Modified habitat would be considered high quality habitat in approximately 20 year or when 60 percent tree canopy cover is reestablished. Variable density thinning, outside of the skipped areas, would not be considered high quality RTV habitat post-harvest, but, in the short-term, may support lower levels of RTVs than prior to treatment. Retained "skips" and "no-treatment" areas in Riparian Reserves may support RTVs in treated areas. Active nest trees would be retained as much as practicable.

Block 2: Under Alternative Two, application of variable retention harvest would remove approximately 29 acres (11 percent) of high quality RTV habitat in Block 2 and variable density thinning in Riparian Reserves would modify approximately four acres (1 percent) of high quality RTV habitat within the block. Two hundred and forty acres (43 percent) of high quality RTV habitat in the block would be maintained west and east of Unit 28-4-17B. An untreated area on the east side of the unit would maintain connectivity to adjacent federal land; connectivity to the west and southwest would not be affected. Post-harvest, areas where VRH is applied would not be considered suitable RTV habitat until 60 percent canopy cover is re-established in approximately 40 years. Aggregate retention areas in the VRH unit would be one half acre or larger which would maintain the home range of RTVs using the active nest trees in the aggregate. However, RTVs would be vulnerable to predation in the concentrated harvest area. Retained aggregates and dispersed retention trees would provide important nesting habitat structures in future habitat. Active nest trees would be retained in aggregates and as dispersed retention trees as much as practicable. In the short-term, Riparian Reserves would not provide high quality habitat, but may continue to support lower levels of RTVs post-treatment and "no-treatment" areas would continue to provide connectivity to adjacent high quality habitat. High quality habitat in treated Riparian Reserves would be restored in approximately 20 years.

Under Alternative Three, high quality habitat in Unit 28-4-17B would be modified by uniform commercial thinning (29 acres) in the uplands portion of the unit and variable density thinning (4 acres) in the Riparian Reserve. Uniform commercial thinning would maintain canopy cover sufficient to provide high quality habitat post-treatment. Harvest operations may cause a reduction in the RTV use of the treated area, but retention of active nest trees and maintaining canopy cover over 60 percent would support continued RTV use. The effects of VDT in Riparian Reserves would be as described above.

Block 3: Uniform commercial thinning under both action alternatives would modify 92 acres of highly suitable RTV habitat and variable density thinning in Riparian Reserves would modify 11 acres of highly suitable RTV habitat (Figures 5 and 8). Uniform commercial thinning would maintain high quality habitat because canopy closure would be at least 60 percent post-treatment. There would be two patches of high quality RTV habitat unaffected on each side of the unit (Figures 5 and 8). The effects of CT and VDT would be as described above.

## Red Tree Vole Non-High Priority Site Designation Evaluation Summary

Appendix F includes the non-high priority site designation evaluation, which is summarized below.

To fulfill the Survey and Manage requirement for red tree voles, the forest habitat in the planned timber sale units has been evaluated against the requirements of the "Criteria for determining the need for pre-disturbance surveys" (USDA/FS-USDI/BLM. 2011d, pp. 14-16). Six proposed harvest units meet the pre-disturbance survey requirements (EA, p. 69). The ground transects and tree climbing components of the pre-disturbance survey protocol were completed in 2015 and 18 active RTV sites were identified. The sites were evaluated to determine if they are necessary for the persistence of the RTVs.

The analysis non-high priority site designation evaluation determined that all four evaluation criteria used to identify sites as non-high priority have been met:

1. Based on the amount of high quality RTV habitat within the analysis area (6,735 acres) and the overall high likelihood of it being occupied (86 percent) there is a moderate-high number of likely extant sites in the analysis area. Completed surveys and database analyses validate this conclusion.
2. After considering the very modest (0.3 percent) amount of the Roseburg District landbase that has been harvested annually for the past two decades, the abundance of highly suitable habitat on BLM-administered lands, and BLM efforts to recover the northern spotted owl, there is little doubt that existing suitable RTV habitat in the analysis area (and the District) will remain available, well-distributed, and occupied.
3. The distribution of high quality RTV habitat on BLM-administered lands and the connectivity habitat on non-federal lands throughout the analysis area provide habitat connectivity that allows RTVs to disperse throughout this landscape because RTV habitat is well distributed.
4. Approximately 70 percent of the analysis area (ACEC, KOAC, RR, OG) is either reserved from timber harvest, or being managed to retain and develop late-successional forests. The proposed action would affect 18 known sites out of hundreds to thousands of estimated active RTV sites in the analysis area and would not diminish the likelihood of RTV persistence in the analysis area.

In conclusion, the BLM would designate 18 active RTV sites as non-high priority sites and conduct proposed harvest treatments in stands where the sites are located. The site management proposal is included in Appendix F. Required concurrence with the U.S. Forest Service and the U.S. Fish and Wildlife Service will be completed prior to any decisions that may use non-high priority site designation.

### Chace Sideband Snail, Crater Lake Tightcoil Snail and Oregon Shoulderband Snail

Uniform commercial thinning and variable density thinning would change microclimate and habitat conditions in potential mollusk habitat. Stands less than 80 years old would benefit from thinning which would promote development of late seral conditions important to mollusk habitat (large diameter down wood, hardwood development, overstory/understory species diversity, etc.). Gaps in variable density thinning units would modify habitat conditions but the release of hardwood components, where present, would be a long-term benefit to these snails.

Variable retention harvest in upland areas of stands at least 80 years old (61 acres) would change microclimate conditions and disturb habitat features (down wood, and other refugia). Road construction in stand at least 80 years old would remove approximately 14 acres of habitat.

Habitat (rock talus, down woody debris, or both) would be identified and searched during surveys which are scheduled in 2014 and 2015. Occupied sites would be protected as described in Chapter Two, Project Design Feature E. Retention areas around known sites and the untreated areas in Riparian Reserves would provide for persistence of these species and serve as a source population for re-colonization of thinned areas.

## d. Land Birds

### "Birds of Conservation Concern"

#### *Purple finch*

Thinning would not prevent this species from using the forest stands. Hagar (1999) observed purple finch only in logged riparian habitats in her Oregon Coast study. Later, Hager et al. (2004) noted a neutral response to thinning and that the species would generally benefit from more open canopy and associated increase in shrub growth. Thinning (1,534 acres) would modify habitat for the purple finch and the release of hardwoods and increase in the numbers and diversity of plant species as a result of opening the stand would improve the habitat.

Variable retention harvest would occur in habitats generally unsuited for purple finch. Based on Hager et al. (2004) findings, the purple finch would be expected to use the aggregate areas, riparian areas, and retention trees within variable retention harvest units that have open canopy and increased shrub growth. Variable retention harvest areas would become suitable habitat when conifer trees are in the sapling to pole size classes.

### Partners In Flight "Focal Species"

#### *Pacific Wren (aka. Winter Wren)*

Hagar et al. (1996) found Pacific wren was more abundant in thinned stands in the Oregon Coast Range during the breeding and winter seasons because the abundance of hardwoods was greater in thinned stands and Hayes et al. (2003) showed Pacific wren numbers did not change in response to thinning. Altman (1999) recommends thinning to enhance growth of understory vegetation that would benefit this species.

All thinning (1,534 acres) may disrupt Pacific wrens during harvest but Pacific wrens would continue to use thinned habitats where canopy closure and shrubs, rootwads, down logs, ferns, and herbaceous vegetation remain (Altman 1999). Chapter Two describes legacy trees, snags and large down wood retention (p. 23) would occur in all thinned areas as well as canopy closure remaining in thinned areas (pp. 21-22) that would help maintain suitable conditions.

The open areas created by variable retention harvest and road construction would not be suited to Pacific wren use as they would not provide complex understory conditions noted by Altman (1999). These areas would remain unsuitable for up to 30 years until reestablishment of canopy cover and understory vegetation. In the interim, the Pacific wren would utilize retention aggregates, adjacent riparian areas and other untreated habitat for nesting and foraging.

#### *Hermit Warbler*

Hayes et al. (2003) found this warbler declines in response to thinning. Hagar et al. (1996, 2009) found there response to thinning to be neutral, reporting densities of hermit warblers declined in the initial years after thinning but increased to pre-treatment levels seven to eight years after treatment; similar results would be expected in the analysis area. Gaps created in variable density thinning units would impact this species more than uniformly thinned areas, but overall hermit warbler would be expected to continue using the thinned units after treatment.

Dillingham *et al*. (2008) demonstrated almost complete reduction in hermit warbler numbers after regeneration harvest. The open areas created by variable retention harvest (334 upland acres) and road construction would not be suited to hermit warbler use as they would not provide the conditions of dense forest canopy favored by the species. Retention aggregates and adjacent riparian areas would continue to provide some level of habitat.

### *Golden Eagle*

Treatment is proposed in ten units (28-4-9A, 28-4-9B, 28-4-10A, 28-4-10B, 28-4-17A, 28-4-17B, 28-4-19A, 28-4-19B, 28-4-29A, 28-5-27A; 551 acres) having conifer trees and large hardwood trees with adequate limb structure suitable for golden eagle nesting with nearby foraging habitat provided by large open grassland and agricultural areas. Evidence of golden eagle use was observed in Units 28-4-9A, 28-4-9B, 28-4-10A and 28-4-10B and a search of the stands for nest structures is planned prior to harvest. If any nest trees are located they would be protected as described in Chapter Two Project Design Feature E.

Thinning in Unit 28-5-27A would modify potential nesting habitat within a known golden eagle territory. Topography visually separates the known nest site from proposed activities in the unit which is approximately 0.8 miles from the nest site. Considering these factors, nesting birds would not be disturbed by harvest activities.

Thinning (428 acres) in potential nesting habitat would reduce habitat quality through reduction of canopy cover, but retained trees would be potential nest trees and roosting habitat. Thinning would promote growth of trees with large limbs that could provide nest structures in the future.

Thinning would promote development of potential nest trees and roosting habitat for golden eagles. Variable density thinning treatments (634 acres) would be more beneficial than uniform thinning (624 acres) because it would promote growth of large trees with large limbs by releasing many trees with gaps and variable spacing that could provide nest structures in the future.

Variable retention harvest in Units 28-4-17B and 28-4-29A would remove approximately 62 acres of suitable nesting habitat. Golden eagles are unlikely to use these stands for nesting after treatment but aggregate and dispersed retention areas would be suitable for roosting and concentrated harvest areas would provide foraging habitat.

## 3. Alternative Three

The effects of uniform commercial thinning (782 acres) and variable density thinning (1,086 acres) under Alternative Three on all wildlife species described in the Affected Environment would be commensurate with the effects for thinning that were described in Alternative Two.

### a. Threatened and Endangered Species

#### Northern Spotted Owl

*Effects on Northern Spotted Owl Habitat*

Implementation of Alternative Three would include thinning 1,199 acres of dispersal habitat and 669 acres of suitable habitat (Table 3-16) and the effects of thinning in northern spotted owl habitat would be as described under Alternative Two.

Canopy cover would remain above 50 percent on 873 treated acres and use by northern spotted owls is expected to continue. Post-harvest canopy cover would be below 50 percent on 995 acres. Northern spotted owls may shift use to untreated areas, expand home range size, reduce use of thinned areas, or shift foraging or roosting locations (Meiman et al. 2003).

All thinning in dispersal habitat would maintain at least 40 percent canopy cover, thus maintaining habitat function. About 288 acres of suitable habitat would be modified by thinning but habitat function would be maintained by retaining at least 60 percent canopy cover. Thinning would downgrade 381 acres of suitable habitat to dispersal habitat.

The effects of Road construction and road daylighting would be the same under both of the action alternatives.

*Effects on Northern Spotted Owl and Current Site Occupancy*

Similar to Alternative Two, 43 units (1,260 gross acres) overlap 26 northern spotted owl home ranges. Timing restrictions described in Chapter Two Project Design Feature D would be applied to eliminate effects of timber harvest, road construction and fuels management from potential disturbance to nesting birds and their young.

Alternative Three would not change the viability status of any of the 26 affected home ranges. Thinning is proposed in suitable habitat in five home ranges that are below the suitable habitat viability threshold (Table 3-18) and is designed to improve future habitat quality. The effects of thinning would be as described in Alternative Two.

This alternative includes 302 gross acres of thinning in dispersal habitat and seven gross acres in suitable habitat within 11 core areas (Table 3-20, Table 3-22).

Alternative Three would enter seven core areas that are below the core area suitable habitat viability threshold and four core areas that are above the suitable habitat viability threshold (Tables 3-13). The viability status of the home ranges would be unchanged. Thinning would temporarily reduce habitat quality in the core areas but sufficient canopy cover would be retained to maintain dispersal habitat function in all but one acre of suitable habitat.

In site No. 2291O, variable density thinning would downgrade 1 acre (28-2-32A) of suitable habitat because canopy cover would be reduced below 60 percent. Suitable habitat in the site is above the core area viability threshold (Table 3-20) and the site would continue to support owls.

To accelerate development of suitable habitat, Alternative Three would thin 14 acres (Unit 28-3-17B) within the nest patch and 9 acres (Unit 28-3-20A) in the core area of owl site No. 02920 which is below the core area viability threshold for suitable habitat. Canopy cover in Unit 28-3-17B would remain above 60 percent, as described in Chapter Two (p. 21), which would maintain dispersal habitat function.

**Table 3-22: Activities in Northern Spotted Owl Suitable and Dispersal Habitat in Core Areas**

| Treatment in Core Areas | Northern Spotted Owl Habitat | Alternative One (Gross Acres) | Alternative Two (Gross Acres) | Alternative Three (Gross Acres) |
|---|---|---|---|---|
| Uniform Commercial Thinning | Dispersal | 0 | 158 | 167 |
| | Suitable | 0 | 0 | 0 |
| Variable Density Thinning | Dispersal | 0 | 137 | 135 |
| | Suitable | 0 | 6 | 7 |
| Variable Retention Harvest | Dispersal | 0 | 7 | 0 |
| | Suitable | 0 | 1 | 0 |
| Road Construction (Total) | Dispersal | 0 | 2 | 2 |
| | Suitable | 0 | <1 | <1 |
| Road Construction Outside of Harvest Units | Dispersal | 0 | <1 | <1 |
| | Suitable | 0 | <1 | <1 |
| Road Daylighting | Dispersal | 0 | 15 | 15 |
| | Suitable | 0 | 53 | 53 |

*Effects on Northern Spotted Owl Prey Species*

The effects of the thinning in Alternative Three would be the same as those described for thinning in Alterative Two. Absent variable retention harvest, early-seral habitat creation would be limited to areas of road construction and gaps created in variable density thinning areas.

*Effects on Northern Spotted Owl 2012 Critical Habitat*

Thirty-two proposed units (893 gross acres) are within the northern spotted owl critical habitat (Table 2-1). Thinning would be applied to 748 acres of dispersal habitat and 145 acres of suitable habitat (Table 3-22). In all thinning units within critical habitat, sufficient canopy cover, 40 percent and 60 percent, respectively, would be retained to maintain habitat function so the critical habitat unit would continue to function as intended. Thinning would promote tree growth and understory development until canopy closure is reestablished. Thinning in dispersal habitat, particularly in variable density thinning units, would promote stand diversity, accelerate development of suitable habitat and increase future habitat quality. Thinning in suitable habitat would promote stand diversity and higher quality habitat.

Although critical habitat would be modified, habitat function would be maintained and Federally-administered lands would continue to provide for dispersal and connectivity between critical habitat subunits.

*2011 Recovery Plan*

As stated in Alternative Two, this alternative would be consistent with the 2011 Northern Spotted Owl Recovery Plan (USDI/FWS 2011a, p. III-13), but would not implement ecological forestry as recommended by the Recovery Plan.

## b. Bureau Sensitive Species

### Peregrine Falcon

Effects on the peregrine falcon would be as described for Alternative Two because treatments in the units nearest to the known aerie would not change between the alternatives.

### Fringed Myotis, Pacific Pallid Bat, and Townsend's Big-eared Bats

Effects on these three bats would be as described for the thinning and road construction components of Alternative Two.

## c. Survey and Manage

### Great Gray Owl

Uniform commercial thinning would modify 186 acres and variable density thinning would modify 15 acres of potential great gray owl nesting habitat. Thinning would retain the larger, dominant trees and accelerate the growth of retained trees providing for the future development of additional potential nesting trees. The opened conditions would also allow for the establishment and development of an understory, albeit for a limited duration, that may provide additional foraging opportunities.

Although great gray owls would avoid thinned areas during implementation, thinning would be beneficial because the largest trees and snags would be retained, potentially developing into nest trees, and the wider tree spacing would increase foraging habitat under the tree canopy until canopy closure occurs.

### Red Tree Vole

Thinning proposed in Alternative Three would modify 339 acres of red tree vole habitat. **The effects of thinning would be as described for Alternative Two.** Pre-disturbance surveys would be conducted in six stands and along one road segment. To ensure persistence of red tree voles, occupied sites would be managed according to the *2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines* (Chapter Two Project Design Feature E)**, which provides options for site protection or non-high priority site designation (USDA/FS-USDI/BLM 2001). The non-high priority site evaluation is addressed in Appendix F.**

### Oregon Shoulderband Snail, Chace Sideband Snail and Crater Lake Tightcoil Snail

Thinning would change microclimate and habitat conditions in potential mollusk habitat. Occupied sites would be protected as described in Chapter Two Project Design Feature E, thus avoiding the creation of conditions (primarily microclimate) that compromise site viability.

## d. Landbirds

### "Birds of Conservation Concern"

#### *Purple finch*

Alternative Three would thin 1,868 acres of potential purple finch habitat. The purple finch would continue to use the thinned areas. Hager et al (2004) noted a neutral response to thinning and that the species would generally benefit from more open tree canopy and associated increase in shrub growth.

### Partners In Flight "Focal Species"

#### *Pacific Wren (aka. Winter Wren)*

Thinning (2,012 acres) may decrease habitat quality and therefore the abundance of Pacific wrens in the short-term but Pacific wrens would continue to use thinned habitats where canopy closure and shrubs, rootwads, down logs, ferns, and herbaceous vegetation remain (Altman 1999).

#### *Hermit Warbler*

As previously stated, Hayes et al. (2003) found this warbler declines in response to thinning but other studies show the response to thinning to be neutral (Hagar et al. 1996 and Hagar et al. 2009). Hagar et al. (1996, 2009) found densities of hermit warblers declined in the initial years after thinning but increased to pretreatment levels seven to eight years after treatment; similar results would be expected in the analysis area. Hermit warblers prefer habitats with closed tree canopy so the gaps in variable density thinning units and road construction locations would be avoided, but overall hermit warbler would continue to use the thinned units after treatment. Road construction would remove suitable habitat.

#### *Golden Eagle*

Thinning in unit 28-5-27A would modify potential nesting habitat within a known golden eagle territory but nesting birds would not be disturbed because topography and distance (0.8 miles) separate the nest site from the unit.

Thinning (490 acres) in potential nesting habitat would reduce habitat quality through reduction of canopy cover.

Variable density thinning (634 acres) in stands less than 80 years old would promote growth of large trees with large limbs by releasing many trees with gaps and variable spacing that would result in future suitable golden eagle nesting structures in units other than the units above.

# III. Fish, Aquatic Habitat and Water Resources _____

## A. Affected Environment

The Myrtle Creek analysis area lies within the Days Creek, Upper Deer Creek, Roberts Creek, Upper and Lower South Myrtle Creek, and Upper and Lower North Myrtle Creek 12th field sub-watersheds. Unless otherwise noted, the scale specific to this aquatic resource analysis includes a subset of the previously listed hydrologic units (HUC) which total 77,294 acres. Table 3-23 identifies these 14th field hydrologic units in the analysis area used in the aquatic resources analysis. The HUC 14 scale was considered for aquatic resources because effects to fish, aquatic habitat, and water resources from the proposed actions would not be expected beyond this geographic scale.

**Table 3-23: Hydrologic Units within the Aquatics Resource Analysis Area**

| Watershed (HUC 10) | Drainage (HUC 14) | HUC 14 acres |
|---|---|---|
| Deer Creek-South Umpqua River | Upper South Fork Deer Creek | 7,542 |
| | Middle Fork South Fork Deer Creek | 4,509 |
| | Lower South Fork Deer Creek | 7,871 |
| | Upper Roberts Creek | 6,260 |
| Myrtle Creek | Headwaters South Myrtle Creek | 3,382 |
| | Upper South Myrtle Creek | 3,217 |
| | Lally Creek | 894 |
| | Weaver Creek | 3,972 |
| | Letitia Creek | 2,285 |
| | Long Wiley Creek | 1,532 |
| | Short Wiley Creek | 1,833 |
| | Lower Louis Creek | 2,169 |
| | Upper Louis Creek | 3,473 |
| | Ben Branch | 1,173 |
| | Lower Slide Creek | 1,783 |
| | Upper Slide Creek | 1,145 |
| | Riser Creek | 2,002 |
| | Curtin Creek | 1,801 |
| | Buck Fork Creek | 2,986 |
| | Lee Creek | 3,854 |
| | Frozen Creek | 4,596 |
| Days Creek-South Umpqua River | Middle Days Creek | 3,817 |
| | Upper Days Creek | 5,198 |

### 1. Fish Species

A variety of anadromous (sea run) fish are found within the analysis area, including Oregon Coast Chinook salmon (*Oncorhynchus tshawytscha*), Oregon Coast coho salmon (*O. kisutch*), Oregon Coast steelhead trout (*O. mykiss*), coastal cutthroat trout (*O. clarki clarki*), and Pacific lamprey (*Lampetra tridentata*). In addition, a variety of non-anadromous (resident) fish are also found within the analysis area, including resident rainbow and cutthroat trout (*O. mykiss and O. clarki clarki*), sculpin (*Cottus sp.*) and brook lamprey (*Lampetra richardsoni*).

### a. Federally Threatened Fish Species

In February 2008 the National Marine Fisheries Service listed the Oregon Coast coho salmon evolutionary significant unit as threatened under the Endangered Species Act. This included the designation of critical habitat for Oregon Coast coho salmon (Federal Register 2008). The Oregon Coast coho salmon is the only fish species on the Roseburg District currently listed under the Endangered Species Act. The fish-bearing portions of Myrtle Creek, Days Creek-South Umpqua and Deer Creek-South Umpqua watersheds within the analysis area are considered to be critical habitat and are occupied by Oregon Coast coho salmon (*Appendix A – Maps*).

### b. Bureau Sensitive Fish Species

Umpqua chub (*Oregonichthys kalawatseti*) and Oregon Coast coho salmon (described above) are Bureau Sensitive Species present on the Roseburg District. Umpqua chub are predominantly found in larger order streams and rivers throughout the Umpqua River basin, but are not known to inhabit water bodies of the analysis area (Markle *et al.* 1991). However, Umpqua chub have been found in the mainstem South Umpqua River adjacent and downstream of the analysis area.

## 2. Aquatic Habitat, Oregon Coast Coho Critical Habitat, and Essential Fish Habitat

### a. Sediment and Substrate

The availability of quality spawning substrate, characterized by gravel and small cobbles relatively free from embedded sediment, is important to resident and anadromous salmonid productivity. Spawning habitat suitability varies with the amount, size and quality of substrate (Kondolf 2000). Fine sediment can fill interstitial spaces within redds increasing the possibility of embryo suffocation, entombment, and disease (Chapman 1988). The accumulation of fine sediment can also reduce availability of macroinvertebrates which may influence salmonid growth and survival (Suttle *et al*. 2004). Suspended fine sediment in the water column can affect visibility, foraging ability and breathing capacity in fish (Waters 1995).

Fish-bearing streams adjacent to proposed units typically consist of moderate to higher gradient reaches (about 4-8 percent) with substrate dominated by cobble and gravel. Because Oregon Coast coho salmon typically occupy lower gradient stream reaches, the streams in the project area typically support lower abundances of coho salmon than those reaches lower in the watershed. Of the moderate and higher gradient reaches, some finer sediment is present but does not appear to reduce the quality and quantity of spawning habitat for steelhead or resident cutthroat trout. Low gradient (less than four percent) depositional reaches have higher accumulations of sand and silt because of reduced water velocities that allow sediment to fall out of the water column. Within these low gradient reaches suitable spawning habitat is typically limited to riffle habitat which is largely free of fine sediment.

Rock Creek flows adjacent to BLM Road No. 29-5-11.0, and in one location is undercutting the road during high flows, creating a direct source of fine sediment to the stream.

## b. In-stream Functional Wood Recruitment

Large woody debris plays an important role in stream morphology. In headwater streams it can capture and store sediment, control channel morphology, form deep scour pools and retain gravel substrate (Bilby and Ward 1989). In higher order fish-bearing streams, wood captures and retains gravel substrates suitable for spawning and creates backwater and pool habitat during a range of stream flows (May and Gresswell 2003).

Wood can be delivered to streams by mass wasting and bank erosion, or from episodic events like landslides and blow-down (Hassan *et al*. 2005). Adjacent riparian stands and hill slopes in steeper, confined valleys astride headwater streams contribute greater amounts of large wood (Reeves *et al*. 2003). Absent large episodic debris flows, wood is retained for longer periods of time in headwater streams (May and Gresswell 2003). Large wood breaks down or is transported out of mainstem reaches over time and, absent a source of future recruitment of large wood from riparian stands, larger fish-bearing reaches may become depleted of habitat forming wood.

Small fish-bearing reaches adjacent to units generally had large volumes of small functional wood derived from adjacent stands as alder and small conifers were subject to blow down or mortality and fell toward the streams. Some larger pieces were interacting with the stream channels, but overall there were few pieces capable of trapping and storing gravel and creating deep pool habitat suitable for rearing juvenile fish. In larger fish-bearing reaches, large wood was infrequent.

In the past decade, in-stream habitat restoration involving placement of large wood in stream locations lacking geomorphic complexity has been conducted in reaches of Weaver, Letitia, Slide, Upper Days, Upper Deer, and North and South Myrtle Creeks. Restoration reaches varied in length, but averaged approximately ¾ of a mile by creek, and 50-70 logs were typically distributed at pre-specified locations throughout the reaches.

## c. Pool Habitat

Pools are important rearing habitat for juvenile salmonids, both during low flow months when high stream temperatures stress fish, and during high flow events when off-channel pools provide refuge habitat. Salmonids are generally found in greater densities (Roni 2002) and maintain larger sizes (Rosenfeld *et al*. 2000) in deep pool habitats.

In smaller headwater streams adjacent to many of the proposed harvest units, pool habitat is typically formed by steps and cascades over large wood or boulders. Of the larger order fish-bearing streams, complex pool habitat is generally created by the presence of large wood or channel meanders, both of which are uncommon in the analysis area due to past land uses. A continuum of pool habitat quality exists in which higher quality pools exist in headwater streams, and more simple pools are present in the larger order streams further downstream in the watersheds.

### d. Habitat Access

Access for migrating fish can be restricted at stream crossings where culvert outlet jumps exceed six inches or the outlet pool depth is less than 1.5 times the height of the jump. Adults are capable of jumping in excess of four feet, but upstream migration by juveniles is often prevented. Culverts sized less than bank-full width or installed on gradients over one-half percent can also limit fish passage by accelerating water velocities within pipes (Watershed Professionals Network 1999). Throughout the project watersheds, there are culverts on private and federally-controlled roads that potentially block access by resident fish to historically occupied habitat.

### e. Critical Habitat

As previously discussed, critical habitat for Oregon Coast coho salmon was designated in the final Federal Register notice of the listing of the Oregon Coast coho salmon as threatened. Critical habitat for Oregon Coast coho salmon is coincident with the distribution of Oregon Coast coho salmon previously described (*Appendix A - Maps*).

### f. Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act of 1996 (Federal Register 2002) designated Essential Fish Habitat for fish species of commercial importance. Essential Fish Habitat consists of streams and habitat currently or historically accessible to Oregon Coast Chinook and Oregon Coast coho salmon, and is coincident with critical habitat designated for Oregon Coast coho salmon in the Myrtle Creek, Days Creek, and Deer Creek watersheds. Within these watersheds there are approximately 94 miles of essential fish habitat.

## 3. Water Resources

### a. Water Quality

Within the analysis area, Myrtle Creek, Days Creek and Deer Creek are listed by the Oregon Department of Environmental Quality (ODEQ) on the Clean Water Act 303(d) list (ODEQ 2008) for temperature.

In 2006, the ODEQ completed the Umpqua Basin Total Maximum Daily Load (TMDL) which was approved by the U.S. Environmental Protection Agency (EPA) on April 12, 2007. The streams listed above are part of the Umpqua Basin TMDL. Approved actions within the analysis area include implementation of federal land management activities. Best Management Practices and project design features would be implemented to prevent exceedance of the TMDL.

Beneficial uses of these waters include salmonid spawning and rearing, and utilization by resident fish and other aquatic life. Other beneficial uses include domestic water supply, irrigation, livestock watering, recreation, and storage. There are 22 domestic water rights filed with the Oregon Department of Water Resources located within one mile of areas where timber harvest and road work are proposed.

The nature of road surfacing can affect runoff, drainage and surface erosion, which can subsequently affect water clarity and turbidity levels. The following estimates are based on roads that are currently within the BLM transportation records and may not include un-inventoried roads and/or recently constructed roads on private lands.

The existing road network in the drainages that make up the analysis area is approximately 121 miles in length. Approximately 95.5 miles or 75 percent of the roads are surfaced with rock or asphalt, while the remainder is natural surface. Many roads are overgrown due to a lack of use and maintenance, and while relatively stable, are compacted and subject to drainage and erosion problems.

There are 88 inventoried stream crossings. Each has a potential for sediment delivery to streams depending upon road surface condition and drainage, and the volume of water passing the road at a given time. Road segments linked to the channel network also increase flow routing efficiency and provide a mechanism for peak flow increases (Wemple *et al*. 1996).

Field surveys noted four improperly functioning stream crossings where road integrity is threatened by potential soil saturation and/or erosion on at least a seasonal basis.

### b. Water Quantity

Average annual precipitation in the analysis area ranges between 35 and 73 inches occurring primarily between October and April. Elevation ranges from 572 feet at the mouths of both Myrtle Creeks up to 4,486 feet at the summit of Deadman Mountain. The analysis area is split between a rain dominated hydroregion and a rain-on-snow dominated hydroregion where some transient snow accumulation is expected throughout the wet season.

There are approximately 68 miles of perennial streams and 51 miles of intermittent streams that comprise the stream network. Perennial stream channels pass water throughout the year, including potentially warm water during the months of summer and early autumn. During this same period of time flow ceases in intermittent stream channels and potentially warm water is no longer transported downstream. Most commonly, spatial interruption can be attributed to subsurface flow. When stream flow subsides below the surface it begins a cooling process which can mitigate downstream temperature impacts (Story *et al*. 2003).

Stream flows are dependent upon capture, storage and runoff of precipitation. Timber harvest can alter the amount and timing of peak flows by changing site-level hydrologic processes that include changes in evapotranspiration, snowmelt, canopy interception of water and snow, road interception of surface and subsurface flow and changes in soil infiltration rates and soil structure (2008 FEIS, p. 352). Large canopy openings that are greater than two tree heights across can affect precipitation, snow melt, and peak flows (2008 FEIS, p. 355). None of the subwatersheds in the analysis area are considered susceptible to increases in peak flow stemming from unrecovered canopy openings (2008 FEIS, pp. 755, 757).

As previously described, the existing road network totals approximately 995 miles of the analysis area, with seven percent under BLM control. Average road density in the analysis area is 4.4 miles per square mile. Assuming an average right-of-way width of 40-feet, roads in all ownerships occupy approximately 4,824 acres, or 3.3 percent of the analysis area. Increases in peak flow can occur when roads and other impermeable areas occupy more than 12 percent of a catchment scale watershed (Harr, *et al*. 1975).

# B. Environmental Consequences - Fish, Aquatic Habitat and Water Resources

## 1. Alternative One (No Action)

### a. Fish Species

The No Action Alternative does not propose any timber harvest, nor associated log hauling, road construction, renovation or decommissioning. Absent these activities, there would be no direct effects to aquatic habitat, anadromous and resident fish, critical habitat for the Oregon Coast coho salmon, or Essential Fish Habitat for Oregon Coast Chinook and Oregon Coast coho salmon. However, fish and aquatic habitat would continue to be indirectly affected by existing watershed conditions which are typified by relatively homogeneous, even age stands and riparian areas, closed or nearly closed canopies, as well as simple in-stream conditions. Riparian areas on private lands generally lack shade. Fish would continue to be affected by roads that are not maintained, roads that have inadequate drainage or roads that are unsurfaced which continue to deliver sediment to streams.

### b. Aquatic Habitat, Coho Critical Habitat, and Essential Fish Habitat

Under the No Action alternative, Riparian Reserves would continue to be dominated by dense, single age stands. Individual tree growth rates would continue to decline and suppression mortality would increase. Over time, these areas would be expected to diversify naturally as individual trees or small groups of trees die, and natural processes leading to structural and vegetative diversity continue to occur. These areas would be expected to attain late-seral characteristics over a longer time frame when compared to Alternatives 2 and 3, resulting in more time required for large wood to be recruited to stream channels. Further, due to the relatively high stand densities present over a longer period of time, there is a higher risk of mass tree mortality from large natural disturbance events such as windstorms or fire which could result in the loss of forest canopy that provides primary stream shading. In addition, such relatively dense stands would limit understory vegetative diversity and limit light available to the forest floor, subsequently limiting nutrient availability to adjacent streams (Progar and Moldenke 2009; Danehy et al. 2007).

*Sediment and Substrate*

Under the No Action Alternative, routine road maintenance would occur, but degraded roads responsible for chronic sediment sources such as the slope failure along BLM Road No. 29-5-11.0 would not be repaired.

Because unmaintained roads that are infrequently used or blocked are rarely designated as maintenance priorities, they are vulnerable to storm damage which often results in sediment production, delivery, and deposition in spawning gravels. However, blocked roads are typically not subject to degradation from large vehicle use like maintained roads frequently are.

The overall lack of road maintenance under the No Action Alternative would be most prominent on roads that are infrequently used or blocked, except in cases where drainage structures such as culverts are removed to prevent failure over time. Although typically, as they age, existing roads and drainage structures are subject to ongoing degradation or failure in the event of a storm. Further, fine sediment generated from inadequate road surfacing/shaping as well as blocked or improperly spaced cross-drains would likely continue and suitable substrate for spawning could become embedded by fine sediment.

Road daylighting in Riparian Reserves, but outside of pre-established "no-treatment" areas would not occur under the No Action alternative, thus contamination of the road surface from needles and heavy shading would continue to lower the quality of road surfaces and prevent road surfaces from drying during intermittent storm events. As a result, the risk of sediment transport from these habitually wet roads would be higher than those where the road canopy is reduced as proposed in Alternatives Two and Three.

In general, stands proposed for timber harvest are densely stocked, single aged, and canopies are closed or quickly approaching closure. This is noteworthy because under Alternative One no timber harvest would occur and thus stand conditions would remain relatively dense with limited ground covering herbaceous vegetation. When such vegetation is present, particularly in riparian areas, it has the ability to effectively filter fine sediment generated from roads prior to entrainment in nearby streams (Chamberlin et al. 1991).

*In-stream functional wood*

It is well documented that thinning younger stands results in increased growth in the remaining trees, thereby speeding attainment of larger diameter trees (Boyer et al. 2003; Latham and Tappeiner 2002) that provide in-stream habitat forming wood. The No Action Alternative does not propose timber harvest within Riparian Reserves. As a result, tree growth rates in these areas would continue on their current trajectory; leading to increased suppression mortality and decreasing the rate of diameter growth.

***Small Functional Wood:*** The No Action Alternative would maintain existing stand densities. There would be no reduction in the amount of small functional wood available to enter stream channels in the future.

***Large Wood:*** Based on the trend of increasing density induced mortality and decreasing diameter growth in the Riparian Reserves, the No Action Alternative would result in an increase in the time needed for average stand diameters to attain dimensions sufficient in size to become key pieces of in-stream large wood when compared to the action alternatives that would increase tree growth rates sooner.

Absent key pieces of large wood to form debris jams, smaller pieces would decay and be flushed from the stream system, reducing the capacity of these streams to store spawning gravel and provide pool habitat.

*Pool Habitat*

In general, pools and associated habitat created by small wood would remain relatively simple and unaffected in the short term by the No Action Alternative. Smaller trees and logs would provide temporary pool habitat and slow-water refugia, but it would generally not be deep and complex habitat. This cycle would persist until trees of larger sizes are available that allow for the development of more complex and longer persisting pools and in-stream habitat. In locations where in-stream large wood exists, complex pool habitat is present and would persist for long periods of time.

*Habitat Access*

Absent any road construction or road renovation involving installation of stream crossings, there would be no change in habitat accessibility in the project watersheds.

*Coho Critical Habitat and Essential Fish Habitat*

In the analysis area, coho critical habitat would continue to be indirectly affected by existing watershed conditions and activities on private lands, as would Essential Fish Habitat for coho and Oregon Coast Chinook salmon.

## c. Water Resources

*Water Quality*

Stream temperature in reaches within or adjacent to proposed harvest units would be maintained as these areas are well-shaded by dense stands of conifers and hardwoods. Stream reaches that are currently thermally impaired, principally due to reduction and removal of tree canopy on privately-managed timber and agricultural lands, are likely to remain so.

As existing roads and drainage structures age and are at an increased risk of failure, particularly during major winter rain events, there would be an increased risk of direct inputs of sediment into the stream network, the amount varying with the severity of the rain events, and the condition, stability and proximity of roads or culverts to a stream.

*Water Quantity*

The potential for peak flow effects varies for different stream types (Grant *et al*., 2008). The 2008 Western Oregon Plan Revision Final Environmental Impact Statement (2008 FEIS, p. 758) indicates that high gradient cascade and step-pool streams, characteristic of nearly all of the streams in the analysis area, have little potential to affect sediment transport and peak flow enhancement.

The 2008 FEIS (pp. 755 and 757) found none of the subwatersheds in the analysis area to be susceptible to peak flow enhancement, whether in the rain-dominated hydroregion or rain-on-snow dominated hydroregion. Without changes in vegetative cover, there would be no change in the magnitude or rate of surface water runoff delivery to the stream network that could influence peak flows.

Existing roads and landings may modify storm peaks by reducing infiltration, which would allow more rapid surface runoff. Roads may also intercept subsurface flow and surface runoff, and channel it more directly into streams (Ziemer 1981). Statistically significant increases in peak flows have only been shown when roads occupy at least 12 percent of the watershed (Harr *et al*., 1975). Roads in the analysis area occupy an estimated 3.3 percent of the land base, and no perceptible increase in peak flows would be expected.

## 2. Alternatives Two and Three

### a. Fish Species

Direct effects to fish species from timber harvest and log hauling can result from the addition of fine sediment to streams resulting in a temporary increase in turbidity. Fine sediment can impair breathing by clogging gill membranes, and increase overall stress levels (Waters 1995). Fine sediment that becomes embedded in spawning substrates can indirectly affect fish by reducing survival of eggs and alevins still buried in gravel.

Variable density thinning in Riparian Reserves would have no detectable direct effects to fishes inhabiting streams adjacent to or downstream of proposed harvest units because there would be no direct effects to the aquatic habitat. Many of the proposed units are located along ridges, well-removed from fish-bearing streams. On fish-bearing reaches that border proposed units, a minimum 60-foot wide, slope-distance, "no-treatment" area, measured from the edge of the stream, would be established on both sides of the stream. When taking into account changes in vegetation, or unstable soils and slopes, the "no-treatment" area widths generally exceeds 60 feet on larger perennial streams. The "no-treatment" areas would continue to prevent sediment from reaching streams, and would maintain streamside shade.

Variable retention harvest is not proposed adjacent to coho/fish-bearing streams. Variable retention harvest in the uplands would have no effects on Riparian Reserves and "no-treatment" areas within them would prevent effects to fish.

The indirect effects to fish would roughly parallel the effects discussed for small functional wood, large wood, and pool habitat. Actions that have a positive or negative impact on these three attributes are likely to result in similar effects to aquatic habitat, and ultimately, fishes.

Where haul routes are paved there is no mechanism to disturb the road surface or transmit sediment to the stream channel. Gravel surfacing on roads effectively reduces sediment production from roads (Burroughs 1990). Road maintenance and application of BMPs would reduce potential sediment production from forest roads. Portions of the haul route that are gravel surfaced and parallel or cross streams have the potential to deliver negligible amounts of sediment. There are approximately 17 graveled haul route crossings on fish-bearing streams, eight of which cross streams (Ben Branch, Rock, Weaver, Slide, Riser, and South Myrtle Creeks) inhabited by Oregon Coast coho salmon. Approximately 5.3 miles of the proposed gravel-surfaced haul route exist within Riparian Reserves in the analysis area. Any elevated levels of turbidity associated with road use would be small in magnitude and short in duration and would not typically exceed background turbidity levels during winter high flows. Hauling on native surfaced roads would be limited to the dry season (Project Design Feature F, Chapter Two), thereby minimizing potential sediment delivery into nearby streams.

To minimize the potential of road derived sediment reaching the stream network, renovation of BLM Road No. 29-5-11.0 may require in-stream work. If so, this work would occur during the designated in-stream work window and Best Management Practices would be followed.

## b. Aquatic Habitat, Oregon Coast Coho Critical Habitat and Essential Fish Habitat

Upland thinning and variable retention harvest as proposed in the action alternatives would not affect Oregon Coast coho salmon, critical habitat for the Oregon Coast coho salmon, or Essential Fish Habitat for the Oregon Coast coho salmon. Trees removed from upland areas in association with thinning and variable retention harvest would not create circumstances that would result in sediment being transported to streams, or reduce large wood sources for future in-stream recruitment. Well-vegetated strips a minimum of 35 feet in width have been shown to be effective in intercepting and precipitating out sediment from overland flow before it reaches streams (Rashin 2006). Thinning in Riparian Reserves could reduce future availability of large wood because trees would be removed which would reduce the pool of trees available for future recruitment.

The effects of road maintenance/renovation, construction, and decommissioning would remain the same between the action alternatives. Although the amount of timber hauled in Alternative Two would be greater than the amount hauled in Alternative Three, no discernable sedimentation would be expected under either action alternative with application of Best Management Practices and project design features described in Chapter Two.

Burning slash piles would take place within unit boundaries or along road segments. Project design features (Chapter Two) such as "no-treatment" areas, would limit hydrologic connectivity to fish-bearing reaches and, hence, aquatic habitat would not be affected. Fire that backs into Riparian Reserves would be low intensity; there would only be partial consumption of duff and litter, but diversification of riparian vegetation would be promoted.

*Sediment and Substrate*

***Sedimentation from Roads:*** The effects of road maintenance/renovation, construction and decommissioning would remain the same between the action alternatives. When compared to Alternative Three, more timber would be hauled under Alternative Two due to variable retention harvest. Under both action alternatives no discernable level of sediment transport to stream networks would be expected with application of Best Management Practices and project design features described in Chapter Two.

According to Reid (1981) and Reid and Dunne (1984), forest roads can be a major contributor of fine sediment to streams, through down cutting of ditch lines and erosion of unprotected road surfaces by overland flow. Due to their design and use, roads surfaces are highly compacted, which affects water infiltration rates and drainage patterns.

Alternatives Two and Three propose road daylighting along haul routes. Road daylighting is intended to maintain the integrity of road surfaces and allow them to dry more quickly following storm events (Albin 2014). As a result, the potential for sediment transport from haul routes to streams would be low/reduced.

Proposed road maintenance would improve road drainage by installing cross drains along haul routes where needed to disconnect roads from the stream network. The degraded section of BLM Road No. 29-5-11.0 would be replaced/renovated under Alternatives Two and Three which would eliminate the chronic sediment source and prevent road failure. These road improvements would be made during the dry season (typically May - October) and prior to timber hauling, which would inhibit sediment

transport to streams. Timber hauling on gravel surfaced roads could occur in both the dry and wet seasons provided project design features described in Chapter Two are implemented, including suspension of hauling during wet weather if road runoff would deliver higher sediment concentrations than seen prior to haul. Therefore, the combination of an improved road system, vegetated ditchlines, and project design features is expected to prevent detectable quantities of sediment delivery to the aquatic system.

There would be a potential for localized soil disturbance specifically associated with road renovation and improvement within Riparian Reserves under Alternatives Two and Three. None of the road construction would have any direct hydrologic connectivity to streams, since newly constructed roads would not cross fish-bearing streams and would be constructed in stable, ridge top locations, to the greatest extent practicable, or separated from the nearest stream by another road.

During the dry season there is no mechanism for sediment transport to occur from roads to streams. Similarly, where haul routes are paved; there is no mechanism for sediment to be generated or carried to adjacent stream channels. However, with the first seasonal rains, there could potentially be a small pulse of sediment at stream crossings of gravel surfaced roads. Intermittent stream channels along the haul route generally have steep gradients with high sediment storage capacity sufficient to retain any small amount of sediment generated from crossings (2008 FEIS, p. 758).

During the wet season, sediment carried by runoff from road surfaces to ditchlines could potentially result in small amounts of sediment transport and delivery to the stream network. This sediment has the potential to impact water quality by increasing turbidity. Vegetated ditches and implementing project design features would filter out any detectable quantity of sediment before it reaches fish-bearing streams.

Fine sediment deposited in substrate suitable for spawning can indirectly affect fish by reducing survival of eggs and alevins still buried in the gravel. Turbidity can reduce foraging ability, impair breathing by clogging gill membranes, and increase overall stress levels (Waters 1995). Potential total sediment inputs from analysis area roads would be negligible, however, because these roads would be properly surfaced and crowned, cross-drains would be properly spaced, and ditchlines would be vegetated. Past monitoring of timber haul and sediment delivery of maintained/improved (as listed above) roads in the Oregon Coast Range indicate that such road sedimentation control features are effective at filtering sediment from water in road ditchlines (Clark 2014).

***Sedimentation from Harvesting/Yarding Operations:*** Potential for localized soil disturbance and erosion could be associated with ground based harvest and yarding operations within Riparian Reserves. However, the project design feature (Chapter Two) requiring full suspension, where practical, when yarding across streams would minimize the risk of sedimentation arising from streambank and channel disturbance. Additionally, operation of ground-based equipment is not authorized within "no-treatment" areas.

Stream substrate would be unaffected as any fine sediment generated by yarding operations would be intercepted and trapped by the vegetated strips provided by "no-treatment" areas prior to reaching stream channels. "No-treatment" areas of 35 feet on intermittent streams, 60 feet on perennial and fish-bearing streams, and 100 feet on coho bearing streams would provide root strength sufficient to maintain bank stability, protect eroding banks, and prevent additional sediment from entering streams. Rashin *et al.* (2006) found that sediment delivery is unlikely when potential erosion features (e.g. skid trails and yarding corridors) are more than 33 feet (10 meters) from stream channels. As

such, the "no-treatment" areas reduce ground disturbance near streams and maintain an intact duff layer that would be effective at intercepting and filtering sediment from upslope sites and not concentrating in gullies or yarding/skidding trails (Rashin *et al*. 2006; Chamberlin et al. 1991). In addition, most stream reaches also have in-stream wood sufficient to trap and store sediment upstream of fish-bearing reaches. Duncan *et al.* (1987) showed that ephemeral stream channels with woody debris are effective at storing coarse sediment delivered from road surfaces.

Further, areas deemed unstable by the project soil scientist would be excluded from harvest or included in aggregate or dispersed retention areas or "skips" in thinning treatment areas. Tree retention within units, coupled with "no-treatment" riparian areas adjacent to stream channels, would result in a low risk of increasing landslide activity or otherwise delivering sediment to streams as a result of implementing an action alternative.

*In-stream Functional Wood*

The processes of small and large wood recruitment to streams, as well as changes to riparian vegetative diversity, take decades or more for the effects to be realized, and then decades more for those changes to influence physical stream habitat conditions. As Riparian Reserve thinning treatments are carried out in Alternatives Two and Three, riparian vegetative and structural diversity would be improved from the existing condition. Thinning treatments in Riparian Reserves would gradually result in riparian areas that are more resilient to disturbance from wind, flood, and fire, while retaining ample stream shading due to the presence of "no-treatment" areas. In addition, as tree growth rates, structural and species diversity increase, these areas would be expected to attain late-seral characteristics in a shorter period of time than if left untreated in their current state. In general, thinning treatments in Riparian Reserves would increase stand diversity as well as upslope primary productivity (i.e. increased light to forest floor) which would allow nutrients to be more readily accessible to fish via nutrient pathways/spiraling within the basin (Progar and Moldenke 2009; Danehy et al. 2007).

> ***Small Functional Wood:*** Thinning along streams outside of "no-treatment" areas would remove small suppressed and intermediate trees which could minimally reduce the availability of small functional wood for in-stream recruitment in the short term. Small woody material can create habitat in smaller stream systems (Bilby and Ward 1989), but smaller diameter wood does not persist in the stream channel for long periods of time (Naiman *et al.* 2002) and is more easily flushed from the system than large pieces (Keim *et al.* 2002).
>
> ***Large Wood:*** Most in-stream wood comes from within one site potential tree height of a channel (Naiman *et al.* 2002), although in steep, confined streams large wood can also come from greater distances as a result of debris flow contribution (Reeves *et al.* 2003). Thinning outside of "no-treatment" areas would, over time, accelerate growth and development of larger trees within the Riparian Reserves, some of which could be recruited into stream channels. Subsequently, this newly recruited large wood would be expected to trap small functional wood, and over time in-stream geomorphic changes would likely result. Conifer and hardwood trees within the "no-treatment" areas would continue to provide adequate small wood as larger trees develop in treated areas.

As part of the variable density thinning prescription, gaps and openings would be created in Riparian Reserves outside of the "no-treatment" areas. These would be designed to mimic natural disturbance events such as windfall and small fire events, favor development of large conifers and retention of hardwoods. Understory vegetation would provide deciduous leaf litter for stream invertebrates that are primary prey for salmonids.

Road renovation, improvement and construction would not affect recruitment of large wood to streams. Generally, removal of trees for road construction would occur outside of "no-treatment" areas. Proposed road construction within Riparian Reserves is limited to 0.14 miles, of which less than 100 feet occurs within a "no-treatment area" of the upper extent of a headwater stream. This construction may minimally reduce the amount of large wood that could enter streams, but the likelihood of reducing the quantity of in-stream large wood is minimal due to site specific characteristics of these roads proposed for construction and the nature of the nearest stream.

Road daylighting would not occur within "no-treatment" areas, except where project hydrologist or fisheries biologist determine that site specific characteristics warrant the need for daylighting. Subsequently, the potential for large in-stream wood to be recruited would be expected to remain unaffected as 70-84 percent of total large in-stream wood in riparian forests of Oregon's Coast Range has been shown to come from within 15 meters (Gregory et al. 2003). Generally speaking, the Myrtle Creek project area is less productive than Oregon's Coast Range, so it is reasonable to expect that the majority of large in-stream wood would originate from less than 15 meters from streams due to shorter average tree heights.

*Pool Habitat*

Pool habitat quality and frequency would remain unaffected under Alternatives Two and Three over the short term since existing large wood and small functional wood in streams currently contributing to the formation of pool habitat and down wood within the "no-treatment" areas would be unchanged. Over a period of decades, thinning in Riparian Reserves outside of "no-treatment" areas would accelerate tree growth rates which would achieve earlier attainment of large diameter trees that could fall into streams and potentially act as habitat forming agents. Removal of small suppressed trees from intermediate canopy layers would minimally reduce small functional wood recruited from outside the "no-treatment" area is possible, but small wood available for recruitment would remain abundant. Surveys within the analysis area indicate that the availability of small functional wood is not a limiting factor in pool formation or complexity. Smaller wood is generally washed out of all but the smallest creeks where large wood is not present. Ultimately, Alternatives 2 and 3 are expected to result in more persistent, complex pools occurring at a higher frequency than would be expected under the No Action Alternative.

Pool habitat availability would remain unaffected by thinning over the short term as all existing large wood and small functional wood that contributes to the formation of pool habitat would be reserved. Headwater fish-bearing reaches generally do not have deep pool habitat or off-channel refugia that could be affected. Thinning in proximity to headwater streams would remove smaller trees from the suppressed and intermediate canopy layers, but "no-treatment" areas would continue to provide abundant small wood for recruitment. As dominant and co-dominant trees would generally be reserved from cutting, thinning outside of the "no-treatment" areas would not reduce availability of larger trees for in-stream recruitment. Over a period of decades, thinning would accelerate growth of the remaining trees which may supply streams with larger wood that would enhance and create pool habitat.

There would be no change in pool availability as road maintenance/renovation, construction, and decommissioning would not remove trees that would affect recruitment of pool-forming wood or impact the capacity of stands adjacent to streams to contribute large wood or small functional wood in the future.

*Habitat Access*

The action alternatives would not change habitat accessibility in the project watersheds. Proposed road construction/improvement and renovation would not involve installation or replacement of stream crossings, and would not affect fish passage.

*Critical Habitat*

As described in the *Aquatic Habitat, Coho Critical Habitat, and Essential Fish Habitat section* there would be no adverse effects anticipated. "No-treatment" areas would prevent overland transport of sediment to streams, help maintain stream bank and channel integrity, provide sources of functional small wood and large wood, and maintain streamside shade.

Project design features and Best Management Practices would be employed to effectively eliminate delivery of road derived sediment to live stream channels. Ditch lines would be left vegetated, where practical, and sediment traps such as hay bales could be deployed to slow runoff and trap sediment in ditches. Timber hauling would be suspended ahead of forecast periods of heavy precipitation or if water in ditch lines is sediment laden. Where sediment could reach streams designated as critical habitat, the amount is expected to be negligible and the effect short-term in nature.

*Essential Fish Habitat*

The following components were analyzed to assess potential effects of the proposed thinning on Essential Fish Habitat, with citations to appropriate sections of this assessment.

- ***Water Quality/Water Quantity*** – There would be no effect to water quality and/or quantity as a result of the proposed timber harvest. "No-treatment" areas along streams would prevent delivery of sediment to streams and preserve streamside shading essential to the maintenance of water temperatures (*Aquatic Habitat, Oregon Coast Coho Critical Habitat, and Essential Fish Habitat p. 100 and Water Resources p. 5*).

- ***Substrate Characteristics*** –Where haul routes cross and proposed harvest units are adjacent to Essential Fish Habitat application of project design criteria would arrest any mechanism for sediment entering stream channels (*Aquatic Habitat, Oregon Coast Coho Critical Habitat, and Essential Fish Habitat, p. 101*).

- ***Channel Geometry*** – Stream channels are stable and have riparian vegetation sufficient to prevent erosion caused by high stream flow. There would be no detectible increase in peak stream flows that would affect channel geometry (*Water Quality p. 105*).

- ***Large woody debris within the channel and large woody debris source areas*** – There are harvest units adjacent to Essential Fish Habitat, but the "no-treatment" area along these streams would protect existing large wood within the streams. Variable density thinning in the Riparian Reserves would promote development of large trees and earlier recruitment of

large wood to adjacent streams when compared to the No Action Alternative. Use of the existing road system and road daylighting would not affect large wood as no trees would be cut to maintain roads near or adjacent to streams designated as Essential Fish Habitat (*Aquatic Habitat, Oregon Coast Coho Critical Habitat, and Essential Fish Habitat p. 102).*

- ***Fish passage*** – There would be no effect on fish passage because proposed activities would not alter any fish passage culverts. (*Aquatic Habitat, Oregon Coast Coho Critical Habitat, and Essential Fish Habitat p.* ).

- ***Forage species (aquatic and terrestrial invertebrates)*** – Forage for Oregon coast coho salmon and Oregon Coast Chinook salmon would remain largely unaffected. Terrestrial invertebrate species may benefit from increased light due to variable density thinning within Riparian Reserves, thus increasing energy available to streams in the vicinity.

  Streamside vegetation in "no-treatment" areas would continue to provide sources of terrestrial invertebrates. Aquatic invertebrate populations would be unaffected by discountable and negligible increases in sediment and may indirectly benefit from retention of hardwoods as stand components, as hardwood litter represents a major nutrient input to streams.

## c. Water Resources

*Water Quality*

Beneficial uses of water and drinking water sources would not be affected, and there would be no cumulative degradation of water quality in the analysis area.

Vegetation that provides primary shading for perennial stream channels would be protected by minimum 60-foot wide "no-treatment" areas based on the cool, moist microclimate gradient found between riparian and upland ecosystems (Rykken *et al*., 2007). For riparian areas extending beyond 60 feet from streams, evidence for increasing air temperature or relative humidity is not distinguishable from upslope areas (Rykken *et al*., 2007). Maintaining a 50 percent angular canopy density within the secondary shade zone would be consistent with TMDL implementation strategies.

For streams with little or no potential to increase summer stream temperature, as with intermittent streams, minimum 35-foot wide "no-treatment" areas would be designated in order to protect streams from sedimentation (Rashin *et al*., 2006). In addition to the "no-treatment" areas established on streams, silvicultural treatments would not be applied to naturally wet areas, springs or seeps within the extent of riparian vegetation or seasonally saturated soils, whichever is greatest.

"No-treatment" areas effectively reduce or eliminate disturbance to stream channels and stream banks, filter surface run-off allowing sediment to be deposited on the forest floor before it can enter streams, and provide thermal regulation of water temperatures.

Variable density thinning treatments can be used as a surrogate for natural disturbances (Christensen *et al*., 2000). The selection of streamside stands to be treated was based on field stream surveys which identified stands of overstocked, conifer-dominated stands adjacent to stable stream channels and banks where structural diversity was lacking (Parker pers. obs., 2010 and 2011). Gaps would be centered on hardwoods such as maple and alder to promote their release, and would not exceed ten percent of the total riparian area in any given unit.

Gaps would allow necessary light filtration through an otherwise dense canopy. When a stream is enclosed by a conifer canopy, the ecosystem shifts to a low quality food base whereas a more open canopy provides greater diversity of nutrient inputs (Franklin *et al*., 1981). The establishment of "no-treatment" areas for the purpose of shading streams and minimizing stream temperatures is often given priority, when in fact the function of streams up through at least third order streams should be providing essential energy and structural inputs (Franklin *et al*., 1981). Creating gaps outside the "no-treatment" areas would not alter stream temperature regimes, but could lead to increased stream production.

Cross-channel yarding of timber would occur where timber cannot be accessed from the existing road network, where new road construction would not be cost effective, or where new road construction would cause excess resource damage. When yarding across stream channels, the following BMPs would be followed:

- (TH2) Design yarding corridors so as to limit canopy loss in Riparian Reserves and to meet shade targets. Techniques include limiting the number of such corridors, using narrow widths, and using a perpendicular orientation to the stream.
- (TH3) Where practicable, require full suspension over flowing streams, non-flowing streams with erodible bed and bank, and jurisdictional wetlands.

Timber hauling could occur in both the dry and wet seasons. During the dry season there are few mechanisms for sediment mobilization and transport from roads to streams.

Wet season hauling would be limited to surfaced (gravel or pavement) roads. During the wet season, sediment inputs from surfaced roads would be negligible where drainage systems do not concentrate delivery of sediment-laden water to streams at stream crossings. With the first seasonal rain there could be a small pulse of sediment at stream crossings and potential increases in turbidity, but the amounts would not exceed levels from naturally occurring erosion and runoff. All streams would be expected to stabilize within 12-20 minutes of a loaded log truck crossing (Toman and Skaugset, 2011), and sediment delivery would be indistinguishable from background levels after a short distance.

Road improvement, road maintenance, and road renovation, particularly in Riparian Reserves (Table 3-24), along with application of Best Management Practices and project design features described in Chapter Two would greatly reduce the amount of sediment entering the stream. Although some sediment may still enter streams, any elevated turbidity would not be distinguishable from background turbidity during frequent winter high flows.

**Table 3-24: Road Activities as a Whole, and a Subset Proposed in Riparian Reserves**

| Road Activity | Total Miles | Miles within Riparian Reserves |
|---|---|---|
| Maintenance/Renovation | 110 miles | 3.21 |
| Improvement | 0.9 miles | 0.51 |
| Road Construction | 5.5 miles | 0.51 |
| Decommissioning | 5.1 miles | 3.35 |

There is potential for localized soil disturbance and erosion associated with road work proposed within Riparian Reserves. To address these issues, Best Management Practices (BMP) would be applied to effectively eliminate any potential for stream sedimentation associated with these actions.

Where haul routes are paved there is no mechanism to disturb the road surface or transmit sediment to the stream channel. Gravel surfacing effectively reduces sediment production from roads (Burroughs 1990). Road maintenance and application of BMPs would reduce potential sediment production from forest roads. Portions of the haul route that are gravel surfaced and parallel or cross streams have the potential to deliver negligible amounts of sediment. There are approximately 17 graveled haul route crossings on fish-bearing streams, eight of which cross streams (Ben Branch, Rock, Weaver, Slide, Riser, and South Myrtle Creeks) inhabited by Oregon Coast coho salmon. Aggregate or native-surfacing portions of the proposed haul routes cross 68 perennial streams, eight of which are fish-bearing, and 51 intermittent streams. Stream crossings have adequate ditch lines and cross-drainage to disperse run-off, rather than collect and discharge large volumes of sediment-laden waters directly into stream channels.

Prescribed burning of machine and hand piles would occur at landings and along selected roads outside of Riparian Reserves but fire may be allowed to back into Riparian Reserves. Prescribed fire that is allowed to back into Riparian Reserves would promote ecological diversity and create snags and it may increase aquatic productivity by stimulating primary production in the form of increased growth of deciduous shrubs and plants, and secondary production in the form of invertebrate biomass (Reeves et al. 2006). Any created snags within Riparian Reserves would provide long-term sources of small and large woody debris that may enter the stream network and improve geomorphic conditions (i.e. pool creation, sediment retention, etc.). Ignition outside of the Riparian Reserves would eliminate the potential for fuel or chemical contaminants to enter the stream network.

Burning would be applied when the soil and organic layer are moist which would produce burn intensities that would not remove all vegetation, and the Riparian Reserve would provide an adequate filtering mechanism for any sediment generated from upslope activities.

Disturbance, like that seen from prescribed fire, maintains biological diversity, and the resilience and productivity of aquatic populations and communities (Poff and Ward 1990). Beneficial uses of water would not be affected by proposed activities. Domestic water supply upslope and adjacent to Unit 29-3-3A would not be affected, although the water supply may be temporarily disrupted during implementation.

Water quality and quantity of drinking water sources would not be affected, and there would be no cumulative degradation of water quality in the analysis area because BMPs would effectively minimize sediment delivery to streams as drinking water sources.

*Water Quantity*

Variable density thinning in Riparian Reserves would create small canopy gaps. These would have little effect on forest hydrology, as there would be no large openings created, greater than two tree heights across, that could affect precipitation, snow melt and peak flows. Variable retention harvest proposed in Alternative Two would not create canopy gaps of a size that could potentially impact peak flows.

There would be a net increase of 1.40 miles of road, increasing road density by approximately 0.01 miles per square mile, essentially maintaining approximately 4.4 miles per square mile and total roaded area of approximately 3.3 percent of the analysis area, well below the 12 percent threshold for risk of peak flow enhancement identified by Harr *et al*. (1975).

Stream morphology of the high gradient cascade and step-pool stream types would remain unchanged and resistant to peak flow enhancement as described for Alternative One.

High intensity fire can reduce soil infiltration capacity which can lead to enhancement of peak flows if the spatial extent of the fire is great enough. The limited amount of prescribed fire that is allowed to back into Riparian Reserve would be managed at a low intensity to minimize potential reductions of soil infiltration capacity. Peak flows are not expected to measurably increase as a result of the use of prescribed fire.

*Equivalent Clearcut Area (ECA)*

Management activities that affect equivalent clearcut area (ECA) were analyzed because ECA can be used as an indicator of increases in peak flow which can lead to channel destabilization. Variable retention harvest proposed in Alternative Two would create canopy gaps of a size that could potentially impact peak flows. Variable density thinning would create small canopy gaps in uplands and Riparian Reserves that would have little effect on forest hydrology. Alternative Three does not include variable retention harvest, so implementing Alternative Three would not change ECA.

Table 3-25 lists the seven 12$^{th}$-field subwatersheds used to analyze ECA (Table 3-25). In a rain-dominated hydroregion, like the analysis area, there would be no mechanism for peak flow enhancement due to a lack of response until ECA exceeds 29 percent of the subwatershed (Grant *et al*. 2008). Current ECA is below the 29 percent threshold for peak flow enhancement in five of the seven subwatersheds (Table 3-25). Under Alternative Two, variable retention harvest would occur in six subwatersheds, including one subwatershed that is above 29 percent ECA. Considering the proposed variable retention harvest included in Alternative Two, ECA would remain below the threshold in five of the six subwatersheds.

Although Roberts Creek is above the ECA threshold, proposed actions in Alternatives Two and Three do not increase ECA, therefore they would have no effect on peak flows. Stream conditions in Roberts Creek would be unchanged under both action alternatives.

In Upper Deer Creek subwatershed, ECA would increase by 0.1 percent to 29.8 percent (Table 3-25). Peak flow estimates and models are complicated (Grant et al. 2008) by the forest types and the human modifications. A large portion of the ECA in the Upper Deer Creek subwatersheds can be attributed to oak savannah. Much of the Upper Deer Creek subwatershed was historically an oak savannah; the watershed has likely always been prone to rapid increases and decreases in stream flows and has adjusted overtime. The headwaters on Federal land in Upper Deer Creek are generally stable, accommodating stream fluctuations, and are not considered to be impaired. Due to the increase in private agricultural uses and a high proportion of oak savannah lower in the subwatershed, stream conditions may be unstable. Implementing Alternative Two would not change this situation.

**Table 3-25: Equivalent Clearcut Area by Alternative**

| Subwatershed Name | Subwatershed Acres | ECA Threshold (%) | Alternative 1 (%) | Alternative 2 (%) | Alternative 3 (%) |
|---|---|---|---|---|---|
| Upper North Fork Myrtle Creek | 18,476 | 29 | 17.7 | 17.8 | 17.7 |
| Upper South Fork Myrtle Creek | 26,629 | 29 | 15.9 | 16.7 | 15.9 |
| Lower North Fork Myrtle Creek | 18,980 | 29 | 22.2 | 22.4 | 22.2 |
| Lower South Fork Myrtle Creek | 12,119 | 29 | 10.0 | 10.0 | 10.0 |
| Days Creek | 22,011 | 29 | 12.4 | 12.6 | 12.4 |
| Upper Deer Creek | 29,813 | 29 | 29.7 | 29.8 | 29.7 |
| Roberts Creek | 16,201 | 29 | 34.7 | 34.7 | 34.7 |

# III. Soils _____

## A. Affected Environment

The soil resources that could be affected are considered to be those within the proposed harvest units as well as areas immediately downslope of the unit boundaries in adjacent vegetated areas. Direct effects would include detrimental soil displacement and soil compaction from activities such as landing construction, ground-based and cable yarding of logs, fire trail construction, and fuels treatments. Indirect effects would include any resulting soil erosion and any subsequent slope failures resulting from soil displacement and disturbance.

In general, direct effects include soil displacement deeper than the organic-enriched surface layer, high compaction deeper than four inches, or severely burned soil (USDI/BLM 2005, pp. 56-57).

The time frame for the analysis of ground disturbing activities, fuels treatments and surface soil erosion is about five years, prior to recovery of vegetative ground cover. The potential for slope failures would generally be within the first decade or until rooting strength in the soil is reestablished (USDI/BLM 2008b, p. 348, Robison et al. 1999). Soil compaction can persist for decades (Amaranthus *et al.* 1996, Powers et al. 2005); however, the benefits from subsoiling would be immediate (Luce 1997).

### 1. Geology and Slope Stability

Topography within the Myrtle Creek analysis area varies from gentle, broad ridges to steep and very steep side slopes, with some headwalls[10] (Johnson *et al.* 2004). There can be areas which are subject to slope failures from natural or management related causes. The types of failures can include deep-seated slumps, slides, and shallow debris slides, headwall failures, and debris slide tracts. Slopes within the units are currently stable, except as noted below.

Seventy-five percent of the acreage proposed for treatment lies over granitic bedrock. The remainder lies over sedimentary, metamorphic, or hard volcanic rock. Granitic soils can be more susceptible to slope failure and surface erosion than non-granitic soils.

*Granitic Bedrock:* Soils developed over deeply-weathered granitic bedrock (about 68 percent of the harvest area) have moderate to high amounts of clay (clay loam and clay textures). The majority of these soils are stable to moderately stable.

Coarse-textured soils overlying hard granitic bedrock (about 7 percent of the harvest area) have a high potential for surface soil erosion on unvegetated slopes above 60 percent. Although the sandy loam soils have a high precipitation infiltration capacity that helps prevent surface runoff, these soils are low in clay soil cohesion which makes them vulnerable to surface erosion.

[10] A headwall is a concave area with steep slopes, generally above a stream inception point or the beginning of a draw, where overland water flow converges downward toward the center of the draw.

The deeply-weathered soils on moderate to steep slopes (approximately 60 percent of harvest area) and the coarse-textured soils on steep slopes (7 percent of the harvest area) are classed as fragile under the Timber Production Capability Classification. However, these soils are manageable with the use of best management practices, to minimize soil and organic matter losses (USDI/BLM 1986, Rel. No. 5-179, pp. 7-8).

*Non-Granitic Bedrock:* The remainder of the proposed harvest areas is on non-granitic bedrock: sedimentary, metamorphic, and volcanic rock. The soils that have developed over these materials tend to be stable to moderately stable, depending on slope steepness. These soils can contain moderate to very high amounts of angular gravels, cobbles and stones, along with pockets of rock outcrop and talus (Johnson *et al.* 2004).

Non-granitic soils on steep to very steep slopes are classified as fragile due to the slope gradients. These sites may be subject to soil and organic matter losses from surface erosion or some mass movement resulting from forest management activities unless measures, such as project design features and best management practices, are used to protect the soils/growing sites (USDI/BLM 1986).

*Summary:* During field exams, approximately 38 acres (two percent of the examined area) of actively unstable and potentially unstable areas were documented adjacent to or within harvest units: 26 acres in granitic soils and 12 acres on non-granitic soils.

## 2. Soil Displacement and Compaction

The ground-based harvest areas with soils containing moderate to high amounts of clay are moderately to highly susceptible to compaction and displacement by ground equipment, depending on the clay content and the amount of rock content (Johnson et al. 2004, Williamson and Neilsen 2000).

Areas that were previously ground-based yarded contain old skid trails that are compacted to varying degrees and topsoil has generally been removed. Existing primary skid trails exhibit heavily compacted and exposed subsoil with dense and massive to platy soil structure in the top five to six inches or more over the running surface. The primary skid trails are predominantly vegetated with forbs, moss, or shrubs with some conifers and little erosion was noted. Secondary skid trails are generally compacted to depths of three to four inches along tread areas, which are three to four feet wide, and are generally well vegetated with conifers, forbs, moss and shrubs.

## 3. Sensitivity to Prescribed Fire

In relation to site preparation burning in harvested units, soils are rated for their sensitivity to fire. Category 1 soils are considered highly sensitive to the effects of prescribed burning, Category 2 soils are moderately sensitive, and Category 3 soils are the least sensitive (USDI/BLM 1988, Handbook 1734-1; USDI/BLM 2001, pp. 66-67).

About 70 percent of the soils in the proposed units are Category 1 soils, mainly because of the granitic soils on slopes over 35 percent. Small areas or soil inclusions on other bedrock types are highly sensitive based on slopes over 70 percent and/or shallow soil depths. Where practicable, broadcast burning in Category 1 soils would be avoided. The remaining soils are Categories 2 and 3, in about equal proportions.

## B. Environmental Consequences

### 1. Alternative One (No Action)

#### a. Slope Stability

There would be no changes in current slope stability and risk of slope failure, absent soil displacement or disturbance associated with harvest activities. The potential for periodic slope failures would still remain in areas exhibiting a historic disposition to soil movement, particularly in the event of a major storm.

#### b. Soil Displacement and Compaction

There would be no direct effects on any soils in the analysis area, as there would be no soil displacement or compaction associated with road and landing construction, cable yarding or ground-based yarding.

Compacted soils on old skid trails would recover slowly, especially at depths below six inches (Amaranthus et al. 1996; Powers et al. 2005).

#### c. Prescribed Burning

Much of the nitrogen and other nutrients in forest ecosystems are derived from the decomposition and recycling of organic matter in the form of decayed leaves or needles, branches, fallen trees, coarse woody debris, and roots. Organic matter helps improve water retention in soils, maintains good soil structure, aids in water filtration into the soil, stores carbon, and promotes the growth of soil organisms (Rapp *et al.* 2000). Absent any timber harvest or application of prescribed fire there would be no change to current levels of organic material and other nutrients. Duff and soil organic matter would continue to slowly increase with the accumulation and decomposition of needles, twigs and small branches, and larger woody material, absent a fire of sufficient intensity to consume the material.

### 2. Alternative Two

#### a. Slope Stability

Slope failures occur on a small percentage of forest lands, over a variety of forest types, whether managed or unmanaged. Trees transpire water and intercept moisture in their canopies, and live roots increase soil strength, both of which increase slope stability (USDI, BLM FEIS 2008, pp. 347-348).

Existing unstable areas and areas with a high potential of instability have been excluded from harvest and road construction, or tree retention would be implemented to help minimize soil disturbance and maintain slope stability. Unit-specific design features (p. 35) would be used in Unit 28-3-35A and Unit 29-3-15B to maintain soil stability in areas known to be unstable.

Pertaining to the areas planned for thinning, Satterlund and Adams (1992, p. 253) reviewed several studies and found that "lesser or nonsignificant responses occur [to stream flow] …where partial cutting systems remove only a small portion of the cover at any time." Where individual trees or small groups of trees are harvested, the remaining trees generally use any increased soil moisture that becomes available. Gradual loss of soil holding strength caused by decay of the roots of cut trees would be compensated for by increased root growth in residual trees and the establishment of understory vegetation. Accelerated growth of residual trees and vegetation, coupled with an increase in understory vegetation would utilize additional available moisture, and further stabilize soils.

High levels of residual canopy cover would be maintained, as described in Chapter Two (pp. 21-22). Although thinning would temporarily decrease the tree canopy and the live root mass that help to hold the soil in place, the risk of slope instability would remain very low. The residual stand would continue to intercept rainfall and transpire water through the tree canopies, and live roots would maintain soil stability. Accelerated tree growth, crown expansion, increased root density, and understory development would increase interception of precipitation and transpiration of moisture, providing increased protection against soil erosion and movement.

Riparian Reserves would be established on all streams so that the more steeply incised and seasonally saturated slopes would be protected from soil disturbance. Where variable density thinning is implemented, "no-treatment" areas would be designated and treatments within the Riparian Reserve would maintain at least 50 percent average canopy cover. With implementation of these measures, project design features (Chapter Two) and Best Management Practices (BMPs), risk of slope failure and landslides in Riparian Reserves would be low.

On portions of the landscape with potential for landslides, timber harvest can increase the probability, but only if a damaging storm occurs in the vegetation re-growth period: up to 10 years following harvest (USDI/BLM 2008, p. 769).

The Oregon Department of Forestry (Robison *et al.* 1999) studied shallow, rapid slope failures in stands ranging in age from reinitiation to over 100 years, that originated from previous clearcut harvest or stand replacement fire. They found that after the severe winter storms of 1996, forested areas between the ages of ten and 100 years old typically exhibited the lowest landslide densities and erosion. The highest risk for shallow, rapid slope failures was found on slopes of over 70 percent, depending on landform and geology.

There are portions of six variable retention harvest units (approximately 33 acres) with slopes greater than 60 percent on moderately stable slopes that would have the highest likelihood of slope failure. Opening size and the proposed management to extend the early seral stage until age 30 in variable retention harvest units would increase the post-harvest tree recovery period, slowing the regrowth of tree roots that stabilize the soil. However, aggregate and dispersed retention, as described in Chapter Two, along with shrub, forb and grass cover would help maintain slope stability until trees are regenerated.

Identified unstable areas within units would be avoided during harvest by excluding them from harvest. Potentially unstable areas would be incorporated into "skips", aggregate retention areas or dispersed retention areas, or additional trees would be retained to prevent surface disturbance. These measures along with application of Project Design Features (Chapter Two) and Best Management Practices would help maintain slope stability, minimize surface disturbance, minimize soil displacement and erosion, and protect soils/growing sites (USDI/BLM 1986).

Over 90 percent of the proposed road construction would be on ridge-tops or on stable sideslopes, having low risk of failure. Nine short segments of road, approximately 0.5 miles in combined length, would be constructed on moderately stable sideslopes. Implementing BMPs would minimize risk of slope failure in these locations.

Considering the factors presented above, and implementing project design features (Chapter Two) and BMPs, the risk of slope failure and landslides in proposed harvest areas would be low.

Any slope failures that occur are expected to be small in size, about 0.10 acres or less. Occasional slope failures of this magnitude would not exceed the level and scope of soil effects considered and addressed in the PRMP/EIS (Chapter 4, pp. 12-16).

### b. Soil Displacement and Compaction

Soil displacement and compaction can reduce soil productivity, with resultant reductions in height and volume growth of conifers (Wert and Thomas 1981). Inter-mixing of the upper soil layers with subsoil layers can reduce site productivity because subsoils are generally denser, and lower in nutrients and organic matter. Extensive displacement can also alter slope hydrology, increasing the potential for surface erosion (Page-Dumroese *et al.* 2009).

*Ground-based Yarding*

For ground-based harvest operations, BMPs in the ROD/RMP (p. 131) specify that landings, main skid trails and large slash piles should cumulatively affect no more than ten percent of the ground-based harvest area. This was further clarified in plan maintenance implemented since adoption of the ROD/RMP (USDI/BLM 2002, p. 70).

Monitoring of ground-based operations from 2000 through 2013, which included rubber-tired skidders, tractors, excavators and harvester/forwarder systems, has shown that with the application of appropriate project design features and BMPs, the areal extent of soil displacement and compaction ranged from three to nine percent of the harvest area (USDI/BLM 2001, 2005, 2007, 2008a, 2008b, 2009, 2011 and 2012; per. obs. W. Fong, November 2013, Eager Weaver DM and Sir Galahad CTDM). In general, the effects included compaction deeper than four inches, and/or soil displacement deeper than the organic-enriched surface layer. The extent varied with the equipment used, number of passes over individual trails, terrain, access routes, climatic conditions, and operator skill.

The project design features (Chapter Two) and BMPs include measures such as dry season operations, use of existing skid trails to the greatest degree practicable, pre-designation of skid trails, generally limiting ground-based equipment to slopes less than 35 percent, and keeping equipment off wet areas, such as seeps and wet meadows. Application of these measures and implementing the project as described in Chapter Two would minimize soil displacement and compaction, and maintain soil productivity. Soil displacement and/or compaction in ground-based variable retention harvest units would be less than 10 percent of each unit, within the ROD/RMP guideline (p. 131).

Identified native-surface landings and compacted equipment areas free of logging slash, heavily compacted skid trails, and road segments designated for decommissioning would be subsoiled (approximately 20 acres) to reduce compaction. Areas of shallow, skeletal soils with high cobble and gravel content, or rocky soils would not be subsoiled. Subsoiling would reduce soil bulk density and provide some soil aeration, allowing for natural reseeding of trees, and contributing to the survival and growth of both natural and planted seedlings. Subsoiling would also help prevent runoff and erosion by increasing infiltration capacity.

Part of the subsoiling process also includes placing slash and other organic debris, and some adjacent topsoil over the tilled areas, for protective cover to reduce surface soil erosion, and to replace organic material, nutrients and soil microbes to help maintain soil productivity. Where available in ground-based units, slash, other organic debris and topsoil would cover at least 50 percent of the subsoiled areas. In thinning units, skid trails that are not subsoiled would be mapped and evaluated for tillage at the time of final harvest (USDI/BLM 2002, p. 71).

Although subsoiling with slash and topsoil placement does not bring about complete recovery from soil compaction and displacement, it is an important step in the recovery process (Luce 1997). Past monitoring indicates that a single tilling pass results in 40 to 80 percent fracturing of compacted soil. Several passes that are offset from each other can bring about greater than 80 percent soil fracturing.

*Cable Yarding*

Cable yarding systems would have the capacity to maintain a minimum one-end log suspension to minimize surface and soil disturbance. Cable yarding would cause localized soil disturbance characterized by duff and mineral soil displacement in yarding corridors, and occasional instances of displaced subsoil. Cable yarding corridors would be less than 20 feet wide.

The extent of displacement depends on the site conditions, volume of timber yarded over any given yarding corridor, topography, operator skill and equipment used. In all units, the greatest disturbance would generally occur within 100 to 150 feet of landings where individual haulback roads merge. Monitoring of cable yarded commercial thinning and density management has shown that application of appropriate project design features and BMPs limits the areal extent of ground affected to no more than three percent (USDI/BLM 2008a, p. 97; 2008b, pp. 86-87; 2009, pp. 72-73; 2011, pp. 77-79; 2012, pp. 108-111; per. obs. W. Fong, November and December 2013, Eager Weaver DM, Sir Galahad CTDM and Kryptonite CT). This includes areas disturbed within yarding corridors, landings and equipment use areas. The aerial extent of ground affected by thinning in this project is expected to be the same as previously monitored units because the same project design features and BMPs would be used.

Needles, twigs and small branches would remain in all thinning units which would provide nutrients and help to maintain soil productivity.

Variable retention harvest would primarily utilize cable yarding (approximately 287 acres). The extent and depth of displacement and compaction within variable retention harvest units would be greater than thinned areas due to the greater volume of timber that would be yarded. Implementation, as described in Chapter Two, would result in less than four percent detrimental disturbance in cable yarded areas.

Portions of the variable retention harvest cable yarded units would be whole-tree yarded, yarding logs with tops and branches attached, which may reduce the depth of concentrated displacement and compaction in the corridors because the tree weight would be dispersed over a wider area when compared to logs that are limbed and bucked prior to yarding. Soil displacement would be limited primarily to the duff and topsoil layer.

Whole-tree yarding removes nutrients contained in tree branches and tree tops from the units. However, needles, twigs and small branches generally fall off during felling and yarding, so nutrients from these sources would remain in the units. Whole-tree yarding also helps to avoid the need to broadcast burn prior to planting. By avoiding broadcast burning, the existing duff and litter in the units would be maintained, and the potential for surface soil erosion would be greatly reduced. In areas that are whole-tree yarded, slash would be piled and burned on the landings.

### c. Prescribed Burning

The degree of change in levels of organic matter and nitrogen is directly related to the magnitude of soil heating and the severity of a fire. When organic matter is burned, the stored nutrients are either volatilized or are changed into highly available forms that can be taken up readily by microbial organisms and vegetation (Neary *et al.* 2005).

Carbon and nitrogen are the key nutrients affected by fire, and large amounts are lost through direct volatilization in moderate to high-severity fires. Soil temperature increases generated during a cool-burning prescribed fire in mixed conifer forests are lower and of shorter duration, however, with volatilization of carbon and nitrogen greatly reduced. Low-severity fires generally have less effect on soil microorganisms as well (Neary *et al.* 2005). Other nutrients, such as cationic calcium, magnesium, sodium and potassium are not as easily volatilized and usually remain on the site in a highly available form.

*Machine and Hand Piling and Burning – Alternative 2*

Slash piling and burning is essential for site preparation prior to planting the variable retention harvest areas and for reducing fire risk. Slash treatment in most units would be accomplished by a combination of machine piling and hand piling, and burning as described in Chapter Two (pp. 29-30).

Piled material would be burned in late-autumn or winter after periods of extended precipitation. Under these circumstances, soil and duff moisture would be high. Burning landings and piles may create higher temperatures that can cause adverse effect to soils, compared to broadcast burning (Korb *et al.* 2004). However, these effects would be limited to areas directly under the piles (Neary et al. 2005). It would be expected that duff layers under the piles would be largely consumed, but high soil moistures would moderate loss of soil carbon, nitrogen and other nutrients.

Any erosion of exposed soils from yarding or burning would principally remain within the boundaries of the harvest units. Any eroded soil that moves beyond unit boundaries would be intercepted by untreated areas (Neary *et al.* 2005).

*Broadcast Burning*

Broadcast burning would occur in portions of one unit (28-4-29A). The unit is primarily Category 2 soils with inclusions of Category 1 soils. Broadcast burning in the Category 1 inclusions would be avoided to the extent practicable.

Broadcast burning could expose mineral soil resulting in surface erosion, including dry ravel on steeper slopes, for several years until the areas are revegetated. The vegetative recovery rate varies depending on burn severity and vegetation recovery (Neary *et al.* 2005). Vegetative recovery in the unit to be broadcast burned in general would be fairly rapid (Rapp 2000, Neary *et al.* 2005).

For this analysis area, vegetative recovery would be expected to be within three years. Broadcast burning would occur on gentle slopes with low to moderate potential for surface erosion. Broadcast burning would be accomplished under site specific prescriptions (i.e. high soil and duff moisture) to achieve resource objectives and minimize adverse impacts on soil properties. In areas to be broadcast burned, exposed mineral soil would not exceed 30 and 40 percent in soil Categories 2 and 3, respectively.

As described in Chapter Two, fire trail would be constructed around the areas to be broadcast burned, and water-barred to reduce erosion. Broadcast burning would be conducted in late-fall to mid-spring when soil, duff and large down log moisture levels are high. Hand ignition would be used to control the rate of ignition so that fire duration would be short. Light to moderate burn intensity would reduce duff consumption and exposure of mineral soil. Loss of soil nutrients from the burning would also be low (ROD/RMP 1995, pp. 75-77; USDI/BLM 2001, p. 67; Erickson and White 2008).

Based on the factors above and implementation of BMPs and broadcast burning as described in Chapter Two, surface erosion would be minimal and site productivity would be maintained.

## 3. Alternative Three

The same BMPs and project design features (Chapter Two) would be applied to both action alternatives. These measures include pre-designating skid trails, limiting ground-based operations to the dry season, limiting ground-based operations to gentler slopes, keeping equipment off wet areas and unit-specific measures for Unit 28-3-35A and Unit 29-3-15B.

### a. Slope Stability

The potential effects of thinning on slope stability under Alternative Three would be identical to the effects of thinning described under Alternative Two, as the same project design features and BMPs would be applied in each case.

### b. Soil Displacement and Compaction

The extent of effects on soil compaction and displacement from **ground-based and cable yarding** the thinning units in Alternative Three would be consistent with those described for thinning in Alternative Two. The areal extent of detrimental soil effects would range from three to nine percent of the ground-based harvest area and less than three percent of the cable yarded area. Alternative Three includes subsoiling as described in Chapter Two and would have identical effects to those disclosed in Alternative Two.

### c. Prescribed Burning

There would be no broadcast burning under Alternative Three. Fuels treatments would be limited to the burning of machined-piled fuels, and hand-piled material up to six inches in diameter. The manner and timing of pile burning would be as described in Chapter Two. Effects of piling and burning slash under Alternative Three would be the same as those described under Alternative Two.

# IV. Fuels Management/Fire Risk and Air Quality _____

## A. Affected Environment

### 1. Fuels Management/Fire Risk

The analysis area for fuels is the seven HUC 12 sub-watersheds that encompass proposed units. Direct and indirect effects are considered at the stand scale and at the road system scale. Short-term effects are considered 3-5 years post-harvest based on the time it would take for activity generated fine fuels (less than 0.25 inch diameter) to degrade. Long-term effects would last up to 20 years and are based on the historic fire return interval of the analysis area.

Nineteen of the proposed units are located within the Wildland Urban Interface of Myrtle Creek as designated in the South Douglas County Community Wildfire Protection Plan. Several major road systems connect the harvest units across ridgelines that are crucial for fire access and control.

Estimated average fuel loading for units under 80 years of age is 11 to 21 tons per acre based on U.S. Forest Service General Technical Report PNW-105 (Maxwell and Ward 1980, photo 1-MC-3, pg. 101 and photo 2-MC-3, pg. 103). Estimated average fuel loading for units over 80 years of age is approximately 33 tons per acre (Maxwell and Ward 1980, photo 5-DFHD-4, pg. 27).

Approximately 9,620 acres of BLM land within the analysis area have had, in the past 10 years, or are planned for mechanical treatment, including pre-commercial thinning, pruning, roadside brushing, commercial thinning, and girdling.

Fire records from 1967-2012 show 399 wildfires burned a total of 8,225 acres in the analysis area. Of those wildfires, approximately 36 percent were caused by lightning while the remainder were human-caused. It is likely that the total number of fires is actually an underestimation as actual locations of lightning-caused fires were often combined and/or the fires burned together and were counted singly. The last large fire (greater than 100 acres) was 3,162 acres and occurred in 1987.

### 2. Air Quality

Direct, indirect, and cumulative effects are considered at the airshed scale as determined by Oregon Department of Environmental Quality. Generally these airsheds align with large watersheds as major rivers channel smoke and other particulate matter.

The Oregon Department of Forestry – Smoke Management Plan (Oregon SMP) identifies areas sensitive to smoke where impacts should be avoided. The Smoke Sensitive Areas in proximity to the analysis area are the cities of Roseburg and Grants Pass.

## B. Environmental Consequences on Fuels Management/Fire Risk and Air Quality

### 1. Alternative One (No Action)

#### a. Fuels Management/Fire Risk

No activity fuels would be generated from proposed harvest. Fuel loads would increase over time through natural accumulation of needles, self-pruning of twigs and limbs, stem breakage, and suppression mortality. Increases in fuel load associated with suppression mortality were estimated using ORGANON, SW Oregon Version 8.4 for stand conditions at 20 years and 40 years from today in representative stands.

Modeling of representative stands 30-60 years old indicates that an average of 111 trees per acre would die in the next 20 years, corresponding to an increase in fuel loading of 11 tons per acre. From 20 to 40 years, an additional 50 trees per acre would die bringing the total accumulation of fuel, including current conditions to approximately 38 tons per acre. In stands aged 61-90 years old the estimated total accumulation of fuel including current conditions after 40 years is 36 tons per acre while stands greater than 90 years old would have a total accumulation including current conditions of 63 tons per acre fuel loading after 40 years. This modeled estimate of additional fuel does not include limbs and other fuels that are separate from the merchantable bole. With this increase in fuel loading would come a corresponding increase in fire risk.

Pre-commercial thinning and manual stand maintenance would continue to increase short-term fuel loading in the analysis area. For the past decade, pre-commercial thinning has averaged approximately 500 acres per year in the analysis area. Using Photo 3-DF-1-TH in U.S. Forest Service General Technical Report PNW-51 fuel loading in the pre-commercially thinned units would increase from approximately 13 tons per acre to approximately 21 tons per acre (Maxwell and Ward 1976, pg. 71). This increase, combined with the natural accumulation of fuels described above would compound the fire risk.

Timber harvest on nearby private lands would continue generating activity fuels that may increase fire risk. The extent of the risk is difficult to gauge, however, as there is no way to forecast the type, scale, manner of harvest, level of utilization, or activity fuel treatments that may be applied.

#### b. Air Quality

Absent implementation of management activities, there would be no potential effects to air quality from BLM forest management actions. As fuel loading increases, however, potential for wildfire could increase. Under conditions of drought or during severe weather events, fires could burn with high intensity and long duration producing large amounts of smoke with heavy particulate loading.

## 2. Alternative Two

### a. Fuels Management/Fire Risk

Fuel loading would increase in all of the units as a consequence of timber harvest, amounts would vary based on the type of harvest in each individual units. For the thinned units under 80 years of age, estimated post-harvest fuel loading would range from 20-28 tons per acre (Maxwell and Ward 1976, photo 2-DF-4-PC pg. 35 and photo 4-DF-4-PC pg. 39). Estimated post-harvest fuel loading in thinned stands greater than 80 years of age would be approximately 43 tons per acre (Maxwell and Ward 1976, photo 4-DFHD-4-PC, pg. 99). This should not greatly increase the risk of fire ignition in the area however, as approximately 66 percent of the material in stands under 80 years of age and approximately 63 percent of the material in the stands over 80 years of age would be in size classes greater than three inches in diameter.

In the variable retention harvest units, the estimated post-harvest fuel load would be approximately 45 tons per acre, of which 84% would be in size classes greater than three inches in diameter (Maxwell and Ward 1976, photo 5-DF-4-CC, pg. 19). Larger fuels are typically associated with the intensity and duration of a fire, while finer fuels less than three inches in diameter are the primary risk for ignition and rate of spread of wildfires. Fine fuels generated by harvest would largely degrade within five years post-harvest, after which the risk of ignition would also diminish.

With the exception of portions of one unit, a combination of machine and hand piling, and burning would be used to reduce post-harvest fuel loading. Hand piling and burning post-harvest activity fuels within 50 feet of major roadways would reduce the concentration of fuels less than three inches diameter. Treating these fine fuels would help reduce fire risk in harvested areas, specifically the risk of human-caused fires from roadway ignitions.

Some activity fuels are collected at landings. These are predominantly larger fuels piled by machine, covered and burned during the fall or winter after an extended period of precipitation. These landing piles are generally not fully consumed, but the remaining material is not a concern to fire managers.

Fuels treatment in portions of variable retention harvest units that are ground-based yarded would consist of machine piling slash along skid trails in the interior of the units. These parameters should produce fire effects similar to under-burning but with more control over placement of concentrations of fuels. This would create conditions favorable for reforestation as well as activity fuels reduction. Post-treatment, fuel load would be reduced to approximately 7 tons per acre (Maxwell and Ward 1976 photo 1-DF-4-CC, p. 11).

As described in Chapter Two, portions of one variable retention harvest unit (16-24 acres) would be broadcast burned in the fall, winter, or spring depending on conditions conducive to achieving resource objectives. Broadcast burning would employ hand-ignition targeting the activity fuels remaining in the units. Areas with snags, accumulations of large down wood and Category 1 soils would be excluded from burning to the extent possible.

Dispersed retention trees may be intentionally killed to create additional snags and downed wood. Burning would be conducted under conditions where large downed wood should not ignite, or if ignited would not be fully consumed.

Harvest and burning would allow for the germination of flowers, herbs, grasses, forbs, and shrubs from existing seed banks. It would facilitate natural reseeding and establishment of species

represented in the adjoining forest, as well as create areas for planting trees. Openings would occur randomly based upon fire effects. Areas with heavy fuel loading that are allowed to burn completely would likely be free of vegetation and duff while areas lightly burned would have more activity fuels and remaining vegetation that would help prevent soil movement.

To address other resource concerns, activity fuels would remain in portions of the units that would be excluded from fuels treatments. Fuels in these areas would be allowed to degrade naturally.

The planned activity fuels treatments along with daylighting may increase public and firefighter safety along roadways for ingress or egress. Additionally, reducing the fuels near the roads may improve the viability of using the road as a fuel break during fire.

At a watershed level the increase in fuel loading resulting from harvest would not influence the risk of fires igniting and/or spreading. The addition of pre-commercial thinning activity fuels as well as anticipated private land harvest as described in Alternative One, however, would increase the fire risk at the watershed as well as the localized scale. The natural degradation of fine activity fuels combined with the planned fuels treatments would mean the risk of fire spread, once ignited, would decrease over time.

### b. Air Quality

Burning landing and hand piles would occur in the autumn or winter months during unstable fall and winter weather conditions when winds and atmospheric instability favor rapid smoke dispersion, and precipitation washes particulates from the air. Burning under an inversion or otherwise very stable conditions would be avoided to minimize the risk of smoke settling into the river drainage or along roadways and persisting for an extended period of time. Potential impacts to air quality in areas within 0.25 to 1.0 mile of units would persist for one to three days and would be characterized by some haziness.

Piles would likely burn for four to 24 hours, depending on pile size. In the event a pile continues to burn for more than 24 hours, additional ignition or suppression would be used to eliminate the generation of smoke.

Jackpot burning in ground-based harvest areas could result in smoldering exceeding 15-20 hours. However, burning when winds and atmospheric instability favor rapid smoke dispersion would still limit the duration and extent of impacts to air quality. In the event of a forecast inversion, aggressive mop-up would be employed to reduce the risk of an extended period of impacts to the local airshed.

With the application of Oregon smoke management restrictions prescribed burning have no cumulative or long-term effects to local air quality.

## 3. Alternative Three

### a. Fuels Management/Fire Risk

There would be no broadcast burning under Alternative Three. Activity fuel loading from thinning and fuels management in thinned areas would be as described under Alternative Two. The potential effects of thinning on fuel loading and fuels management under Alternative Three would be identical to the effects described for thinning under Alternative Two.

### b. Air Quality

The potential effects of fuels management in thinning units on air quality under Alternative Three would be identical to the effects of fuels management in thinning units described under Alternative Two, as the same project parameters would be applied in each case.

## V. Carbon Storage and Release _____

Climate change and greenhouse gas emissions have been identified as a resource concern by the Secretary of the Interior (Secretarial Order No. 3226; January 16, 2009), and the OR/WA BLM State Director (Instruction Memorandum OR-2010-012, January 13, 2010).

Forster *et al.* 2007 (pp. 129-234), incorporated here by reference, reviewed scientific information on greenhouse gas emissions and climate change. Their conclusion was that human-caused increases in greenhouse gas emissions have likely exerted a substantial warming effect on global climate. Literature, however, has not yet defined any specifics on the nature or magnitude of any cause and effect relationship between greenhouse gases and climate change.

The U.S. Geological Survey, in a May 14, 2008 memorandum (USDI/USGS 2008) to the U.S. Fish and Wildlife Service, summarized the latest science on greenhouse gas emissions concluding that it is currently beyond the scope of existing science to identify a specific source of greenhouse gas emissions or sequestration and designate it as the cause of specific climate impacts at a specific location. Given this uncertainty, this analysis is focused on calculating carbon emissions and storage, in the context of release and sequestration.

The 2008 FEIS (pp. 488-490), incorporated by reference, described current information on predicted changes in regional climate, concluding that the regional climate has become warmer and wetter with reduced snowpack, and that continued change is likely. Changes in resource impacts as a result of climate change would be highly sensitive to specific changes in the amount and timing of precipitation, which are presently too uncertain to predict. Because of this uncertainty, it is not possible to predict changes in vegetation types and condition, wildfire frequency and intensity, streamflow, or wildlife habitat.

Forests fix and store carbon through photosynthesis, and release carbon through respiration and decay, affecting atmospheric concentrations of carbon dioxide which thereby affect global climate. Forest management can be a source of carbon emissions through land use conversion and deforestation, or store carbon through forest growth or afforestation (2008 FEIS, p. 220).

Even though a causal link between this project and specific climate change effects cannot be assigned, the amount of carbon released or stored under the alternatives analyzed can be estimated. Values in this analysis, of carbon stored and released, are expressed as tonnes, the most common unit of measure used in scientific literature on the subject. One tonne of carbon is equivalent to 3.67 tons of carbon dioxide (U.S. EPA 2005).

Data from stand exams specific to the proposed units was input into the ORGANON Growth Model (Hann *et al.* 2005). Outputs were then used to calculate amounts of carbon release and sequestration, and the net carbon balance that would result under each of the alternatives. Modeling of effects of each of the alternatives was conducted for three intervals extending out 50 years, a period deemed sufficient to illustrate long-term trends across the alternatives. The net carbon balance was derived

from: the amount of carbon held in live trees and other components of the forest stands (snags, down wood, soil carbon, etc.), the amount of carbon held in wood products and logging slash that gradually release carbon over time, and the amount of carbon released by the burning of fossil fuels and slash. The methodology used is described in *Appendix E-Calculation Assumptions for Carbon Sequestration and Release*.

## A. Affected Environment

Total annual global emissions of carbon dioxide ($CO_2$) are estimated at 25 billion tonnes (Denman *et al.* 2007), with estimated U.S. emissions of 6.9 billion tonnes of $CO_2$ (USEPA, 2010; Table 2-3). In 2008, fossil fuel combustion accounted for 94.1 percent of $CO_2$ emissions in the U.S. (EPA 2010; Executive Summary p. 6).

Land use, land use change and forestry nationally resulted in a net sequestration of 940 million tons of $CO_2$ in 2008 (USEPA, 2010; Table 2-3). Forest management in the U.S., alone, resulted in net $CO_2$ sequestration of 792 million tonnes (USEPA, 2010; Table 2-9), an offset of approximately 11 percent of total U.S. $CO_2$ emissions.

On lands managed by the BLM in western Oregon and on the Klamath Falls Resource Area of the Lakeview District there are 222 million tonnes of carbon stored in live trees (2008 FEIS, p. 221). The amount of carbon stored in other than live trees (includes shrubs, brush, snags, woody debris, and organic carbon in the soil) is calculated at 195 million tonnes (2008 FEIS, p. 222).

The Myrtle Creek project would treat up to 2,012 gross acres. Modeling indicates the stands currently hold between 153 and 165 tonnes of carbon per acre. Using a mid-point value of 159 tonnes of carbon per acre, the total amount of storage would total about 319,908 tonnes, approximately 0.08 percent of the estimated 417 million tonnes of carbon stored on BLM-administered lands in western Oregon.

## B. Environmental Consequences

### 1. Alternative One (No Action)

There would be no direct release of carbon as fossil fuels would not be consumed in conjunction with road construction and renovation, timber harvest operations, or timber hauling. Direct release of carbon from the cutting of live trees would not occur. No wood products would be produced which would release carbon over time. Absent the creation of any logging slash, no carbon would be released by the burning and/or decomposition of activity fuels.

Forest stands in the analysis area would continue to grow and develop along a trajectory described in Timber Resources/Alternative One Effects (pp. 44-47). Carbon would be released through the decay of snags, woody debris and dead vegetation, and through the process of respiration. At the same time, carbon would be sequestered as live, growing trees and other vegetation fix atmospheric carbon dioxide through the process of photosynthesis.

Over the course of the next 50 years the total carbon stored on-site would increase from current levels to between 370 and 452 tonnes per acre. Using a mid-point value of 159 tonnes per acre for current carbon storage, and a mid-point value of 411 tonnes per acre as the future carbon balance, the increase in sequestered carbon would be approximately 507,024 tonnes, representing an increase of 158 percent over current conditions.

Average annual sequestration of approximately 10,140 tonnes would represent an offset of 0.0002 percent of projected annual global emissions of 6.8 billion tonnes, and 0.0006 percent of current annual United States emissions estimated to be 1.7 billion tonnes.

Annual carbon sequestration in the proposed analysis area would constitute 0.005 percent of the net annual sequestration of 196 million tonnes by all forest management in the United States. In approximately 50 years (ca. 2063), carbon sequestration in the proposed analysis area would represent approximately 0.09 percent of the 596 million tonnes of carbon stored on BLM-administered lands in western Oregon.

## 2. Alternatives Two and Three

The effect of commercial and variable density thinning on carbon storage under Alternative Two, Sub-Alternatives A was derived from calculations for the South River FY 2009 Commercial Thinning (http://www.blm.gov/or/districts/roseburg/plans/files/SR09CThinEA.pdf), Sir Galahad Commercial Thinning and Density Management (http://www.blm.gov/or/districts/roseburg/plans/files/Sir GalahadEA.pdf), and Box of Rocks Commercial Thinning and Density Management (http://www.blm.gov/or/districts/roseburg/plans/files/BoxofRocksEA.pdf) environmental assessments. All of these projects are similar in nature to the commercial and variable density thinning proposed in this environmental assessment, with comparable relative densities, tree sizes and harvest volumes per acre.

### *Alternative Two*

This alternative includes 1,678 gross acres of commercial thinning and variable density thinning along with 334 acres of variable retention harvesting. Based on the previous analyses cited above, the combination of direct carbon release as $CO_2$ from road construction, harvest operations, log hauling and slash burning associated with uniform and variable density thinning would average between three and four tonnes per acre. The direct carbon release under this alternative would total between 5,034 and 6,712 tonnes. The variable retention harvest treatment would release an additional 4,732 tonnes of carbon, bringing the total direct carbon release to between 9,766 and 11,444 tonnes for this alternative.

Direct release of carbon under this alternative would represent 0.0006 percent of annual emissions in the United States, and 0.0002 percent of annual global emissions.

Carbon would be stored in wood products and untreated logging slash. Both of these carbon pools would gradually release carbon over time through processes of decay, sublimation and disposal of wood products by burning. Thinning under this alternative would release between 0.19 and 0.22 tonnes per acre annually, with sublimation of between 319 to 369 tonnes of carbon annually over the first 50 years, post-harvest. The variable retention harvest treatment would release approximately 0.7 tonnes per acre annually or 234 tonnes annually for the first 50 years after harvest. Combined, the project would release between 553 and 603 tonnes of carbon annually over the first 50 years.

While there would be a direct release of carbon, and an annual indirect release of carbon from wood products and unburned slash, growth of remaining trees would sequester atmospheric carbon and store it on site in the form of woody biomass. The amount of carbon directly released by thinning

would be re-sequestered in less than two years. Taking into account the continued sequestration of carbon by trees in retention aggregates and dispersed retention trees, along with the growth of trees established in the areas of dispersed retention within the variable retention harvest units, re-sequestration of carbon directly released by harvest would occur in a little less than 40 years (Table 3-26). The Carbon Neutral Time is affected by the productivity of the site, the amount of retention and regeneration, the time in which it takes to get canopy closer of trees, and the amount of fuels treatments after harvest. The differences in site classes affects the rate at which retention trees and regeneration accumulate carbon, lower sites accumulate carbon at lower rates than on higher sites. The amount of regeneration and management of competing vegetation also affects how carbon is stored. The lower the density of regeneration and the longer the stand stays in open canopy conditions the lower the rate of long term storage of carbon. In early serial conditions shrub and forb species will accumulate carbon, but it is captured for a relatively short period of time compared to carbon captured in tree species.

As a whole, re-sequestration of all carbon directly released under this alternative would occur in approximately eight years.

In the first 50 years, post-harvest, carbon storage would increase between 151 to 203 tonnes per acre on the thinning units, and 9 tonnes per acre on units proposed for variable retention harvest, representing an increase of stored carbon of between 256,384 and 343,640 tonnes, and a 83 to 104 percent increase over the current condition.

The total carbon balance 50 years following harvest would be between 564,220 and 675,620 tonnes, an amount approximately 180,220 to 233,804 tonnes less than under Alternative One.

**Table 3-26: Alternative One Comparison with Alternative Two Variable Retention Harvest Effects on Carbon Release and Storage**

| **Myrtle Creek Alternative One – No Action (Per Acre)** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Timestep (-) | Standing, Live Carbon | Wood Products (tonnes) | Logging Slash* (tonnes) | Other Than Live Trees* (tonnes) | Fossil Fuels (tonnes) | Slash Burning (tonnes) | Carbon Balance (tonnes) | Net Change (+/-) (tonnes) |
| Current Condition | 125 | 0 | 0 | 70 | 0 | 0 | 195 | 0 |
| At Harvest | 125 | 0 | 0 | 70 | 0 | 0 | 195 | 0 |
| 10 years | 143 | 0 | 0 | 70 | 0 | 0 | 213 | 18 |
| 20 years | 161 | 0 | 0 | 88 | 0 | 0 | 249 | 36 |
| 50 years | 218 | 0 | 0 | 95 | 0 | 0 | 313 | 64 |
| **Myrtle Creek Alternative Two – Variable Retention Harvest (Per Acre)** | | | | | | | | |
| Timestep (-) | Standing, Live Carbon (tonnes) | Wood Products (tonnes) | Logging Slash* (tonnes) | Other Than Live Trees* (tonnes) | Fossil Fuels (tonnes) | Slash Burning (tonnes) | Carbon Balance (tonnes) | Net Change (+/-) (tonnes) |
| Current Condition | 125 | 0 | 0 | 70 | 0 | 0 | 195 | 0 |
| At Harvest | 30 | 47 | 41 | 68 | (1) | (4) | 181 | (14) |
| 10 years | 33 | 43 | 32 | 68 | 0 | 0 | 176 | (6) |
| 20 years | 37 | 41 | 27 | 70 | 0 | 0 | 175 | (1) |
| 50 years | 63 | 38 | 17 | 73 | 0 | 0 | 190 | 16 |
| | | | | | | Carbon Neutral Time | | 40 years |

### *Alternative Three*

The direct release of carbon would be between 6,036 and 8,048 tonnes for the 2,012 acres proposed for thinning treatment under this alternative, representing approximately 0.0004 percent of estimated annual U.S. emissions, and 0.0001 percent of estimated annual global emissions.

Carbon would be stored in wood products and untreated logging slash. Both of these carbon pools would release carbon over time through processes of decay, sublimation and disposal of wood products by burning. This release is between 0.19 and 0.22 tonnes per acre annually or 382 to 443 total tonnes over the analysis area annually for the first 50 years under this alternative.

While there would be a direct release between 6,036 and 8,048 tonnes of carbon, and an annual indirect release of carbon from wood products and unburned slash, previous analyses indicate that the growth of remaining trees and sequestration of atmospheric carbon would return carbon stores to pre-harvest levels in a period of one to two years.

Over a period of 50 years, post-harvest, on-site carbon storage would increase between 151 and 203 tonnes per acre under this alternative, totaling between 303,812 and 408,436 tonnes. This represents an increase of approximately 100 to 123 percent over the current condition. The total carbon balance approximately 132,792 to 169,008 tonnes less than under Alternative One.

## VI. Cumulative Effects _____

The cumulative effects of the BLM timber management program on the Roseburg District have been described and analyzed in the PRMP/EIS (Chapter Four), incorporated herein by reference. For all analyzed resources, Alternative One (No Action) would have no cumulative effects because no new management actions would occur at this time.

Past actions and previous decisions have been included in the description of existing conditions. Ongoing BLM actions in the analysis area include pre-commercial thinning, pruning, manual maintenance, dispersed recreation, special forest products gathering, road maintenance, fire suppression, weed control, and the White Castle Area Closure. Pacific Connector Pipeline, Upper Days Creek In-Stream Restoration and Days Creek-South Umpqua Harvest Plan were considered as future foreseeable projects.

Seven segments of the Pacific Connector Pipeline would enter the Myrtle Creek Harvest Plan analysis area. Approximately 3.5 miles of right-of-way averaging 90 feet in width would be required; up to 39 acres would be cleared of trees. A 30-foot wide portion of the right-of-way, centered on the pipeline, would be maintained in a low-grown grass and shrub condition to allow for aerial inspection of the pipeline route, while the remainder of the right-of-way would be allowed to grow back in trees. A portion of the pipeline would be located in existing rights-of-ways and roads. The implementation period could coincide with implementation of the proposed action.

The Upper Days Creek In-Stream Restoration project would include the placement of large wood in approximately 0.5 miles of Days Creek (designated as Oregon Coast coho salmon critical habitat) in addition to at least 7 acres of invasive plant removal followed by planting of native tree and shrub species within Riparian Reserves. Implementation is planned during the summer of 2015.

The preliminary Days Creek-South Umpqua Harvest Plan would harvest approximately 1,320 acres, and would include approximately three miles of road construction and approximately 43 miles of road renovation that overlap the Myrtle Creek analysis area in the Upper and Lower South Myrtle Creek and Days Creek subwatersheds. Implementation is planned in 2016 through 2018.

It is assumed that most late-seral forest stands on private land have been converted to early-seral conditions and large industrial owners will continue to manage primarily for timber production on a rotation of 40 to 65 years. Intensive timber management on private lands will include the use of herbicides for control of competing vegetation, resulting in highly simplified vegetative communities.

The Myrtle Creek analysis area includes several parcels of land being legislatively proposed for conveyance by the BLM to the Cow Creek Band of Umpqua Tribe of Indians (Senate Bill 1415, the Canyon Mountain Land Conveyance Act of 2013). Since this is a legislative proposal, when or if the proposal is passed and which parcels would be selected are unknown. The transfer of the land title from the BLM to the Tribes would not affect current resource conditions.

## 1. Timber Resources

The cumulative effects analysis area for timber resources includes BLM land in Myrtle Creek 10th Field watershed and Roberts Creek 12th Field, Days Creek 12th Field, and Upper Deer Creek 12th Field subwatersheds. Age class distribution within the GFMA land use allocation was used to assess cumulative effects on timber resources, allowing comparison with ROD/RMP desired conditions. Alternative One and Alternative Three would not alter the age class because Alternative One does not include timber harvest and Alternative Three, thinning only, would not change age class distribution; therefore Alternatives One and Three would have no cumulative effects.

The Days Creek-South Umpqua analysis includes an estimated 450 acres of variable retention harvest that would shift age class distribution from current age classes to the zero-year age class. The cumulative effects on GFMA age class distribution when considering treatments proposed in Alternative Two of the Myrtle Creek analysis and as preliminarily proposed in the Days Creek-South Umpqua Harvest Plan are displayed in Table 3-27. Both projects shift GFMA lands toward the desired condition of balanced seral stages as described in the ROD/RMP (p. 150).

Seven segments of the proposed Pacific Connector Pipeline are contained in the cumulative effects analysis area. This proposal would convert up to 39 acres from their current condition to the zero-year age class. This change in ten-year age class would affect less 0.03 percent of the analysis area which would provide a slight incremental shift toward desired conditions.

Other proposed and ongoing management activities such as commercial thinning, pre-commercial thinning, pruning, manual stand maintenance and roadside fuels reduction would also occur in the cumulative effects analysis area. These activities have no cumulative effects on age class distribution because they do not affect stand age class.

**Table 3-27: Cumulative Effects on GFMA Land Use Allocation Age Class Distribution**

| Age Class | Desired Condition % | Analysis Area | | Myrtle Creek Watershed % | Roberts Creek Subwatershed % | Days Creek Subwatershed % | Upper Deer Creek Subwatershed % |
|---|---|---|---|---|---|---|---|
| | | Existing Conditions (2013) | Post-Harvest* % | | | | |
| 0-30 year age class | 33 | 21.5 | 23.1 | 22.6 | 13.0 | 27.1 | 22.0 |
| 40-80 years age class | 33 | 26.3 | 27.0 | 26.9 | 13.0 | 19.9 | 41.4 |
| 90+ year age class | 33 | 48.4 | 48.2 | 48.9 | 51.5 | 53.0 | 35.7 |
| Non-Forest | N/A | 1.6 | 1.6 | 1.6 | 22.5 | 0.0 | 0.9 |

*Includes variable retention harvest in Myrtle Creek and Days Creek-South Umpqua harvest plans and forest clearing associated with the Pacific Connector Pipeline

## 2. Wildlife Resources

### A. Alternative Two

**Northern Spotted Owl**

*Northern Spotted Owl Habitat*

Cumulative effects were assessed on northern spotted owl habitat within the three subwatersheds in common between the Myrtle Creek and Days Creek-South Umpqua harvest plans. In the three subwatersheds, total dispersal habitat is 4,877 acres and suitable habitat is 15,953 acres. Proposed and future foreseeable variable retention harvest would reduce existing dispersal habitat by four percent and existing suitable habitat by three percent. An additional 24 percent of dispersal habitat would be modified by thinning, but habitat function would be maintained by retaining at least 40 percent canopy cover. Approximately two percent of suitable habitat would be thinned and may be downgraded to dispersal habitat. The effects of these actions would be as described in the Alternative Two Northern Spotted Owl Habitat effects analysis.

*Northern Spotted Owl Site Occupancy*

There would be no cumulative effects on northern spotted owl nest patches or core areas because there are no proposed or future foreseeable actions in any common nest patches or core areas. There are five common home ranges affected by the Myrtle Creek and Days Creek-South Umpqua harvest plans: 0295O, 0361B, 2293O, 4046O and 4576O. All five home rangers were unoccupied in 2013. In 2012, surveys indicate four of them were unoccupied and one (0361B) had a resident bird but pair status was unknown. Three of the home ranges (0295O, 2293O and 4046O) are above the core area and home range suitable habitat viability thresholds. Proposed and future foreseeable harvest within the five home ranges would not change current viability status.

Proposed and future foreseeable actions include thinning 113 acres of dispersal habitat in home range 0259O; thinning 22 acres of dispersal habitat in home range 0361B; and thinning 66 acres of dispersal habitat in home range 4046O. Habitat function in these home ranges would be maintained because at least 40 percent canopy cover would be retained. No suitable habitat would be affected. The home range would continue to support northern spotted owls.

In home range 2293O, dispersal habitat function in 75 thinned acres would be maintained by retaining at least 40 percent canopy cover. Thinning may downgrade three acres of suitable habitat to dispersal habitat in the home range. However, the suitable habitat thresholds would be maintained and the home range would continue to support northern spotted owls.

Proposed and future foreseeable actions include thinning 83 acres in dispersal habitat and variable retention harvest in 30 acre of dispersal habitat in home range 4576O. Suitable habitat would not be affected. Thinning would maintain dispersal habitat function, but variable retention harvest would remove dispersal habitat. Home range 4576O is comprised of 38 percent BLM ownership and 62 percent private ownership; it is assumed that the home range suitable habitat viability threshold (40 percent of the home range) would not be achievable under any scenarios due to the lack of sufficient Federal ownership and intensive timber management on private lands.

*Northern Spotted Owl Prey Species*

Cumulative effects to northern spotted owl prey species were assessed in the three subwatersheds common to the Myrtle Creek and Days Creek-South Umpqua harvest plans. Approximately 800 acres would shift from providing prey species associated with mature forest to prey species associated with early-successional habitats. Approximately 1,600 acres would be affected by thinning, as described previously on pages 75-81. The distribution of prey species associated with early-successional and mature habitats would change and a variety of northern spotted owl prey species would remain available.

*2012 Northern Spotted Owl Critical Habitat*

The Myrtle Creek and Days Creek-South Umpqua harvest plans are located in subunit 2 of the Klamath East critical habitat unit (KLE-2; 101,942 acres) which was designated to protect and develop primary constituent habitat elements, including suitable and dispersal habitats. The harvest plans would treat up to 1,804 gross acres (1.8 percent of KLE-2) of northern spotted owl critical habitat in KLE-2.

Within critical habitat, commercial thinning would modify 1,126 to 1,398 acres (7 to 8 percent) of the dispersal habitat in KLE-2, and 222 to 254 acres (approximately 0.5 percent) of suitable habitat in KLE-2, depending upon the treatments selected in any future decisions issued. Northern spotted owls may initially reduce use of thinned stands, but canopy cover would remain above 40 percent, thus maintaining dispersal habitat function and the critical habitat unit would continue to facilitate northern spotted owl movements between the western Cascades and coastal Oregon and the Klamath Mountains.

Variable retention harvest would remove 76 to 348 acres (0.7-3.5 percent) of dispersal habitat and 76 to 108 acres (0.3-0.4 percent) of suitable habitat within KLE-2, depending upon the treatments selected in any future decisions issued. Federally-administered lands would continue to provide for dispersal and connectivity between critical habitat subunits. The BLM will consult with the U.S. Fish and Wildlife Service (FWS) to ensure the function of KLE-2 would not be impaired by proposed actions. By implementing any terms and condition that may be put forth by the FWS and the proposed and future foreseeable actions would not impair the intended function of KLE-2.

**American Peregrine Falcon** – Cumulative effects were analyzed for the known peregrine falcon site within the Myrtle Creek analysis area. The nearest unit proposed for treatment (thinning) in the Days Creek-South Umpqua Harvest Plan is nearly three miles south of the known site. Days Creek-South Umpqua Harvest Plan would not have direct or indirect effects to the site in South Myrtle Creek. There would be no cumulative effects because foreseeable future actions would not affect peregrine falcons within the known peregrine site in the Myrtle Creek analysis area.

**Crater Lake tightcoil snail**, **chace sideband snail** and **Oregon shoulderband snail** – Cumulative effects were analyzed at the stand scale due to the limited mobility of these snails. There would be no cumulative effects because no foreseeable future actions that would alter snail habitat would occur in the units proposed for harvest in the Myrtle Creek analysis, therefore there would be no cumulative effects. Additionally, project design features described in Chapter Two would be used to protect identified populations.

**Fringed myotis**, **Pacific pallid bat** and **Townsend's big-eared bat** – The cumulative effects analysis for these bats considers timber harvest in the three common subwatersheds (Days Creek, Lower South Myrtle Creek and Upper South Myrtle Creek) in the Myrtle Creek and the Days Creek-South Umpqua harvest plan analysis areas. No caves or mines are known to be present in the harvest units so proposed and future foreseeable actions would have no direct, indirect or cumulative effects on hibernacula sites.

Proposed and future foreseeable actions would retain snag and large trees would be retained as described in Chapter Two and thinning would promote development of large trees that would become future roosting habitat. Snag habitat would be managed to meet or exceed ROD/RMP management direction (pp. 23, 34, 38, 64). Large trees and snags remain available in Riparian Reserves and untreated upland areas. Over 13, 000 acres of the BLM land in the subwatersheds would be older than 90 years of age. Given the amount of mature and older habitat in the analysis area, proposed and foreseeable future actions would not alter the status of these bat species and bats would continue to persist in the three subwatersheds.

**Great gray owl** – The cumulative effects analysis for great gray owls considers timber harvest in the three common subwatersheds (Days Creek, Lower South Myrtle Creek and Upper South Myrtle Creek) in the Myrtle Creek Harvest Plan and the Days Creek-South Umpqua Harvest Plan analysis areas. None of the proposed or future foreseeable harvest areas or road locations coincide with the documented great gray owl locations. In general, the stands proposed for thinning do not qualify as nesting habitat and the nearest proposed and future foreseeable harvest areas would be thinned. Protocol surveys would be conducted in suitable habitat and identified sites would be protected. There would be no effects to great gray owls; therefore there would be no cumulative effects.

**Oregon red tree vole** – The cumulative effects analysis for red tree vole considers timber harvest in the three common subwatersheds (Days Creek, Lower South Myrtle Creek and Upper South Myrtle Creek) in the Myrtle Creek Harvest Plan and the Days Creek-South Umpqua Harvest Plan analysis areas. Required protocol surveys would be conducted. Active sites would be managed according to the *2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines,* which provides options for site protection or non-high priority site designation (USDA/FS-USDI/BLM 2001). **The non-high priority site evaluation is addressed in Appendix F.** Proposed and future foreseeable actions would not alter the status of the species and red tree voles would continue to persist in the analyzed subwatersheds because over 13,000 acres of BLM land within the subwatersheds would provide suitable habitat older than 90 years of age.

**Purple finches** – The cumulative effects analysis for purple finch considers timber harvest in the three common subwatersheds (Days Creek, Lower South Myrtle Creek and Upper South Myrtle Creek) in the Myrtle Creek Harvest Plan and the Days Creek-South Umpqua Harvest Plan analysis areas. The cumulative effects timeframe is about 30-40 years, the time it would take for sapling and small trees to become established in variable retention harvest units.

Thinning would not prevent this species from using the forest stands. Proposed and future foreseeable thinning (1,593 acres) would release hardwoods and increase understory vegetation as a result of opening the stand, thus improving habitat for the species. Proposed and future foreseeable variable retention harvest would occur in generally unsuitable habitats. Approximately 759 upland acres of potentially suitable purple finch habitat would develop in about 30-40 years, when trees are in the sapling and pole size classes. Based on Hager et al. (2004) findings, the purple finch would be expected to continue to use the aggregate areas, riparian areas, and retention trees within variable retention harvest units that have open canopy and increased shrub growth. In addition, the species would continue to persist in the three subwatersheds in existing BLM land with sapling and pole sized trees (approximately 4,200 acres) and in future habitat created by implementing variable retention harvest.

**Pacific wren** – The cumulative effects analysis for Pacific wren considers timber harvest in the three common subwatersheds in the Myrtle Creek Harvest Plan and the Days Creek-South Umpqua Harvest Plan. The cumulative effects timeframe is 30-40 years because tree canopy cover would begin shading understory vegetation and reducing habitat quality after this time. Thinning (1,593 acres) may disturb Pacific wrens during implementation but Pacific wrens would continue to use thinned habitats where canopy closure and shrubs, rootwads, down logs, ferns, and herbaceous vegetation remain (Altman 1999). Legacy trees, snags and large down wood retention in both Harvest Plans would occur in all thinned areas. In both Harvest Plans, "no-treatment" stream buffers would be applied and Pacific wrens would continue to use Riparian Reserves.

The open areas created variable retention harvest (up to 759 acres) and road construction would not be suited to Pacific wren use as they would not provide the conditions noted by Altman (1999): vegetative and structural complexity of the forest floor and low understory layer including down logs, stumps, root wads, litter layer, ferns, and a well-developed growth of mosses/bryophytes in mature and old-growth forests. These areas would remain unsuitable for up to 30 years until reestablishment of canopy cover. In the interim, the Pacific wren would likely continue to utilize retention aggregates, adjacent riparian areas and untreated areas for nesting and foraging. The Pacific wren would continue to persist in the three subwatersheds as over 11,000 acres of BLM land within the subwatersheds would provide suitable habitat at least 120 years of age that would continue to provide suitable habitat.

The **hermit warbler** – The cumulative effects analysis for the hermit warbler considers timber harvest in the three common subwatersheds in the Myrtle Creek Harvest Plan and the Days Creek-South Umpqua Harvest Plan. The cumulative effects timeframe is 30 years because tree canopy cover in variable retention harvest areas would begin to provide suitable habitat at this time. The Myrtle Creek and Days Creek-South Umpqua harvest plans would thin 1,383 acres of potential young habitat and 204 acres of potential mature habitat. The harvest plans would apply variable retention harvest on 344 acres of young habitat and 414 acres on mature habitat. The hermit warbler would continue to persist in thinned areas and untreated suitable young habitat (7,499 acres) and mature habitat (14,109 acres) would remain available.

**Golden eagles** – Cumulative effects were analyzed for known golden eagle sites. There are no known golden eagle sites in the subwatersheds that are common to the Myrtle Creek analysis and future foreseeable actions that would affect potentially suitable golden eagle habitat so there would be no cumulative effects.

## B. Alternative Three

### Northern Spotted Owl

*Northern Spotted Owl Habitat*

Considering Alternative Three and future foreseeable variable retention harvest would reduce existing dispersal habitat by less than one percent and existing suitable habitat by 2.5 percent. An additional 28 percent of dispersal habitat would be modified by thinning, but habitat function would be maintained by retaining at least 40 percent canopy cover. Approximately three percent of suitable habitat would be thinned and may be downgraded to dispersal habitat. The effects of these actions would be as described in the Alternative Two Northern Spotted Owl Habitat effects analysis.

*Northern Spotted Owl Site Occupancy*

There would be no cumulative effects on northern spotted owl nest patches or core areas because there are no proposed or future foreseeable actions in any common nest patches or core areas. Activities proposed under Alternative Three when combined with future foreseeable harvest within the five home ranges being analyzed for cumulative effects would not change current viability status and are the same under both action alternatives.

*Northern Spotted Owl Prey Species*

Cumulative effects to northern spotted owl prey species were assessed in the three subwatersheds common to the Myrtle Creek and Days Creek-South Umpqua harvest plans. Approximately 485 acres of variable retention harvest is proposed in the Days Creek-South Umpqua Harvest Plan. Availability of prey species would shift from species associated with mature forest to species associated with early-successional habitats. Approximately 1,900 acres would be affected by thinning, as described previously on pages 75-81.

*2012 Northern Spotted Owl Critical Habitat*

Thinning proposed in critical habitat in Alternative Three and Days Creek-South Umpqua Harvest Plan would modify 1,202 to 1,474 acres of dispersal habitat and 298 to 330 acres of suitable habitat. Variable retention harvest proposed in the Days Creek-South Umpqua Harvest Plan would remove up to 272 acres of dispersal habitat and up to 32 acres of suitable habitat within northern spotted owl critical habitat. The cumulative effects would be as described for under Alternative Two.

**American Peregrine Falcon** –There would be no cumulative effects because ongoing and foreseeable future actions would not affect peregrine falcons within the known peregrine site in the Myrtle Creek analysis area.

The **Crater Lake tightcoil snail**, **chace sideband snail** and **Oregon shoulderband snail** – There would be no cumulative effects because no ongoing or foreseeable future actions would occur in the units proposed for harvest in the Myrtle Creek analysis. Additionally, project design features described in Chapter Two would be used to protect identified populations.

**Fringed myotis**, **Pacific pallid bat** and **Townsend's big-eared bat** – No caves or mines are known to be present in the harvest units so proposed and future foreseeable actions would have no cumulative effects on hibernacula sites. Given the amount of mature and older habitat in the analysis area, proposed and foreseeable future actions would not alter the status of these bat species and bats would continue to persist in the cumulative effects analysis area.

**Great gray owl** – None of the proposed or future foreseeable harvest areas or road locations coincide with the documented great gray owl locations. In general, the stands proposed for thinning do not qualify as nesting habitat and the nearest proposed and future foreseeable harvest areas would be thinned. There would be no effects to great gray owls; therefore there would be no cumulative effects.

**Oregon red tree vole** – Required protocol surveys would be conducted. Active sites would be managed according to the *2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines*, **which provides options for site protection or non-high priority site designation (USDA/FS-USDI/BLM 2001). The non-high priority site evaluation is addressed in Appendix F.** Proposed and future foreseeable actions would not alter the status of the species and red tree voles would continue to persist in the analyzed subwatersheds because over 13,000 acres of BLM land within the subwatersheds would provide suitable habitat older than 90 years of age.

**Purple finches** – Thinning (1,907 acres) would not prevent this species from using the forest stands. The cumulative effects would be as describe under Alternative Two. Variable retention harvest associated with the Days Creek-South Umpqua Harvest Plan would occur in generally unsuitable habitat, but treated areas may become suitable purple finch habitat in about 30-40 years. Based on Hager et al. (2004) findings, the purple finch would be expected to continue to use the aggregate areas, riparian areas, and retention trees within variable retention harvest units that have open canopy and increased shrub growth. In addition, the species would continue to persist in the cumulative effects analysis area in existing BLM land with sapling and pole sized trees (approximately 4,200 acres).

**Pacific wren** – Thinning (1,593 acres) may disturb Pacific wrens during implementation but Pacific wrens would continue to use thinned habitats where canopy closure and shrubs, rootwads, down logs, ferns, and herbaceous vegetation remain (Altman 1999). Legacy trees, snags and large down wood retention in both Harvest Plans would occur in all thinned areas. Pacific wrens would continue to use Riparian Reserves. Up to 444 acres of variable retention harvest associated with the Days Creek-South Umpqua Harvest Plan and road construction locations would not be suited to Pacific wren use as they would not provide the conditions noted by Altman (1999). The effects would be as describe for Alternative Two cumulative effects.

The **hermit warbler** – Hermit warbler would continue to persist in thinned areas and untreated suitable young habitat (7,499 acres) and mature habitat (14,109 acres). Variable retention harvest areas associated with Days Creek-South Umpqua Harvest Plan would become suitable habitat about 30 years after harvest.

**Golden eagles** – There are no known golden eagle sites in the subwatersheds that are common to the Myrtle Creek analysis and future foreseeable actions that would affect potentially suitable golden eagle habitat so there would be no cumulative effects.

## 3. Aquatics

The cumulative effects analysis area for aquatic resources includes all lands within the Upper and Lower South Myrtle Creek, Upper and Lower North Myrtle Creek, Upper Deer Creek, Roberts Creek, and Days Creek 12th HUC subwatersheds. This scale was selected because actions outside of this area would have no effect on aquatic resources within the analysis area. The time period considered for this analysis is 2015 to 2022. Within this time period, all proposed and future foreseeable activities would be completed, and there would be sufficient time for growth of shrubs and other ground cover to re-establish in managed areas.

### A. Fish

The analysis on fish considers proposed and future foreseeable activities that can affect sediment and substrate, and in-stream functional wood such as thinning and road construction in the Riparian Reserves. Other proposed and ongoing management activities listed previously, and timber harvest and road construction outside of Riparian Reserves would have no cumulative effects on sediment and substrate or in-stream functional wood as they would have no direct or indirect effects.

No discernable sedimentation would be expected under either action alternative with application of Best Management Practices and project design features described in Chapter Two. Stream substrate would be unaffected as any fine sediment generated by yarding operations would be trapped in untreated areas, preventing sediment delivery to streams. Any sediment delivered to area streams from proposed activities in Riparian Reserves would not exceed background turbidity levels during winter high flows; therefore there would be no cumulative effects.

Project design features (Chapter 2) such as “no-treatment” areas would limit hydrologic connectivity to fish-bearing reaches and, hence, aquatic habitat and fish would not be directly, indirectly or cumulatively affected by proposed and future foreseeable variable density thinning within the Riparian Reserves.

Thinning in Riparian Reserves could reduce future availability of large wood in the short-term because trees would be removed which could provide small functional wood and reduce the number of trees available for future recruitment. On the other hand, thinning would accelerate tree growth which would provide future in-stream large wood.

There are no known aquatic habitat access limitations (e.g. perched or failing culverts) within the analysis area. Proposed and future foreseeable actions would have no direct, indirect or cumulative effects on aquatic organism passage because there are no new stream crossings proposed.

Stream restoration in Days Creek would improve in-stream and riparian habitat diversity. The Myrtle Creek Harvest Plan would not affect in-stream conditions; therefore there would be no cumulative effects.

### B. Water Quality and Quantity

Proposed and future foreseeable management activities that affect ECA were analyzed because ECA can be used as an indicator of increases in peak flow which can lead to channel destabilization. Variable retention harvest is the only proposed or future foreseeable activity that could affect ECA. Other proposed or future foreseeable activities such as thinning, pruning, recreation, fire suppression and road management would not affect ECA so they would not have cumulative effects on ECA. For this reason, there would be no cumulative effects associated with Alternative Three (thinning only).

The Myrtle Creek Harvest Plan analysis area overlaps the Days Creek-South Umpqua Harvest Plan in three subwatersheds: Upper South Myrtle Creek, Lower South Myrtle Creek and Days Creek. Alternative Two of the Myrtle Creek Harvest Plan and the Days Creek-South Umpqua Harvest Plan include variable retention harvest in one common subwatershed (Days Creek). The Myrtle Creek Harvest Plan proposes 26 acres and Days Creek-South Umpqua Harvest Plan proposes up to 213 acres of variable retention harvest in the Days Creek subwatershed. Cumulatively, ECA would increase 1.1 percent to 13.5 percent which is under the 29 percent threshold. The Pacific Connector Pipeline, requiring up to 39 acres of forest clearing on BLM-administered lands, also overlaps the Myrtle Creek Harvest Plan analysis area, increasing ECA by up to 0.2 percent. The ECA would remain under the 29 percent threshold so no changes in peak flow are expected and condition of streams would remain stable.

Implementation of BMPs and project design features would eliminate effects from proposed or future foreseeable actions on beneficial uses and water quality factors such as temperature, pH, dissolved oxygen and turbidity, and water quality would be no cumulative effects associated with beneficial uses or water quality.

## 4. Soils

The cumulative effects analysis area for soils includes the individual proposed harvest units and associated roads. This scale was selected because actions outside of these areas would have no effect on cumulative soil disturbance within affected areas and the scale of acceptable compaction and displacement in the ROD/RMP is on an individual unit bases. The time period considered for this analysis is 2015 to 2022. Within this time period, all proposed and future foreseeable activities would be completed, and there would be sufficient time for growth of shrubs and other ground cover to become re-established in disturbed areas.

This analysis considers proposed and future foreseeable activities that would affect soil disturbance such as subsoiling, road construction and decommissioning, timber harvest, prescribed fire/wildfire and during the cumulative effects timeframe.

Since the implementation of the 1995 ROD/RMP, primary and secondary skid trails, equipment areas and associated landings that have been created or re-used from ground base harvest operations have either been subsoiled or mapped for subsoiling evaluation at final harvest. By subsoiling newly created and re-used old skid trails, landings and equipment areas with the current timber sale project, conditions are incrementally improving with implementation of each timber sale. Likewise, proposed road decommissioning helps to offset road construction and reduces cumulative effects associated with new roads.

Project design measures, BMPs, and ROD/RMP guidelines are used to reduce the cumulative extent of soil disturbance and to maintain soil productivity in harvested areas. Designated skid trails, retention of woody material, operating under dry conditions, and limiting ground-based skidding activities to slopes generally less than 35 percent are common practices that protect soils that were not used in early forest management.

Monitoring past harvest operations from 2000 to 2014 shows the amount of soil disturbance has ranged from three to ten percent for ground base operations and three percent or less for cable yarded areas, within the ROD/RMP ten percent guideline. Proposed and future foreseeable harvest areas are expected to yield similar results since similar project design features, BMPs and ROD/RMP guidelines would be applied.

Fire exclusion will continue but future wildfires and suppression efforts are expected. The time, location, size and intensity of future wildfires or suppression efforts are not predictable, so effects on soils cannot be predicted.

Within the proposed and future variable retention harvest units, broadcast burning and machine piling within harvest units would occur. The ROD/RMP guidelines, BMPs, and project design features would be used, limiting the areal extent and degree of soil effects within each harvest unit so cumulative effects would remain within ROD/RMP guidelines.

## 5. Fuels

Cumulative effects analysis for fuels is considered at the unt and road system scales as well as at the watershed scale. Previous treatments in adjacent stands or in the same main road system can add to overall fire risk for an area.

Cumulative effects were analyzed for the seven HUC 12 subwatersheds that incorporate the harvest units. Subwatershed boundaries were used because they represent potential ridge tops that could serve as fire breaks. Quantitative data in acres was available for previous timber management that influenced activity fuel loading but actual fuel loading measurements were not available. Comparisons and estimates were made using the Photo Series for estimating fuel loading.

The timeframe for cumulative effects is ten years to account for harvesting, activity fuels treatment, and natural degradation of small activity fuels. Activities considered for cumulative effects include management actions that may alter fire risk such as fire suppression/exclusion and activity fuel accumulation from timber harvest. Over the past ten years, nearly 1,000 acres per year were mechanically treated by commercial thinning, pre-commercial thinning and pruning on federal lands in the analysis area.

Thinning and variable retention harvest proposed in the action alternatives would alter the landscape by creating areas of discontinuous fuels which could increase firefighter safety during fire suppression due to changing the fuel type and/or arrangement. Crown fire potential may decrease by creating more gaps between the crowns of remaining trees. Ongoing, proposed and future foreseeable actions would cumulatively increase fine fuels in the short-term (5 year post-treatment). To address the short-term increase in fine fuels, piling and burning slash and broadcast burning are used to reduce activity fuel loading.

Wildfire and fire suppression are expected, but predicting the time, location, size or intensity of these events is not possible. Fire suppression would continue on all lands as mandated in the 1995 ROD/RMP, the Coos Bay/Roseburg Fire Management Zone Fire Management Plan (2013), and the Westside Fire Protection Contract. The Westside Fire Protection Contract and the Coos Bay/Roseburg Fire Management Zone Fire Management Plan require 94% of all fires to be suppressed at ten acres or less. Fire suppression would allow fuel loading and crown fire potential to incrementally increase. Forest conditions would continue to depart from natural conditions based on fire regime and fire regime condition class.

## 6. Carbon

This cumulative effects analysis considers proposed and future foreseeable actions proposed in the Days Creek-South Umpqua Harvest Plan and the Pacific Connector Pipeline project. The Days Creek-South Umpqua Harvest Plan proposes to apply variable retention harvest to 445 acres and commercial thinning to 875 acres. The forest stand conditions in proposed treatments units are similar to those found in the Myrtle Creek analysis area. The proposed Pacific Connector Pipeline would convert up to 39 acres from their current condition to the zero age class. Approximately 13 acres are expected to be managed in low-growing vegetation during the 50 year carbon analysis time period. Other ongoing forest management activities such as pre-commercial thinning, manual stand maintenance, tree pruning, and roadside fuels reduction may have cumulative impacts, but the release of carbon from these activities would be undiscernible.

Carbon storage calculations for the cumulative effects analysis were completed as described in *Appendix E – Carbon* of this document. The cumulative effects are analyzed on a stand basis for the proposed and future foreseeable actions; a total of 3,371 acres (2,012 acres of treatment proposed in the Myrtle Creek Harvest Plan; 1,320 acres of treatment proposed in the Days Creek-South Umpqua Harvest Plan; and 39 acres of treatment proposed for the Pacific Connector Pipeline). This is appropriate because it represents all proposed and future foreseeable management activities that can affect carbon storage and release.

The total amount of carbon stored in the cumulative effects analysis area is 535,989 tonnes of carbon. This would equal approximately 0.13 percent of the estimated 417 million tonnes of carbon stored on BLM-administered lands in western Oregon.

### A. Alternative One (No Action)

With no treatments the carbon stored on site in 50 years within the cumulative effects analysis area would be 1,385,481 tonnes. This is an increase of 158% over the current conditions. Average annual sequestration of approximately 14,300 tonnes would represent an offset of 0.0002 percent of projected annual global emissions and 0.00008 percent of current projected annual US emissions.

Annual carbon sequestration in the proposed analysis area would constitute 0.007 percent of the net annual sequestration by all forest management in the US. In approximately 50 years, carbon sequestration in the analysis area would represent approximately 0.1 percent of carbon stored on BLM-administered lands in western Oregon.

### B. Alternative Two

Under Alternative Two, the direct release of carbon from road construction, harvest operations, log hauling and slash burning associated with proposed treatment and future foreseeable treatments would be approximately 20,000 tonnes. The direct release of carbon would represent 0.001 percent of projected annual emissions in the US and 0.0003 percent of projected annual global emissions.

Carbon stored in wood products and untreated logging slash would decay and release approximately 1107 tonnes of carbon annually over the first 50 years.

While there would be a direct release of carbon, and an annual indirect release of carbon from wood products and unburned slash, growth of remaining trees would sequester atmospheric carbon and store it on site in the form of woody biomass. The amount of carbon directly released by thinning would be re-sequestered in less than two years. Taking into account the continued sequestration of carbon by trees in retention aggregates and dispersed retention trees, along with the growth of trees established in the areas of dispersed retention within the variable retention harvest units, re-sequestration of carbon directly released by harvest would occur in a little more than 40 years. As a whole, re-sequestration of all carbon directly released under this alternative and foreseeable future projects in the analysis area would occur in approximately ten years.

In the first 50 years, post-harvest, carbon storage would increase approximately 460,000 tonnes which would equal an increase of 86 percent over the current condition. The total carbon balance 50 years following harvest would be approximately 995,989 tonnes, an amount approximately 390,000 tonnes less than the no action alternative.

### C. Alternative Three

The direct release of carbon from road construction, harvest operations, log hauling and slash burning associated with proposed treatment and future foreseeable treatments would be approximately 14,500 tonnes. The Direct release of carbon would represent 0.0009 percent of annual emissions in the US and 0.0002 percent of annual global emissions.

Carbon stored in wood products and untreated logging slash would decay and release approximately 782 tonnes of carbon annually over the first 50 years.

While there would be a direct release of carbon, and an annual indirect release of carbon from wood products and unburned slash, growth of remaining trees would sequester atmospheric carbon and store it on site in the form of woody biomass. The amount of carbon directly released by thinning would be re-sequestered in less than two years. Taking into account the continued sequestration of carbon by trees in retention aggregates and dispersed retention trees, along with the growth of trees established in the areas of dispersed retention within the variable retention harvest units, re-sequestration of carbon directly released by harvest would occur in a little more than 38 years. As a whole Alternative 3 combined with foreseeable future harvest treatments in the project area the re-sequester time would be approximately 7 years.

In the first 50 years, post-harvest, carbon storage would increase 520,300 tonnes which would equal an increase of 97 percent over the current condition. The total carbon balance 50 years following harvest would be approximately 1,056,300 tonnes, an amount approximately 329,148 tonnes less than the no action alternative.

## VII. Monitoring

Monitoring will be conducted in accordance with provisions contained in the ROD/RMP, Appendix I (pp. 84-86, 190-199). Monitoring efforts will focus on consideration of the following resources: Riparian Reserves, Matrix, Air Quality, Water and Soil, Wildlife Habitat, Fish Habitat, and Special Status Species.

# Chapter Four – Agencies and Individuals Contacted; Preparers; and Literature Cited

Initiation of the project was published in the Winter 2012 Quarterly Planning Update. Upon completion of the EA, an electronic Notice of Availability for public review and comment **was** posted to individuals and organizations having expressed interest in these types of projects. **A 30-day review and comment period was provided June 4, 2014 through July 3, 2015. An additional 15-day period will be provided for review and comment on the revised portions of the Revised Myrtle Creek Harvest Plan EA from August 12, 2015 until August 26, 2015.**

## I. Agencies & Persons Contacted

Adjacent Landowners and Down-stream Water Users
Cow Creek Band of Umpqua Tribe of Indians
Confederated Tribes of Grand Ronde
Confederated Tribes of Siletz Indians
NOAA Fisheries
U.S. Fish and Wildlife Service

Consultation under Section 7 of the Endangered Species Act (1973 as amended) with the U.S. Fish and Wildlife Service is incomplete. Consultation on a portion of the Myrtle Creek project was completed on December 30, 2013 (USDI/FWS 2013). The Biological Opinion found that the proposed treatments included in the 2013 document would not jeopardize the northern spotted owl and would not adversely modify designated critical habitat for the recovery of the northern spotted owl (Tails #01EOFW00-2013-F-0200).

Consultation with the U.S. Fish and Wildlife Service for the remainder of the Myrtle Creek project is scheduled for completion in 2015, prior to any decision documents that may be issued for timber sales included in the 2015 consultation.

## II. Agencies, Organizations and Individuals to be Notified of the Completion of the Revised EA

American Forest Resources Council
Cascadia Wildlands Project
Douglas Timber Operators, Robert Ragon - Executive Director
Klamath Siskiyou Wildlands Center
National Marine Fisheries Service
Oregon Department of Environmental Quality
Oregon Department of Fish and Wildlife
Oregon Wild
Pacific Northwest 4-Wheel Drive Association
U.S. Fish and Wildlife Service
Umpqua Valley Audubon Society
Umpqua Watersheds, Inc.
Ronald S. Yockim, Attorney-at-Law

## III. List of Preparers

| | | |
|---|---|---|
| Susan Carter | Botanist | Special Status Plants/Noxious Weeds |
| Molly Casperson | Archaeologist | Cultural/ Historical Resources |
| Steven Clark | Fisheries Biologist | Fisheries and Aquatic Habitat |
| Roli Espinosa | Wildlife Biologist | Special Status Wildlife |
| Ward Fong | Soil Scientist | Soils |
| Brennan Garrelts | Supervisory Forester | Management Representative |
| Ariel Hiller | Recreation Planner | Visual Resources Management |
| Ryan Johnson | Forester | Silviculture |
| Krisann Kosel | Fire Ecologist | Fuels Management/Air Quality |
| Macrina Lesniak | Forester/Project Lead | Timber |
| Sidney Post | Hydrology | Water Quality/Resources |
| Michelle Roberts | Environmental Coordinator | Writer/Editor |
| Aaron Roe | Botanist | Special Status Plants/Noxious Weeds |

## IV. Literature and References Cited


Acker, S.A., E.K. Zenner and W.H. Emmingham. 1998. Structure and yield of two-aged stands on the Willamette National Forest, Oregon: implications for green tree retention. Canadian Journal of Forest Research, 28: 749-758.

Albin, B. 2014. Bureau of Land Management Civil Engineer. Personal observations.

Altman, B. 1999. Conservation strategy for land birds in coniferous forests of Western Oregon and Washington. American Bird Conservancy.

Altman, B., and J. C. Hagar. 2006. Rainforest birds: a land manager's guide to breeding bird habitat

in young conifer forests in the Pacific Northwest. U.S. Department of Interior, Geological Survey,

Scientific Investigations Report 2006-5304, Reston, Virginia.

Amaranthus, Michael P., Debbie Page-Dumroese, Al Harvey, Efren Cazares, and Larry F. Bednar. 1996. Soil compaction and organic matter affect conifer seedling nonmycorrhizal and ectomycorrhizal root tip abundance and diversity. Research paper PNW-RP-494. U.S. Dept. of Agriculture, Forest Service, Pacific Northwest Research Station.

Anthony, R.G. and F.B. Isaacs. 1989. Characteristics of bald eagle nest sites in Oregon. Journal of Wildlife Management 53:148-159.

Applegarth, J.S. 1995. Invertebrates of special status or special concern in the Eugene district. U.S. Department of the Interior, Bureau of Land Management.

Bailey, J.D. and J.C. Tappeiner. 1998. Effects of thinning on structural development in 40-to 100-year old Douglas-fir stands in western Oregon. Forest Ecology and Management Vol. 108 pp. 99-113.

Bilby, R. E., and J. W. Ward. 1989. Changes in characteristics and function of woody debris with increasing size of streams in western Washington. Transactions of the American Fisheries Society 118:368-378.

Bottorff, J. 2007. Managing Pacific Northwest forests for band-tailed pigeons. A woodland and fish and wildlife project publication. Washington State University. Extension Bulletin MISC0564. 8 pp.

Boyer, K.L., Berg, D.R., Gregory, S.V., 2003. Riparian management for wood in rivers. Am. Fish. Soc. Symp. 37, 409-412.

Brown, C.R. 1997. Purple Martin. The Birds of North America, No. 287. A. Poole and F. Gill, editors. 31pp. The Academy of Natural Sciences, Philadelphia, PA and the American Ornithologists' Union, Washington, DC.

Buehler, D.A. 2000. Bald eagle (*Haliaeetus leucocephalus*). The Birds of North America.No. 506. A. Poole and F. Gill editors. The Academy of Natural Sciences, Philadelphia, PA and the American Ornithologists' Union, Washington, D.C.

Buermeyer, K. R. and C. A. Harrington (2002): Fate of overstory trees and patterns of regeneration 12 years after clearcutting with reserve trees in Southwest Washington. Western Journal of Applied Forestry 17: 78–85.

Burke, T. E. Land Snails and Slugs of the Pacific Northwest. 2013. Pp 137-138. Photographs by William P Leonard. Oregon State University Press, Corvallis, Oregon. Paperback, 344 p. ISBN 978-0-87071-085-0.

Burroughs, E.R., Jr. 1990. Predicting onsite sediment yield from forest roads. Proceedings of Conference XXI, International Erosion Control Association, Erosion Control: Technology in Transition. Washington, DC, February 14-17, 1990. 223-232.

Busby, Posy, Peter Aldler, Timothy Warren, and Frederick Swanson. 2006. Fate of live trees retained in forest cutting units, western Cascade Range, Oregon. Canadian Journal of Forest Research, 36: 2550-2560.

Carey, A. B. 2001. Experimental manipulation of spatial heterogeneity in Douglas-fir forests: effects on squirrels. Forest Ecology and Management 152:13-30.

Carey, A. B., and S. M. Wilson. 2001. Induced heterogeneity in Douglas-fir canopies: effects on small mammals. Journal of Wildlife Management 65:1014-1027.

Carey, A.B. 1991. The biology of arboreal rodents in Douglas-fir forests. General Technical Report PNW-GTR-276. 53 pp.

Carey, A.B., M.M. Hardt, S.P. Horton, and B.L. Biswell. 1991. Spring bird communities in the Oregon Coast Range. pp. 123-140 In Wildlife and vegetation of unmanaged Douglas-fir forests (L.F. Ruggiero, K.B. Aubry, A.B. Carey and M.H. Huff, tech. coords.). USDA Forest Service General Technical Report PNW 285.

Carey, A.B. 1995. Sciurids in Pacific Northwest managed and old-growth forests. Ecological Applications 5(3):648–661.

Carey, A.B. 2000. Effects of new forest management strategies on squirrel populations. Ecological Applications 10(1):248–257.

Carey, A.B., C.C. Maguire, B.L. Biswell and T.M. Wilson. 1999. Distribution and abundance of *Neotoma* in western Oregon. Northwest Science 73: 65-80.

Chamberlin, T.W., R.D. Harr, and F.H. Everest. 1991. Timber harvesting, silviculture, and watershed processes. *In*: Influence of Forest and Rangeland Management on Salmonid Fishes and Their Habitats. Editor William Meehan. Pages 181-205.

Chan, Samuel, David Larson, Kathleen Maas-Hebner, William Emmingham, Stuart Johnston, and Daniel Mikowski. 2006. Overstory and understory development in thinned and underplanted Oregon Coast Range Douglas-fir stands. Canadian Journal of Forest Resources. 36: 2696-2711.

Chapman, D.W. 1988. Critical review of variables used to define effects of fines in redds of large salmonids. Trans. Am. Fish. Soc. 117: 1-21.

Christensen, N.L., S.V. Gregory, P.R. Hagenstein, T.A. Heberlein, J.C. Hendee, J.T. Olson, J.M. Peek, D.A. Perry, T.D. Schowalter, K. Sullivan, G.D. Tilman, K.A. Vogt. 2000. Environmental issues in Pacific Northwest forest management. National Academy of Sciences. National Academy Press. Washington D.C.

Clark, S.M. 2014. BLM Fisheries Biologist. Personal observations.

Cook, J.G., B. K. Johnson, R. A. Riggs, T. DelCurto, L. D. Bryant and L. L. Irwin. 2002. Effects of summer-autumn nutritional and parturition date on reproduction and survival of elk.

Corkran, C. C. and C. Thoms. 1996. Amphibians of Oregon, Washington and British Columbia. A field identification guide. Lone Pine Publishing. Vancouver, B.C. 175 pp.

Courtney, S.P., J.A. Blakesley, R.E. Bigley, M.L. Cody, J.P. Dumbacher, R.C. Fleischer, A.B. Franklin, J.F. Franklin, R.J. Gutiérrez, J.M. Marzluff, and L. Sztukowski. 2004. Scientific evaluation of the status of the Northern Spotted Owl. Sustainable Ecosystems Institute. Portland, Oregon, USA.

Cross, S. P. and D. Waldien. 1995. Survey of bats and their habitats in the Roseburg District of the BLM in 1994. Final Report to the BLM. Roseburg, OR.

Csuti, B., A.J. Kimerling, T.A. O'Neil, M.M. Shaughnessy, E.P. Gaines, and M.M.P. Huso. 1997. Atlas of Oregon Wildlife. Oregon State University Press. Corvallis, OR. 492pp.

Curtis, Robert O. 1982. A simple index of stand density for Douglas-fir. Forest Science 28(1): 158 92-94

Danehy R.J., Chan S.S., Lester G.T., Langshaw R.B. & Turner T.R. (2007) Periphyton and macroinvertebrate assemblage structure in headwaters bordered by mature, thinned, and clearcut douglas-fir stands. Forest Science, 53, 294–307.

Daniel, T.W., J. Helms, and F. Baker. 1979. Principles of silviculture. McGraw Hill Book Company, 2nd edition.

Denman, K.L., G. Brasseur, A. Chidthaisong, P. Ciais, P.M. Cox, R.E. Dickinson, D. Hauglustaine, C. Heinze, E. Holland, D. Jacob, U. Lohmann, S Ramachandran, P.L. da Silva Dias, S.C. Wofsy and X. Zhang, 2007: Couplings between changes in the climate system and biogeochemistry. *In*: *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M.Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Di Lucca, M.C., J.W. Goudie, and S.C. Stearns-Smith. 2004. Variable retention yield adjustment factors for TIPSY. Extension Note No. 69. British Columbia Ministry of Forests, Forest Science Program. Victoria, B.C.

Dillingham, C.P., D.P. Vroman, and P.W. Dillingham. 2008. Breeding bird responses to silvicultural treatments in the Klamath Province of Oregon. Northwestern Naturalist 89:33-45.

Dowlan, S.G. 2003. Harlequin Duck. Birds of Oregon: a general reference. D.B. Marshall, M.G. Hunter, and A.L. Contreras (editors). Oregon State University Press, Corvallis, OR. Pp. 115-118.

Duncan. N. 2004a. Conservation assessment for *Helmynthoglypta hertlieni*, Oregon shoulderband. USDA Forest Service Region 6 and USDI BLM, Oregon-Washington 15pp. Update of Weasma, T.R. 1998. Management Recommendations for *Helminthoglypta herteinii*, the Oregon Shoulderband in N. Duncan, editor. Management Recommendations for Survey and Manage Terrestrial Mollusks, version 2.0.Regional Ecosystem Office. Portland, OR.

Duncan. N. 2004b. Conservation assessment for *Pristiloma arcticum crateris*, Crater Lake tightcoil. USDA Forest Service Region 6 and USDI BLM, Oregon-Washington 15pp. Update of Darryl Gowan and Thomas E. Burke. 1999. Management Recommendations for *Pristiloma arcticum crateris*, the Crater Lake Tightcoil in N. Duncan, editor. Management Recommendations for Survey and Manage Terrestrial Mollusks, version 2.0.Regional Ecosystem Office. Portland, OR.

Duncan. N. 2005. Conservation assessment for *Monadenia* (*Shastelix*) *chaceana*, chace sideband. USDA Forest Service Region 6 and USDI BLM, Oregon-Washington 15pp. Update of Weasma, T.R. 1998. Management Recommendations for *Monadenia* (*Shastelix*) *chaceana*, the chace sideband in N. Duncan, editor. Management Recommendations for Survey and Manage Terrestrial Mollusks, version 2.0.Regional Ecosystem Office. Portland, OR.

Duncan, N. 2005. BLM Wildlife Biologist. Personal communication.

Duncan, N., T. Burke, S. Dowlan, and P. Hohenlohe. 2003. Survey protocol for survey and manage terrestrial mollusk species from the Northwest forest plan. Bureau of Land Management, U.S. Forest Service, and U.S. Fish and Wildlife Service. Portland, OR.

Duncan, S. H., R. E. Bilby, J. W. Ward, and J. T. Heffner. 1987. Transport of road-surface sediments through ephemeral stream channels. Water Resources Bulletin 23:113-119.

Dunk, J.R. 1995. White-tailed kite (*Elanus leucurus*): The Birds of North America, No. 178. A. Poole and F. Gill, editors. The Academy of Natural Sciences, Philadelphia, PA and the American Ornithologists' Union, Washington, D.C.

Dyrness, C.T. 1973. Early stages of plant succession following logging and burning in the western Cascades of Oregon. Ecology. 54(1): 57-69.

Ehrlich, P.R., D.S. Dobkin, and D. Wheye. 1988. Wood Duck *in* The Birder's Handbook: A field guide to the natural history of North American birds. Simon and Schuster Co. New York. p. 74

Erickson, Heather E., and Rachel White. 2008. Soils under fire: soils research and the joint fire science program. General Technical Report PNW-GTR-759. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. Portland, OR: 17 p.

Federal Register. 2002. Magnuson-Stevens Act Provisions; Essential Fish Habitat. 67(12):2343-2383.

Federal Register. 2008. Endangered and threatened species: final threatened listing determination, final protective regulations, and final designation of critical habitat for the Oregon Coast evolutionarily significant unit of coho salmon. 73(28):7816-7873.

Fellers, G.M. and E.D. Pierson. 2002. Habitat use and foraging behavior of Townsend's big-eared bat (*Corynorhinus townsendii*) in coastal California. Journal of Mammology 83: 167-177.

Foltz, S., S. Black, S. Jepsen, E. Evans, and R. Thorp. 2009. Species fact sheet: *Bombus franklini*. The Xerces Society.

Fong, Ward. 2013. BLM Soil Scientist. Personal observations.

Forsman, E.D. 1994. Demographic characteristics of spotted owls on the Olympic Peninsula, 1987-1992. Wildlife Habitat Relationships In Western Washington And Oregon FY92. Annual Report.

Forsman, Eric D., Anthony, Robert G., Zabel, Cynthia J. 2004. Distribution and abundance of red tree voles in Oregon based on occurrence in pellets of northern spotted owls. Northwest Science, Vol. 78(4):294-302.

Forsman, E.D. and J. K. Swingle. 2007. Use of arboreal nests of tree voles (Arborimus spp.) by amphibians. Herpetological Conservation and Biology 2(2):113-118.

Forsman, E.D., E.C. Meslow, and H.M. Wight. 1984. Distribution and biology of the spotted owl in Oregon. Wildlife Monographs No. 87. 64 pp.

Forster, P. et al. 2007. Climate Change 2007: The Physical Science Basis. Contribution of Working Group 1 to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Solomon, S. D., Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller, Eds. Cambridge University Press, U.K. and New York, N.Y. *(pp. 129-234).* @ http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-chapter2.pdf

Franklin, J.F., K. Cromack, W. Denison, A. McKee, C. Maser, J. Sedell, F. Swanson, G. Juday. 1981. Ecological characteristics of old-growth Douglas-fir forests. General Technical Report PNW-118. USDA, Forest Service.

Franklin, Jerry F., Thomas A. Spies, Robert Van Pelt, Andrew B. Carey, Dale A. Thornburgh, Dean Rae Berg, David B. Lindenmayer, Mark E. Harmon, William S. Keeton, David C. Shaw, Ken Bible, and Jiquan Chen. 2002. Disturbances and structural development of natural forest ecosystems with silvicultural implications, using Douglas-fir forests as an example. Forest Ecology and Management (155) 399–423.

Frest, T.J. and E.J. Johannes. 2000. A baseline mollusk survey of southwestern Oregon, with emphasis on the Rogue and Umpqua River Drainages. Deixis Consultants. Seattle, WA.

Fyfe, R.W. AND R.R. Olendorff. 1976. Minimizing the dangers of nesting studies to raptors and other sensitive species. Occas. Paper No. 23. Canadian Wildlife Service, Ottawa, Ontario, Canada.

Garber, Sean, Tzeng Yih Lam and Douglas A. Maguire. 2011. Growth and mortality of residual Douglas-fir after regeneration harvests under group selection and two-story silvicultural systems. Western Journal of Applied Forestry. 26(2): 64-70.

Gillesberg, A. and A.B. Carey. 1991. Arboreal nests of *Phenacomys longicaudus* in Oregon. Journal of Mammology 72:784-787.

Grant, Gordon E., Sarah L. Lewis, Frederick J. Swanson, John H. Cissel, and Jeffrey J. McDonnell. 2008. Effects of forest practices on peak flows and consequent channel response in western Oregon: a state-of-science report for western Oregon and Washington. General Technical Report PNW-760. USDA, Forest Service, Pacific Northwest Research Station, Corvallis, OR.

Gregory, S., Boyer, K. and A. Gurnell. The ecology and management of wood in rivers. ISBN 1888569-56-5. American Fisheries Society, Bethesda, Maryland. 2003. p. 326.

Hagar, J., S. Howlin, and L. Ganio. 2004. Short-term response of songbirds to experimental thinning of young Douglas-fir forests in the Oregon Cascades. Forest Ecology and Management 199: 333–347.

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

Hann, David W. *et al.* 2005. Organon Growth Model: Southwest Oregon Edition. Forestry Intensified Research Cooperative (FIR). @ http://www.cof.orst.edu/cof/fr/research/organon/orginf.htm

Hanson, E., D. Hays, L. Hicks, L. Young, and J. Buchanan. 1993. Spotted owl habitat in Washington. A report to the Washington Forest Practices Board. Final Report. Washington Forest Practices Board, Washington Department of Natural Resources. 116 pp.

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

Hassan, M. A., M. Church, T. E. Lisle, F. Brardinoni, L. Benda, and G. E. Grant. 2005. Sediment transport and channel morphology of small, forested streams. Journal of the American Water Resources Association 81:853-876.

Hayden, J., G. Ardt, M. Fleming, T. W. Keegan, J. Peek, T. O. Smith, and A. Wood. 2008. Habitat guidelines for mule deer: northern forest ecoregion. Mule Deer Working Group, Western Association of Fish and Wildlife Agencies. USA.

Hayes, J.P., Weikel, J.M., Huso, M., 2003. Effects of commercial thinning on breeding birds in the northern Coast Range of Oregon. Ecol. Appl. 13, 1222–1232.

Heithecker, T. D. and C. B. Halpern. 2006. Variation in microclimate associated with dispersed-retention harvests in coniferous forests of western Washington. Forest Ecology and Management. 226: 60-71

Heithecker, T. D. and C. B. Halpern. 2007. Edge-related gradients in microclimate in forest aggregates following structural retention harvests in western Washington. Forest Ecology and Management 248: 163-173.

Hejl, Sallie J., Jennifer A. Holmes and Donald E. Kroodsma. 2002. Winter Wren (*Troglodytes hiemalis*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/623 doi:10.2173/bna.623

Hepp, G. R. and F. C. Bellrose. 2013. Wood duck (*Aix sponsa*). The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/169 doi:10.2173/bna.169

Hershey, K. 1997. Characteristics of forests at spotted owl nest sites in the Pacific Northwest. Master of Science, Oregon State University.86 pp.

Horvath, E. 2003. Purple Martin. Pages 428-430 *In* D. B. Marshall, M. G. Hunter, and A L. Contreras, editors. Birds of Oregon: A General Reference. 768 pp. Oregon State University Press. Corvallis, OR.

Huff, R., K. Van Norman, C. Hughes, R. Davis and K. Mellen-Mclean. 2012. Survey protocol for the red tree vole, version 3.0. U.S. Department of the Interior, Bureau of Land Management, Oregon/Washington, and U.S. Department of Agriculture, Forest Service Regions 5 and 6. Portland, OR. 52 pp.

Janisch, J. E., Harmon, M. E., Chen, H., Comack, K. Jr., Fasth, B. and Sexton, J. M. 2005. Carbon flux from coarse woody debris in a Pacific Northwest conifer forest ecosystem: a chronosequence approach. Ecoscience 12: 151-160.

Johnson, David R., John T. Haagen and Alan C. Terrell. 2004. Soil survey of Douglas County area, Oregon. U.S. Department of Agriculture, Natural Resources Conservation Service.

Jones, S.L., and J.E. Cornely. 2002. Vesper Sparrow (*Pooecetes gramineus*): The birds of North America, No. 624, A. Poole and F. Gill, editors. The Academy of Natural Sciences, Philadelphia, PA and the American Ornithologists' Union, Washington, DC.

Keim, R.F, A.E. Skaugset, and D.S Bateman. 2002. Physical aquatic habitat II, pools and cover affected by large woody debris in three western Oregon streams. North American Journal of Fisheries Management 22:151-164.

Ketchum, J. Scott and John C.Tappeiner. 2005. Early Douglas-fir, grand fir and plant community responses to modified clearcut, two-story, and small patch cut silvicultural treatments. Pages 52-62 *in:* C.C. Maguire and C.L. Chambers, editors. Ecological and socioeconomic responses to alternative silvicultural treatments. Oregon State University, Res. Contrib. 46.

Kochert, M. N., K. Steenhof, C. L. Mcintyre and E. H. Craig. 2002. Golden Eagle (*Aquila chrysaetos*), The Birds of North America Online (A. Poole, Ed.). Ithaca, NY. Cornell Lab of Ornithology

Kondolf, G.M. 2000. Assessing salmonid spawning habitat quality. Transactions of the American Fisheries Society 129: 262-281.

Korb, J.E., N.C. Johnson, and W.W. Covington. 2004. Slash pile burning effects on soil biotic and chemical properties and plant establishment: Recommendations for amelioration. Restoration Ecology Volume 12 Number 1, pp. 52-62. Kosel, K. 2009. BLM Fire Ecologist. Personal Communication.

Lam, Tzeng Yih and Douglas A. Maguire. 2011. Thirteen-year height and diameter growth of Douglas-fir seedlings under alternative regeneration cuts in Pacific Northwest. Western Journal of Applied Forestry. 26(2): 57-63.

Latham, P. & Tappeiner, J. 2002. Response of old-growth conifers to reduction in stand density in western Oregon forests. Tree Physiol. 22: 137-146

Lee, D. C. and L. Irwin. 2005. Assessing risks to spotted owls from forest thinning in fire-adapted forests of the western United States. Forest Ecology and Management 211 (2005) 191–209.

Leonard, J.P. 1998. Nesting and foraging ecology of the band-tailed pigeon in western Oregon. Ph.D. Dissertation. Oregon State University. Corvallis, OR.

Lewis, J. C. and D. Kraege. 1999. Harlequin Duck. Washington Department of Fish and

Wildlife. Priority Habitats and Species (PHS) list. Chapter IV: Birds.

Lewis, S.E. 1994. Night roosting ecology of pallid bats (*Antrozous pallidus*) in Oregon. American Midland Naturalist 132:219-226.

Lint, J. 2005. Population status and trends. Pages 7–19 *in* J. Lint, technical coordinator. Northwest Forest Plan—the first 10 years (1994–2003): status and trends of northern spotted owl populations and habitat. U.S. Forest Service General Technical Report PNW-GTR-648. Pacific Northwest Research Station. Portland, Oregon.

Loeffler, D., G. Jones, N. Vonessen, S. Healey, and W. Chung. 2009. Estimating diesel fuel consumption and carbon dioxide emissions from forest road construction. In: W. McWilliams, G. Moisen, R. Czaplewski, comps 2009. 2008 Forest Inventory and Analysis (FIA) Symposium; October 21-23, 2008: Park City, UT. Proc. RMRS-P-56CD. Fort Collins, CO: USDA USFS Rocky Mountain Research Station. 1 CD.

Luce, C.H. 1997. Effectiveness of road ripping in restoring infiltration capacity of forest roads. Restoration Ecology, 5(3): 265-270.

Maguire, D.A., D. B. Mainwaring and C. B. Halpern. 2006. Stand dynamics after variable-retention harvesting in mature Douglas-fir forests of western North America. *Allgemeine Forst und Jagdzeitung*. 177: 120-131.

Markle, D. F., T. N. Pearsons, and D. T. Bills. 1991. Natural history of Oregonichthys (*Pisces: Cyprinidae*) with a description of a new species from the Umpqua River of Oregon. Copeia 2:227-293.

Marshall, D. B. 1996. Sensitive, threatened, and endangered vertebrates of Oregon. Oregon Department of Fish and Wildlife, Portland, Oregon.

Maser, C., B. R. Mate, J. F. Franklin, and C. T. Dyrness. 1981. Natural history of Oregon Coast mammals. GTR-PNW-133. USDA/Forest Service. Portland, OR.

Maser, C.O. 1998. Mammals of the Pacific Northwest: from the coast to the high Cascades. Oregon State University Press. Corvallis, Oregon.

Maxwell, Wayne and Franklin Ward. 1976. Photo series for quantifying forest residues in the coastal Douglas-fir-hemlock type. U.S. Forest Service General Technical Report PNW-51.

May, C. L., and R. E. Gresswell. 2003. Large wood recruitment and redistribution in headwater streams in the southern Oregon Coast Range, U.S.A. Canadian Journal of Forestry Resources 33:1352-1362.

McGarigal, K., and W.C. McComb. 1992. Streamside versus upslope breeding bird communities in the central Oregon Coast range. Journal of Wildlife Management 56:10-23.

McGaughey, Robert J. 2002. *Stand Visualization System, Version 3.36.* USDA, U.S Forest Service. Pacific Northwest Research Station.

Meiman, S., R. Anthony, E. Glenn, T. Bayless, A. Ellingson, M. C. Hansen, and C. Smith. 2003. Effects of commercial thinning on home-range and habitat-use patterns of a bale northern spotted uwl: a case study. Wildlife Society Bulletin Vol. 31(4): 1254-1262. (Winter).

Munger, Thornton T. 1940. The cycle from Douglas-fir to hemlock. Ecology 21(4): 451-459.

Naiman, R. J., E. V. Balian, K. K. Bartz, R. E. Bilby, and J. J. Latterell. 2002. Dead wood dynamics in stream ecosystems. USDA, Forest Service. PSW-General Technical Report-181.

Neary, Daniel G., Kevin C. Ryan, and Leonard F. DeBano, eds. 2005 (Revised 2008). Wildland fire in ecosystems: effects of fire on soils and water. General Technical Report RMRS-GTR-42-vol.4. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. Ogden, UT: 250 p.

Nedeau, E., A. K. Smith, and J. Stone, and S. Jepsen. 2009. Freshwater mussels of the Pacific Northwest. The Xerces Society for Invertebrate Conservation. Portland, OR 51pp.

Newton, M. and L. Cole. 2013. Stream temperature and streamside cover 14-17 years after clearcutting along small forested streams, western Oregon. West. J. Appl. For. 28(3) 107-115.

North, Malcolm, Jiquan Chen, Gordon Smith, Lucy Krakowiak, and Jerry Franklin. 1996. Initial responses of understory plant diversity and overstory tree diameter growth to a green tree retention harvest. Northwest Science 70(1): 24-35.

O'Dell, T.E., J.F. Ammirati, and E.G. Schreiner. 1999. Ectomycorrhizal Basidiomycete diversity and abundance on a moisture gradient in the *Tsuga heterophylla* zone. Can.J.Bot.

Oliver, Chadwick D. and Bruce C. Larson. 1990. Forest stand dynamics. McGraw-Hill Inc. New York. 467 pgs.

Olsen, P. and J. Olsen. 1978. Alleviating the impacts of human disturbance on the breeding peregrine falcon. Corella Journal of the Australian Bird Study Association 2(1):1-7.

Oregon Department of Environmental Quality (ODEQ). 2008. Oregon's 2004/2006 integrated report database, 303(d) list. [http://www.deq.state.or.us/wq/assessment/rpt0406/results.asp]. Portland, OR.

Oregon Department of Forestry Smoke Management Plan. 2008. Oregon Administrative Rules. 629-048.

Otis, David L., John H. Schulz, David Miller, R. E. Mirarchi and T. S. Baskett. 2008. Mourning Dove (*Zenaidamacroura*). The Birds of North America Online (A. Poole, Ed.). Ithaca, NY. Cornell Lab of Ornithology.

Page-Dumroese, Deborah S., Ann M. Abbott, and Thomas M. Rice. 2009. Forest soil disturbance monitoring protocol. General Technical Report WO-82a Volume 1: Rapid assessment. United States Department of Agriculture, Forest Service.

Parker, Jonas. 2010 and 2011. BLM Hydrologist personal observations.

Pearson, Scott F. 1997. Hermit Warbler (*Setophaga occidentalis*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/303 doi:10.2173/bna.303

Poff, N. L., and J. V. Ward. 1990. Physical habitat template of lotic systems: recovery in the context of historical pattern of spatial temporal heterogeneity. Environmental Management 14:629-645.

Powers, Robert F., D. Andrew Scott, Felipe G. Sanchez, Richard A. Voldseth, Deborah Page-Dumroese, John D. Elioff, and Douglas M. Stone. 2005. The North American long-term soil productivity experiment: Findings from the first decade of research. Forest Ecology and Management. 220:31-50.

Progar, R., and A.R. Moldenke. 2009. Aquatic insect emergence from headwater streams flowing through regeneration and mature forests in western Oregon. Journal of Freshwater Ecology 24:53-66.

Rapp, Valerie, editor. 2000. First approximation report for sustainable forest management in Oregon. Oregon Department of Forestry.

Rashin, E., Clishe, C., Loch, A., Bell, J. 2006. Effectiveness of timber harvest practices for controlling sediment related water quality impacts. Journal of the American Water Resources Association 42:1307-1327.

Reeves, G. H., K. M Burnett, and E. V. McGarry. 2003. Sources of large wood in the main stem of a fourth-order watershed in coastal Oregon. Canadian Journal of Forestry Research 33:1363-1370.

Reeves, Gordon H., Peter A. Bisson; Bruce E. Rieman; Lee E. Benda. 2006. Postfire logging in riparian areas. Conservation Biology. 20(4): 994-1004.

Reid, L.M. 1981. Sediment production from gravel-surfaced forest roads, Clearwater basin, Washington, Publ, FRI-UW-8108. Univ. of Wash. Fish. Res. Inst., Seattle.

Reid L.M., Dunne T. 1984. Sediment production from forest road surfaces. *Water Resource. Res.* 20:1753–61.

Squires, John R. and Richard T. Reynolds. 1997. Northern Goshawk (*Accipiter gentilis*), The Birds of North America Online (A. Poole, ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/298

Richardson, M.J. 1970. Studies of *Russula emitica* and other agarics in a Scots pine plantation. Transcript of the British Mycological Society. 55 pp.

Robison, E.G., Keith A. Mills, Jim Paul, Liz Dent and Arne Skaugset. 1999. Oregon Department of Forestry, storm impacts and landslides of 1996: Final Report. Forest Practices Technical Report Number 4. Oregon Department of Forestry, Forest Practices Monitoring Program.

Roni, P. 2002. Habitat use by fishes and Pacific giant salamanders in small western Oregon and Washington streams. Transactions of the American Fisheries Society 131:743-761.

Rosenberg, D., J. Gervais, D.Vesely,S. Barnes, L. Holts, R. Horn,R. Swift, L. Todd, and Chris Yee. 2009. Conservation assessment of the western pond turtle in Oregon (*Actinemys marmorata*), Version 1.0. 80 pp.

Rosenfeld, J. S., and M. Porter, and E. Parkinson. 2000. Habitat factors affecting the abundance and distribution of juvenile cutthroat trout (*Oncorhynchus clarki*) and coho salmon (*Oncorhynchus kisutch*). Canadian Journal of Fisheries and Aquatic Sciences 57:766-774.

Rykken, J.J., S.S. Chan, and A.R. Moldenke. 2007. Headwater riparian microclimate patterns under alternative forest management treatments. Forest Science 53(2). Society of American Foresters.

Sakai, H.F. and B.R. Noon. 1993. Dusky-footed woodrat abundance in different-aged forests in northwestern California. Journal of Wildlife Management 57: 373-382.

Sanders, T. A., and R. L. Jarvis. 2000. Do band-tailed pigeons seek a calcium supplement at mineral sites? Condor 102:855–863.

Sanders, T.A. and R.L. Jarvis. 2003. Band-tailed pigeon distribution and habitat component availability in western Oregon. Northwest Science. 77(3): 183-193.

Satterlund, D.R. and P.W. Adams. 1992. Wildland watershed management. 2nd edition. John Wiley and Sons, Inc. New York. (Currently out of print.)

Schoonmaker, Peter and Arthur McKee. 1988. Species composition and diversity during secondary succession of coniferous forests in the western Cascade Mountains of Oregon. Forest Science 34(4): 960-979.

Smith, J.E., L.S. Heath, K.E. Skog, and R.A. Birdsey. 2006. Methods for calculating forest ecosystem and harvested carbon with standard estimates for forest types of the United States. General Technical Report NE-343. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northeastern Research Station. 216 pp.

Starkey, T.T, D. S. deCalesta, G. W. Witmer. 1982. Management of Roosevelt elk habitat and harvest. Transactions of the forty-seventh North American wildlife and natural resources conference, ed. Kenneth Sabol (Washington, DC, 1982).

Stein, William I. 1955. Some Lessons in artificial regeneration for Southwestern Oregon. Pacific Northwest Forest and Range Experiment Station. Portland, OR.

Story, A., R.D. Moore, and J.S. MacDonald. 2003. Stream temperatures in two shaded reaches below cutblocks and logging roads: Downstream cooling linked to subsurface hydrology. Canadian Journal of Forest Resources. 33(8): 1383-1396.

Suttle, K B., M. E. Power, J. M. Levine, and C. McNeely. 2004. How fine sediment in riverbeds impairs growth and survival of juvenile salmonids. Ecological Applications 14:969-974.

Tappeiner, John C. II, Douglas A. Maguire and Timothy B. Harrington. 2007. Silviculture and ecology of western U.S. forests. Oregon State University Press. Corvallis. 440 pgs.

Thomas, J.W.; E.D. Forsman; J.B. Lint; E.C. Meslow; B.R. Noon; and J. Verner. 1990. A conservation strategy for the northern spotted owl: a report of the Interagency Scientific Committee to address the conservation of the northern spotted owl. U.S. Department of Agriculture, Forest Service; U.S. Department of the Interior, Bureau of Land Management, U.S. Fish and Wildlife Service, National Park Service.427 pp. Portland, OR.

Tobalske, B.W. 1997. Lewis' Woodpecker (*Melanerpes lewis*): The Birds of North America, No. 284, A. Poole and F. Gill editors. The Academy of Natural Sciences, Philadelphia, PA and the American Ornithologists' Union, Washington D.C.

Toman, E. M. and A. E. Skaugset. 2011. Transportation research record: Journal of the Transportation Research Board. No. 2203, pp. 13-19. Washington D.C.

US EPA (U.S. Environmental Protection Agency). 2005. Emission facts: Average carbon dioxide emissions resulting from gasoline and diesel fuel. EPA420-F-05-001 February 2005 @ http://www.epa.gov/otaq/climate/420f05001.htm.

US EPA (U.S. Environmental Protection Agency). 2009. Inventory of U.S. greenhouse gas emissions and sinks: 1990 – 2007 @ http://www.epa.gov/climatechange/emissions/usinventoryreport.html

US EPA (U.S. Environmental Protection Agency). March 9, 2010. Draft inventory of U.S. greenhouse gas emissions and sinks: 1990 – 2008. U.S. EPA, Washington, D.C. http://www.epa.gov/climatechange/emissions/usinventoryreport.html

USDA/FS-USDI/BLM. 2000. Final Supplemental Environmental Impact Statement for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl.

USDA/FS-USDI/BLM. 2001. Record of Decision for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl.

USDA/FS-USDI/BLM. 2004a. Final Supplemental Environmental Impact Statement to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl.

USDA/FS-USDI/BLM. 2004b. Survey protocol for the great gray owl within the range of the Northwest Forest Plan. pp. 34, 68, 178, Version 3.0, January 12, 2004. Prepared by Deborah L. Quintana-Coyer-Taxon Leader, Richard P. Gerhardt, Matthew D. Broyles, Jeffrey A. Dillon, Cheryl A. Friesen,Steven A. Godwin, Shane D. Kamrath.

USDA/FS-USDI/BLM. 2007. Final Supplement to the 2004 Supplemental Environmental Impact Statement to Remove or Modify the Survey and Manage Mitigation Measures Standards and Guidelines.

USDA/FS-USDI/BLM. 1994a. Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl.

USDA/FS-USDI/BLM. 1994b. Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern spotted Owl and Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl.

USDA/FS-USDI/BLM. 2012. Survey Protocol for the Red Tree Vole, Version 3.0. Portland, OR. Prepared by Huff, R., K. Van Norman, C. Hughes, R. Davis and K. Mellen-Mclean for

U.S. Department of the Interior, Bureau of Land Management, Oregon/Washington, and U.S. Department of Agriculture, Forest Service Regions 5 and 6. 52 pp.

USDI/BLM. 1984. Visual Resource Management Manual 8400.

USDI/BLM. 1986. Timber Production Capability Classification (TPCC), Handbook 5251-1. Release 5-179. Section III – Fragile Classifications. Portland, OR.

USDI/BLM. 1986. Visual Resource Inventory Handbook H-8410-1.

USDI/BLM. 1988. Monitoring Western Oregon Records of Decision, Handbook 1734-1. Release 1-271. Section XVIII – Slash Burning. Portland, OR.

USDI/BLM. 2008a. Final Environmental Impact Statement for the Revision of the Resource Management Plans of the Western Oregon Bureau of Land Management. Portland, OR.

USDI/BLM. 2008c. Instruction Memorandum OR-2008-050, "Migratory Bird Treaty Act-Interim Guidance". Portland, OR. 3 pp.

USDI/BLM. 2010a. A Biological Assessment for the Roseburg District, BLM, of the Planned FY 2011-2012 Programmatic Activities and Timber Sales.

USDI/BLM. Roseburg District. 1994. Proposed Resource Management Plan/Environmental Impact Statement. Vol. 1, p. xii.

USDI/BLM. Roseburg District. 1995a. Record of Decision and Resource Management Plan.

USDI/BLM. Roseburg District. 1995b. Roseburg District Integrated Weed Control Plan and Environmental Assessment.

USDI/BLM. Roseburg District. 1998b. Roseburg District annual program summary and monitoring report, fiscal year 1997.

USDI/BLM. Roseburg District. 2000. Lower South Umpqua Watershed Analysis.

USDI/BLM. Roseburg District. 2001. Roseburg District annual program summary and monitoring report, fiscal year 2000.

USDI/BLM. Roseburg District. 2001a. South Umpqua Watershed Analysis.

USDI/BLM. Roseburg District. 2002. Roseburg District annual program summary and monitoring report, fiscal year 2001.

USDI/BLM. Roseburg District. 2005. Roseburg District annual program summary and monitoring report, fiscal year 2004.

USDI/BLM. Roseburg District. 2007. Roseburg District annual program summary and monitoring report, fiscal year 2006.

USDI/BLM. Roseburg District. 2008b. Roseburg District annual program summary and monitoring report, fiscal year 2007.

USDI/BLM. Roseburg District. 2010b. Roseburg District annual program summary and monitoring report, fiscal year 2009.

USDI/BLM. Roseburg District. 2011. Roseburg District annual program summary and monitoring report, fiscal year 2010.

USDI/BLM. Roseburg District. 2012. Roseburg District annual program summary and monitoring report, fiscal year 2011.

USDI/BLM. 2013. Biological Assessment: FY 2014-2015 Programmatic activities and timber sales on the Roseburg District, BLM. Roseburg, OR.

USDI/BLM. Roseburg District. 2009. Roseburg District annual program summary and monitoring report, fiscal year 2008.

USDI/BLM. Roseburg District. 2002a. Myrtle Creek Watershed Analysis.

USDI/FWS. 1990. Endangered and threatened wildlife and plants; determination of threatened status for the northern spotted owl; final rule. Federal Register 50 CFR 17: 26,114-26,194.

USDI/FWS. 2008a. Final recovery plan for the northern spotted owl, *Strix occidentalis caurina*. Portland, OR.

USDI/FWS. 2008b. Methodology for estimating the number of northern spotted owls affected by proposed federal actions. Version 2.0. Portland, OR.

USDI/FWS. 2009. Informal consultation regarding the Roseburg BLM District's proposed commercial thinning, density management and various programmatic activities for fiscal years 2009-2010 that may affect northern spotted owls, marbled murrelets, and their designated critical habitats. Roseburg BLM-FY2009-10-Projects_TAILS 13420-2009-I-0109. 37 pp.

USDI/FWS. 2011a. Final recovery plan for the northern spotted owl, *Strix occidentalis caurina*. Portland, OR

USDI/FWS. 2011c. Endangered and threatened wildlife and plants; 12-Month finding on a petition to list a distinct population segment of the red tree vole as endangered or threatened. 76 FR 63720-63762

USDI/FWS. 2012a. Protocol for surveying proposed management activities that may impact northern spotted owls. U.S. Fish and Wildlife Service. Revised January 9, 2012.

USDI/FWS. 2012b. Endangered and threatened wildlife and plants; designation of revised critical habitat for the northern spotted owl; final rule. Federal Register Volume 77(No. 233): 71875-72068, Tuesday, December 4, 2012.

USDI/FWS. 2013. Formal consultation on the Roseburg District Bureau of Land Management's Fiscal Year 2014-2015 program of activities (TAILS#:01EORW00-2013-F-0200). Roseburg Field Office, USFWS. Roseburg, OR.

USDI/FWS. 2007. National bald eagle management guidelines.

USDI/Geological Survey. 2008. The challenges of linking carbon emissions, atmospheric greenhouse gas concentrations, global warming, and consequential impacts. Reston, VA. 2 pp.

Verts, B. J. and L. N. Carraway. 1998. Land mammals of Oregon. University of California Press. Berkeley, CA.

Waters, T, F. 1995. Sediment in streams: sources, biological effects, and control. American Fisheries Society Monograph 7.

Watershed Professionals Network. 1999. Oregon watershed assessment manual. Prepared for the Governor's Watershed Enhancement Board. Salem, OR.

Watson, K. and M. Schirato. 1998. Managing deer in small woodlands. Washington State University Cooperative Extension, Oregon State University Extension Service and the U.S. Department of Agriculture. MISC0189. 6 pp.

Weasma, T.R. 1998a. Management recommendations for *Helminthoglypta herteinii*, the Oregon shoulderband *in* N. Duncan, editor. Management Recommendations for Survey and Manage Terrestrial Mollusks, version 2.0.Regional Ecosystem Office. Portland, OR.

Weasma, T.R. 1998b. Draft management recommendations for *Monadenia* (*Shastelix*) *chaceana*, the chace sideband (land snail) *in* N. Duncan, editor. Management Recommendations for Survey and Manage Terrestrial Mollusks, version 2.0.Regional Ecosystem Office. Portland, OR.

Weller, T.J. and C.J. Zabel. 2001. Characteristics of fringed myotis day roosts in northern California. Journal of Wildlife Management 66: 489-497.

Wemple, B.C., J.A. Jones, and G.E. Grant. 1996. Channel network extension by logging roads in two basins, western Cascades, Oregon. *Water Resources Bulletin* 32(6).
White, C.M., N.J. Clum, T.J. Cade, and W.G. Hunt. 2002. Peregrine Falcon (*Falco peregrinus*). The Birds of North America, No. 660, A. Poole and F. Gill editors.The Academy of Natural Sciences, Philadelphia, PA and the American Ornithologists' Union, Washington, DC.

Wiens J.D., R.G. Anthony, and E.D. Fosman. 2014. Competitive unteractions and resource partitioning between northern spotted owls and barred owls in Western Oregon. Wildlife Monographs 185: 1-50.

Williamson, J.R., and W.A. Neilsen. 2000. The influence of forest site on rate and extent of soil compaction and profile disturbance of skid trails during ground-based harvesting. Canadian Journal of Forestry Research 30: 1196-1205.

Wilson, J.S. and C.D. Oliver. 2000. Stability and density management in Douglas-fir plantations. Canadian Journal of Forest Research 30: 910-920.

Wilson, T.M. 2008. Limiting factors for northern flying squirrels *(glaucomys sabrinus)* in the Pacific Northwest a spatio-temporal analysis. PhD Dissertation 2008. Union Institute and University of Cincinnati, Ohio, USA.

Wonn, Hagan T. and Kevin L. O'Hara. 2001. Height:diameter ratios and stability relationships for four northern Rocky Mountain tree species. Western Journal of Applied Forestry. 16(2): 87-94.

Wootton, J. Timothy. 1996. Purple Finch (*Haemorhous purpureus*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/208 doi:10.2173/bna.208

The Xerces Society . 2008. Status review of three formerly common species of bumble bees in the subgenus *Bombus Bombus affinis* (the rusty patched bumble bee), *B. terricola* (the yellowbanded bumble bee), *and B. occidentalis (*the western bumble bee*).* Prepared by Evans, E.,R. Thorp, and S.H. Black. The Xerces Society for Invertebrate Conservation. Portland, OR.

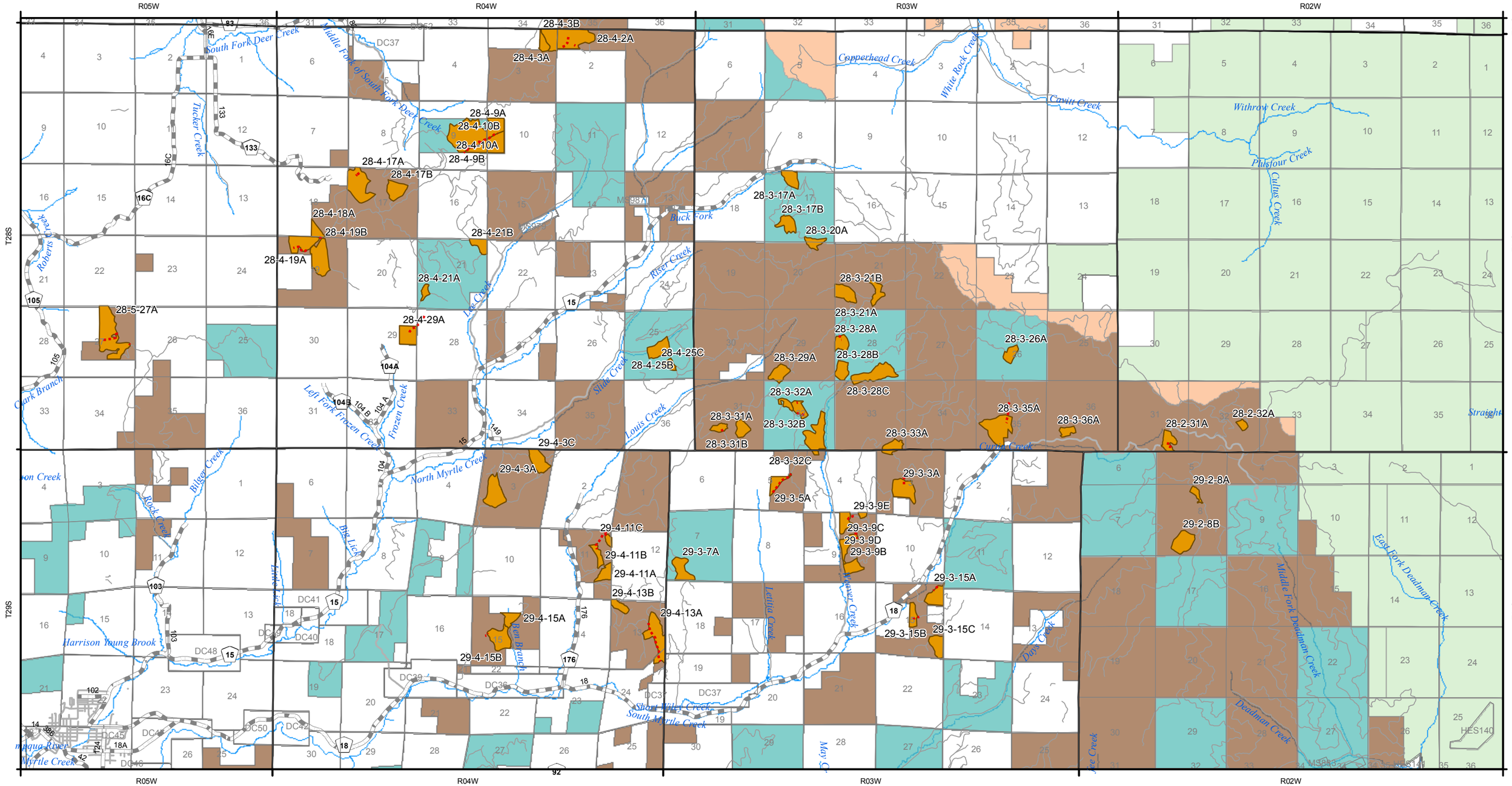
Ziemer, R. R. 1981. Storm flow response of road building and partial cutting in small streams of Northern California. Water Resources Research, Vol. 17(4): 907-917.

# Appendix A – Maps

Vicinity Map ..... 156
Alternative Two Detail Maps ..... 157
Alternative Three Detail Maps ..... 167
Northern Spotted Owl Critical Habitat and Analyzed Home Ranges ..... 177
Coho Salmon Distribution Map ..... 178

Page Intentionally Blank

# Myrtle Creek Harvest Plan - Vicinity Map




## Legend

- Myrtle Creek Units
- U.S. Forest Service Lands
- Private Lands

**Land Use Allocations**

- Adaptive Management Area
- Connectivity/Diversity Block
- General Forest Management Area

- Proposed Road Construction
- Major Stream
- County Roads
- Paved Road
- Rocked Road

Date: 5/29/2014

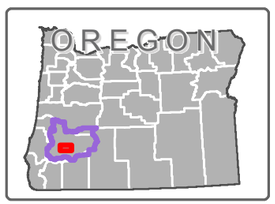
0 0.5 1 1.5 2 2.5

Miles

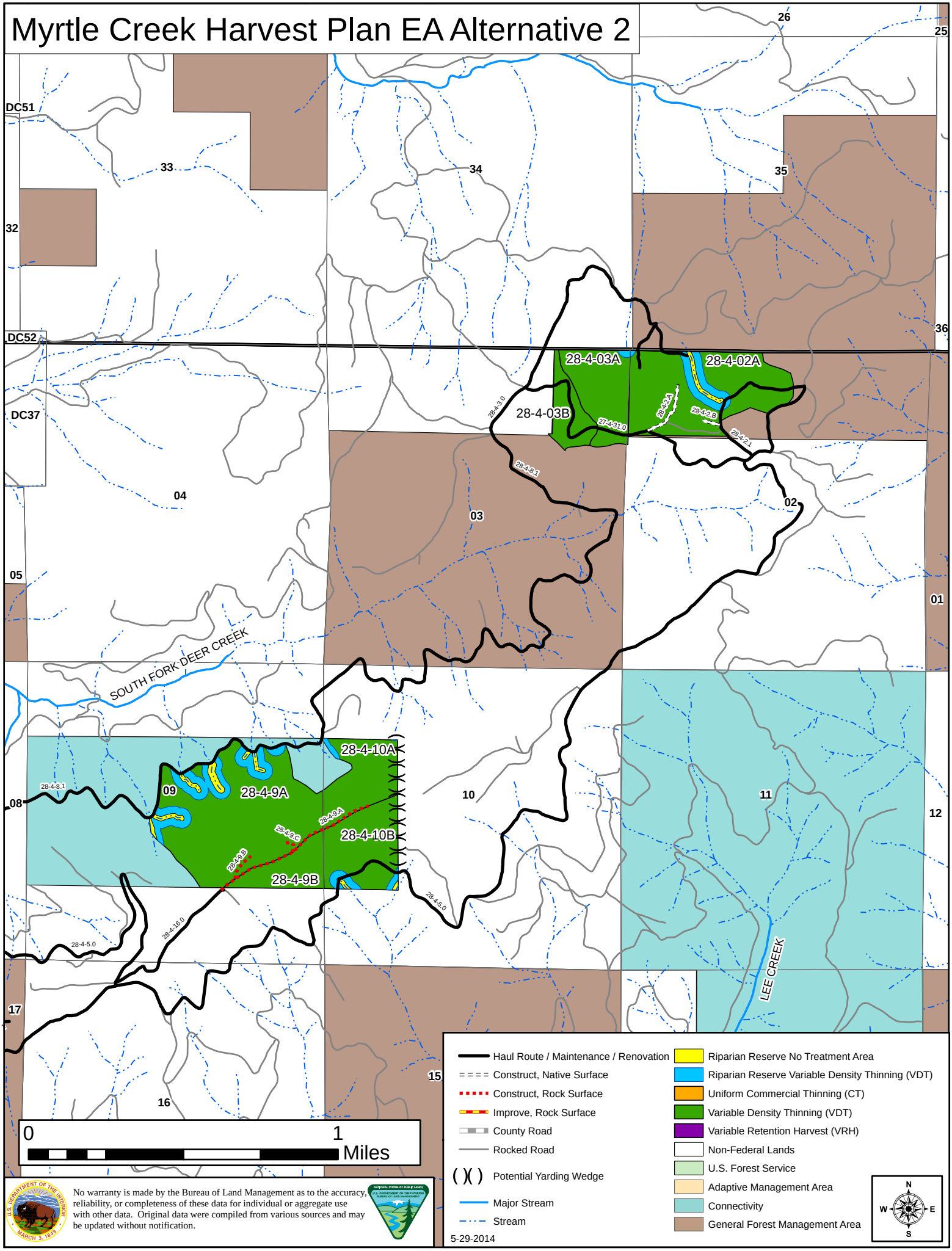
N W E S


Roseburg District
Bureau of Land Management
777 NW Garden Valley Blvd.
Roseburg, Oregon 97471



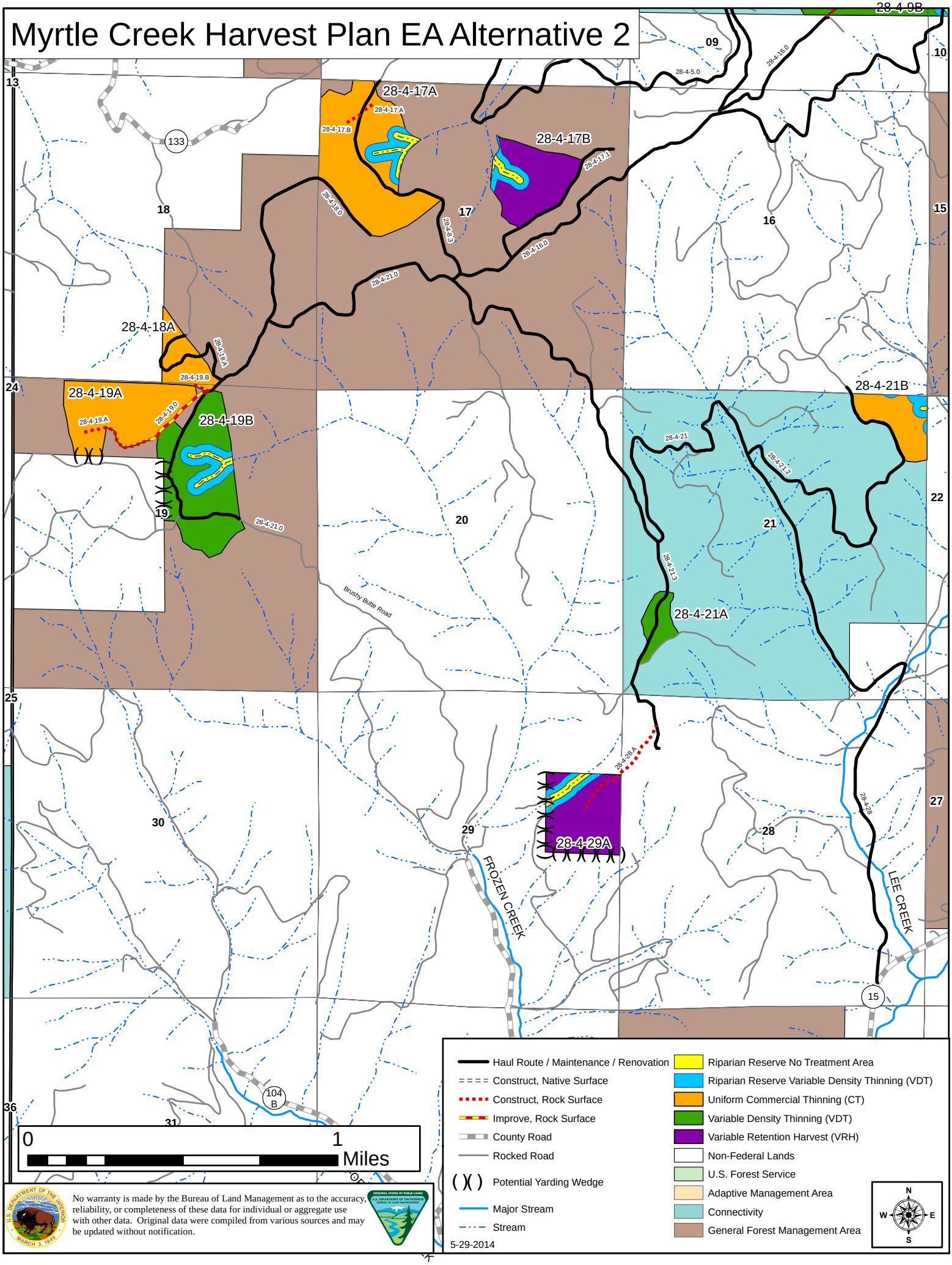
# Myrtle Creek Harvest Plan EA Alternative 2



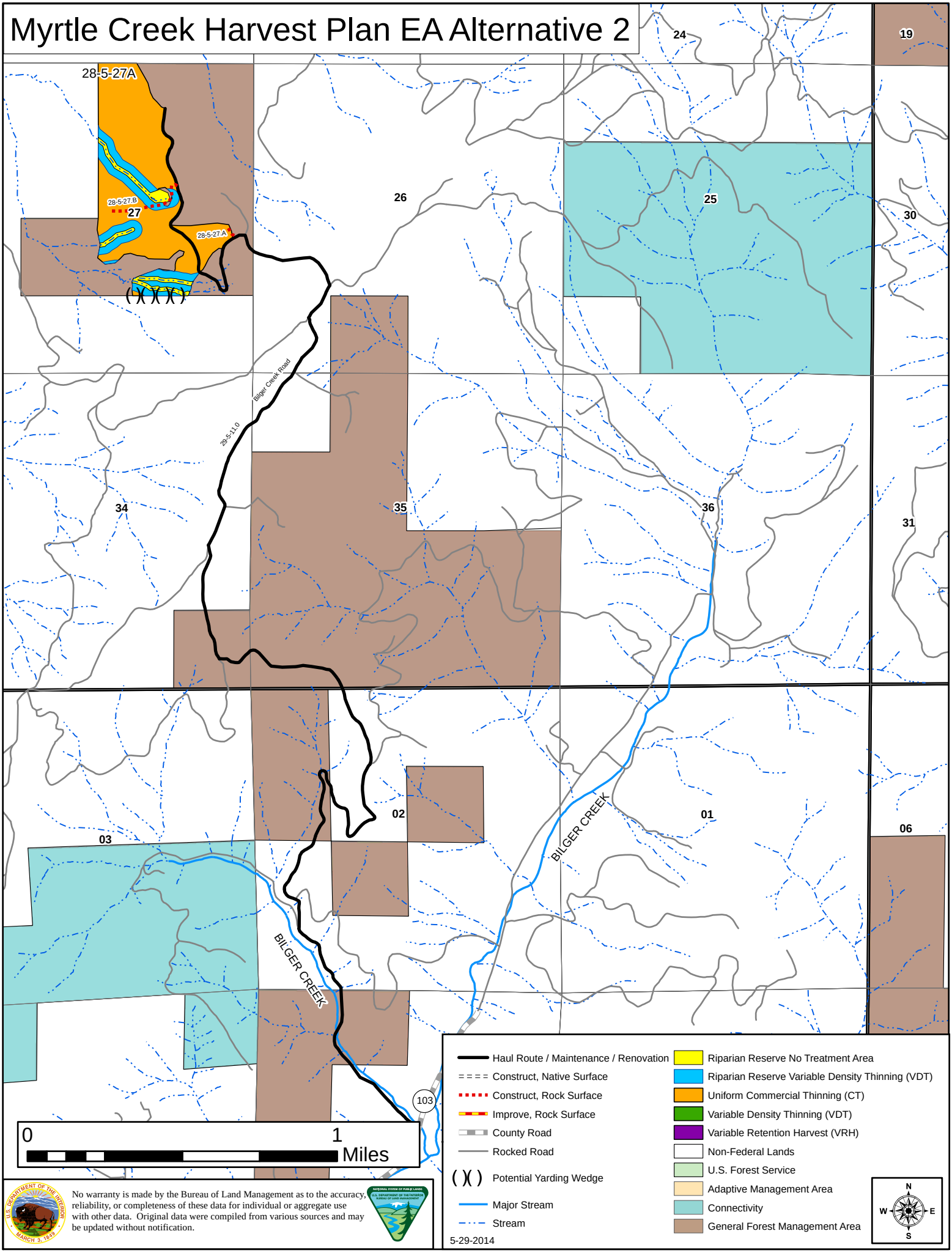

- Haul Route / Maintenance / Renovation
- Construct, Native Surface
- Construct, Rock Surface
- Improve, Rock Surface
- County Road
- Rocked Road
- Potential Yarding Wedge
- Major Stream
- Stream
- Riparian Reserve No Treatment Area
- Riparian Reserve Variable Density Thinning (VDT)
- Uniform Commercial Thinning (CT)
- Variable Density Thinning (VDT)
- Variable Retention Harvest (VRH)
- Non-Federal Lands
- U.S. Forest Service
- Adaptive Management Area
- Connectivity
- General Forest Management Area

N W E S

5-29-2014

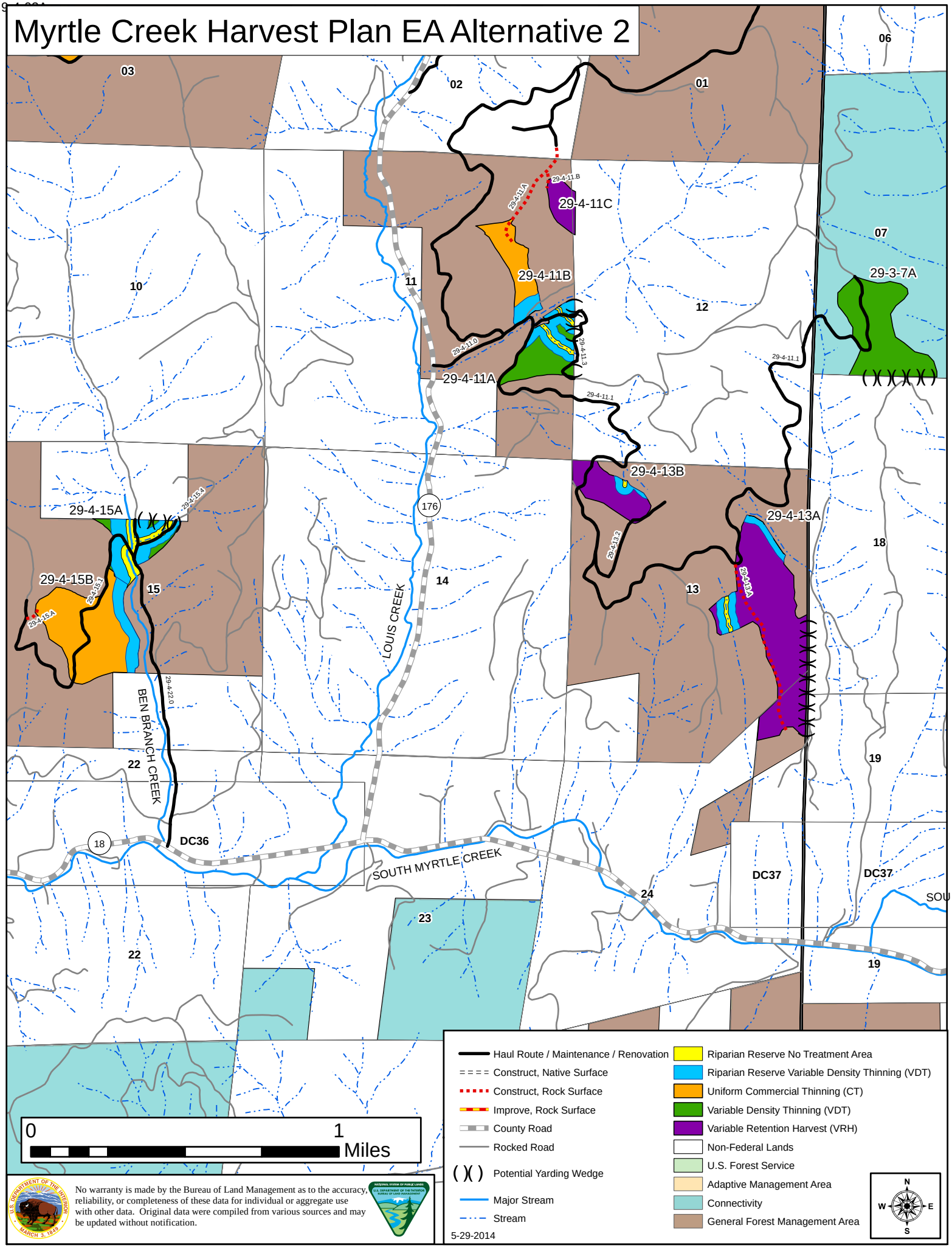

Myrtle Creek Harvest Plan EA Alternative 2
28-4-17A
28-4-17B
28-4-18A
28-4-19A
28-4-19B
28-4-21B
28-4-21A
28-4-29A
28-4-9B
09
10
13
18
17
16
15
24
19
20
21
22
25
30
29
28
27
36
31
133
104
B
15
Brushy Butte Road
FROZEN CREEK
LEE CREEK
28-4-5.0
28-4-16.0
28-4-17.A
28-4-17.B
28-4-17.1
28-4-18.0
28-4-18.A
28-4-19.A
28-4-19.B
28-4-19.0
28-4-21.0
28-4-21
28-4-21.2
28-4-21.3
28-4-29.A
28-4-28
0
1
Miles
Haul Route / Maintenance / Renovation
Construct, Native Surface
Construct, Rock Surface
Improve, Rock Surface
County Road
Rocked Road
Potential Yarding Wedge
Major Stream
Stream
Riparian Reserve No Treatment Area
Riparian Reserve Variable Density Thinning (VDT)
Uniform Commercial Thinning (CT)
Variable Density Thinning (VDT)
Variable Retention Harvest (VRH)
Non-Federal Lands
U.S. Forest Service
Adaptive Management Area
Connectivity
General Forest Management Area
N
W
E
S
5-29-2014
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. Original data were compiled from various sources and may be updated without notification.

# Myrtle Creek Harvest Plan EA Alternative 2




5-29-2014

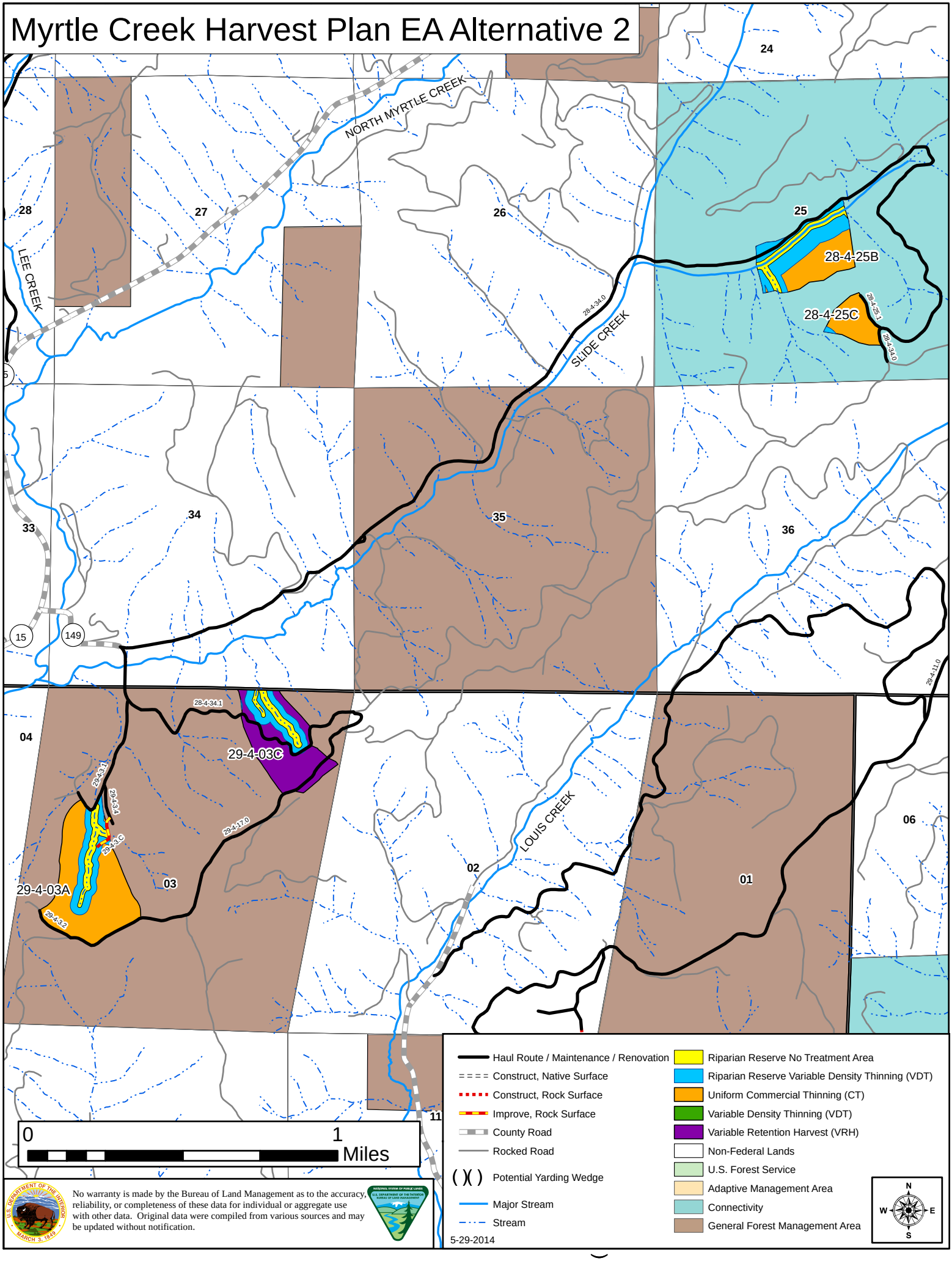
# Myrtle Creek Harvest Plan EA Alternative 2




- Haul Route / Maintenance / Renovation
- Construct, Native Surface
- Construct, Rock Surface
- Improve, Rock Surface
- County Road
- Rocked Road
- Potential Yarding Wedge
- Major Stream
- Stream
- Riparian Reserve No Treatment Area
- Riparian Reserve Variable Density Thinning (VDT)
- Uniform Commercial Thinning (CT)
- Variable Density Thinning (VDT)
- Variable Retention Harvest (VRH)
- Non-Federal Lands
- U.S. Forest Service
- Adaptive Management Area
- Connectivity
- General Forest Management Area

5-29-2014

# Myrtle Creek Harvest Plan EA Alternative 2

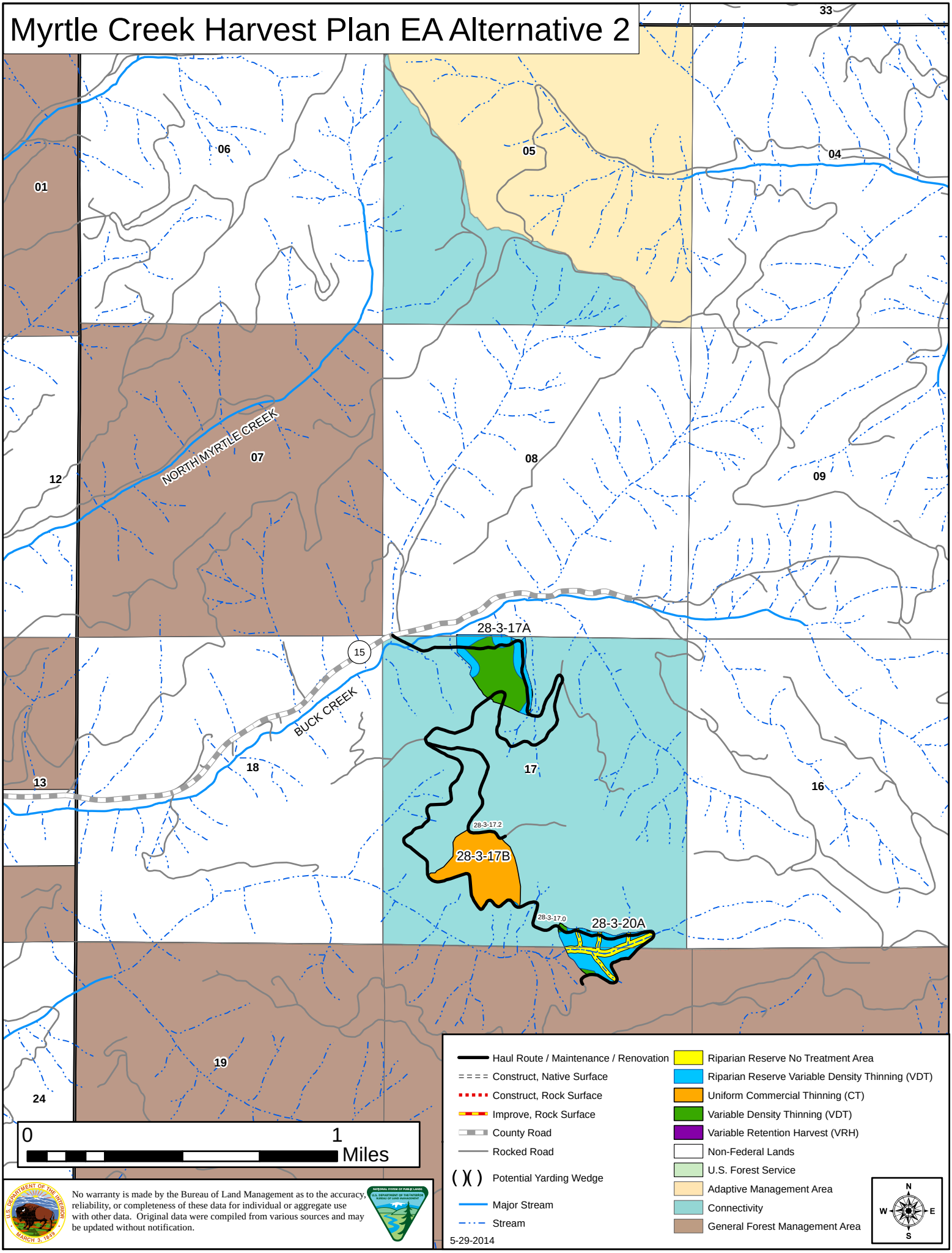



- Haul Route / Maintenance / Renovation
- Construct, Native Surface
- Construct, Rock Surface
- Improve, Rock Surface
- County Road
- Rocked Road
- Potential Yarding Wedge
- Major Stream
- Stream
- Riparian Reserve No Treatment Area
- Riparian Reserve Variable Density Thinning (VDT)
- Uniform Commercial Thinning (CT)
- Variable Density Thinning (VDT)
- Variable Retention Harvest (VRH)
- Non-Federal Lands
- U.S. Forest Service
- Adaptive Management Area
- Connectivity
- General Forest Management Area

N W E S

5-29-2014

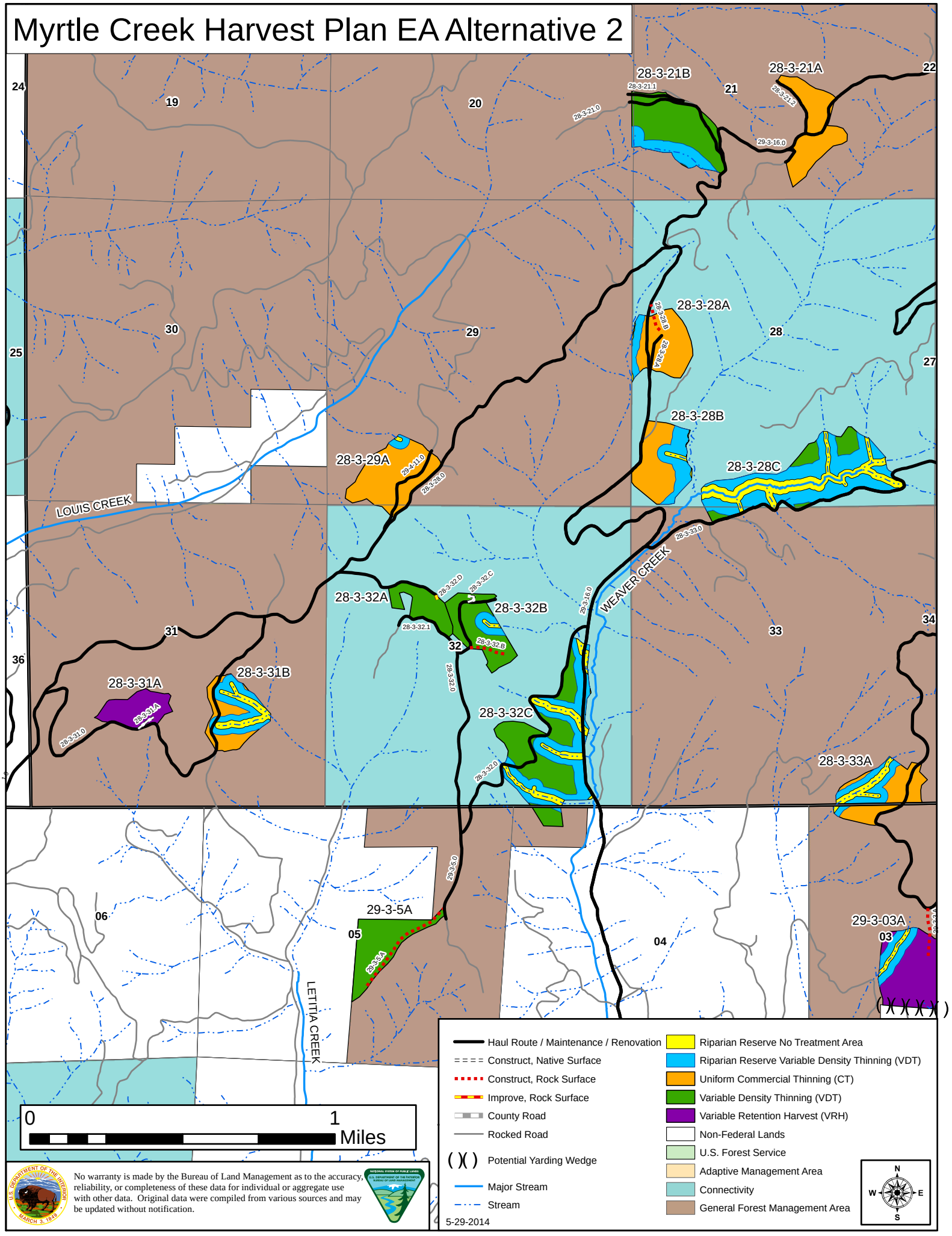
# Myrtle Creek Harvest Plan EA Alternative 2




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. Original data were compiled from various sources and may be updated without notification.

5-29-2014

# Myrtle Creek Harvest Plan EA Alternative 2

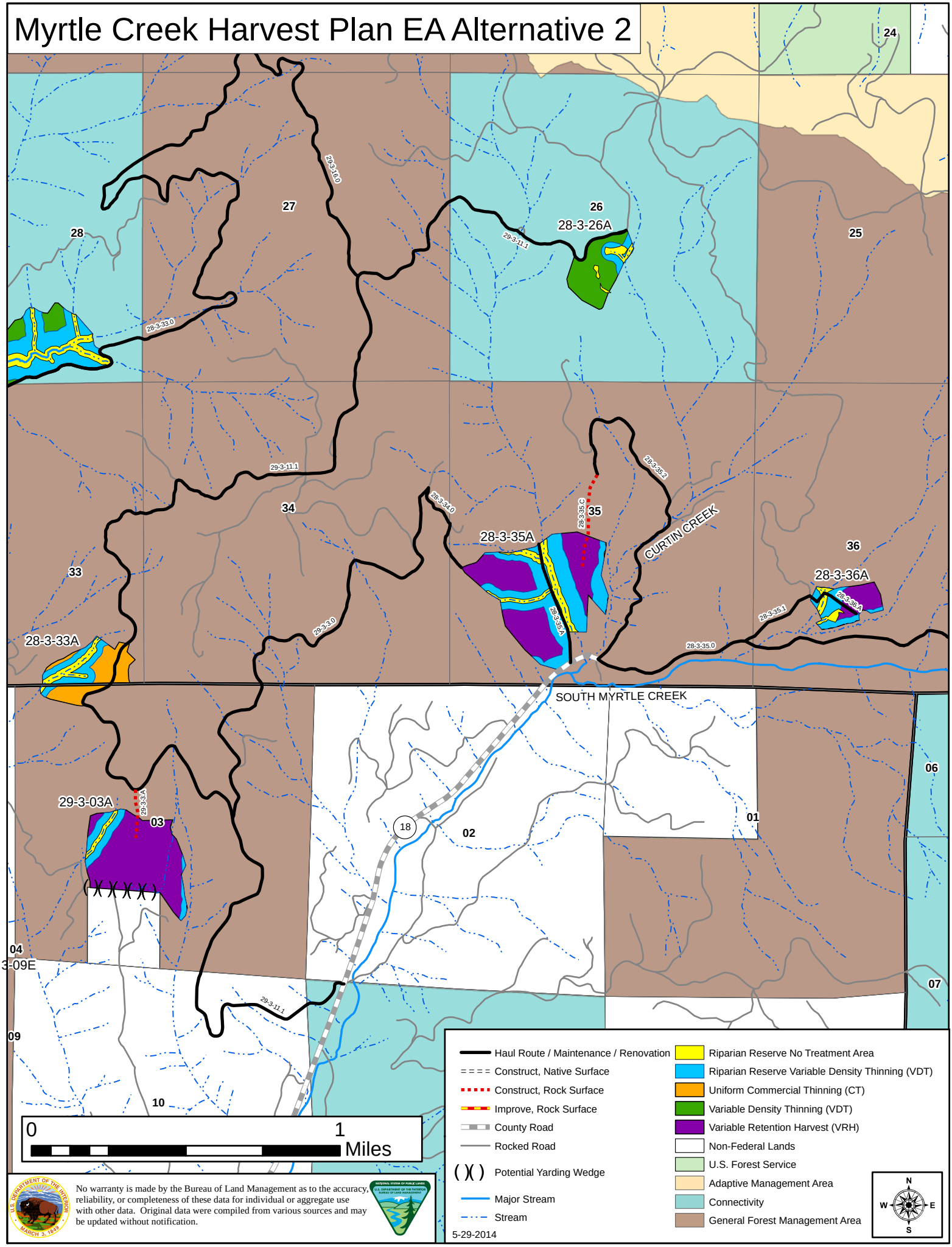



Haul Route / Maintenance / Renovation
Construct, Native Surface
Construct, Rock Surface
Improve, Rock Surface
County Road
Rocked Road
Potential Yarding Wedge
Major Stream
Stream

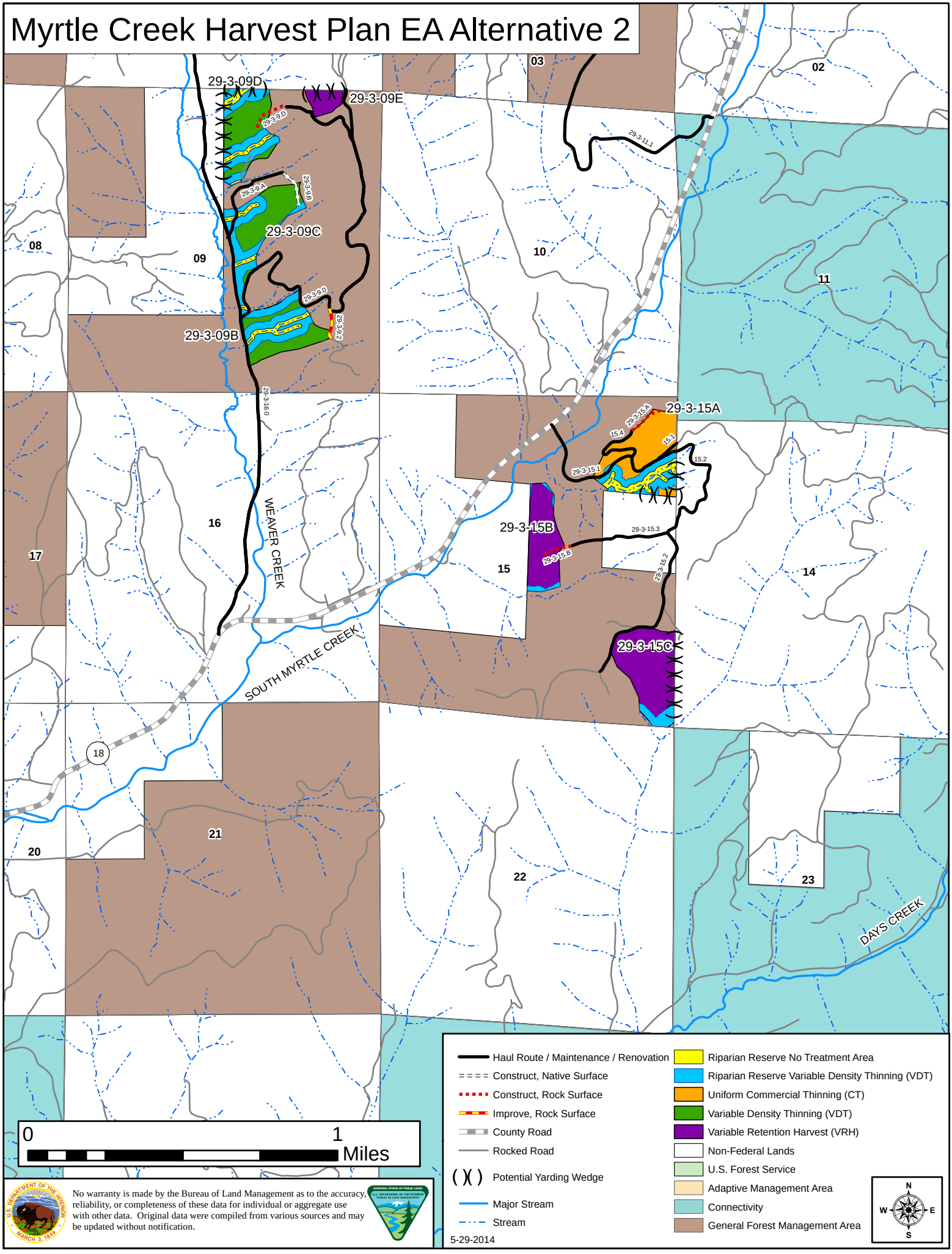
Riparian Reserve No Treatment Area
Riparian Reserve Variable Density Thinning (VDT)
Uniform Commercial Thinning (CT)
Variable Density Thinning (VDT)
Variable Retention Harvest (VRH)
Non-Federal Lands
U.S. Forest Service
Adaptive Management Area
Connectivity
General Forest Management Area

N
W
E
S

5-29-2014


Myrtle Creek Harvest Plan EA Alternative 2
24
25
26
27
28
28-3-26A
29-3-16.0
29-3-11.1
28-3-33.0
34
35
36
33
28-3-35A
28-3-35.C
28-3-35.2
28-3-34.0
CURTIN CREEK
28-3-36A
28-3-36.A
28-3-35.1
28-3-35.0
28-3-33A
29-3-3.0
SOUTH MYRTLE CREEK
29-3-03A
29-3-3.A
03
02
01
06
07
18
04
3-09E
09
10
0
1
Miles
Haul Route / Maintenance / Renovation
Construct, Native Surface
Construct, Rock Surface
Improve, Rock Surface
County Road
Rocked Road
Potential Yarding Wedge
Major Stream
Stream
Riparian Reserve No Treatment Area
Riparian Reserve Variable Density Thinning (VDT)
Uniform Commercial Thinning (CT)
Variable Density Thinning (VDT)
Variable Retention Harvest (VRH)
Non-Federal Lands
U.S. Forest Service
Adaptive Management Area
Connectivity
General Forest Management Area
N
W
E
S
5-29-2014
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. Original data were compiled from various sources and may be updated without notification.

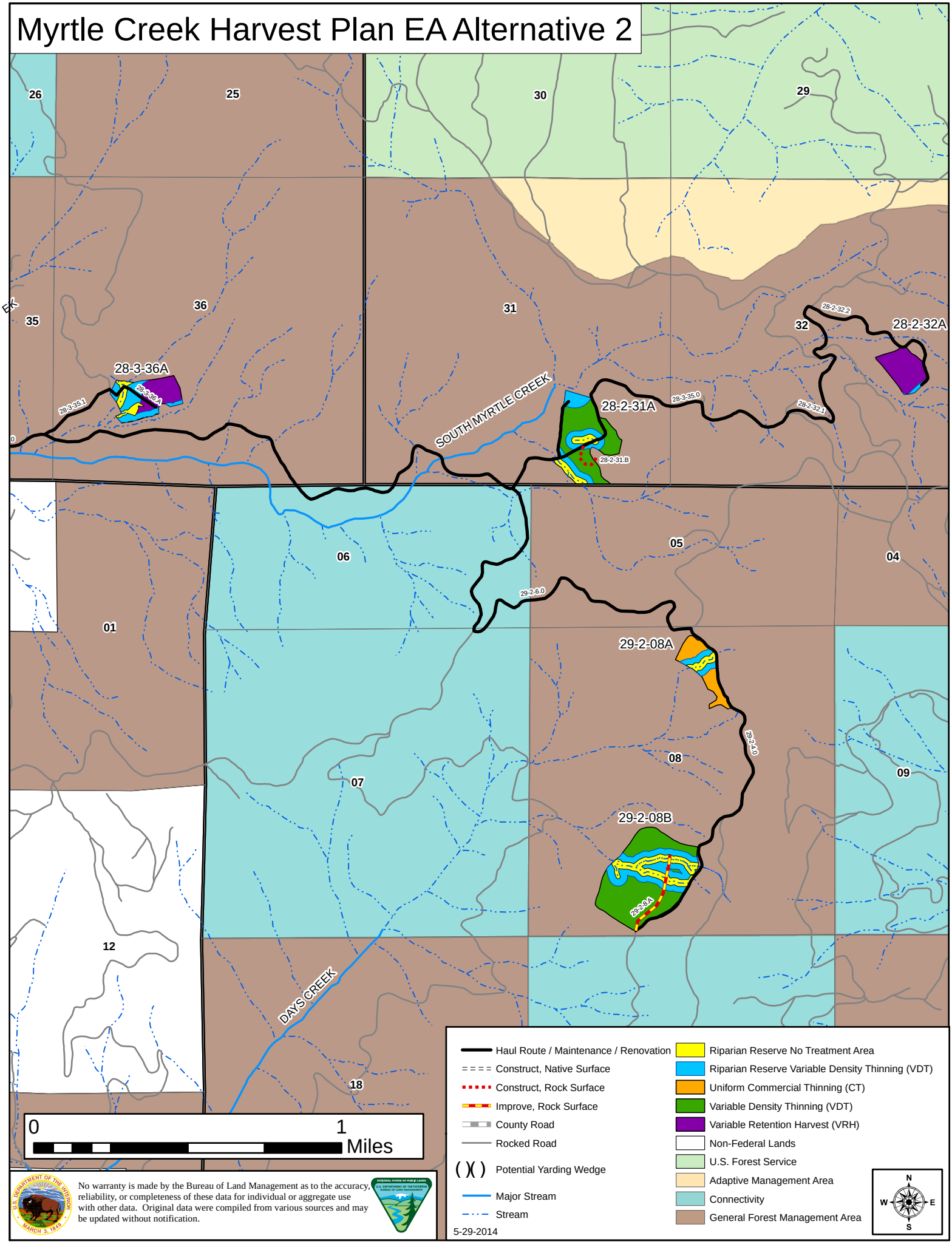
# Myrtle Creek Harvest Plan EA Alternative 2




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. Original data were compiled from various sources and may be updated without notification.

5-29-2014

# Myrtle Creek Harvest Plan EA Alternative 2

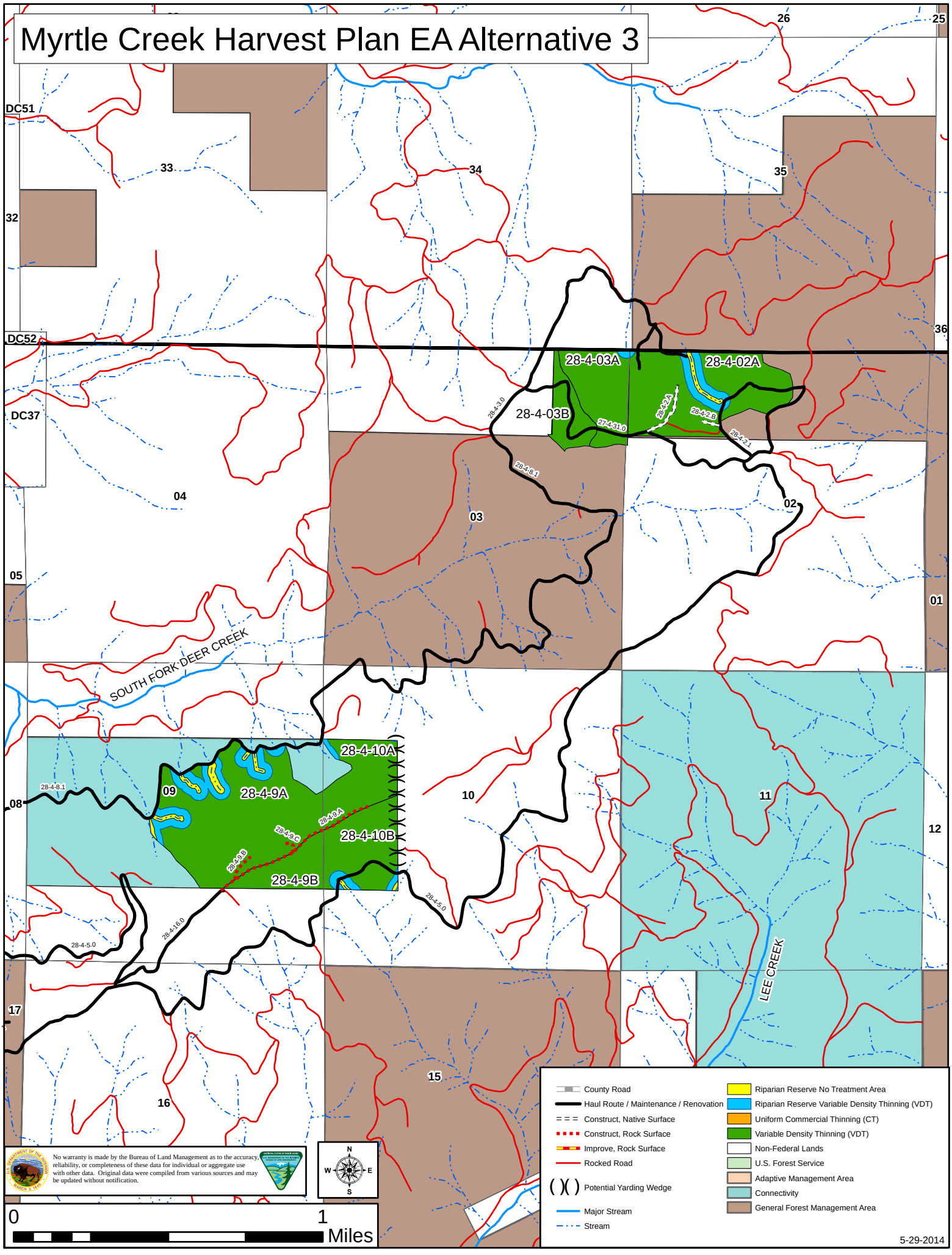


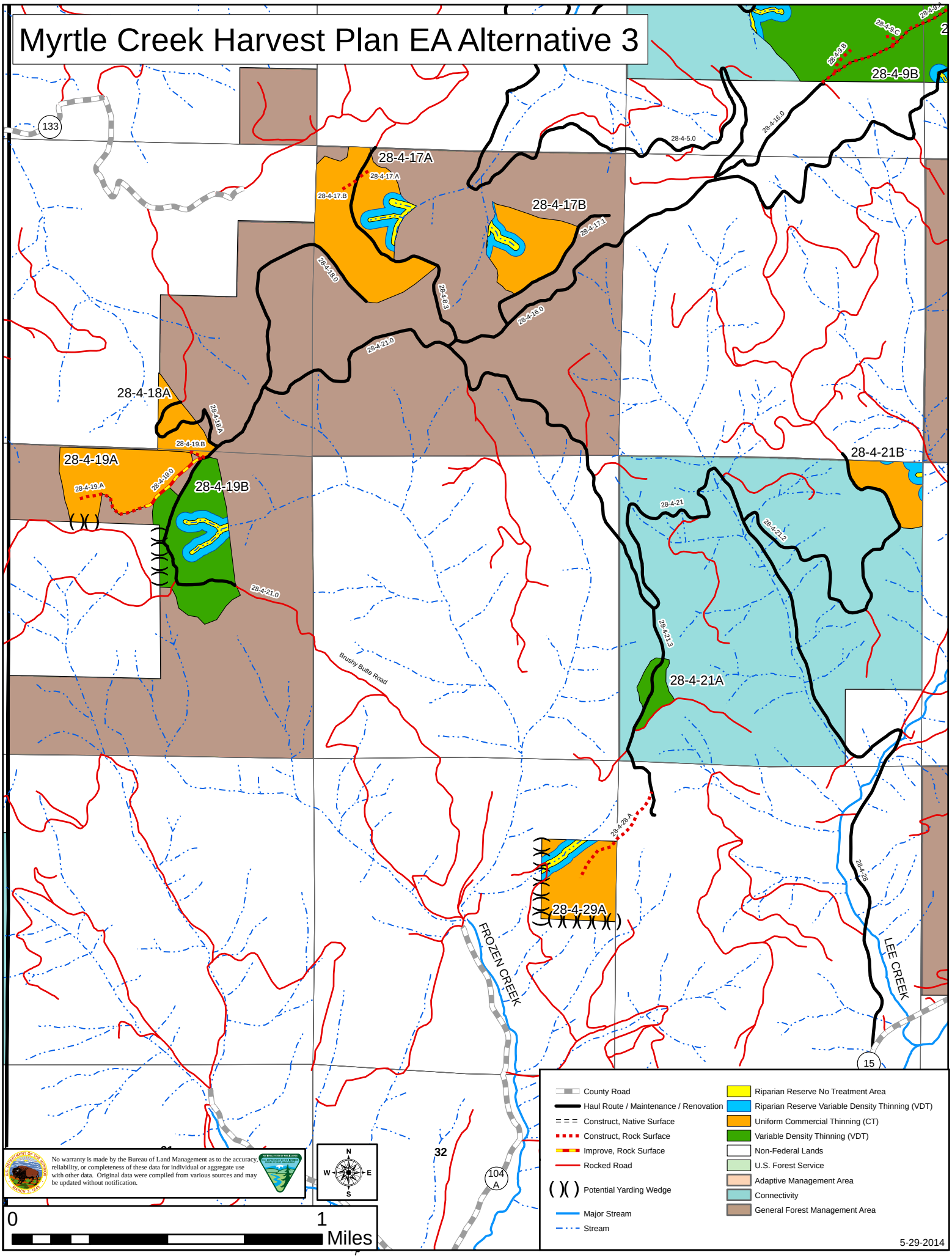

Haul Route / Maintenance / Renovation
Construct, Native Surface
Construct, Rock Surface
Improve, Rock Surface
County Road
Rocked Road
Potential Yarding Wedge
Major Stream
Stream

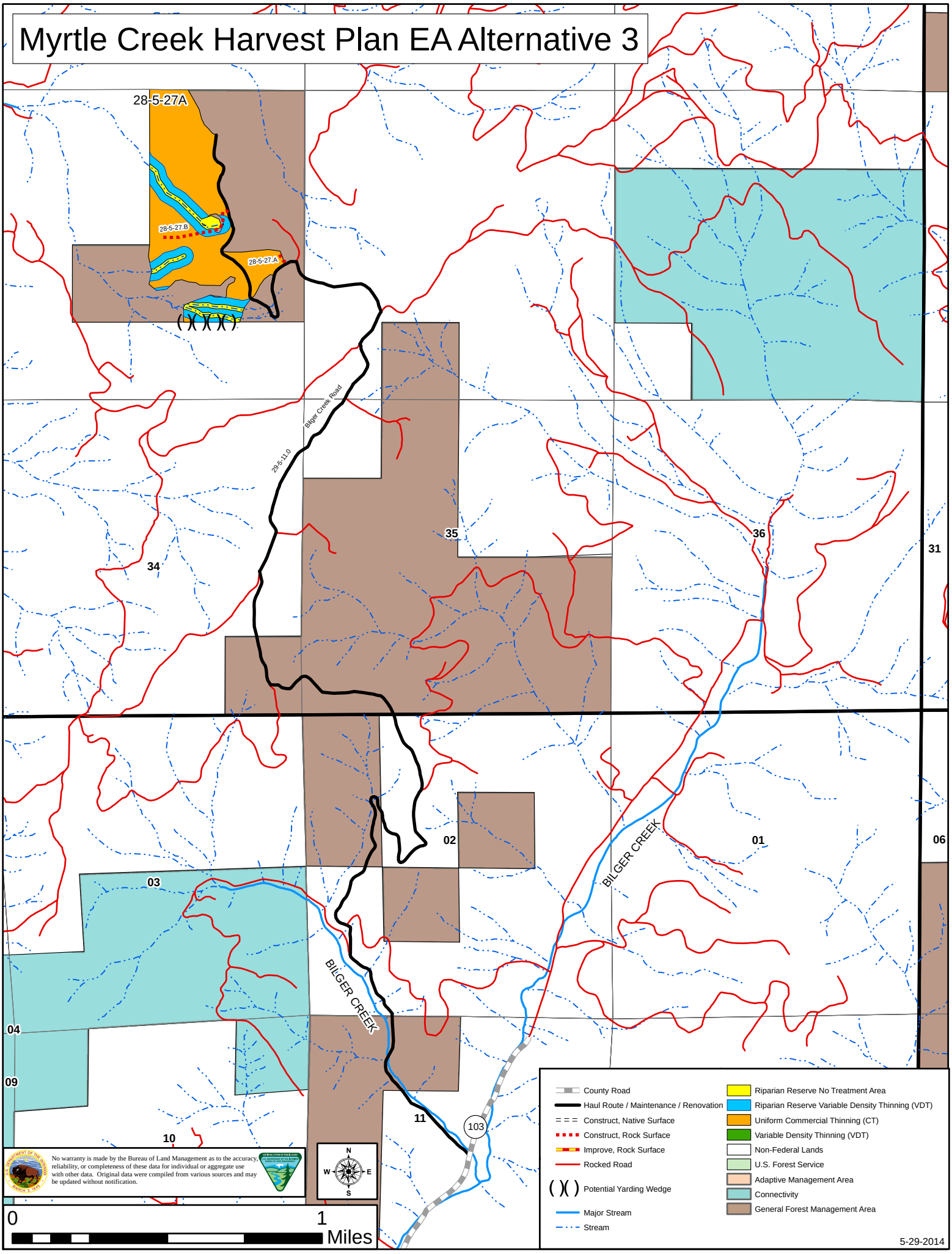
Riparian Reserve No Treatment Area
Riparian Reserve Variable Density Thinning (VDT)
Uniform Commercial Thinning (CT)
Variable Density Thinning (VDT)
Variable Retention Harvest (VRH)
Non-Federal Lands
U.S. Forest Service
Adaptive Management Area
Connectivity
General Forest Management Area

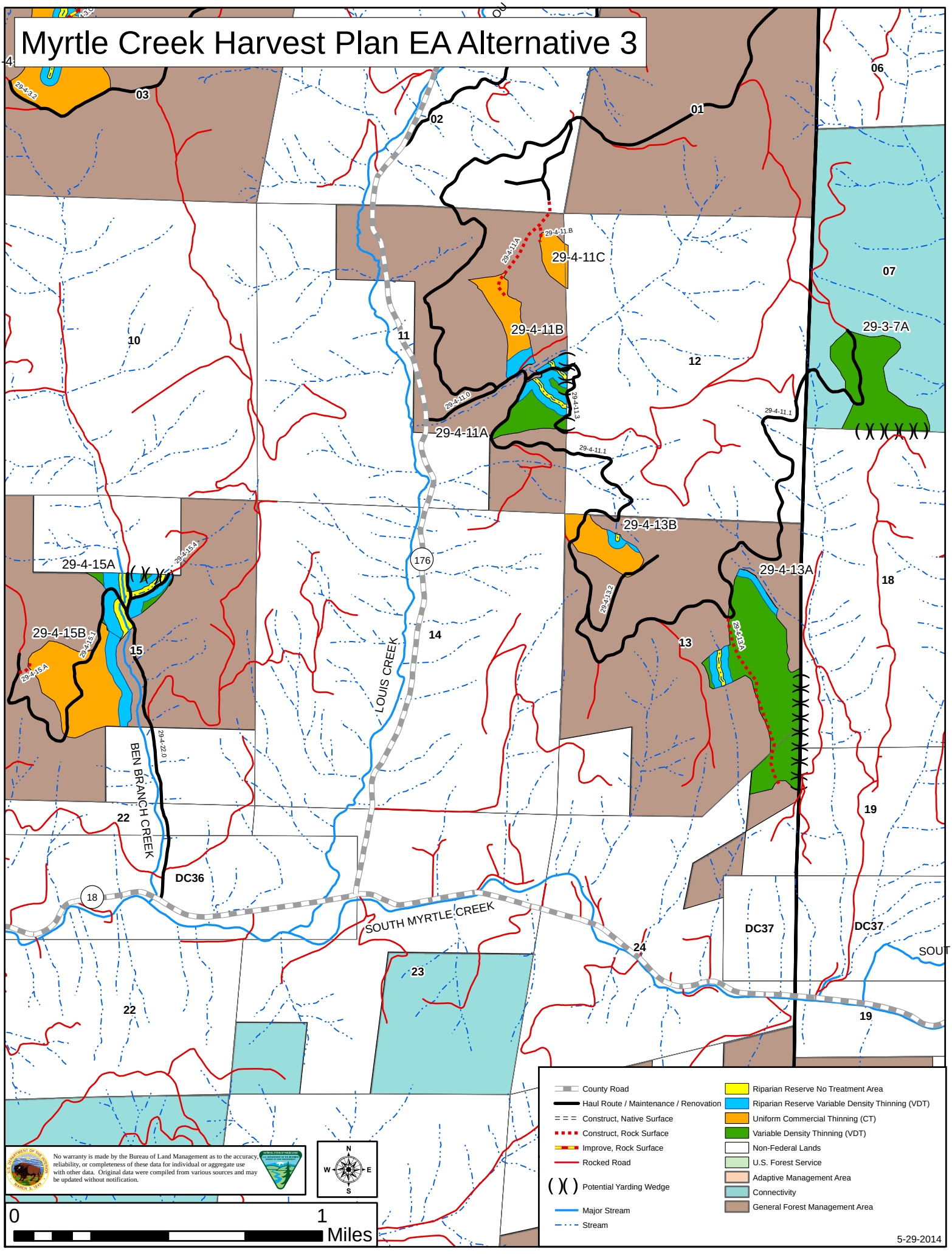
N
W
E
S

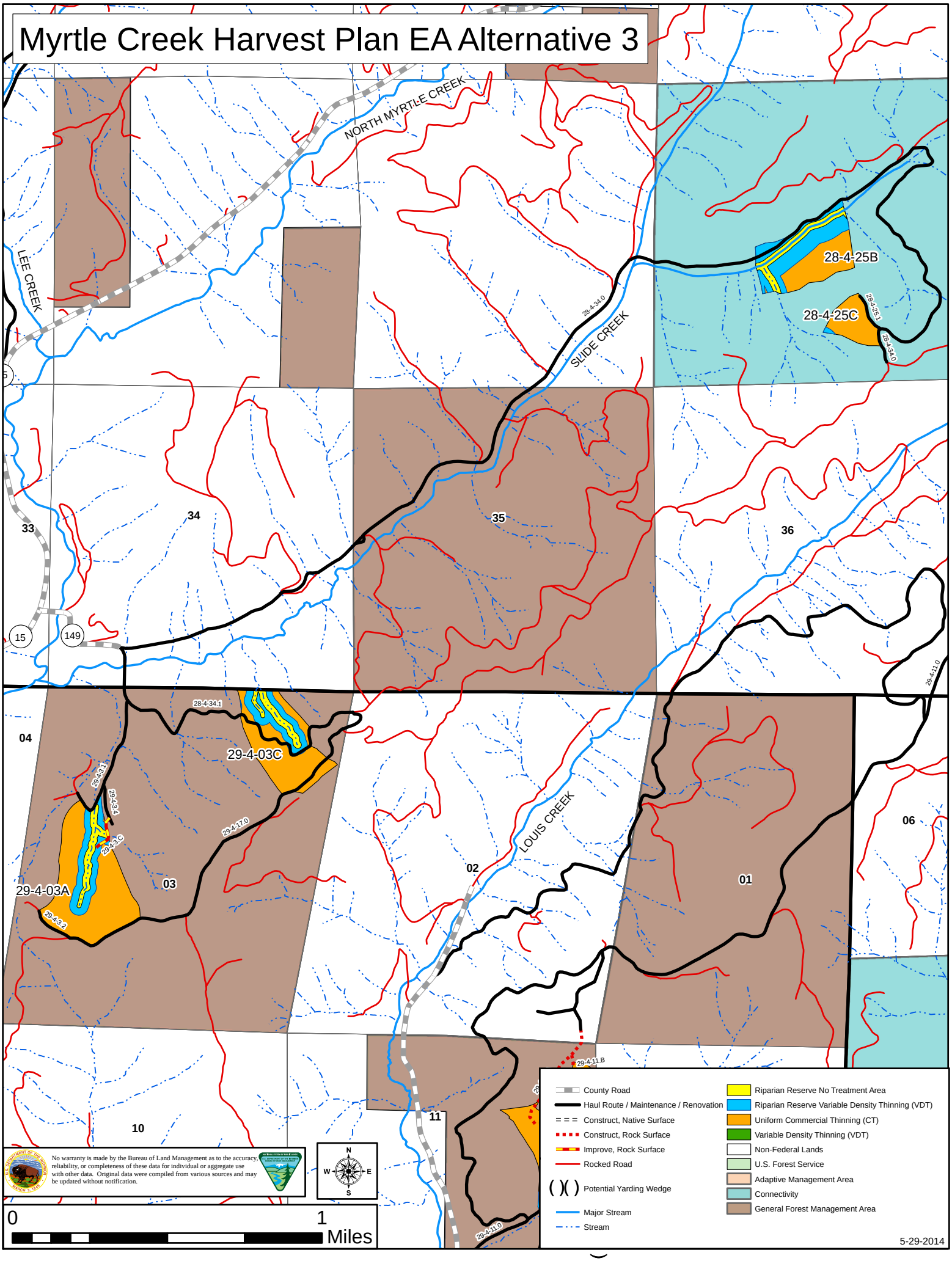
5-29-2014

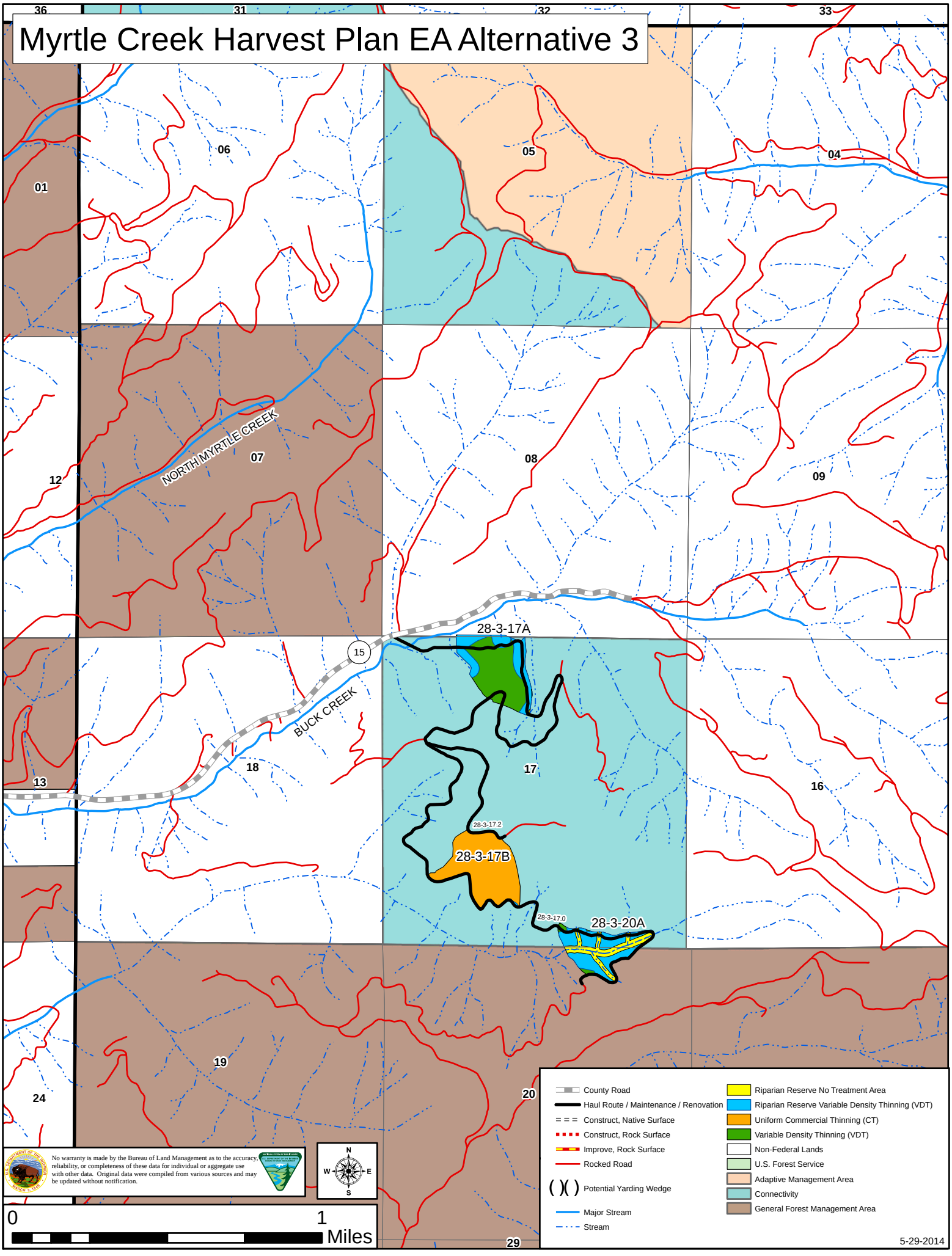

Myrtle Creek Harvest Plan EA Alternative 3
DC51
DC52
DC37
26
25
33
34
35
32
36
04
03
02
05
01
28-4-03A
28-4-02A
28-4-03B
28-4-3.0
28-4-2.A
28-4-2.B
27-4-31.0
28-4-2.1
28-4-8.1
SOUTH FORK DEER CREEK
28-4-10A
09
28-4-9A
28-4-8.1
08
10
11
12
28-4-9.A
28-4-9.C
28-4-10B
28-4-9.B
28-4-9B
28-4-5.0
28-4-16.0
28-4-5.0
LEE CREEK
17
15
16
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. Original data were compiled from various sources and may be updated without notification.
N
W
E
S
0
1
Miles
County Road
Haul Route / Maintenance / Renovation
Construct, Native Surface
Construct, Rock Surface
Improve, Rock Surface
Rocked Road
Potential Yarding Wedge
Major Stream
Stream
Riparian Reserve No Treatment Area
Riparian Reserve Variable Density Thinning (VDT)
Uniform Commercial Thinning (CT)
Variable Density Thinning (VDT)
Non-Federal Lands
U.S. Forest Service
Adaptive Management Area
Connectivity
General Forest Management Area
5-29-2014

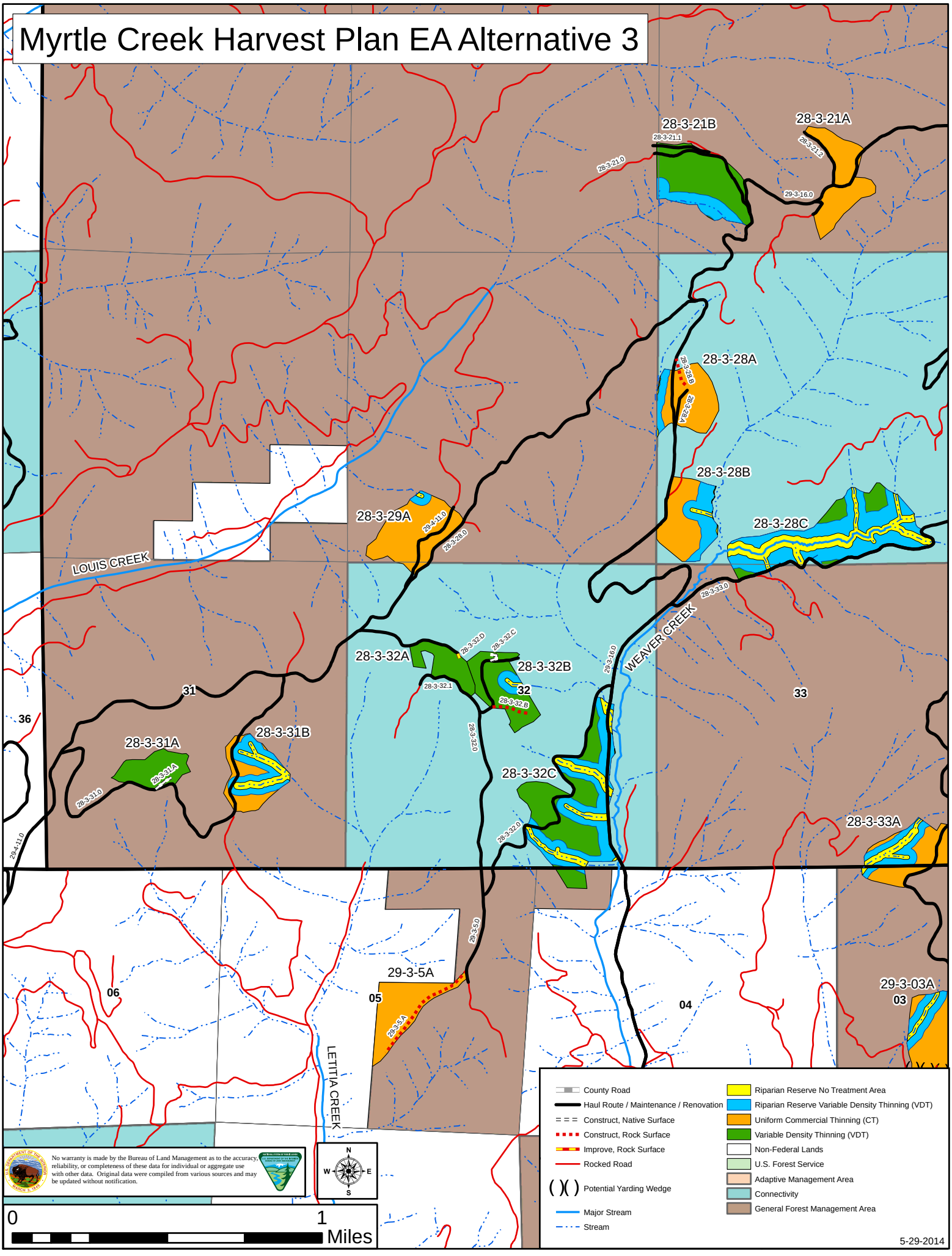

Myrtle Creek Harvest Plan EA Alternative 3
28-4-17A
28-4-17B
28-4-18A
28-4-19A
28-4-19B
28-4-21B
28-4-21A
28-4-29A
28-4-9B
28-4-17.A
28-4-17.B
28-4-17.1
28-4-18.0
28-4-18.A
28-4-19.0
28-4-19.A
28-4-19.B
28-4-21.0
28-4-16.0
28-4-5.0
28-4-3
28-4-21
28-4-21.2
28-4-21.3
28-4-29.A
28-4-28
28-4-9.B
28-4-9.C
Brushy Butte Road
FROZEN CREEK
LEE CREEK
133
15
32
104
A
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. Original data were compiled from various sources and may be updated without notification.
N
W
E
S
0
1
Miles
County Road
Haul Route / Maintenance / Renovation
Construct, Native Surface
Construct, Rock Surface
Improve, Rock Surface
Rocked Road
Potential Yarding Wedge
Major Stream
Stream
Riparian Reserve No Treatment Area
Riparian Reserve Variable Density Thinning (VDT)
Uniform Commercial Thinning (CT)
Variable Density Thinning (VDT)
Non-Federal Lands
U.S. Forest Service
Adaptive Management Area
Connectivity
General Forest Management Area
5-29-2014

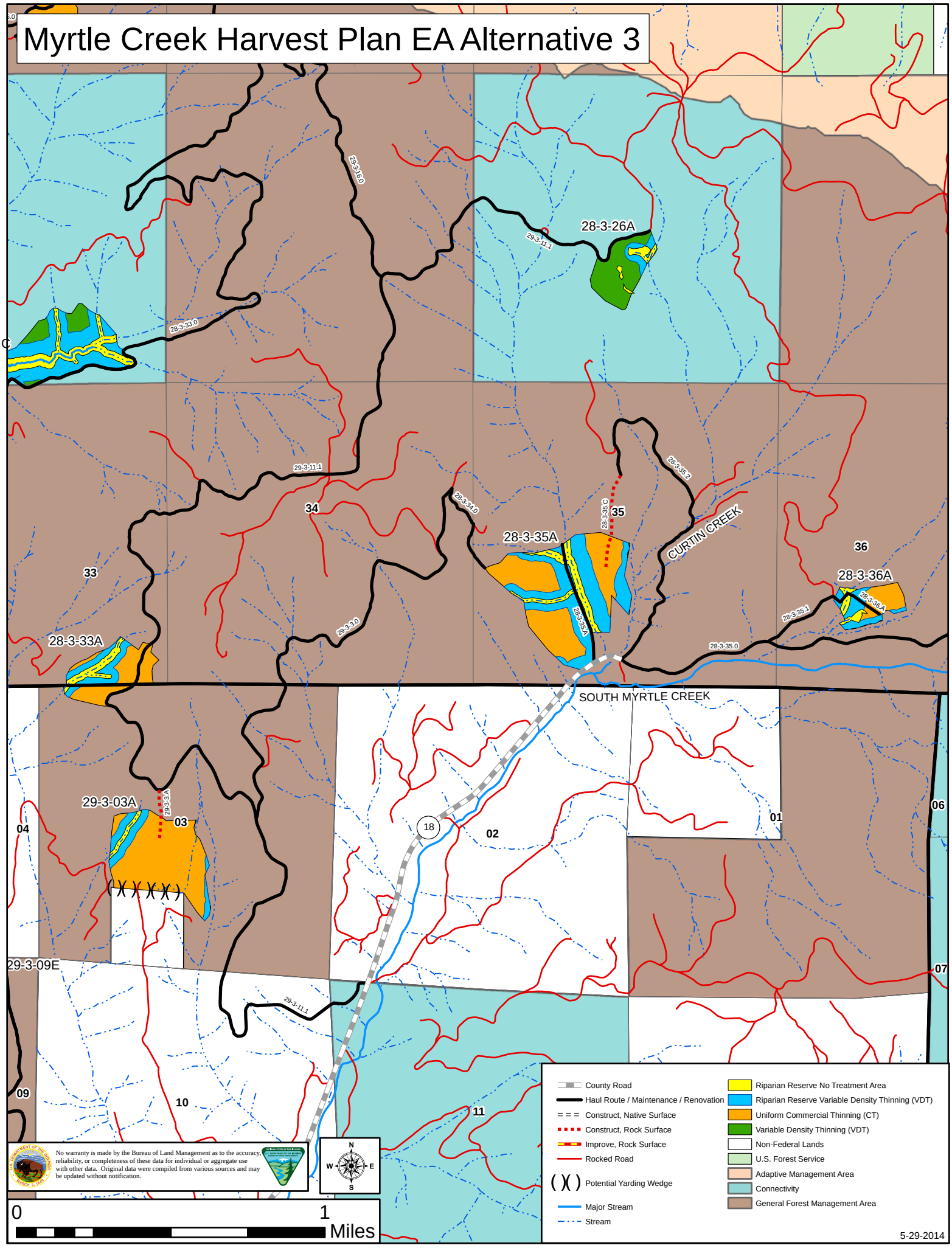

Myrtle Creek Harvest Plan EA Alternative 3
28-5-27A
28-5-27.B
28-5-27.A
Bilger Creek Road
29-5-11.0
34
35
36
31
02
01
06
03
04
09
10
11
103
BILGER CREEK
BILGER CREEK
No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources and may be updated without notification.
N
W
E
S
0
1
Miles
County Road
Haul Route / Maintenance / Renovation
Construct, Native Surface
Construct, Rock Surface
Improve, Rock Surface
Rocked Road
Potential Yarding Wedge
Major Stream
Stream
Riparian Reserve No Treatment Area
Riparian Reserve Variable Density Thinning (VDT)
Uniform Commercial Thinning (CT)
Variable Density Thinning (VDT)
Non-Federal Lands
U.S. Forest Service
Adaptive Management Area
Connectivity
General Forest Management Area
5-29-2014

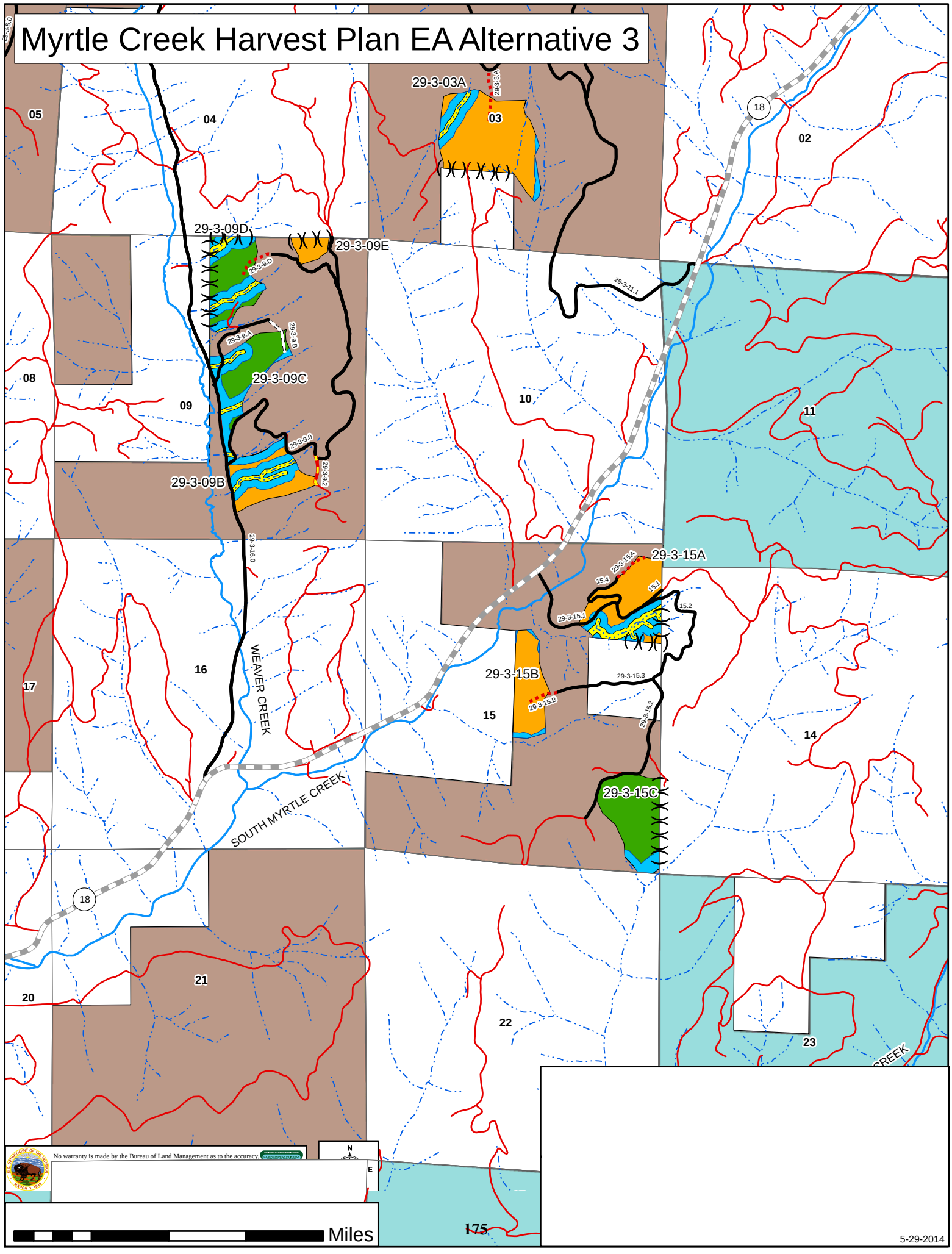

Myrtle Creek Harvest Plan EA Alternative 3
29-4-11C
29-4-11B
29-4-11A
29-3-7A
29-4-13B
29-4-13A
29-4-15A
29-4-15B
LOUIS CREEK
BEN BRANCH CREEK
SOUTH MYRTLE CREEK
DC36
DC37
DC37
176
18
01
02
03
06
07
10
11
12
13
14
15
18
19
22
23
24
County Road
Haul Route / Maintenance / Renovation
Construct, Native Surface
Construct, Rock Surface
Improve, Rock Surface
Rocked Road
Potential Yarding Wedge
Major Stream
Stream
Riparian Reserve No Treatment Area
Riparian Reserve Variable Density Thinning (VDT)
Uniform Commercial Thinning (CT)
Variable Density Thinning (VDT)
Non-Federal Lands
U.S. Forest Service
Adaptive Management Area
Connectivity
General Forest Management Area
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. Original data were compiled from various sources and may be updated without notification.
N
W
E
S
0
1
Miles
5-29-2014

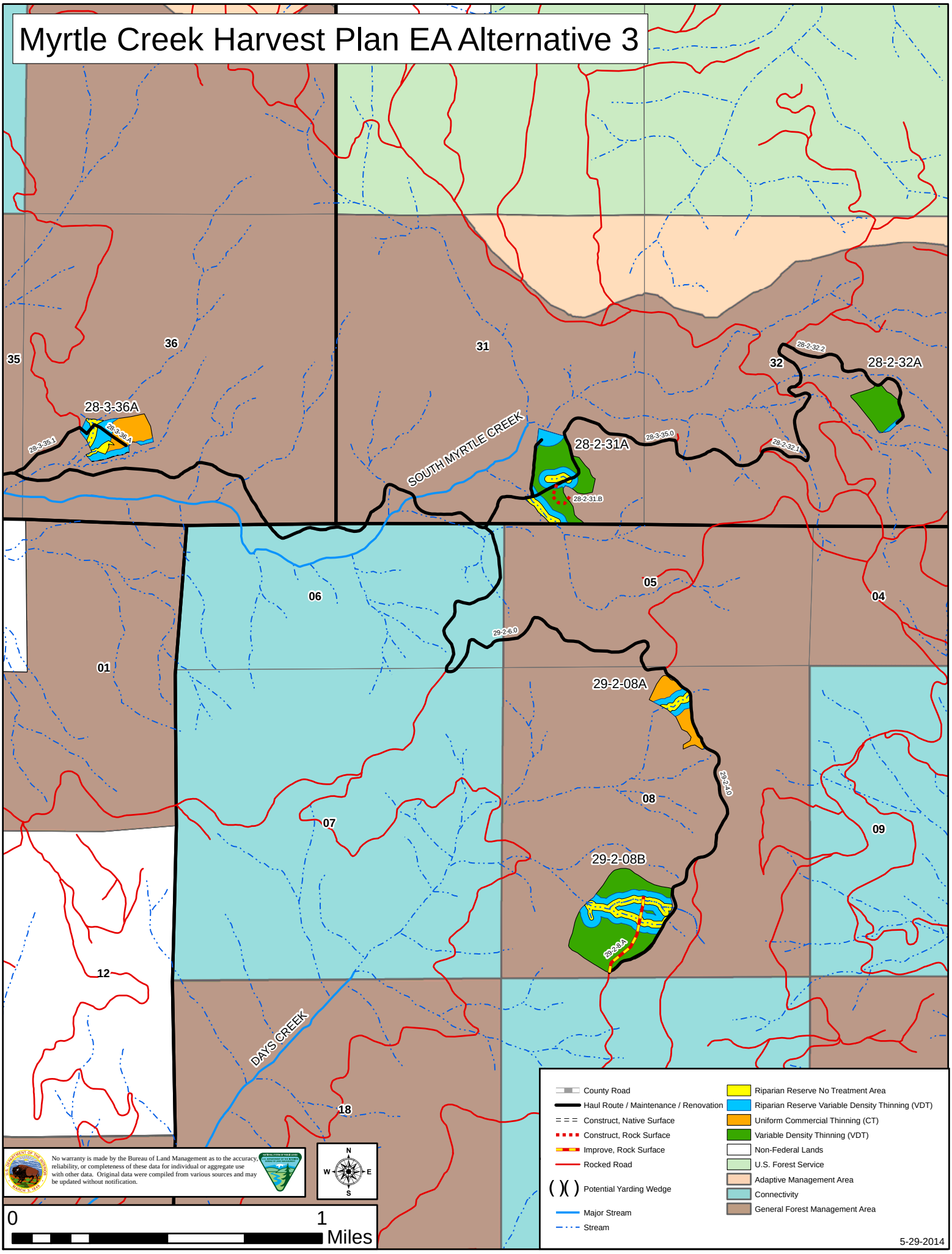

Myrtle Creek Harvest Plan EA Alternative 3
NORTH MYRTLE CREEK
LEE CREEK
SLIDE CREEK
LOUIS CREEK
28-4-25B
28-4-25C
28-4-25.1
28-4-34.0
28-4-34.1
29-4-03C
29-4-03A
29-4-3.1
29-4-3.4
29-4-3.C
29-4-3.2
29-4-17.0
29-4-11.0
29-4-11.B
33
34
35
36
04
03
02
01
06
10
11
15
149
No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources and may be updated without notification.
N
W
E
S
0
1
Miles
County Road
Haul Route / Maintenance / Renovation
Construct, Native Surface
Construct, Rock Surface
Improve, Rock Surface
Rocked Road
Potential Yarding Wedge
Major Stream
Stream
Riparian Reserve No Treatment Area
Riparian Reserve Variable Density Thinning (VDT)
Uniform Commercial Thinning (CT)
Variable Density Thinning (VDT)
Non-Federal Lands
U.S. Forest Service
Adaptive Management Area
Connectivity
General Forest Management Area
5-29-2014


Myrtle Creek Harvest Plan EA Alternative 3
36
31
32
33
01
06
05
04
07
08
09
12
NORTH MYRTLE CREEK
28-3-17A
15
BUCK CREEK
18
17
16
13
28-3-17.2
28-3-17B
28-3-17.0
28-3-20A
19
20
24
29
County Road
Haul Route / Maintenance / Renovation
Construct, Native Surface
Construct, Rock Surface
Improve, Rock Surface
Rocked Road
Potential Yarding Wedge
Major Stream
Stream
Riparian Reserve No Treatment Area
Riparian Reserve Variable Density Thinning (VDT)
Uniform Commercial Thinning (CT)
Variable Density Thinning (VDT)
Non-Federal Lands
U.S. Forest Service
Adaptive Management Area
Connectivity
General Forest Management Area
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. Original data were compiled from various sources and may be updated without notification.
N
W
E
S
0
1
Miles
5-29-2014

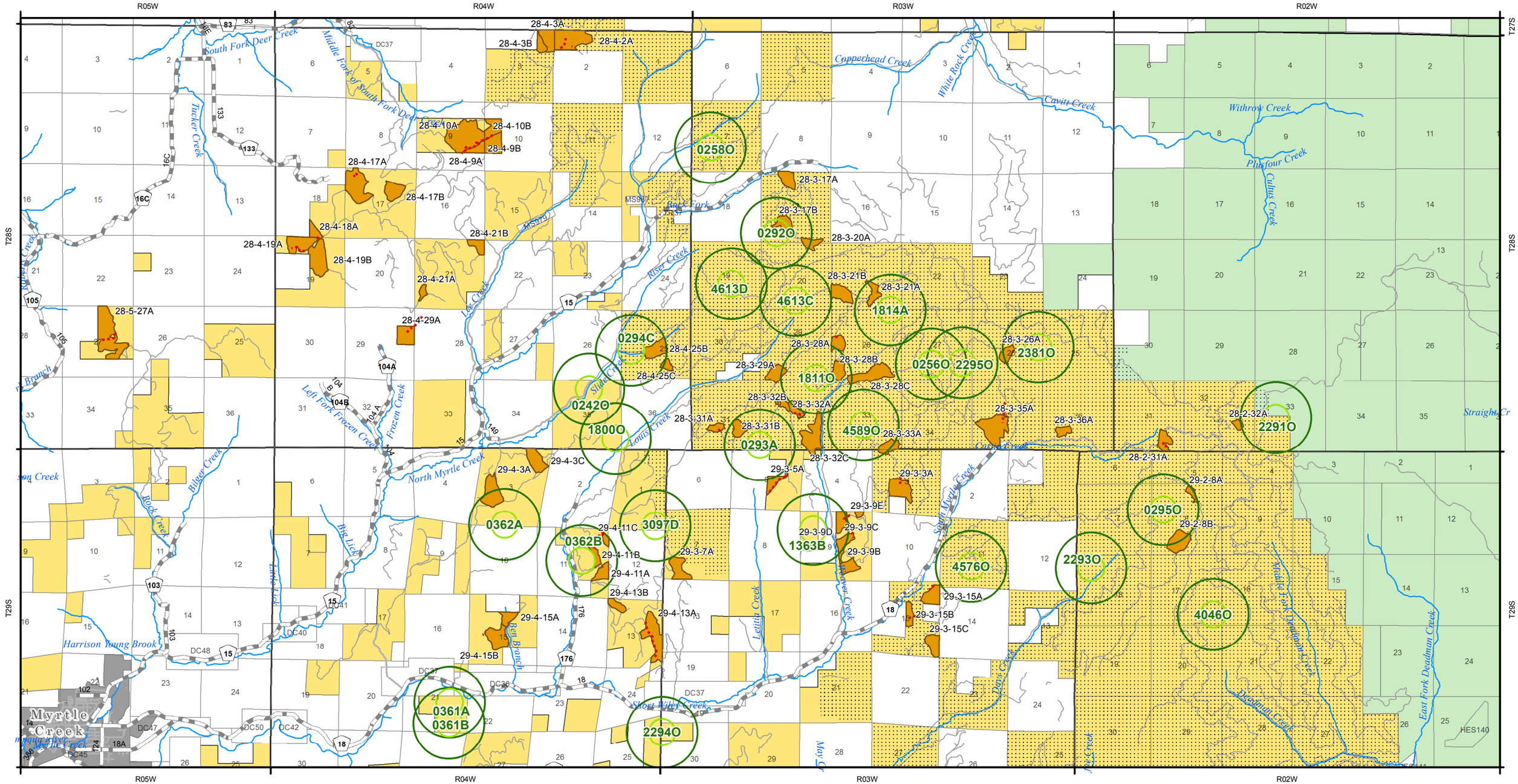

Myrtle Creek Harvest Plan EA Alternative 3
28-3-21B
28-3-21A
28-3-21.1
28-3-21.2
28-3-21.0
29-3-16.0
28-3-28A
28-3-28.B
28-3-28A
28-3-28B
28-3-28C
28-3-29A
29-4-11.0
28-3-28.0
LOUIS CREEK
28-3-33.0
WEAVER CREEK
28-3-32A
28-3-32.D
28-3-32.C
28-3-32B
28-3-32.1
28-3-32.B
29-3-16.0
28-3-32.0
31
32
33
36
28-3-31A
28-3-31B
28-3-31.A
28-3-31.0
28-3-32C
28-3-33A
29-4-11.0
29-3-5.0
29-3-5A
06
05
04
03
29-3-03A
LETITIA CREEK
County Road
Haul Route / Maintenance / Renovation
Construct, Native Surface
Construct, Rock Surface
Improve, Rock Surface
Rocked Road
Potential Yarding Wedge
Major Stream
Stream
Riparian Reserve No Treatment Area
Riparian Reserve Variable Density Thinning (VDT)
Uniform Commercial Thinning (CT)
Variable Density Thinning (VDT)
Non-Federal Lands
U.S. Forest Service
Adaptive Management Area
Connectivity
General Forest Management Area
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. Original data were compiled from various sources and may be updated without notification.
N
W
E
S
0
1
Miles
5-29-2014


Myrtle Creek Harvest Plan EA Alternative 3
28-3-26A
28-3-33A
28-3-35A
28-3-36A
29-3-03A
CURTIN CREEK
SOUTH MYRTLE CREEK
29-3-09E
29-3-16.0
29-3-11.1
28-3-33.0
29-3-11.1
28-3-35.2
28-3-34.0
28-3-35.C
28-3-35.A
29-3-3.0
28-3-35.1
28-3-36.4
28-3-35.0
29-3-3.A
29-3-11.1
33
34
35
36
04
03
02
01
06
07
09
10
11
18
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. Original data were compiled from various sources and may be updated without notification.
N
W
E
S
0
1
Miles
County Road
Haul Route / Maintenance / Renovation
Construct, Native Surface
Construct, Rock Surface
Improve, Rock Surface
Rocked Road
Potential Yarding Wedge
Major Stream
Stream
Riparian Reserve No Treatment Area
Riparian Reserve Variable Density Thinning (VDT)
Uniform Commercial Thinning (CT)
Variable Density Thinning (VDT)
Non-Federal Lands
U.S. Forest Service
Adaptive Management Area
Connectivity
General Forest Management Area
5-29-2014


Myrtle Creek Harvest Plan EA Alternative 3
29-3-03A
29-3-09D
29-3-09E
29-3-09C
29-3-09B
29-3-15A
29-3-15B
29-3-15C
WEAVER CREEK
SOUTH MYRTLE CREEK
05
04
03
02
08
09
10
11
16
17
15
14
21
20
22
23
18
No warranty is made by the Bureau of Land Management as to the accuracy,
N
E
Miles
175
5-29-2014


Myrtle Creek Harvest Plan EA Alternative 3
35
36
31
32
28-3-36A
28-3-35.1
28-3-36.4
SOUTH MYRTLE CREEK
28-2-31A
28-3-35.0
28-2-32.1
28-2-31.B
28-2-32.2
28-2-32A
01
06
05
04
29-2-6.0
29-2-08A
29-2-4.0
08
09
07
29-2-08B
29-2-8.A
12
DAYS CREEK
18
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. Original data were compiled from various sources and may be updated without notification.
N
W
E
S
0
1
Miles
County Road
Haul Route / Maintenance / Renovation
Construct, Native Surface
Construct, Rock Surface
Improve, Rock Surface
Rocked Road
Potential Yarding Wedge
Major Stream
Stream
Riparian Reserve No Treatment Area
Riparian Reserve Variable Density Thinning (VDT)
Uniform Commercial Thinning (CT)
Variable Density Thinning (VDT)
Non-Federal Lands
U.S. Forest Service
Adaptive Management Area
Connectivity
General Forest Management Area
5-29-2014

# Myrtle Creek Harvest Plan - Northern Spotted Owl Sites




## Legend

- Myrtle Creek Units
- Bureau of Land Management Lands
- U.S. Forest Service Lands
- Private Lands

- NSO Critical Habitat
- NSO Nest Patch
- NSO Core Area
- Proposed Road Construction

- Major Stream
- County Roads
- Paved Road
- Rocked Road

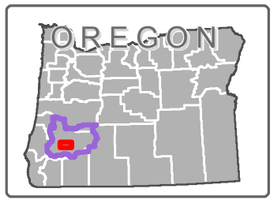
Date: 5/30/2014

0 0.5 1 1.5 2 2.5
Miles

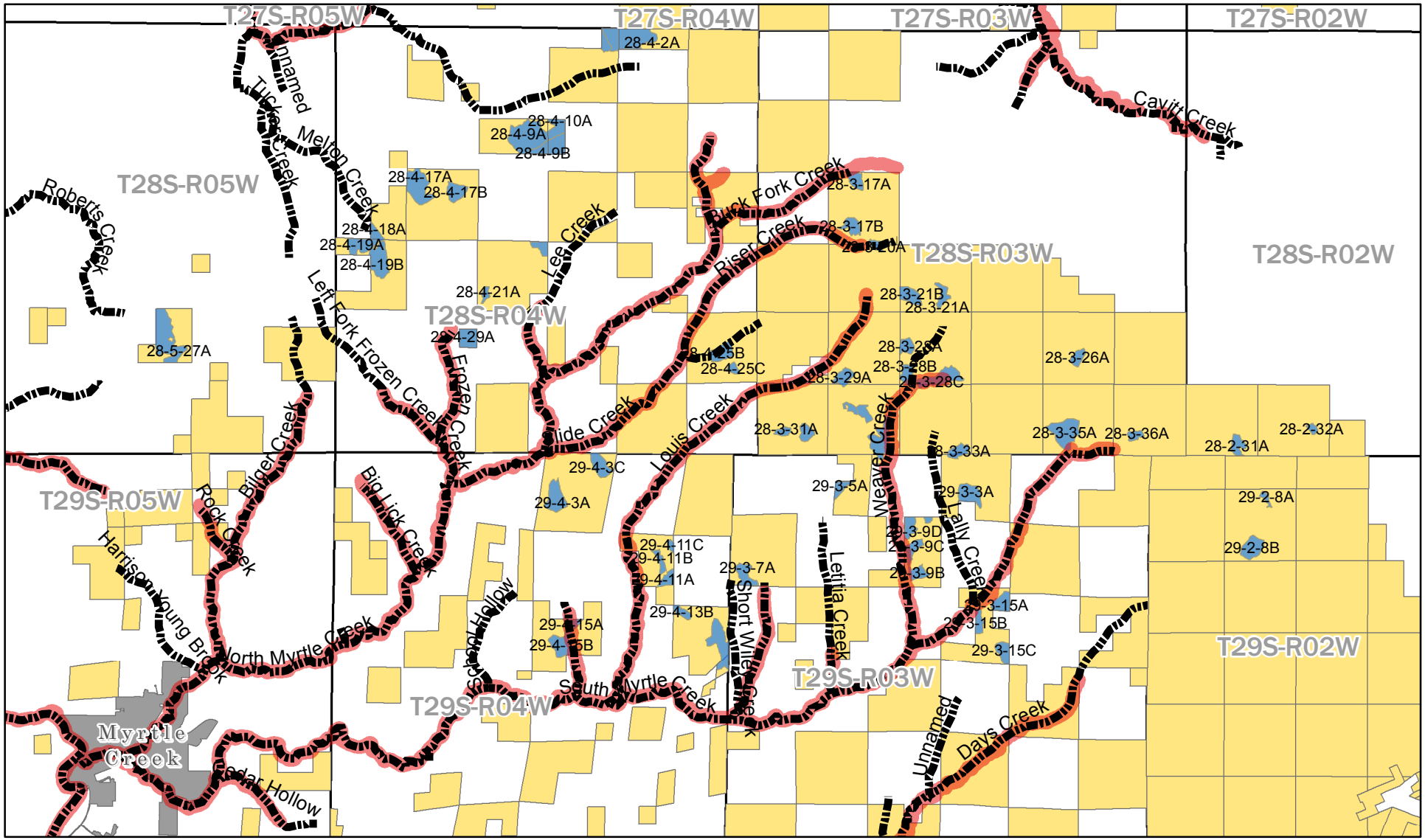
N
W E
S

Roseburg District
Bureau of Land Management
777 NW Garden Valley Blvd.
Roseburg, Oregon 97471





# Coho Salmon Distribution and Critical Habitat




Coho Salmon Critical Habitat

Coho_Salmon_Observed_Distribution

Proposed Timber Harvest Units

BLM Ownership

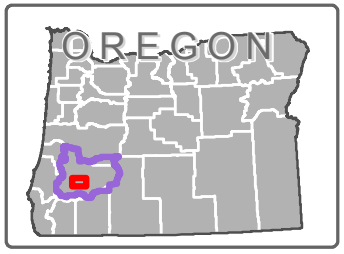
N
W E
S

0 1 2 3 4

Miles

Date: 5/20/2014
Roseburg District
Bureau of Land Management
777 NW Garden Valley Blvd.
Roseburg, Oregon 97471





# Appendix B – Botanical Species Considered but Dropped from Detailed Study

Kincaid's lupine (*Lupinus sulphureus* var. *kincaidii*) is the only federally listed plant species that has the potential to be found in the analysis area. One unit (28-5-27A) was identified as having suitable Kincaid's lupine habitat. Surveys were conducted in May and June of 2012 and no individuals were identified.

Seventy-two special status plant and fungi species are known or suspected to occur on the Roseburg District: 12 species of fungi, six species of lichens, four species of liverworts, 11 species of moss, and 37 vascular plant species. Potential habitat for 15 of the species is not present in the analysis area (Table B-2).

There are 207 species of fungi identified by the Survey and Manage standards and guidelines. Most Special Status, and Survey and Manage fungi species are highly isolated in occurrence, producing short-lived, ephemeral sporocarps or fruiting structures that are seasonal and annually variable in occurrence (USDA/FS and USDI/BLM 2000, S&M SEIS, p. 191). Richardson (1970) estimated that sampling every two weeks would fail to detect about 50 percent of macrofungal species fruiting in any given season. In another study (ODell et al., 1999), less than ten percent of species were detected in each of two consecutive years at any one of eight sites. Given this, it has been determined that surveys for these species are impractical.

A single species, *Bridgeoporus nobilissimus*, is identified in Survey and Manage Category A. It is dependent upon noble (*Abies procera*) and Pacific silver fir (*Abies amabilis*) which are not present in the project area. There are 10 fungi species that fall within Survey and Manage Category D for which surveys are considered impractical or unnecessary. There are three Survey and Manage Category E species considered to be of rare and undetermined status for which no management recommendations exist, and four Survey and Manage Category F species considered to be uncommon or concern for persistence unknown and status undetermined (USDA/FS and USDI/BLM, 2001 S&M ROD, Standards and Guidelines pp. 7-13).

The remaining 189 fungi species are in Survey and Manage Category B, considered rare, and pre-disturbance surveys are not considered practical. To avoid inadvertent loss, the 2001 S&M ROD (Standards and Guidelines, pp. 9 and 25) states that for projects on which decisions are issued after fiscal year 2011, equivalent-effort surveys for Category B species will be conducted in old-growth forest if strategic surveys were not completed. The proposed harvest units and road locations avoid all forest stands that are characterized as old-growth forest based upon the definition with the Northwest Forest Plan SEIS and FEMAT. Therefore equivalent surveys are not required for this project.

There are fifty species of lichens, sixteen non-vascular plants species, and ten vascular plant species identified by the Survey and Manage standards and guidelines. Pin lichens were identified in 17 surveyed units (Table B-1). They would be protected as described in Chapter 1 (p. 13).

There are nine lichen, two non-vascular and six vascular plant species in Survey and Manage Category A, which require pre-disturbance surveys in suitable habitat and management of all known sites. There is one lichen and four vascular plant species in Survey and Manage Category C, which require pre-disturbance surveys in suitable habitat and high-priority sites are to be managed (all sites are to be managed until high-priority sites are identified). There are 16 lichens and 11 non-vascular plants in Survey and Manage Category B, for which surveys have been determined to not be practical but which require the management of all known locations. There are two Survey and Manage Category D non-vascular species for which pre-disturbance surveys are considered impractical or unnecessary but which require management of identified high-priority sites. Survey and Manage Category E includes 15 lichens and one non-vascular plant, which are considered rare, having undetermined status and for which no management recommendations exist but in the interim all known sites are to be managed. There are nine Survey and Manage Category F lichen species considered to be uncommon or concern for persistence unknown and status undetermined (Standards and Guidelines, pp. 7-13).

**Table B-1:** Presence/absence results for *Chaenotheca chrysocephala* (CHCH) and *C. ferruginea* (CHFE) within surveyed units

| Unit ID | CHCH | CHFE |
|---|---|---|
| 28-2-32A | present | absent |
| 28-3-26A | absent | present |
| 28-3-28C | absent | present |
| 28-3-31A | present | absent |
| 28-3-32C | absent | present |
| 28-3-35A | present | present |
| 28-4-09A | present | absent |
| 28-4-09B | absent | absent |
| 28-4-10A | absent | present |
| 28-4-10B | present | present |
| 28-4-17B | present | present |
| 28-4-19B | present | present |
| 28-4-21A | absent | absent |
| 28-4-29A | absent | absent |
| 28-5-27A | present | present |
| 29-3-03A | absent | present |
| 29-3-09B | absent | absent |
| 29-3-15B | present | present |
| 29-3-15C | present | absent |
| 29-4-11C | absent | absent |
| 29-4-13A | absent | present |
| 29-4-13B | present | present |

**Table B-2: Special Status Plant Species Survey Requirements, Survey Results and Rational for Exclusion from Detailed Analysis**

| Status[1] | Scientific Name | Common Name or Taxon | Habitat | Elevation (feet) | Identified on Roseburg District | Survey Results |
|---|---|---|---|---|---|---|
| Bureau Sensitive S&M A | *Bridgeoporus nobilissimus* | Fungi | Large, dying and dead noble fir and Pacific silver fir in late-successional old-growth forests. | 298-4400 | No | Habitat Not Present-Surveys Not Required |
| Bureau Sensitive S&M B | *Dermocybe humboldtensis* | Fungi | Associated with various members of the pine family. | 1353-1956 | Roseburg Same Watershed | Surveys Not Feasible |
| Bureau Sensitive S&M B | *Helvella crassitunicata* | Fungi | Montane old-growth forests containing true firs. | | No | Habitat Not Present-Surveys Not Required |
| Bureau Sensitive S&M B | *Phaeocollybia californica* | Fungi | Roots of Pacific silver fir, Sitka spruce, Douglas fir and western hemlock. | 309-3817 | Roseburg Same Watershed | Surveys Not Feasible |
| Bureau Sensitive S&M B | *Phaeocollybia gregaria* | Fungi | Associated with Sitka spruce and Douglas fir. | 477-1486 | No | Surveys Not Feasible |
| Bureau Sensitive S&M B | *Phaeocollybia oregonensis* | Fungi | Associated with Pacific silver fir, Douglas fir, and western hemlock. | 826-3817 | No | Surveys Not Feasible |
| Bureau Sensitive S&M B | *Pseudorhizina californica* | Fungi | Rotted stumps or logs of coniferous trees or on soil rich in rotted wood. | 158-6026 | Roseburg | Surveys Not Feasible |
| Bureau Sensitive S&M B | *Ramaria amyloidea* | Fungi | Associated with true fir, Douglas fir and western hemlock. | 1799-5527 | Roseburg | Surveys Not Feasible |
| Bureau Sensitive S&M B | *Ramaria rubella* var. *blanda* | Fungi | Growing on wood in conifer forests. | | Roseburg Same Watershed | Surveys Not Feasible |
| Bureau Sensitive S&M B | *Ramaria spinulosa Var. diminutiva* | Fungi | Associated with hosts from the pine family. | 1470 | No | Surveys Not Feasible |
| Bureau Sensitive S&M B | *Rhizopogon chamaleontinus* | Fungi | Growing on roots of Douglas fir and sugar pine. | 3500 | No | Surveys Not Feasible |

**Table B-2 continued: Special Status Plant Survey Requirements, Survey Results and Rational for Exclusion from Detailed Analysis**

| Status[1] | Scientific Name | Common Name or Taxon | Habitat | Elevation (feet) | Identified on Roseburg District | Survey Results |
|---|---|---|---|---|---|---|
| Bureau Sensitive S&M B | *Rhizopogon exiguus* | Fungi | Associated with Douglas fir and western hemlock. | 2850 | No | Surveys Not Feasible |
| Bureau Sensitive S&M A | *Bryoria subcana* | Lichen | Sitka spruce, western hemlock, wet Douglas fir, wet noble fir and mixed hardwood-coniferous forests. In coastal bays, streams, dune forests, and high precipitation ridges and summits within 30 miles of the ocean. | <2000 | Roseburg | Habitat Not Present-Surveys Not Required |
| Bureau Sensitive S&M E | *Calicium adspersum* | Lichen | The bark of living grand fir, Douglas fir, oak, California redwood and western redcedar. Generally in relatively open stands in drier microhabitats where sheltered from precipitation. On trees greater than 200 years. | <2000 | No | Not Present |
| Bureau Sensitive | *Calicium quercinum* | Lichen | Old growth forests growing on oak, maple, ash, and elm. | | No | Habitat Not Present-Surveys Not Required |
| Bureau Sensitive | *Lobaria linita* | Lichen | Cool and humid, mesic to moist, old-growth Pacific silver fir, mountain hemlock, or western hemlock forests (possibly oak forest and late mature tanoak and madrone). | 700-4500 | Roseburg | Not Present |
| Bureau Sensitive | *Pilophorus nigricaulis* | Lichen | Cool, moist, rocky slopes in the open but where sheltered by surrounding topography. Substrate is noncalcareous rocks, primarily volcanic. | 130-4700 | No | Not Present |
| Bureau Sensitive | *Stereocaulon spathuliferum* | Lichen | Sheltered microsites in cool moist habitats, especially talus slopes and cliffs on noncalcareous rock. | 3000-5000 | No | Not Present |
| Bureau Sensitive | *Cephaloziella spinigera* | Liverwort | Growing in bogs and fens. | | Roseburg | Habitat Not Present-Surveys Not Required |
| Bureau Sensitive | *Gymnomitrion concinnatum* | Liverwort | Growing on peaty soil of cliffs and rock outcrops. | subalpine parklands | No | Habitat Not Present-Surveys Not Required |
| Bureau Sensitive | *Phymatoceros phymatodes* | Liverwort | Bare, mineral soils which remains moist until late spring or summer. | <2100 | No | Not Present |
| Bureau Sensitive | *Porella bolanderi* | Liverwort | Forming shaded to partly exposed mats on a variety of rock types (siliceous, calcareous, and metamorphic) and trunks of oaks, Oregon myrtle, and big leaf maple. Primarily within Oregon white oak, ponderosa pine, and Douglas fir forests. | 500-3000 | Roseburg | Not Present |
| Bureau Sensitive | *Bryum calobryoides* | Moss | Forming sods or occurring as individuals among other mosses on rocks and soil. | 3000-7000 | No | Not Present |
| Bureau Sensitive | *Campylopus schmidii* | Moss | Nutrient-poor sandy substrates near the coast. Forms sods in open stands of shore pine and Mendocino cypress. | | No | Habitat Not Present-Surveys Not Required |
| Bureau Sensitive | *Codriophorus depressus* | Moss | Forming mats on rocks in perennial or intermittent streams, and in the spray zone of waterfalls. | 400-11000 | No | Not Present |

**Table B-2 continued: Special Status Plant Survey Requirements, Survey Results and Rational for Exclusion from Detailed Analysis**

| Status[1] | Scientific Name | Common Name or Taxon | Habitat | Elevation (feet) | Identified on Roseburg District | Survey Results |
|---|---|---|---|---|---|---|
| Bureau Sensitive | *Entosthodon gascicularis* | Moss | Individuals or small sods on seasonally wet exposed soil in seeps or along intermittent streams. Including grasslands, oak savanna, grassy balds, and rock outcrops. | <3000 | No | Not Present |
| Bureau Sensitive | *Helodium blandowii* | Moss | Forming mats and small hummocks in montane fens, usually with calcareous groundwater. | 5000-6000 | No | Habitat Not Present-Surveys Not Required |
| Bureau Sensitive | *Meesia uliginosa* | Moss | Turfs in medium to rich montane fens growing on saturated ground, usually in full sunlight | 5000-6000 | No | Habitat Not Present-Surveys Not Required |
| Bureau Sensitive S&M A | *Schistostega pennata* | Moss | Growing on damp rock, soil and decaying wood in dark places. | | Roseburg | Not Present |
| Bureau Sensitive S&M A | *Tetraphis geniculata* | Moss | Forming small turfs on well-rotted stumps and logs rarely on rocks in shaded, humid locations. | sea level to subalpine | No | Not Present |
| Bureau Sensitive | *Tomentypnum nitens* | Moss | Forming loose or dense sods or intermixed with other bryophytes in medium to rich montane fens. | 5000-6000 | No | Habitat Not Present-Surveys Not Required |
| Bureau Sensitive | *Tortula mucronifolia* | Moss | Forming small cushions on soil, tree roots, and sheltered ledges and crevices of rock outcrops and cliffs. Primarily in true fir and riparian forests. | 5000-7000 | No | Habitat Not Present-Surveys Not Required |
| Bureau Sensitive | *Trematodon asanoi* | Moss | Forming loose mats on moist bare soil along the edges of trails, streams, and ponds in the subalpine zone. | subalpine zone | No | Habitat Not Present-Surveys Not Required |
| Bureau Sensitive | *Adiantum jordanii* | California maiden-Hair | Growing on seasonally moist, shaded, rocky banks, canyons, and ravines. | <3600 | Roseburg | Not Present |
| Bureau Sensitive | *Arabis koehleri* var. *koehleri* | Koehler's rockcress | Growing on serpentine and limestone outcrops. | 300-3000 | Roseburg | Not Present |
| Bureau Sensitive | *Arctostaphylos hispidula* | Hairy manzanita | Growing on rocky serpentine soils or sandstone. Generally associated with interior chaparral and open woodland. | 300-3750 | No | Not Present |
| Bureau Sensitive | *Asplenium septentrionale* | Grass-fern | Growing in the crevices of granite. | 750-10050 | Roseburg | Not Present |
| Bureau Sensitive | *Bensoniella oregana* | Bensonia | Periphery of meadows in the true fir zone. | 1800-4500 | Roseburg | Not Present |
| Bureau Sensitive | *Calochortus coxii* | Crinite mariposa-lily | Serpentine soils on north facing open grassy or wooded slopes. | 450-3200 | Roseburg Same Watershed | Not Present |
| Bureau Sensitive | *Calochortus umpquaensis* | Umpqua mariposa-lily | Transitional zone between forest and grasslands, on serpentine soils. | 800-2500 | Roseburg Same Watershed | Not Present |

**Table B-2 continued: Special Status Plant Survey Requirements, Survey Results and Rational for Exclusion from Detailed Analysis**

| Status[1] | Scientific Name | Common Name or Taxon | Habitat | Elevation (feet) | Identified on Roseburg District | Survey Results |
|---|---|---|---|---|---|---|
| Bureau Sensitive | *Camassia howellii* | Howell's camas | Grassy wet meadows, swampy ground and transitional areas between wet meadows and coniferous woodlands on serpentine soils. | 720-4050 | No | Not Present |
| Bureau Sensitive | *Carex brevicaulis* | Short stemmed sedge | On coastal dunes or headlands. | <1200 | No | Habitat Not Present-Surveys Not Required |
| Bureau Sensitive | *Carex comosa* | Bristly sedge | Growing in relatively wet locations. | <1200 | No | |
| Bureau Sensitive | *Cicendia quadrangularis* | Timwort | Growing in open, wet locations. | 9600-11700 | Roseburg | Habitat Not Present-Surveys Not Required |
| Bureau Sensitive S&M C | *Cypripedium fasciculatum* | Clustered lady's-slipper | Growing in a variety of habitats with 60-100% cover. | 990-5235 | Roseburg | Not Present |
| Bureau Sensitive | *Delphinium nudicaule* | Red larkspur | Found on moist talus, wooded, rocky slopes. | <7800 | No | Not Present |
| Bureau Sensitive | *Epilobium oreganum* | Oregon willow-herb | Found in bogs and small streams on serpentine soils. | 1650-5400 | Roseburg | Not Present |
| Bureau Sensitive | *Eschscholzia caespitosa* | Gold poppy | Growing in open chaparral sites. | <5400 | No | Habitat Not Present-Surveys Not Required |
| Bureau Sensitive S&M A | *Eucephalus vialis* | Wayside aster | Found in gaps and edges of dry, open Douglas fir forests. Generally on shallow, rocky soils. | 250-2200 | Roseburg Same watershed | Not Present |
| Bureau Sensitive | *Frasera umpquaensis* | Umpqua swertia | Found in coniferous forests dominated by true firs, in damp, shaded sites under forest canopy, forest edges. | 3000-6100 | Roseburg | Habitat Not Present-Surveys Not Required |
| Bureau Sensitive | *Horkelia congesta ssp. congesta* | Shaggy horkelia | Growing in grasslands, oak savannas and grassy balds. | 275-1700 | Roseburg | Not Present |
| Bureau Sensitive | *Horkelia tridentata ssp. tridentata* | Three-toothed horkelia | Found in meadows and open woodlands. | 150-2100 | No | Not Present |
| Bureau Sensitive | *Iliamna latibracteata* | California globe-mallow | Growing within conifer forests. | 1500-6000 | Roseburg | Not Present |
| Bureau Sensitive | *Kalmiopsis fragrans* | Fragrant kalmiopsis | Growing on rock outcrops and crevices, in sun or shady coniferous forests. | 1400-3900 | Roseburg | Not Present |
| Bureau Sensitive | *Lathyrus holochlorus* | Thin-leaved peavine | Found along low elevation roadsides, fencerows, creek banks, forest edges, oak savannas, shrublands, and grasslands. | 100-2000 | No | Not Present |
| Bureau Sensitive | *Lewisia leeana* | Lee's lewisia | Growing on granite, serpentine cliffs, rocky slopes, and under conifer forest. | 3900-10050 | No | Habitat Not Present-Surveys Not Required |

**Table B-2 continued: Special Status Plant Survey Requirements, Survey Results and Rational for Exclusion from Detailed Analysis**

| Status[1] | Scientific Name | Common Name or Taxon | Habitat | Elevation (feet) | Identified on Roseburg District | Survey Results |
|---|---|---|---|---|---|---|
| Bureau Sensitive | *Limnanthes gracilis ssp. gracilis* | Slender meadow-goam | Growing in seasonally wet meadows, rocky slopes and basins, on serpentine soils. | 450- 5100 | Roseburg | Not Present |
| Bureau Sensitive | *Lotus stipularis* | Stipuled trefoil | Found in thickets and chaparral sites, often within previously logged locations. | 600-3600 | No | Not Present |
| Federally Threatened | *Lupinus oreganus var. kincaidii* | Kincaid's lupine | Found in upland prairie grasslands, oak savanna, and woodland edges. | 600-6000 | Roseburg Same Watershed | Not Present |
| Bureau Sensitive | *Meconella oregana* | White fairypoppy | Growing in shaded canyons. | <3000 | No | Not Present |
| Bureau Sensitive | *Pellaea andromedifolia* | Coffee fern | Growing on rocky or dry sites. | 90-5400 | Roseburg Same Watershed | Not Present |
| Bureau Sensitive | *Perideridia erythrorhiza* | Red-rooted yampah | Meadows and swales which are vernally moist and dry out in the summer. Found within oak woodlands. | 400-900 | Roseburg Same Watershed | Habitat Not Present-Surveys Not Required |
| Federally Threatened | *Plagiobothrys hirtus* | Rough popcorn flower | Growing in wet meadows and vernal pools, | 270-450 | Roseburg | Habitat Not Present-Surveys Not Required |
| Bureau Sensitive | *Polystichum californicum* | California sword-fern | Growing in woodlands, stream banks, and rocky open slopes. | <3300 | Roseburg | Not Present |
| Bureau Sensitive | *Romanzoffia thompsonii* | Thompson's mistmaiden | Found in seasonally wet, open, sunny cliffs and gravelly slopes. | 700-6100 | Roseburg Same Watershed | Not Present |
| Bureau Sensitive | *Schoenoplectus subterminalis* | Water clubrush | Growing in fresh water lakes and streams that are low in nutrients. | <6900 | No | Not Present |
| Bureau Sensitive | *Scirpus pendulus* | Drooping bulrush | Growing in marshes, moist meadows, and ditches, on calcereous soils. | 0-2000 | No | Not Present |
| Bureau Sensitive | *Sisyrinchium hitchcockii* | Hitchcock's blue-eyed grass | Found in prairies and oak savannas. | 200-650 | Roseburg | Habitat Not Present-Surveys Not Required |
| Bureau Sensitive | *Utricularia gibba* | Humped bladderwort | Growing in shallow water or mud. | 20-6900 | No | Habitat Not Present-Surveys Not Required |
| Bureau Sensitive | *Utricularia minor* | Lesser bladderwort | Growing in shallow (generally <30 cm) acidic waters. | 0-50, 2100-5500 | Roseburg | Habitat Not Present-Surveys Not Required |

**Table B-2 continued: Special Status Plant Survey Requirements, Survey Results and Rational for Exclusion from Detailed Analysis**

| Status[1] | Scientific Name | Common Name or Taxon | Habitat | Elevation (feet) | Identified on Roseburg District | Survey Results |
|---|---|---|---|---|---|---|
| Bureau Sensitive | Wolffia borealis | Dotted water-meal | Found in freshwater ponds and slow flowing ditches with high levels of organic material, natural ponds as well as log and sewage treatment ponds. | 350-1500 | Roseburg | Habitat Not Present-Surveys Not Required |
| Bureau Sensitive | Wolffia columbiana | Columbia water-meal | Found in freshwater ponds and slow flowing ditches with high levels of organic material, natural ponds as well as log and sewage treatment ponds. | 20-1500 | Roseburg Same Watershed | Habitat Not Present-Surveys Not Required |

[1] Survey and Manage Standards and Guidelines (2001 S&M ROD, pp. 7-13)
Category A – Require pre-disturbance surveys in suitable habitat and management of all known sites.
Category B – Considered rare, and pre-disturbance surveys are not considered practical.
Category C – Require pre-disturbance surveys in suitable habitat and high-priority sites are to be managed. Manage all sites until identification of high-priority sites.
Category E – Considered rare and of undetermined status. No management recommendations exist but in the interim all known sites are to be managed.

# Appendix C – Wildlife Species Considered in the Revised Myrtle Creek EA

**Table C-1: Wildlife Species Dropped from Detailed Study for the Myrtle Creek Project**

| Status[1] | Common Name | Scientific Name | Key Habitat Features | Rationale for Exclusion from Detailed Study |
|---|---|---|---|---|
| Bureau Sensitive | Bald Eagle | *Haliaeetus leucocephalus* | Large trees near large bodies of water (Buehler 2000, Anthony and Isaacs 1989) | Species not expected in project area, no suitable water bodies |
| Game Bird<br><br>Below Desired Condition | Band-tailed Pigeon | *Patagioenas fasciata* | Conifer forest with high canopy cover and hardwood stands (Bottorff 2007). In Oregon, nest primarily in closed Douglas-fir stands with canopy cover above 70 percent (Leonard 1998). Presence is linked to mineral springs (Altman 1999, Sanders and Jarvis 2000). Used mineral sites appear to be scared in western Oregon, and are seemingly essential resources for this species (Sanders and Jarvis 2000). Sanders and Jarvis (2003) indicate availability of food sources may be directly related to the declining band-tailed pigeon population in Oregon. | There are no mineral springs associated with proposed units and the stands offer little or no foraging opportunities due to high canopy closure. Both action alternatives would create potential foraging habitat in areas of variable density thinning in the short-term until canopy cover increases to existing levels and variable retention harvest for at least 30 years while the tree canopy in these areas remains open. |
| Bureau Sensitive | California Shield-backed bug | *Venduzeeina borealis californica* | A tall grass prairie specialist, this subspecies inhabits high elevation (e.g. 900 m) natural balds and meadows (Applegarth 1995). | Natural balds meadows or grasslands not present in the project area. |
| Game Species | Columbian Black-tailed Deer | *Odocoileus hemionus columbianus* | Fawn on gentle slopes with low trees and shrubs within several hundred feet of water. In summer they spend considerable time near water where green forage is available (Watson and Schirato 1998). Forage on a variety of shrubs and trees, lichens and mushrooms. (Watson and Schirato 1998). High-quality deer range includes transitory open stands are used for foraging (Hayden *et al*. 2008). | Forage availability is generally low in proposed units because of high canopy closure. Beneficial effect based on forage created by VRH and VDT in the action alternatives. |
| Bureau Sensitive | Columbian White-tailed Deer | *Odocoileus virginianus leucurus* | Oak woodland habitats near and north of Roseburg, OR (USDI USFWS 1983) | Project area outside the currently accepted distribution range of the species. |
| S&M Cat: D | Del Norte Salamander | *Plethodon longicaudus* | Talus accumulations in southern portion of Douglas Co. | Project is outside the known distribution range of the species. |
| Bureau Sensitive | Green Sideband Snail | *Monadenia fidelis beryllica* | Deciduous trees and brush in wet forest, low elevation; strong riparian associate (USDA/USDI 1994, Frest and Johannes 2000) | Project area outside the known range of the species. |
| Bureau Sensitive | Fisher | *Martes pennanti* | Large contiguous blocks of mature forest with structural complexity (Verts and Carraway 1998) | Forest stands in the project are not suitable habitat and known species range is outside the project area |
| Bureau Sensitive | Foothill Yellow-legged Frog | *Rana boylii* | Low-gradient streams with bedrock or gravel substrate (Corkran and Thoms 1996) | Project would not modify stream systems, ponds, or wetlands |
| Bureau Sensitive | Franklin's Bumble Bee | *Bombus franklini* | Requires habitat with a sufficient supply of floral resources to provide continuous blooming throughout the colony season (Foltz et. al. 2011). | Project within the historical range of the species. Undocumented in the Roseburg District. Not reasonably expected to occur in the analysis area due to lack of suitable habitat. Beneficial effect based on creation of early-successional habitat from VRH in Alternative Two. |

**Table C-1 continued: Wildlife Species Dropped from Detailed Study for the Myrtle Creek Project**

| Status[1] | Common Name | Scientific Name | Key Habitat Features | Rationale for Exclusion from Detailed Study |
|---|---|---|---|---|
| Bureau Sensitive | Harlequin Duck | *Histrionicus histrionicus* | Nesting has not been documented in the Umpqua River Basin (Dowlan 2003, p. 116). In the western Cascades, breeding pairs are observed on low to moderate gradient (1-7%) third to fifth-order streams in the western hemlock zone (Dowlan 2003, p. 116). | Large fast-flowing streams are not present within proposed harvest units. "No treatment" buffers within Riparian Reserves would protect water quality. Riparian Reserves in Unit 28-3-28C and Unit 28-4-25B have the characteristics of suitable harlequin duck nesting habitat, but streams in these units are two to five feet wide and do not provide suitable habitat. These units are over 14 miles from the nearest document harlequin duck siting in the North Umpqua River, near Rock Creek (GeoBOB 2013). Nesting has not been documented on the District. |
| Bureau Sensitive | Lewis' Woodpecker | *Melanerpes lewis* | Open woodland with ground cover and snags (Tobalske 1997) | Project area outside breeding and wintering range and associated habitats. |
| Federally Threatened | Marbled Murrelet | *Brachyramphus marmoratus* | Forests where trees have large diameter branches, mistletoe brooms or other nesting platforms within 50 miles of the Oregon Coast (Hamer and Nelson 1995, McShane et al. 2004). | Project area is outside the Management Zones |
| Game Bird Below Desired Condition | Mourning Dove | *Zenaida macroura* | Forests, woodland edges, savannas, grasslands, deserts, suburban and urban areas, and agricultural lands. Frequently seen on the Roseburg District along roadsides and forest openings. Nesting may occur on the ground, on ledges, in bushes and in trees (Otis et al. 2008), in edge-habitats between woodlands/shrubs and open areas (Csuti et al. 1997). Generally avoid extensive forests and wetlands. | Known to occur in the analysis area. Habitat improvement from VDT and VRH in the action alternatives. |
| Protected Landbird | Northern Goshawk | *Accipiter gentilis gentilis* | Mature and older mixed conifer forests with high canopies for nesting (Squires, John R. and Richard T. Reynolds. 1997) | Within the range of the species. There is a historic site in the analysis area near units 28-3-17B and 28-3-20A. The Rise and Fall Thinning Decision (2007), a component of 2005 Myrtle Creek Commercial Thinning and Density Management EA, states surveys failed to document presence for 5 years (2001-2005) at the 1997 northern goshawk site. Subsequently, the site was determined to be abandoned. Searches in units 28-3-17B and 28-3-20A would occur prior to activities (Project Design Feature, Chapter 2). |
| Bird of Conservation Concern | Olive-sided Flycatcher | *Contopus borealis* | Forages in early-seral areas associated with natural or man-made openings with tall trees or snags available for perching and singing (Altman 1999). In the Oregon Coast Range, it is closely associated with edges of older stands with tall trees and snags greater than 21 inches diameter breast height and broken canopy (Carey et al. 1991). | Suitable habitat is generally absent within the proposed units but often present in adjacent or nearby older stands. VRH and VDT in the action alternatives create early-successional habitat. |
| Bureau Sensitive | Oregon Vesper Sparrow | *Pooecetes gramineus affinis* | Grassland, farmland, sage. Dry, open habitat with moderate herb and shrub cover (Jones and Cornely 2002) | Grassland and open habitat not present in project area. |
| Bureau Sensitive | Pacific Pond Turtle | *Actinemys marmorata* | Marshes, ponds, lakes, streams, and rivers with emergent structure (Csuti et al. 1997). Nesting habitat is in areas of high solar exposure and sparse vegetation consisting of grass, forbs, compact soil composed of clay, silt or sandy loam and sometimes a mix of soil and gravel/cobble (Rosenberg et. al. 2009). There is one documented occurrence in the analysis area outside of proposed units. | Habitat components are present in 5 units, but the species is not reasonably expected to be in the units due to high canopy closure and lack of solar exposure. Habitat improvement by reducing canopy cover at small (<1 acre) sites in four units (28-3-36A, 28-4-2A, 28-3-26A, 29-4-3C). |

**Table C-1 continued: Wildlife Species Dropped from Detailed Study for the Myrtle Creek Project**

| Status[1] | Common Name | Scientific Name | Key Habitat Features | Rationale for Exclusion from Detailed Study |
|---|---|---|---|---|
| Bureau Sensitive | Purple Martin | *Progne subis* | Snags, woodpecker cavities; typically found in open areas near water (Brown 1997, Horvath 2003). | Within range of the species. Nesting and foraging habitat created by VRH in Alternative Two. Neutral effects from thinning in the action alternatives. |
| Game Species | Roosevelt Elk | *Cervus elaphus roosevelti* | Inhabited large blocks of forests containing a considerable amount of diverse ages, size, and understory (Franklin et.al. 1981 in Starkey et. al. 1982). Forage on grasses, forbs, and deciduous shrubs (Franklin et. al. 1981). | The condition of the proposed units does not provide diverse habitats with gaps dominated by diverse ages and forage species. Forage created by VRH and VDT in the action alternatives. |
| Bureau Sensitive | Round Lanx Snail | *Lanx subrotunda* | Umpqua River and major tributaries (USDA/USDI 1994) | Project is outside the vicinity of major tributaries and the Umpqua River |
| Bird of Conservation Concern | Rufus Hummingbird | *Selasphorus rufus* | Nests in shrubs and small trees, and is highly dependent on nectar producing flowering plants. | Suitable habitat is generally not found in the proposed units because of high canopy cover. Foraging habitat created by VDT and VRH in the action alternatives. |
| Bureau Sensitive | Western Bumble Bee | *Bombus occidentalis* | Western bumble bees forage on flowering shrubs and forbs usually found in open spaces including lupines and California poppy (Xerces Society 2008). | Limited data but project within the historical range of the species. Undocumented in the Roseburg District. Not reasonably expected to occur in the analysis area due to lack of suitable habitat. Habitat creation from VRH in Alternative Two. |
| Bureau Sensitive | Western Ridged Mussel | *Gonidea angulata* | Low to mid-elevation streams with cobble, gravel, or mud substrates (Nedeau et al. 2005) | Project would not modify stream habitat and units above the low-mid elevation range. |
| Bureau Sensitive | White-tailed Kite | *Elanus leucurus* | Low-elevation grassland, farmland or savannah and nearby riparian areas (Dunk 1995) | Project at unsuitable elevations, lack suitable habitat. |
| Landbird Strategy | Wilson's Warbler | *Wilsonia pusilla* | Nest in low deciduous vegetation in mature conifer forests, and forages in stands with a diverse deciduous shrub and/or mid-canopy layer. | Habitat in upland areas of the proposed units is limited to scattered openings with some shrub habitat for foraging. Many of the riparian areas in units provide nesting and foraging habitat. Habitat improvement/creation by VDT in both action alternatives. |
| Game Bird Below Desired Condition | Wood Duck | *Aix sponsa* | Nest in tree cavities (Lewis and Kraege 1999) in the vicinity of wooded swamps, flooded forest, marsh, or ponds (Ehrlich et. al.1988). At least 10 acres of wetland or other aquatic habitat in a contiguous unit or in isolated parcels separated by no more than 100 feet of upland is needed in close proximity to nesting habitat is needed (http://www.abirdshome.com/wdwater.htm). Open water makes up 25% of brood-rearing area with the remainder a mixture of shrubs and herbaceous emergent plants and trees (Hepp and Bellrose 2013). | Suitable habitat is not present in the harvest units. |

1-Cat - Category A, B, C, D and F are levels of pre-disturbance clearance or protection needs for these species during review of BLM projects (under BLM-IM-OR-2011-063 and associated 2001 ROD (USDA and USDI 2001).

**Table C-2: Wildlife Species Studied in Detail for the Myrtle Creek Project**

| Status[1] | Common Name | Scientific Name | Key Habitat Features | Rationale for Inclusion in Detailed Analysis |
|---|---|---|---|---|
| Bureau Sensitive; S&M Cat: B | Chace Sideband Snail | *Monadenia chaceana* | This snail requires refugia from desiccation during dry periods, which may include interstices in rock-on-rock habitat (talus), soil fissures or interior of large woody debris (Weasma 1998a, 1998b; Duncan et al. 2003, Frest and Johannes 2000). | Project area within range of species and habitat present. |
| Bureau Sensitive; S&M Cat: A | Crater Lake Tightcoil Snail | *Pristiloma articum crateris* | Above 2000 feet in elevation throughout the Oregon Cascades and associated with perennially wet situations in mature conifer forests, among rushes, mosses within 10 meters of open water in wetlands, springs, and riparian areas (Duncan et al. 2003, Duncan 2004). | Portion of the project above 2000 feet and habitat present. |
| Bureau Sensitive | Fringed Myotis | *Myotis thysanodes* | Hibernacula and roost sites includes caves, mines, buildings and large snags<br><br>(Weller and Zabel 2001) | Snags present in the analysis area. All units considered foraging habitat |
| Bald Eagle<br><br>Act | Golden Eagle | *Aquila chrysaetos* | Usually associated with open grassland, pasture, and shrub land conditions. In southwestern Oregon, golden eagles nest in a variety of trees including ponderosa pine, Douglas-fir, oak species, and madrone (Csuti et al. 1997; Kochert et al. 2002). | One known site in the analysis area. Units 28-4-9A, 28-4-9B, 28-4-10A and 28-4-10B are within the known territory. |
| Federally Threatened | Northern Spotted Owl | *Strix occidentalis caurina* | Forests older than 80 years with habitat for nesting, roosting and foraging, and dispersal. Suitable habitat typically has multi-layered, multi-species canopy dominated by large overstory trees > 20" DBH. Canopy cover is typically 60-80 percent, with open spaces in and below the overstory canopy. Trees with large cavities and other deformities, large snags, and large down wood are typically abundant (Thomas et al. 1990; Forsman et al. 1984; Hershey et al. 1997) | Analysis area is within multiple historical territories of this species. Proposed activities would modify or remove dispersal habitat or suitable habitat. |
| Bureau Sensitive | Oregon Shoulderband Snail | *Helminthoglypta hertleini* | These snails require refugia from desiccation, during dry periods, which may include interstices in rock-on-rock habitat, soil fissures, or the interior of large woody debris (Duncan et al. 2003) | Analysis area is within the range of the species. Proposed activities would impact species. |
| Bureau Sensitive | Peregrine Falcon | *Falco peregrinus* | Cliffs and rocky outcrops with shear vertical structure often near water (White et al. 2002). | One known site in the analysis area. Units 28-3-36A and 28-2-31A are within 1 mile of the site. |
| Bureau Sensitive | Pacific Pallid Bat | *Anthrozous pallidus pacificus* | Hibernacula and roost sites in caves, mines, rock crevices, bridges, hollow trees and snags (Lewis 1994) | All units are considered foraging habitat. Snags present. |
| Bureau Sensitive | Townsend's Big-eared Bat | *Corynorhinus townsendii* | Roost and hibernate in mines and caves and hollow trees (Fellers and Pierson 2002) | Snags present in project. All units considered foraging habitat |
| S&M Cat: C | Great Gray Owl | *Strix nebulosa* | Conifer forest in vicinity of natural meadows (USDA & USDI. 2004 Survey protocol for the great gray owl within the range of the Northwest Forest Plan, V3) | Suitable habitat in units 28-4-19A, 28-4-29A and 28-5-27A, |
| S&M Cat: C | Red Tree Vole | *Arborimus longicaudus* | Conifer stands in the Mesic Zone (Huff et al. 2012) | Suitable habitat in units 28-4-9A, 28-4-9B, 28-4-10A, 28-4-10B, 28-4-17B and 28-5-27A |
| Landbird Strategy | Pacific Wren | *Troglodytes pacificus* | Require complex vegetative structure on the forest floor. In Oregon, Pacific wrens are more abundant along streams (McGarigal and McComb 1992). Nests are in concealed cavities in root wads, stumps and downed logs; forages for insects on the ground and in low understory vegetation. | Generally absent in proposed units given the high canopy closure that limits growth of shrubs and ferns. Nesting habitat in Riparian Reserves. |
| Landbird Strategy | Hermit Warbler | *Dendroica occidentalis* | Douglas-fir dominated stands greater than 30 years old, where dense canopy provides foraging and nesting habitat (reviewed by Altman 1999). | Proposed units are suitable habitat and hermit warblers are known to be present in many of them. |
| Bird of Conservation Concern | Purple Finch | *Haemorhous purpureus* | Open areas or edges of low to mid-elevation mixed coniferous/hardwood forests (Csuti *et al.* 1997). Primarily nest in Douglas-fir, pine or spruce but may use oak, maple, and fruit trees. | Known to occur in the analysis area. |

[1] Category A, B, C, and F indicate levels of pre-disturbance clearance or protection requirements for Survey and Manage Species under BLM-IM-OR-2011-063 and associated 2001 ROD (USDA and USDI 2001).

# Appendix D – Consistency of the Proposed Action with the Objectives of the Aquatic Conservation Strategy

The Aquatic Conservation Strategy (ACS) was developed to restore and maintain the ecological health of watersheds and aquatic ecosystems on public lands. The ACS must strive to maintain and restore ecosystem health at watershed and landscape scales to protect habitat for fish and other riparian-dependent species and resources and restore currently degraded habitats. This approach seeks to prevent further degradation and restore habitat over broad landscapes as opposed to individual projects or small watersheds (Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl.

## ACS Components

1. Riparian Reserves (ACS Component #1)

Riparian Reserves were established in the Matrix land use allocations, two site potential tree heights (SPTH) in width, slope distance, on each side of fish-bearing streams, lakes and natural ponds, and one site-potential tree height in width, slope distance, on each side of perennial or intermittent non-fish bearing streams, wetlands greater than an acre, and constructed ponds and reservoirs. Site potential tree height in the Deer Creek-South Umpqua, Myrtle Creek and Days Creek-South Umpqua watersheds is 160 feet.

A maximum of 520 acres of Riparian Reserves would be treated with a variable density thinning prescription. Under Alternatives 2 and 3, prescribed fire would be allowed to back down into Riparian Reserves. The proposed Riparian Reserve treatments are designed to promote ecological diversity and complexity.

2. Key Watersheds (ACS Component #2)

Key Watersheds were established "as refugia . . . for maintaining and recovering habitat for at-risk stocks of anadromous salmonids and resident fish species (ROD/RMP, p. 20)." There are no Tier 1 Key Watersheds in the analysis area.

3 Watershed Analysis (ACS Component #3):

In development of the proposed project, Watershed Analyses for each of the affected 10$^{th}$ field Hydrologic Unit Codes (HUCs) or watersheds were used to evaluate existing conditions, establish desired future conditions, and assist in the formulation of appropriate alternatives (Table D-1). Existing watershed conditions along with short and long term effects of the alternatives on aquatic resources are described in the **Revised** Myrtle Creek Environmental Assessment and in the pertinent Watershed Analyses.

**Table D-1: Myrtle, Days, and Deer Creek Contextual Watershed Information**

| Watershed | Site/Project Scale Assessment | 10th Field Watershed Scale Assessment |
|---|---|---|
| **Deer Creek-South Umpqua River** | Scale Description: This project is located in four, 14th field drainages of the Deer Creek-South Umpqua River 10th field HU. The BLM manages approximately 3,170 acres in the four drainages (12 percent).<br><br>The 554 acres proposed for treatment represents two percent of the combined drainage areas. | Scale Description: The watershed is approximately 110,008 acres in size, of which 4,146 acres are managed by the BLM (3 percent).<br><br>The acreage proposed for treatment represents less than one percent of the watershed, and thirteen percent of the BLM-managed lands in the watershed. |
| **Myrtle Creek** | Scale Description: This project is located in seventeen, 14th field drainages of the Myrtle Creek 10th field HU. The BLM manages approximately 22,827 acres in the seventeen drainages (54 percent).<br><br>The 1,354 acres proposed for treatment represents three percent of the combined drainage areas. | Scale Description: The watershed is approximately 76,205 acres in size, of which 31,085 acres are managed by the BLM (40 percent).<br><br>The acreage proposed for treatment represents approximately one percent of the watershed and four percent of the BLM-managed lands in the watershed. |
| **Days Creek-South Umpqua River** | Scale Description: This project is located in two 14th field drainages of the Days Creek-South Umpqua River 10th field HU. The BLM manages approximately 4,977 acres in the two drainages (55 percent).<br><br>The 85 acres proposed for treatment represents less than one percent of the combined drainage areas. | Scale Description: The watershed is approximately 141,483 acres in size, of which 58,023acres are managed by the BLM (41 percent).<br><br>The acreage proposed for treatment represents less than one percent of the watershed and less than one percent of the BLM-managed lands in the watershed. |

4. Watershed Restoration (ACS Component #4)

One of the purposes of this project is to accelerate tree growth in Riparian Reserves, and speed attainment of late-seral stand conditions while promoting ecological structure and diversity. The variable density thinning prescriptions are considered to be a restoration action and are therefore consistent with the Watershed Restoration component of the ACS.

During the last 22 years, the BLM has implemented stream enhancement projects in the Myrtle Creek project watersheds for the purpose of enhancing spawning and rearing habitat and improving migratory access for Oregon Coast coho salmon, steelhead trout and coastal cutthroat trout. Fish are expected to continue to have access to historic salmon and steelhead habitat in large mainstem rivers. An unknown number of culverts on BLM and private roads, and low-head irrigation dams on small tributary streams on private lands may still block access during low flow periods of the year.

# Range of Natural Variability

Typical natural disturbances to aquatic systems in the Pacific Northwest include wildfires, floods, landslides, and wind storms. The spatial extent, intensity, and timing of these natural disturbances can vary widely.

Wildfire return intervals west of the Coast Range are generally greater than several decades, while east of the Coast Range return intervals are generally shorter as a result of reduced precipitation. Fires can consume riparian vegetation, allowing stream temperatures and peak flows to increase. Subsequent erosion can mobilize high volumes of sediment. At the same time, stream systems may experience nutrient enhancement which can lead to increases in macro-invertebrate populations which can be beneficial to fish populations.

Flood magnitude and frequency is unpredictable and highly variable, but floods usually occur in the winter months in association with storm events. Floods can be more prevalent in stream networks with reduced vegetation (canopy cover), and in watersheds largely located in the rain-on-snow zone where transient snow accumulations can rapidly melt under certain meteorological conditions. Floods can alter stream systems by removing or altering stream substrates, and affect salmonid eggs deposited in stream beds that winter. Floods can also benefit stream morphology by returning nutrients to the floodplain and providing off-channel rearing habitat for fish.

Wind storms may be extremely isolated resulting in the toppling of individual trees but can also be catastrophic in nature resulting in widespread loss of trees across multiple watersheds. Loss of trees can lead to increased exposure of streams to solar radiation which can potentially lead to increases in stream temperatures. The addition of large wood to stream systems greatly enhances stream complexity, although in some instances, site specific characteristics such as stream gradient or valley formation may increase the potential for large wood to be exported downstream.

Landslides and debris flows are typically shallow soil events that occur on unstable, steep, and/or highly saturated soils, that are often the result of one of the previously mentioned disturbances, but can also be attributed to negligent land management practices (historic and recent). When landslides enter a stream, the system may be overwhelmed by high turbidity or even blocked to fish passage. The contribution of large wood, boulders, and sediment can enhance fish habitat, leading to long-term stream complexity.

Based on the dynamic nature of aquatic systems in the Pacific Northwest, the range of natural variability at the site scale would range from 0-100 percent of potential for any given aquatic habitat parameter over time. Any of the aforementioned disturbances may negatively impact local biota in the short term, and then subsequent positive effects are likely to persist into the future. It is important to consider that all streams in the Pacific Northwest evolved with these major disturbances, and that over time the condition of aquatic systems have cyclically moved between relatively stable and chaotic.

# Aquatic Conservation Strategy Objectives

*1. Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations, and communities are uniquely adapted.*

The proposed actions would apply variable density thinning to Riparian Reserves. Within these stands, the remaining trees would attain larger heights and diameters in a shorter amount of time than if left untreated. Deciduous trees and other unique riparian features targeted for release would produce a more diverse and complex stand structure.

Where variable retention harvest is applied in upland stands, ecological structure and diversity would be enhanced by providing gaps where early-successional habitat would provide additional vegetative diversity and complexity.

This distribution of these site specific treatments across all the project watersheds would support attainment of this objective at the watershed scale.

*2. Maintain and restore spatial and temporal connectivity within and between watersheds*

Riparian Reserves would only be treated as deemed necessary by BLM aquatics staff. Riparian treatments would not inhibit spatial and temporal connectivity, but would work towards restoring conditions to a more natural state over time, by reducing stand density and releasing hardwoods. No-treatment areas would maintain a contiguous corridor along stream channels, providing habitat for riparian-dependent species while treated portions of Riparian Reserves would create diverse habitat throughout the watersheds.

Roads in Riparian Reserves would be temporary in nature, and decommissioned after use. Absent additional permanent stream crossings, there would be no influence on spatial and temporal connectivity at the site scale.

Spatial and temporal connectivity would be maintained at the site-scale and therefore at the watershed scale.

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

As discussed in the EA (p. 109), variable retention harvest, and commercial and variable density thinning would not increase Equivalent Clearcut Area (ECA) to an extent that would influence peak flows. Road density would not exceed threshold levels that pose a risk for peak flow enhancement (p. 109). Absent any peak flow enhancement, stream channel and bank stability would be unchanged.

Where cross-channel yarding is necessary for logging, a minimum of one-end log suspension would be required, and no logging equipment would cross streams.

The physical integrity of aquatic systems would be maintained for the same reasons at the site and watershed scale.

*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.*

Riparian Reserves would only be treated as deemed necessary by BLM aquatics staff to improve structural and species diversity of stream-side stands and improve future wood recruitment to streams.

No-treatment areas along streams would protect stream banks from disturbance and erosion that could contribute sediment to streams and would serve to filter any sediment laden overland flow from harvested upland stands.

At least 50 percent canopy cover would be retained outside of "no treatment" areas within Riparian Reserves to provide shade and prevent potential increases in stream temperatures.

Implementation of Project Design Features (PDFs) would ensure that water quality would not be degraded by proposed road work. Road and ditch renovation, installation of additional road drainage structures, seasonal restrictions on haul over unsurfaced roads, and sediment traps in ditches close to streams would remove the mechanism for sediment transport to streams.

Where necessary for logging, cross-channel yarding would require at least one-end log suspension. No logging equipment would cross streams. There would be no new, permanent stream crossings or new, permanent road construction in Riparian Reserves.

Water quality would be maintained and in some cases restored through road renovation at the site-scale and hence the watershed scale.

*5. Maintain and restore the sediment regime under which aquatic ecosystems evolved.*

As previously discussed, no-treatment areas established on streams adjacent to proposed units and PDFs for road work would prevent direct disturbance to stream channels and stream banks, and intercept surface run-off allowing sediment transported by overland flow to settle out before reaching the stream network.

Maintenance of the existing road network which would include resurfacing and installing cross drain relief will more rapidly transport water from the road surface and minimize the amount of road derived sedimentation to streams.

Based on the information discussed at the site scale, this project would aid in restoring the historic sediment regime at the watershed scale.

*6. Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing.*

The combination of commercial and variable density thinning, and variable retention harvest would not increase ECA to an extent that could potentially influence peak flows (p. 108). The project would also not increase roaded area to an extent where peak flows could potentially be enhanced (p. 107).

This project would maintain stream flows within the range of natural variability at the site-scale and hence at the watershed scale.

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

As discussed in Objective 6, this project would maintain stream flows within the range of natural variability at the site scale. First and second order streams in confined valleys have limited floodplain interaction. As previously mentioned, absent any change in ECA or roaded area and therefore no increase in peak flows, the timing, variability, and duration of flows would remain unchanged at the site scale.

At the watershed scale, this project would also maintain stream interactions with the floodplain and respective water tables within the range of natural variability.

*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.*

Proposed treatments in Riparian Reserves were designed with input from hydrology and fisheries staff with the objective of restoring structural and species diversity capable of providing for the historic functions of an intact riparian ecosystem. These include shade and temperature regulation, bank stability, forage for insect species and nutrient inputs to the stream environment.

The proposed project is designed to return riparian stands at the site-scale to a more natural density and growth trajectory. This would serve to restore plant species composition and structural diversity at the watershed scale as well.

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

The intent of this project is to set riparian stands on a trajectory that would trend toward historical conditions. As a result, populations of riparian-dependent species including plants, invertebrates and vertebrates would respond positively at the site-scale.

Improving riparian stand conditions across the multiple watersheds would help restore adequate habitat to support riparian-dependent species at the watershed scales.

# Aquatic Conservation Strategy Summary

Based upon the information listed above, the proposed action would meet Aquatic Conservation Strategy objectives at the site and watershed scales. In addition, based upon the restorative nature of many actions taken by the BLM independently or in cooperation with other entities in the Myrtle Creek, Deer Creek-South Umpqua, and Days Creek-South Umpqua 10$^{th}$ field watersheds, this project would not retard or prevent attainment of ACS objectives but would actually support attainment of these objectives. Therefore, this action is consistent with the Aquatic Conservation Strategy, and its objectives at the site and watershed scales.

# Appendix E – Carbon Storage and Releases Analytical Methodology

This appendix describes the analytical methodology used for calculating carbon storage and release associated with timber management, provides the assumptions used, and describes how calculations were made.

**Analysis of Carbon Storage**

A variety of scientific literature is available describing quantitative measures (e.g. decay rates of slash, fire consumption of slash, fuel use and efficiency, haul distances, etc.) and other factors that may be used in calculating carbon storage with the potential to influence the outcome of an analysis. The methodology described here provides a consistent means for comparison of the relative effects of alternatives considered. It is not intended to express the absolute amount of carbon that would be stored or released. The analysis models carbon stored in the forest and wood products, and carbon released into the atmosphere in association with timber harvest. The analysis divides carbon storage/release into six pools:

- Standing, Live Trees
- Other Than Live Trees
- Wood Products
- Slash Burning
- Logging Slash
- Fossil Fuels

The total estimated carbon in each of the six pools was summed for analytical interval to derive the Net Carbon Balance by alternative over time.

The effect of commercial and variable density thinning on carbon storage under Alternative Two, Sub-Alternatives A and B was derived from calculated ranges from the South River FY 2009 Commercial Thinning (http://www.blm.gov/or/districts/roseburg/plans/files/SR09CThinEA.pdf), Sir Galahad Commercial Thinning and Density Management (http://www.blm.gov/or/districts/roseburg/plans/files/Sir GalahadEA.pdf), and Box of Rock Commercial Thinning and Density Management (http://www.blm.gov/or/districts/roseburg/plans/files/BoxofRocksEA.pdf) environmental assessments. All of these projects are similar in nature to the commercial and variable density thinning proposed in this environmental assessment, with comparable relative densities, tree sizes and harvest volumes per acre. Proposed VHR units under Alternative Two was modeled separately using site specific conditions. Modeled results for the variable retention harvest treatment under Alternative Two are displayed in Table 3-26 – Alternative Two Variable Retention Harvest Effects on Carbon Release and Storage

**Carbon Storage in Standing, Live Trees**

1. Current and future standing, live tree carbon was derived using the outputs from the ORGANON model (Hann *et al.*, 2005) for standing tree volume for each alternative. VRH analysis includes the growth of trees established by natural and artificial regeneration.
2. Standing tree volumes measured in board feet per acre were converted to cubic feet using a conversion factor of 6.00 board feet/cubic foot (2008 FEIS Appendices-28).
3. Cubic foot tree volumes per acre were converted to pounds of biomass, assumed to be Douglas-fir in this analysis, using a factor of 35 pounds of biomass/cubic foot (2008 FEIS Appendices-28, Table C-1).
4. Pounds of biomass per acre for entire trees (including branches, bark, and roots) were derived from tree volumes using an expansion factor of 1.85 (2008 FEIS Appendices-28).
5. The expanded biomass value was converted to pounds of carbon per acre by multiplying by 0.50 (USDI/BLM 2008A, Appendices-28).
6. Pounds of carbon per acre in whole trees were converted to tonnes of carbon by dividing by 2,200 (2008 FEIS Appendices-28).
7. Total carbon within individual units was determined by multiplying tonnes of carbon per acre in whole trees by unit acres.
8. Tonnes of carbon in whole trees for the entire project were derived by summing the tonnes of carbon in whole trees for each unit, and represented in Table 3-26 as "Standing, Live Trees".

**Carbon Storage in Forests Other than Live Trees**

"Other than Live Trees" is the portion of the carbon pool consisting of shrubs, brush, snags, woody debris, and organic carbon in the soil.

1. Carbon in "other than live trees" was derived by multiplying unit acreage by tonnes of carbon per acre by structural stage, as expressed in Table E-1 (adapted from Table C-2, 2008 FEIS Appendices-29). Stands were aged based on time intervals used in the analysis (i.e. 10, 20, and 50 years after the current condition) and the corresponding tonnes of carbon per acre used to calculate "other than live tree carbon." A weighted average age was used for portions of stands retained in aggregates in the VRH prescription under Alternative Two, Sub-Alternative B. Stand age for harvested areas with dispersed retention was reset to 0 at the time of harvest.
2. The total tonnes of carbon, represented in Table 3-26 as "Other Than Live Trees", were derived by summing the tonnes of carbon within each unit.

**Table E-1: Forest Ecosystem Carbon (Excluding Live Trees) By Structural Stage***

| Age of Stand(s) | Structural Stage | Tonnes of Carbon per Acre |
|---|---|---|
| 5-34 years | Stand Establishment | 67.8 |
| 35-94 years | Young | 70.3 |
| 95-124 years | Mature | 88.2 |
| $\geq$ 125 years | Developed Structurally Complex | 94.8 |

*Adapted from USDI/BLM 2008AA, Appendices-29.

**Carbon Storage in Wood Products**

"Wood Products" represents the portion of the carbon pool converted from standing, live trees into saw logs or pulpwood. There would be no carbon pool of wood products under No Action.

1. Tonnes of carbon in whole trees were derived in Steps 1-7 under "Standing, Live Trees" for each time interval expressed in this analysis. The difference between the "current condition" and "at harvest time" would be the tonnes of carbon in whole trees harvested.
2. Tonnes of carbon in whole trees harvested per unit were summed to provide the project total.
3. Tonnes of carbon in whole trees harvested were converted to tonnes of carbon in saw logs by dividing by 1.85 (2008 FEIS Appendices-28). *Note:* this reversed the calculation that expanded biomass of harvested logs into the biomass of whole trees performed previously (Step 4 of "Standing, Live Trees").
4. At harvest, 13.5 percent of saw log carbon would immediately be released (Smith *et al.* 2006). Remaining tonnes of carbon held in saw logs were then decayed over time using the values in Table E-2 (adapted from the 2008 FEIS Appendices-30, and Smith *et al.* 2006).
5. Tonnes of carbon held in pulpwood (e.g. chips) were derived by multiplying tonnes of carbon in saw logs (derived in Step 3 above) by five percent (2008 FEIS Appendices-30). *Note*: Pulpwood tonnage is five percent *in addition to* the saw logs not five percent *of* the saw logs.
6. At harvest, 14.8 percent of pulpwood carbon would immediately be released (Smith *et al.* 2006). Tonnes of carbon held in pulpwood were then decayed over time using the values in Table F-2 (adapted from the 2008 FEIS Appendices-30, and Smith *et al.* 2006).
7. The sum of tonnes of carbon immediately released from saw logs (Step 4 above) and pulpwood (Step 6 above) represents the total amount of carbon released by "Wood Products" at harvest time. The sum of tonnes of carbon held in saw logs (Step 4 above) and pulpwood (Step 6 above) at each time interval represents carbon stored in "Wood Products" as illustrated in Table 3-26.

**Table E-2: Fraction of Carbon Remaining or Captured as an Alternative Energy Source***

| Time Interval | Saw Logs | Pulpwood |
|---|---|---|
| Harvest Time (0 years) | 0.865 | 0.852 |
| +10 years | 0.796 | 0.730 |
| +20 years | 0.761 | 0.691 |
| +50 years | 0.702 | 0.655 |

*These fractions include; wood products in use, wood products in the landfill, and wood products emitted as energy in lieu of fossil fuels (adapted from USDI/BLM 2008A, Appendices-30 and Smith *et al.* 2006)

**Carbon Release in Slash Burning**

"Slash Burning" represents the pool of carbon released by prescribed burning. There would be no carbon pool of slash burning under No Action.

1. The amount of slash burned in landing piles for uniform thinning was calculated as two tonnes of biomass per acre, derived by averaging slash burned under similar conditions in recently implemented sales. Total tonnes to be burned was calculated by multiplying the number of acres to be treated by two.

2. A consumption rate of 90 percent was assumed for pile burning would be consumed (K.Kosel, pers. comm., 2009). Tonnes consumed were derived by multiplying the tonnes per acre by 0.90.
3. Tonnes consumed were converted to tonnes of carbon released using a conversion factor of 0.50 tonnes of biomass/tonne of carbon. An average of 0.9 tonnes of carbon would be released per acre of thinning unit scheduled for piling and burning.
4. The release of carbon from pile burning in areas treated by regeneration harvest was calculated the same as areas treated by thinning except that 4.0 tonnes per acre was used as a constant. Total carbon released per acre of regeneration treatment was 1.8 tonnes.
5. The amount of slash burned by broadcast burning was calculated by averaging the estimate amount slash loading and consumption by using the Photo Series Post-harvest (Maxwell and Ward 1976). The average used was 15.2 tonnes of slash. These averages were multiplied by the treatment acres proposed for broadcast burning to calculate the total amount of carbon released from broadcast burning
6. The total amount of carbon released from prescribe burning was calculated by adding up the total amount of carbon released from pile burning in regeneration treatment areas, pile burning in thinning treatment areas, and broadcast burning of regeneration treatment areas proposed for broadcast burning.

**Carbon Storage in Logging Slash**

"Logging Slash" is the portion of the carbon pool held in leaves and needles, twigs and branches, limbs, stumps, and roots of harvested trees that would remain on site post-harvest, not consumed by prescribed burning. There would be no "logging slash" carbon pool under No Action.

1. Tonnes of logging slash remaining on-site was calculated by subtracting tonnes of carbon immediately released from wood products (derived in Step 7 of "Wood Products"), stored in wood products at harvest time (derived in Step 7 of "Wood Products"), and released from slash burning from the total tonnes of carbon in whole trees that would be harvested (derived in Step 2 under "Wood Products").
2. The tonnes of logging slash on-site were then multiplied by the fraction of Douglas-fir slash remaining at each time step as shown in Table E-3 (based on Janisch *et al.* 2005). This represents the amount of carbon stored in "Logging Slash" as it decayed and released carbon over time as shown in Table 3-26.

**Table E-3: Decay Rates of Carbon from Douglas-fir Slash***

| Time Interval | Fraction of Carbon Remaining in Douglas-fir Slash |
|---|---|
| Harvest Time (0 years) | 1.000 |
| +10 years | 0.852 |
| +20 years | 0.726 |
| +50 years | 0.449 |

* Based on Janisch *et al.* 2005.

**Carbon Release in Fossil Fuels**

The carbon pool of "Fossil Fuels" represents the amount of carbon that would be released by consumption of gasoline and diesel fuel used by; road construction and renovation, timber felling, timber yarding, and log hauling. There would be no "fossil Fuels" carbon pool under No Action.

1. Fuel consumption associated with harvest operations (i.e. timber felling and yarding) was estimated based on production rates and fuel efficiencies from Table E-4, and an 8.5 hour work day.
2. This analysis assumed an average log-truck load of 4,500 BF (based on experience of BLM Contract Administrators and Cruiser/Appraisers), a fuel efficiency of 6 miles per gallon, and 60-mile round trip.
3. It was assumed that 588 gallons of diesel would be consumed per mile of road constructed, and 73 gallons per mile of road renovated (Loeffler *et al*., 2009)
4. It was assumed that for every station (100 ft.) of surfaced road constructed, 57.5 yards of rock would be used (USDI/BLM 1970). It was also assumed that a truck would hold 10 yards and the average miles per load would be 60. Fuel consumption was assumed to be one gallon for every six miles travelled.
5. Gallons of fuel consumed by harvest operations (derived in Step 1), log hauling (derived in Step 2), road construction and renovation (derived in Step 3), and road rocking (derived in step 4) were summed to provide the total fuel consumption for the project.
6. Total gallons of fuel consumed were converted to tonnes of carbon released using the following conversion factors; 1 gallon of gasoline is equal to 19.4 pounds of $CO_2$, 1 gallon of diesel is equal to 22.2 pounds of $CO_2$, 1 pound of carbon is equivalent to 3.67 pounds of $CO_2$ (U.S. EPA, 2005). The total amount of carbon that would be released by fuel consumption is shown as "Fossil Fuels" in Table 3-26.

**Table E-4: Fossil Fuel Consumption during Harvest Operations**

| Equipment | Production Rate[1] (acres/day) | Fuel Efficiency[2] (gallons/hour) |
|---|---|---|
| Chainsaw (gasoline) | 0.4 | 0.2 |
| Motorized Carriage (gasoline) | 1.0 | 0.4 |
| Cable/Skyline Yarder (diesel) | 1.0 | 6.1 |
| Loader (diesel) | 1.0 | 4.5 |
| rubber tire skidder (diesel) | 2.0 | 4.8 |
| tracked tire skidder (diesel) | 2.0 | 3.6 |
| Harvester (diesel) | 3.0 | 4.7 |
| Forwarder (diesel) | 3.0 | 4.3 |

[1] Based on experience of BLM Contract Administrators and Cruiser/Appraisers.
[2] Based on World Forestry Institute (1997).

# Appendix F – Red Tree Vole Non-High Priority Site Evaluation

**The Roseburg District is considering non-high priority site designation in a portion of the red tree vole sites in the 42,800-acre Myrtle Creek Harvest Plan analysis area. Five thinning units (28-4-9A, 28-4-9B, 28-4-10A, 28-4-109B, and 28-5-27A) and one variable retention harvest unit (28-4-17B) were considered for non-high priority site designation. Consultation with the U.S. Fish and Wildlife Service and the adjacent public land manager (Umpqua National Forest) will be completed prior to any decisions where the BLM would utilize the non-high priority site designation.**

The 2001 "Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines" (ROD S&Gs) provides for the local line officer to identify non-high priority sites on a case-by-case basis (2001 ROD S&Gs, p. S&G-10). Non-high priority sites are not needed for species persistence and do not require site management. This document evaluates the non-high priority site designation for six units in the Revised Myrtle Creek Harvest Plan Environmental Assessment (EA).

Red tree voles (*Arborimus longicaudus*) (hereafter referred to as RTV) were identified in the 2001 Survey and Manage ROD S&Gs (Table 1-1, p. S&G-49) as a Category C species (Uncommon Species, Pre-Disturbance Surveys Practical) (ROD S&Gs, p. S&G-10).

## Introduction

The EA identifies 59 potential timber harvest units. Treatments under Alternative Two include uniform commercial thinning (CT; 529 acres), variable density thinning (VDT; 1,005 acres), and variable retention harvest (VRH; 334 acres). Alternative Three includes 782 acres of CT and 1,086 acres of VDT. Both alternatives are consistent with the Northwest Forest Plan, and as such include the Survey and Manage provisions (USDA and USDI 2001). To fulfill the requirement for red tree voles, the forest habitat in the planned timber sale units has been evaluated specifically against the requirements of the "Criteria for determining the need for pre-disturbance surveys" (USDA/FS-USDI/BLM 2012). Table 1 displays the stand characteristics of six (350 acres) of the 59 proposed harvest units that meet all three criteria of the pre-disturbance survey requirements for RTVs (EA, p. 69). These six units are located in the South River Resource Area (Figure 1) and are the subject of this evaluation.

### Proposed Treatments

This discussion is limited only to units identified in Table 1; units that contain high quality RTV habitat. Under both action alternatives, CT would be applied to uplands in Unit 28-4-27A (92 acres); CT would reduce the density of trees within this stand to a relative density between 0.25 and 0.30, canopy cover would remain at or above 70 percent, 80-110 trees per acre would be retained, and basal area would be 100-140 square feet per acre (EA, p. 21).

In both action alternatives, VDT (219 acres) is proposed for the upland and Riparian Reserve portions of harvest units 28-4-9A, 28-4-9B, 28-4-10A, and 28-4-10B; and the Riparian Reserve portions of 28-4-17B and 28-5-27A (Table 1). Variable density thinning in uplands, as described in the EA (p. 22), would be achieved by varying the density and spacing of reserve trees and by creating canopy openings (gaps) and areas of no treatment (skips) in up to 20 percent of treated area. Gaps and skips would be up to 0.25 acres in size. Post-harvest canopy cover would be at least 40 percent and relative density would be 0.20 to 0.30. Variable

density thinning in Riparian Reserves outside of the "no-treatment" area would be similar to the upland VDT, with the exception that canopy gaps and skips would be a maximum of 1.5 acres in size and minimum canopy cover would be 50 percent, on average.

Under Alternative Two, VRH (29 acres) is proposed for the upland portion of unit 28-4-17B; the treatment would be designed to retain at least 20-30 percent of the pre-harvest basal area, through a combination of both aggregate and dispersed retention (EA, pp. 23-24); canopy cover would be reduced to 10 to 20 percent outside of the retention aggregates (EA, p 77). Uniform commercial thinning, as described above, would be applied to Unit 28-4-17B under Alternative Three.

Table 1: Treatment units in the Myrtle Creek Harvest Plan that were surveyed for red tree voles.

| Unit Name | Gross Area (ac) | Age as of 2013 | QMD[1] | Upland Treatment | | Upland Area (ac) | VDT RR[1] Treatment (ac) | Untreated RR[3] (ac) | Analysis Block |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Alt 2 | Alt 3 | | | | |
| 28-4-9A | 114 | 103 | 23.4 | VDT | VDT | 92 | 17 | 5 | 1 |
| 28-4-9B | 20 | 103 | 23.4 | VDT | VDT | 20 | 0 | 0 | 1 |
| 28-4-10A | 31 | 99 | 20.8 | VDT | VDT | 30 | 1 | 0 | 1 |
| 28-4-10B | 39 | 99 | 20.8 | VDT | VDT | 35 | 3 | 1 | 1 |
| 28-4-17B | 35 | 124 | 23.7 | VRH | CT | 29 | 4 | 2 | 2 |
| 28-5-27A | 111 | 118 | 24.0 | CT | CT | 92 | 11 | 8 | 3 |
| TOTAL | 350 | | | | | 298 | 36 | 16 | |

[1] QMD = Quadratic Mean Diameter; RR = Riparian Reserve

## Analysis Area Existing Conditions

The analysis area is located in the mesic zone of the RTV's range and includes four 6th-field watersheds (Table 2; Figure 1). This analysis area is consistent with the *Overview Of The Four-Step Process For Identifying Category C And D Non-High Priority Sites* which recommends that analysis be completed on a "…logical analysis unit that more appropriately addresses the species distribution (i.e. 5th field watershed)" (USDA/FS-USDI/BLM 2012, p. Attachment 1-2). Often, the 5th-field watershed scale is used as the scale for evaluating non-high priority site status. These 6th-field watersheds were selected as the analysis area because they share similar ownership patterns and RTV habitat conditions within the general area; contain the high quality RTV habitat affected by proposed actions or are immediately adjacent to them; the RTV sites are centrally located in the analysis area; they allow for appropriate analysis of habitat connectivity and habitat distribution; and when combined, these 6th-field watersheds (83,471 acres) approximate the size of an average 5th-field watershed in the range of the species (Huff, per. Comm. August 10, 2015).

Table 2: Summary of federal ownership in the Myrtle Creek Harvest Plan RTV analysis area.

| RTV Analysis Block | 6th Field Watershed | Area (ac) | Federal Ownership | |
|---|---|---|---|---|
| | | | Acres | Percent |
| 1 | Upper North Myrtle Creek | 18,476 | 8,665 | 47 |
| | Lower North Myrtle Creek | 18,981 | 3,657 | 19 |
| 3 | Roberts Creek | 16,201 | 406 | 3 |
| 1, 2 | Upper Deer Creek | 29,813 | 3,339 | 11 |
| | TOTALS | 83,471 | 16,067 | 19 |

The analysis area is comprised of the General Forest Management Area (6,592 acres) and the Connectivity/Diversity Blocks (2,988 acres) and Riparian Reserves (6,064acres) land use allocations (Figure 1). The remaining portion of the analysis area is privately owned land assumed to be managed for intensive timber production and agriculture or is non-industrial forest or residential areas.

High quality RTV habitat is comprise of conifer stands with quadratic mean diameter (QMD) that is 18 inches or larger. Based upon professional experience from the South River Field Office silviculturalist, high quality habitat is typically at least 100 years old in this analysis area; 100 years is the average age at which trees would reach 18 inches QMD. Using 10-year age class, stands 40-90 years of age are considered connectivity habitat, while stands 100 years of age and older are referred to as high quality habitat. Using the most recent BLM vegetation data from Forest Operations Inventory database, there are 7,049 acres of high quality RTV habitat in the analysis area.

It is assumed that large industrial land managers will continue to manage primarily for timber production on a rotation of 40 to 65 years and lands converted to agricultural use will continue to be managed for agricultural purposes. Therefore, privately owned lands in the analysis area will not provide high quality RTV habitat, but they may provide connectivity habitat. However, RTV habitat on private forestlands may be transitory. Given the fragmented BLM ownership within these four 6th-field watersheds, connectivity within the watershed must rely on private lands. Red tree voles move into young, unthinned forest when trees become big enough to support arboreal nests. Swingle (5005) found 2/3ds of the 173 nest found in young forest were in branch whorls or forked trunks. Young forest can sometimes have high densities of vole (Clifton 1960, Maser 1966, Thompson and Diller 2002, Swingle 2005). Young forest may be important habitat for red tree voles, especially in landscapes where high quality habitat has been eliminated or much reduced (Swingle and Forsman 2009).

The proposed harvest would occur in three blocks of habitat (Figures 2-7) that are located on the periphery of federal ownership in the South River Field Office. These blocks are located in the valley margin, separated from large areas of contiguous federal ownership (White Rock block) by at least four miles.

Analysis Block 1 (Figures 2 and 5) is 371 acres of federally owned land and includes units 28-4-9A, 28-4-9B, 28-4-10A and 28-4-10B (204 acres) which form a contiguous patch of high quality RTV habitat in the eastern portion of the block (Figures 3 and 6). Block 1 is separated from other federal lands by at least 0.25 miles of forest managed for intensive timber production (Figure 5). The block includes 249 acres (67 percent) of high quality RTV habitat. Surveyors identified all or portions of eight active RTV sites[11] in Block 1.

Analysis Block 2 (Figures 3 and 6) is 629 acres of federally owned land and includes Unit 28-4-17B (35 acres) (Figures 4 and 7). There are 273 acres of high quality RTV habitat in the block. Block 2 is adjoined on three sides by private land, but BLM land to the west side provides connectivity to adjacent BLM high quality habitat creating a large patch of high quality habitat in this block (Figure 6). Three active RTV sites[1] have been identified in Block 2.

Analysis Block 3 (Figures 4 and 7) is comprised of 279 acres of federally owned land and includes Unit 28-5-27A (111 acres) which is located in the central portion of the block. Like the other analysis blocks, Block 3 is surrounded by private industrial forest lands, which separates it from other federal lands by a minimum of 0.25 miles. There are 164 acres of high quality RTV habitat in Block 3 and four active RTV sites[1] have been identified in the block. This is an isolated block situated on the edge of the valley margin, at the end of the ridgeline (Figures 1 and 10).

[11] RTV sites have been defined based upon ground transects and the climbing of those potential nest trees identified. Intensive 100 meter surveys have not been completed around the active nest trees.

## Environmental Consequences of Proposed Actions

Block 1: Under both action alternatives, variable density thinning would modify approximately 204 acres of high quality RTV habitat in Block 1. Post-treatment, approximately 49 acres of high quality RTV habitat would remain in the western third of the block. Variable density thinning, outside of the skipped areas, would not be considered high quality RTV habitat post-harvest, but, in the short-term, may support lower levels of RTVs than prior to treatment. Retained "skips" and "no-treatment" areas in Riparian Reserves may support RTVs in treated areas. Active nest trees would be retained as much as practicable. Variable density thinning outside of "skips" would not be high quality habitat post-treatment, but would be considered high quality habitat in approximately 20 year or when 60 percent tree canopy cover is reestablished.

Block 2: Under Alternative Two, application of variable retention harvest would remove approximately 29 acres (11 percent) of high quality RTV habitat in Block 2 and variable density thinning in Riparian Reserves would modify approximately four acres (1 percent) of high quality RTV habitat within the block. Two hundred and forty acres (43 percent) of high quality RTV habitat in the block would be maintained west and east of Unit 28-4-17B. An untreated area on the east side of the unit would maintain connectivity to adjacent federal land; connectivity to the west and southwest would not be affected. Post-harvest, areas where VRH is applied would not be considered high quality RTV habitat until 60 percent canopy cover is re-established in approximately 40 years. Variable retention harvest aggregate retention areas containing active nest trees would be one half acre or larger, large enough to encompass the home range of a red tree vole (Swingle 2005). However, RTVs would be vulnerable to predation in the concentrated harvest area. Retained aggregates and dispersed retention trees would provide important nesting habitat structures in future habitat. Active nest trees would be retained in aggregates and as dispersed retention trees as much as practicable. In the short-term, Riparian Reserves would not provide high quality habitat, but may continue to support lower levels of RTVs post-treatment and "no-treatment" areas would continue to provide connectivity to adjacent high quality habitat. High quality habitat in treated Riparian Reserves would be restored in approximately 20 years.

Under Alternative Three, high quality habitat in Unit 28-4-17B would be modified by uniform commercial thinning (29 acres) in the uplands portion of the unit and variable density thinning (4 acres) in the Riparian Reserve. Uniform commercial thinning would maintain canopy cover sufficient to provide high quality habitat post-treatment. Harvest operations may cause a reduction in the RTV use of the treated area, but retention of active nest trees and maintaining sufficient canopy cover to support continued RTV use. The effects of VDT in Riparian Reserves would be as described above.

Block 3: Uniform commercial thinning under both action alternatives would modify 92 acres of highly suitable RTV habitat and variable density thinning in Riparian Reserves would modify 11 acres of highly suitable RTV habitat (Figures 5 and 8). Uniform commercial thinning would maintain high quality habitat because post-treatment canopy closure would be over 60 percent. There would be two patches of high quality RTV habitat unaffected on each side of the unit (Figures 5 and 8). The effects of CT and VDT would be as described above.

## Red Tree Vole Survey Results

Survey and Mange Standards and Guidelines require clearance surveys in high quality RTV habitat prior to conducting habitat-disturbing activiites per the current survey protocol (USDA and USDI 2012, p. 14). Ground surveys were completed in the winter of 2015, using qualified contractors. All portions of the six units were surveyed including "aggregate retention" areas and "no-treatment" areas in Riparian Reserves. Potential RTV nests found on the transects were climbed in July of 2015 to determine site status. Site status was determined by the contractor and confirmed by BLM biologists.

Ground surveys yielded evidence of 264 potential RTV nest trees (Table 2). Through climbing the potential nest trees, biologists confirmed 43 active RTV nest trees; 62 inactive RTV nest trees, 158 nests of other species, and one undetermined structure that was evaluated as if it were an active RTV nest tree (Table 2). The arrangement of active, inactive, and the undetermined nest trees form approximately 18 active RTV sites (Figures 3-8).

Table 2. Results of BLM Red Tree Vole Surveys.

| Unit Name | Active RTV[1] | Inactive RTV[2] | Confirmed Non-tree Vole Nest | Undetermined Nest[3] | Total |
|---|---|---|---|---|---|
| 28-4-9A | 5 | 11 | 13 | 0 | 29 |
| 28-4-9B | 6 | 5 | 1 | 0 | 12 |
| 28-4-10A | 2 | 5 | 7 | 0 | 14 |
| 28-4-10B | 1 | 2 | 3 | 1 | 7 |
| 28-4-17B | 11 | 3 | 6 | 0 | 20 |
| 28-5-27A | 18 | 36 | 128 | 0 | 182 |
| Total | 43 | 62 | 158 | 1 | 264 |

[1] An arboreal nest that is confirmed to be currently in use by a red tree vole. Confirmed by the presence of green resin ducts, or clippings, either in the nest or on the ground beneath it.

[2] An arboreal nest that is confirmed to be currently not in use by a red tree vole - but evidence of past use is present. Confirmed by the lack of green resin ducts on, or in, the nest structure.

[3] Any arboreal nest that is not confirmed as belonging to a red tree vole or any other species. Some of these undetermined structures may not be rodent nests but rather a bird nest or accumulation of litter fall. There are treated as active RTV nest trees.

## Non-high Priority Site Analysis

Red tree voles were identified as a Survey and Manage species, Category C (uncommon, pre-disturbance surveys practical) species because they were found to meet the following criteria (USFS and BLM 2001, p. S&G-10):

- The species is uncommon, and not all known sites or population areas are likely to be necessary for reasonable assurance of persistence, as indicated by one or more of the following:
    - A higher number of likely extant sites/records do not indicate rarity of the species.
    - Low-to-high number of individuals per site.
    - Less restricted distribution pattern relative to range or potential habitat.
    - Moderate-to broad ecological amplitude.
    - Moderate-to high likelihood of sites in reserves. And
- Pre-disturbance surveys are practical.

Management direction is: "[h]igh-priority sites will be managed according to the management recommendations for the species…assume all sites are high priority, or local determination…of non-high priority sites may be made on a case-by-case basis…" (USFS and BLM 2001, S&G-10).

Non-high priority status will be evaluated based upon meeting most of the following criteria (USFS and BLM 2012, Attachment 1-2):

- "Moderate-to-high number of likely extant sites/records.
- High proportion of sites and habitat in reserve land allocations or limited number of sites within reserves, but the proportion or amount of potential habitat within reserves is high and there is a high probability that the habitat is occupied.
- Sites are relatively well distributed within the species range.
- Matrix S&G or other elements of the NWPF provide a reasonable assurance of species persistence."

Moderate-to-High number of likely extant sites/records

A query of the BLM's special status species databases (GeoBOB, data queried 08/01/2015) identified over 9,400 observations of RTV nesting structures (active, inactive, or unknown status) range-wide; over 3,400 within the Mesic zone. Three thousand nine hundred and seventy-seven (3,977) surveys have been completed on over 156,000 acres on BLM-administered lands; 538 surveys of 21,375 acres were in the Mesic zone. Red tree voles have been detected on 69 percent of the units surveyed in the Mesic Zone. Within the Mesic Zone, detection rates vary from 49 percent to 86 percent (GeoBOB data). In the South River Field Office portion of the Mesic Zone, 4,270 acres have been surveyed for RTV with a detection rate of 86 percent (McGraw pers. comm. July 31, 2015). Huff (pers. comm. 10 July 2015, p. 21) stated that the "Roseburg BLM has the highest occurrence rate of any of the NWFP units". These detection rates show that RTVs are common in suitable habitats on the South River Resource Area and likely extant populations in suitable habitat are at least moderate, if not high.

In 2010 through 2012, approximately 492 acres in the South River Resource Area were surveyed in associated with the Pacific Connector Gas Pipeline (PCGP) project; RTVs were detected on 25 of the 26 survey units, validating that RTVs are common in high quality RTV habitats in the South River Resource Area. They found an average density of 1.7 active RTV nest trees per acre (or one active nest for every 0.6 acres).

Prior to the Myrtle Creek survey effort, there were 108 RTV observations in the analysis area. One hundred of these observations have been documented since 2010 and most of them were associated with the PCGP effort in the southwest corner of the analysis area. The remaining eight observations were associated with surveys in the Elementary Watson Timber Sale; no sites were designated because the project was withdrawn prior to completing the protocol surveys.

Prior to the Myrtle Creek survey effort, a total of 78 acres were surveyed for RTV in the analysis area; 61 acres associated with the PCGP and 17 acres associated with the Elementary Watson Timber Sale. The PCGP surveyors identified five sites within the Myrtle Creek analysis area (Siskiyou BioSurvey LLC 2012, Figures RTV Units 24-27).

The BLM surveyed 350 acres for this project and located 44 active RTV nest trees (Table 2) equating to a density of 0.13 active nest trees per acre (or 1 active site for every 7 acres). Surveys are not complete (100 m. searches have not been conducted) so this density estimate is low and does not represent the liely number of active nests present in the survey area. However, translating this occurrence rate out to the larger analysis area, application of the Management Recommendations for this species would result in the entire analysis area managed within red tree vole habitat areas, as each red tree vole nest is managed with a minimum 10 acre buffer. Assuming that high quality RTV habitat equates to those stands with a QMD **greater than 18 inches (modeled as stands ≥ 100 years of age) there are 6,735 acres of high quality RTV** habitat (outside of the project units) on federal lands in the analysis area.

Using the BLM and PCGP detection rates (0.13 and 1.7 active nest trees per acre, respectively) as lower and upper limits, there are 886 to 12,049 potential active RTV nest trees in high quality habitat within the BLM-administered lands in the analysis area. Although there are only 23 known active RTV nest sites in the analysis area, depending upon their arrangement, these potential active RTV nest trees represent several hundred to several thousand active RTV nest sites on federal lands within the analysis area. In an analysis of random surveys, Rosenberg (unpublished) determined that Roseburg BLM has the highest occurrence rate of RTVs of any of the NWFP units; therefore it is reasonable to assume these potential nest sites are occupied.

Based on the amount of high quality RTV habitat within the analysis area (6,735 acres) and the high likelihood that habitat is occupied (86 percent); there is a moderate-to-high number of likely extant sites within the analysis area.

High proportion of sites and habitat in reserve land allocations or limited number of sites within reserves, but the proportion or amount of potential habitat within reserves is high and there is a high probability that the habitat is occupied.

Table 4 shows the BLM portion of the analysis area is comprised of 15,406 acres (96 percent) of Matrix and Adaptive Management Area lands use allocations, and associated Riparian Reserves. There are 6,481 acres (40 percent) of reserve land use allocations on BLM-administered lands in the analysis area: 453 acres in an Area of Environmental Concern, 211 acres in a Known Owl Activity Center, and 5817 acres in Riparian Reserves. Forty-one percent of these reserve lands provide high quality RTV habitat.

Table 4. Red tree vole habitat in reserves and areas managed for late-successional forest habitat.

| Land Use Allocation or Management Emphasis | Total Area[1] (ac) | % BLM Land | % All Land Ownerships | Connectivity Habitat[2] | | High Quality Habitat[3] | | Total Habitat | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Acres | % | Acres | % | Acres | % |
| Late-Successional Reserve | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Known Owl Activity Center | 211 | 1.3 | 0.3 | 27 | 13 | 176 | 83 | 203 | 96 |
| Area of Critical Environmental Concern | 453 | 27.2 | 0.5 | 28 | 6 | 376 | 83 | 404 | 89 |
| Riparian Reserve | 5817 | 36.2 | 7.0 | 1,674 | 28.7 | 2,328 | 40 | 4,002 | 69 |
| Matrix[4] & Adaptive Management Area | 15,406 | 95.9 | 18.5 | 2,422 | 16 | 6,532 | 42 | 8,954 | 58 |

[1] Acreage figures account for overlap
[2] Habitat is defined as conifer stands with a ten-year age class of 40-90 years
[3] High Quality Habitat is conifer stands with a ten-**year age class ≥100 years; an estimate of those stands with a QMD ≥18 inches.**
[4] The Connectivity/Diversity Blocks land use allocation within the Matrix is intended to provide connectivity between Late-Successional Reserves (ROD/RMP, p. 33) which provides landscape scale connectivity that benefits RTVs.

The previous discussion demonstrates that there is a high probability that suitable RTV habitat in the analysis area is occupied. Furthermore, the Roseburg District has harvested an average of 0.3 percent of the District landbase per year for the past 20 years, which is a trend that may continue. Most of the harvest in the past two decades was thinning in stands less than 80 years old, in other words, harvest has focused on habitats that are not considered high quality RTV habitat. This rate of timber harvest indicates that although the suitable RTV habitat is not in reserve allocations, there is little doubt that existing suitable RTV habitat in the analysis area will remain available, well-distributed, and occupied. Proposed actions affecting 350 acres of high quality RTV habitat (0.08 percent of the District; 0.4 percent of the analysis area) would not alter that conclusion.

Sites are relatively well distributed

Forsman, et al. (2004, p. 300) found that RTVs are "widely distributed" in the Roseburg District, based upon analysis of spotted owl pellets. There are 23 known RTV sites located within the analysis area: five sites were identified in associated with the PCGP project in the southern portion of the analysis area and 18 sites were identified in association with the Myrtle Creek Harvest Plan survey efforts. There are seven additional RTV observation (sites were never designated) in the northeast corner of the analysis area (Figure 8). The

majority of high quality habitat in the analysis area is unsurveyed (6,246 acres). High quality RTV habitat is well distributed throughout the analysis area; it is located in almost all federally managed blocks (Figure 8).

The BLM manages 19 percent of this checkerboard analysis area (Table 2). Connectivity in the majority of the analysis area facilitated by habitat on intermingled private lands. Connectivity is provided by adjacency of shared BLM corners, transitory habitat on non-federal lands (Figure 9), and habitat in Riparian Reserves/riparian areas.

Figure 9 illustrates the distribution of RTV habitat in and adjacent to the analysis area. The northwest half of the analysis area contains no federal land; private forest lands provide some patches of habitat, but eventually forested lands transition into valley bottom oak forests, grasslands, and residential areas. Connectivity to the southwest is restricted by the valley bottoms of the South Umpqua River, the river itself, and Interstate 5 (Figures 1 and 9). The east quadrant of the analysis area is the best connected to the large block of BLM ownership around the White Rock/Deadman area and the Umpqua National Forest. The proposed treatments do not alter the existing conditions in these portions of the analysis area.

Federal lands in the analysis area follow the ridgeline that runs between the Umpqua Valley to the northwest and the valley bottom of North Myrtle Creek and it major tributaries. Along the southeast boundary of the analysis area BLM lands are located along the ridgeline separating North Myrtle Creek from South Myrtle Creek. Red tree vole dispersal is supported by habitats providing connectivity in the southwest-northeast directions by the high quality habitat on federal and habitat on private lands along these ridgelines. The habitat models illustrate several large patches of RTV habitat on private lands (Figure 9). Additionally, connectivity is provided by the network of Riparian Reserves on BLM land in the analysis area (Figure 10B). Connectivity for RTVs in this analysis area would not be measurably reduced given the existing habitat potential and land use patterns.

As discussed above, PCGP surveyors located, on average, 1.7 active RTV nest tree per acre of surveyed habitat; BLM surveyors located, on average, 0.13 active RTV nest trees per acre in the surveyed portions of the analysis area. Active RTV nest trees have been located on 86 percent of all surveyed units in the South River Resource Area. Given the conclusion made by Foresman et al (2004), the prevalence of unsurveyed high quality RTV habitat in the analysis area, and the high detection rates in the South River Resource Area in suitable RTV habitat, it is highly probable that RTVs occupy the well distributed high quality habitat in the analysis area and would remain well distributed under the action alternatives.

Matrix Standards and Guidelines or other elements of the Northwest Forest Plan provide a reasonable assurance of the species persistence.

Extensive surveys done throughout the range of the RTV as part of the NWFP Survey and Manage program have resulted in information that has helped to refine the distribution of the RTV (USDA and USDI 2000a, p. 376; USDA and USDI 2007, pp. 289-290). Information gleaned from these more recent surveys indicate that the RTV continues to be widely distributed throughout much of their range in Oregon with the exception of the North Coast Range (Federal Register 2011). The analysis area is not in the North Coast Range.

The USFS and BLM conducted an annual species review of the RTV in 2003 and an analysis of the available data as it pertained to the species persistence. They determined:

1. *That there was a "Moderate to High" number of likely extant known sites within the Mesic zone (p. 13, Table 3-1 in USFS and BLM 2003a).*
2. *That there was not a high proportion of sites and habitat in reserves (p. 23, Table 3.9 in USFS and BLM 2003a) but there is a high probability that potential habitat in reserves is occupied (p. 26, Table 3-10 (USFS and BLM 2003a).*

3. *That RTV sites are well–distributed within the Mesic zone (p. 21, Table 3-7 in USFS and BLM 2003a). and,*
4. *That Matrix Standards and Guidelines or other elements of the Northwest Forest Plan do not provide a reasonable assurance of species persistence. (p.26, in USFS and BLM 2003a).*

We disagree that management of the Matrix has not provide reasonable assurance of species persistence because Matrix lands have not been managed as proposed in the Northwest Forest Plan. Davis et al. (in prep) state,

> "…net changes in the amount of older forests on federal lands managed under the NWFP have been small (a 2.8 to 2.9 percent net decrease). This occurred despite gross losses from wildfire (4.2 to 5.4 percent), timber harvest (1.2 to 1.3 percent), and insects or other causes (0.7 to 0.9 percent)…The [Northwest Forest] Plan anticipated a continued decline in older forests for the first few decades…Decadal gross losses of about 5 percent per decade as a result of timber harvesting and wildfire were expected. Observed losses from wildfire were about what was expected, but losses from timber harvesting were about one quarter of what was anticipated."

The Roseburg District is no exception to the observations made by Davis et al. (in prep), indicating management of Matrix lands on the District has been implemented to assure the persistence of RTVs.

The decision makers, taking into account the recommendations of the technical specialists and managers who conducted the annual species review, removed the RTV within the Mesic Zone from Survey and Manage (S&M) (USFS and BLM, 2003). Additionally, the 2004 Final Supplemental Impact Statement (USFS and BLM, 2004a) concluded that, without the S&M provisions and with the implementation of the current Riparian Reserve strategy, the persistence rating for the RTV was improved by an undetermined amount above 73 percent likelihood of sufficient habitat to provide for stable, well-distributed populations across Federally managed lands and a zero percent likelihood of extirpation in the Northwest Forest Plan Area (p. 208 *in* USFS and BLM 2004). The 2007 supplement to the 2004 SEIS further stated that within the Mesic zone that the red tree vole would have sufficient habitat to support stable populations on federal lands (USFS and BLM, 2007).

Additionally, RTVs benefit incidentally from the presence of northern spotted owl (NSO) critical habitat (37 percent of federal lands in the analysis area); and the protection of NSO sites and older, structurally-complex owl habitat, recommended in Recovery Actions 10 and 32 (USFWS 2011, pp III-43 and III-67). The objective to create and maintain long-term ecologically sustainable suitable owl habitat also provides RTV habitat. While these stands are mostly Matrix lands designated for sustained yield timber production and are not designated or being managed as reserves, BLM has exercised its management discretion with regard to the timing, location and type of harvest to manage these stands consistent with the goals of designated critical habitat and northern spotted owl recovery, thereby providing additional late-successional habitat conditions that benefit the RTV.

## Conclusions

1. Based on the amount of high quality RTV habitat within the analysis area (6,735 acres) and the overall high likelihood of it being occupied (86 percent) there is a moderate-high number of likely extant sites in the analysis area. Completed surveys and database analyses validate this conclusion.
2. After considering the very modest (0.3 percent) amount of the Roseburg District landbase that has been harvested annually for the past two decades, the abundance of highly suitable habitat on BLM-administered lands, and BLM efforts to recover the northern spotted owl, there is little doubt that existing suitable RTV habitat in the analysis area (and the District) will remain available, well-distributed, and occupied.

3. The distribution of high quality RTV habitat on BLM-administered lands and the connectivity habitat on non-federal lands throughout the analysis area provide habitat connectivity that allows RTVs to disperse throughout this landscape because RTV habitat is well distributed (Figure 9).
4. The proposed action would affect 18 known sites out of hundreds of estimated active RTV sites in the analysis area and would not diminish the likelihood of RTV persistence in the analysis area.

## RTV Site Management Proposal

We are proposing to designate 18 active RTV sites as non-high priority sites. We have determined that all four criteria identifying sites as non-high priority have been met. Active RTV nest trees would be marked, where feasible, as retention trees in thinning units 28-4-9A, 28-4-9B, 28-4-10A, 28-4-10B, and 28-5-27A. Canopy cover in the uplands of VDT units 28-4-9A, 28-4-9B, 28-4-10A, and 28-4-10B (183 acres) would be maintained at or above 40 percent. Canopy cover in all treated Riparian Reserves (36 acres) would be maintained at or above 50 percent. "Skips" (untreated areas) in VDT units would be approximately 0.25 acres, within the home range size of RTVs and may support RTVs post-harvest. Canopy cover in the uplands of Unit 28-5-27A would be maintained at or above 70 percent. In VRH Unit 28-4-17B, active RTV nest trees would be included in retention aggregates or marked as dispersed retention trees as much as practicable (EA, pp. 23-24). Aggregate retention areas in the VRH unit would be one half acre or larger which would maintain the home range of RTVs using the active nest trees in the aggregate.

By retaining active RTV nest trees in units 28-4-9A, 28-4-9B, 28-4-10A, 28-4-10B, and 28-5-27A and aggregated retention patches around some nest trees in unit 28-4-17B, suitable RTV nesting structures would be maintained so that RTVs would remain active in treated stands or the re-establishment of suitable habitat (and RTV occupancy) post treatment would be accelerated.

## Concurrence

We concur with the recommendations to designate the above described red tree vole sites as Non-High Priority Sites, in accordance to the Survey and Manage management options described for Category C species (Uncommon Occurrence, Pre-disturbance Surveys Practical) (USFS and BLM, 2001, pp. S&G - 10).

_____ _____

Steve Lydick, Field Manager Date
South River Field Office, BLM

_____ _____

Alice Carlton, Forest Supervisor Date
Umpqua National Forest, USFS

_____ _____

Jim Thrailkill, Supervisor Date
Roseburg Field Office, USFWS

## Literature Cited


Davis, Raymond J.; Ohmann, Janet L.; Kennedy, Robert E.; Cohen, Warren B.; Gregory, Matthew J.; Yang, Zhiqiang; Roberts, Heather M.; Gray, Andrew N.; and Spies, Thomas A. (in prep). Northwest Forest Plan–the first 20 years (1994-2013): status and trends of late-successional and old-growth forests. Gen. Tech. Rep. PNWGTR-XXX. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.

Forsman, E.D., R.G. Anthony, and C.J. Zabel. 2004. Distribution and abundance of red tree voles in Oregon based on occurrence in pellets of northern spotted owls. Northwest Science 78(4): 294-302.

Huff, R. 2015. Personnel communications dated 14 July 2015 discussing RTV high priority site designation.

McGraw, R. 2015. Personnel communications dated 31 July 2015 summarizing RTV survey effort within the western Oregon planning area.

Siskiyou BioSurvey LLC. 2012. Interim Report Two, 2010-2012 Red Tree Vole Surveys. Pacific Connector Pipeline Project. Eagle Point, OR.USDA/FS-USDI/BLM 1994b. Record of Decision and Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl. Portland, Oregon.

USDA/FS-USDI/BLM. 1994a. Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl. Portland, OR.

USDA/FS-USDI/BLM. 1994c. Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl, Appendix J2. Portland, OR.

USDA/FSUSDI/BLM. 2000. Management Recommendations for the Oregon Red Tree Vole. Portland, OR.

USDA/FS-USDI/BLM. 2001. Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines. Portland, Oregon.

USDA/FS-USDI/BLM. 2003. BLM-IM-OR-2004-034. Portland, OR.

USDI/FS-USDI/BLM. 2003a. Step 2 Worksheet, 2003 Annual Species Review, Executive Summary. Portland, OR.

USDA/FS-USDI/BLM. 2004. Record of Decision to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines in Forest Service and Bureau of Land Management Planing Documents within the Range of the Northern Spotted Owl. Portland, Oregon.

USDA/FS-USDI/BLM. 2004a. Final Supplemental Environmental Impact Statement to Remove or Modify the Survey and Mange Mitigation Measure Standards and Guidelines. Portland, Oregon: USFS.

USDA/FS-USDI/BLM. 2007. Final Supplement to the 2004 Final Supplement EIS to Remove or Modify the Survey and Manage Mitigation Measure Stnadards and Guidelines. Portland, OR: USFS.

USDA/FS-USDI/BLM. 2011d. BLM IM-OR-2011-063. Portland, OR

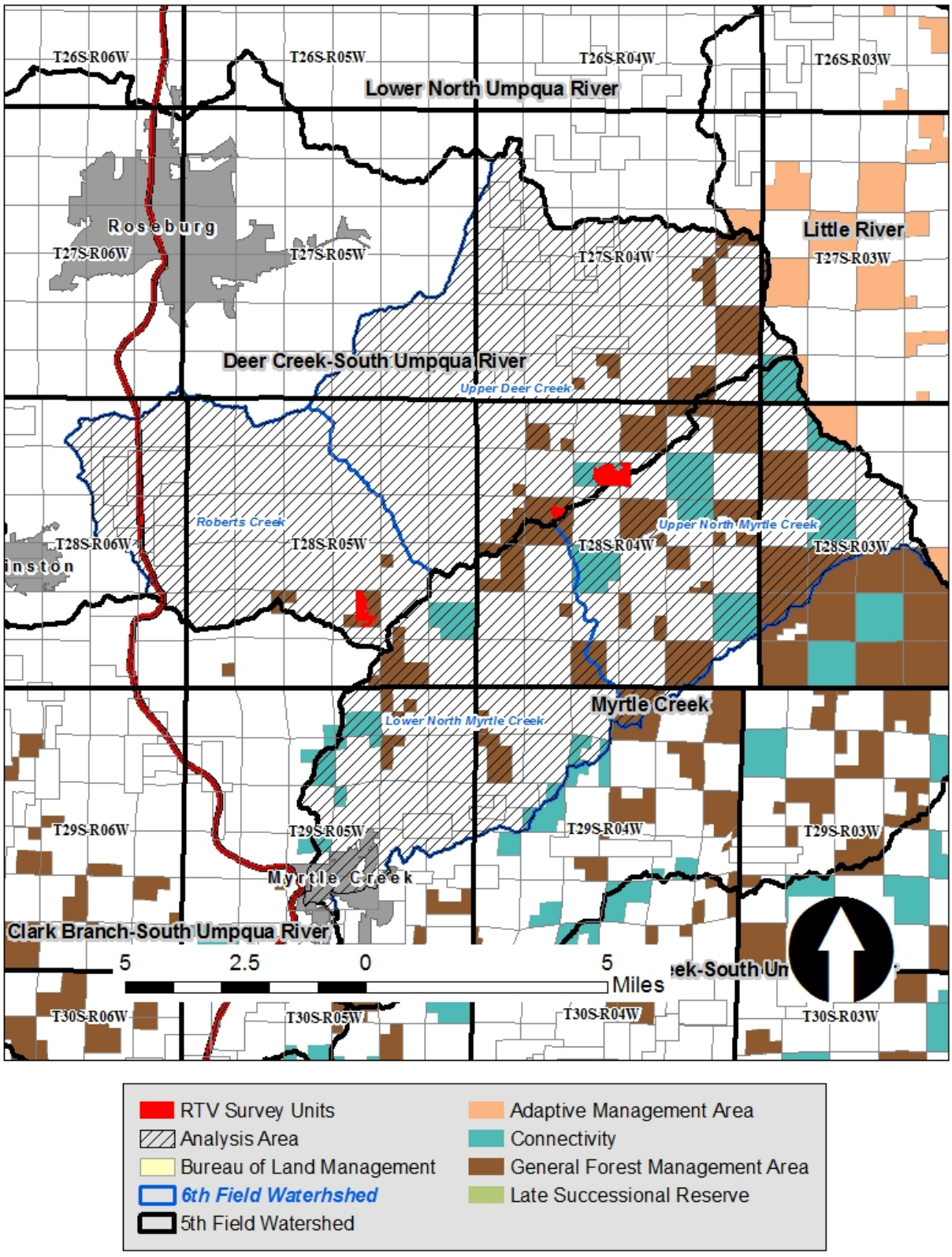
USDA/FS-USDI/BLM. 2012. Survey Protocol for the Red Tree Vole, Version 3.0. Portland, OR. Prepared by Huff, R., K. Van Norman, C. Hughes, R. Davis and K. Mellen-McLean .

USDA/FS-USDI/BLM. 2012b. BLM IM-OR-2012, Portland, OR

USDI/FWS. 2011a. Revised Recovery Plan for the Northern Spotted Owl (Strix occidentalis caurina). Portland, Oregon.

USDI/FWS. 2011c. Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition to List a Distinct Population Segment of the Red Tree Vole as Endangered or Threatened. In Federal Register (Vol. 76, pp. 63720-63762).

**Figure 1: Location of the Revised Myrtle Creek Harvest Plan red tree vole analysis area and survey units.**



Page intentionally left blank

**Figure 2: Red tree vole survey results in Analysis Block 1 (units 28-4-9A, 28-4-9B, 28-4-10A, and 28-4-10B).**

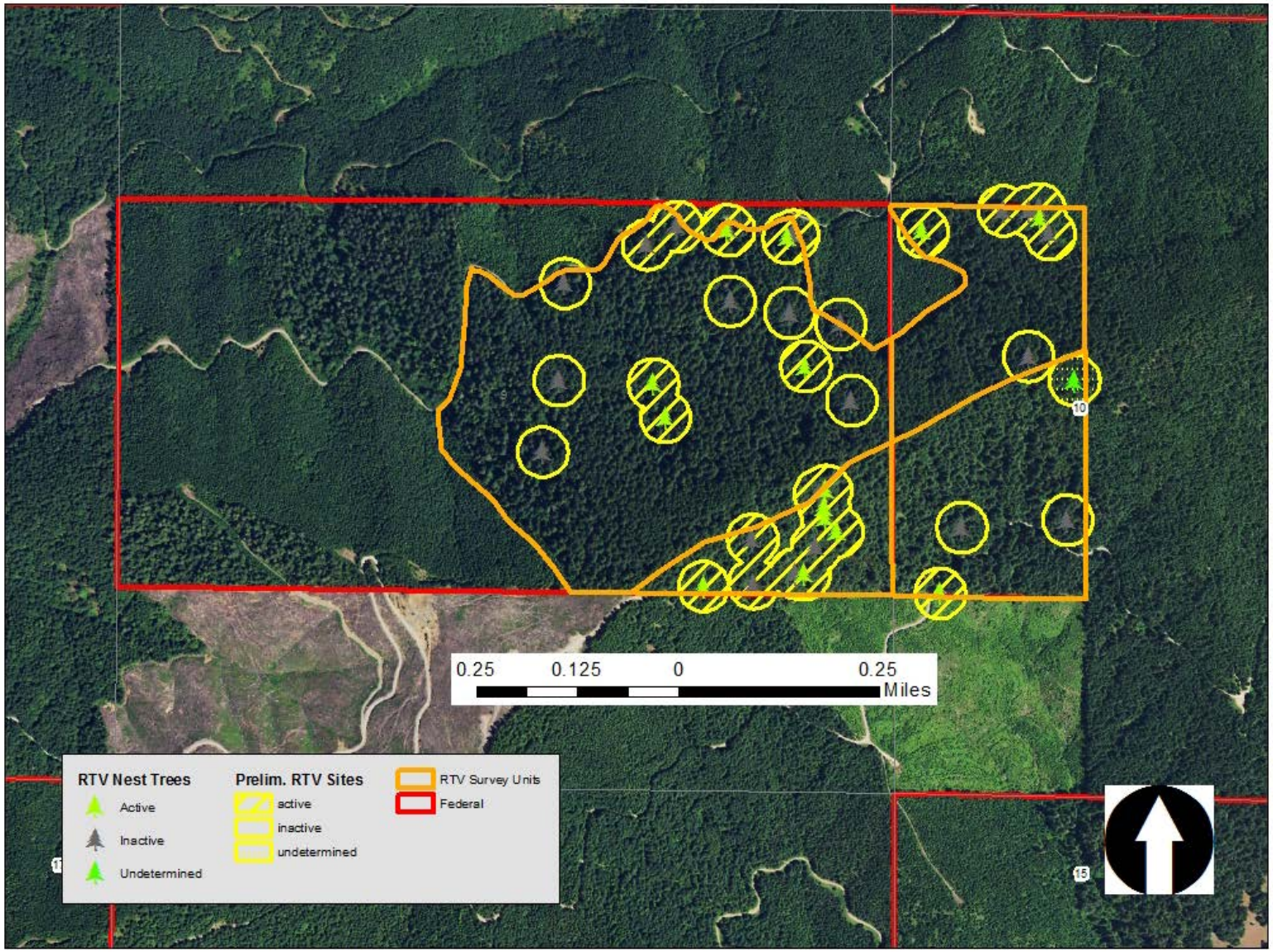


**Figure 3: Red tree vole survey results in Analysis Block 2 (Unit 28-4-17B).**

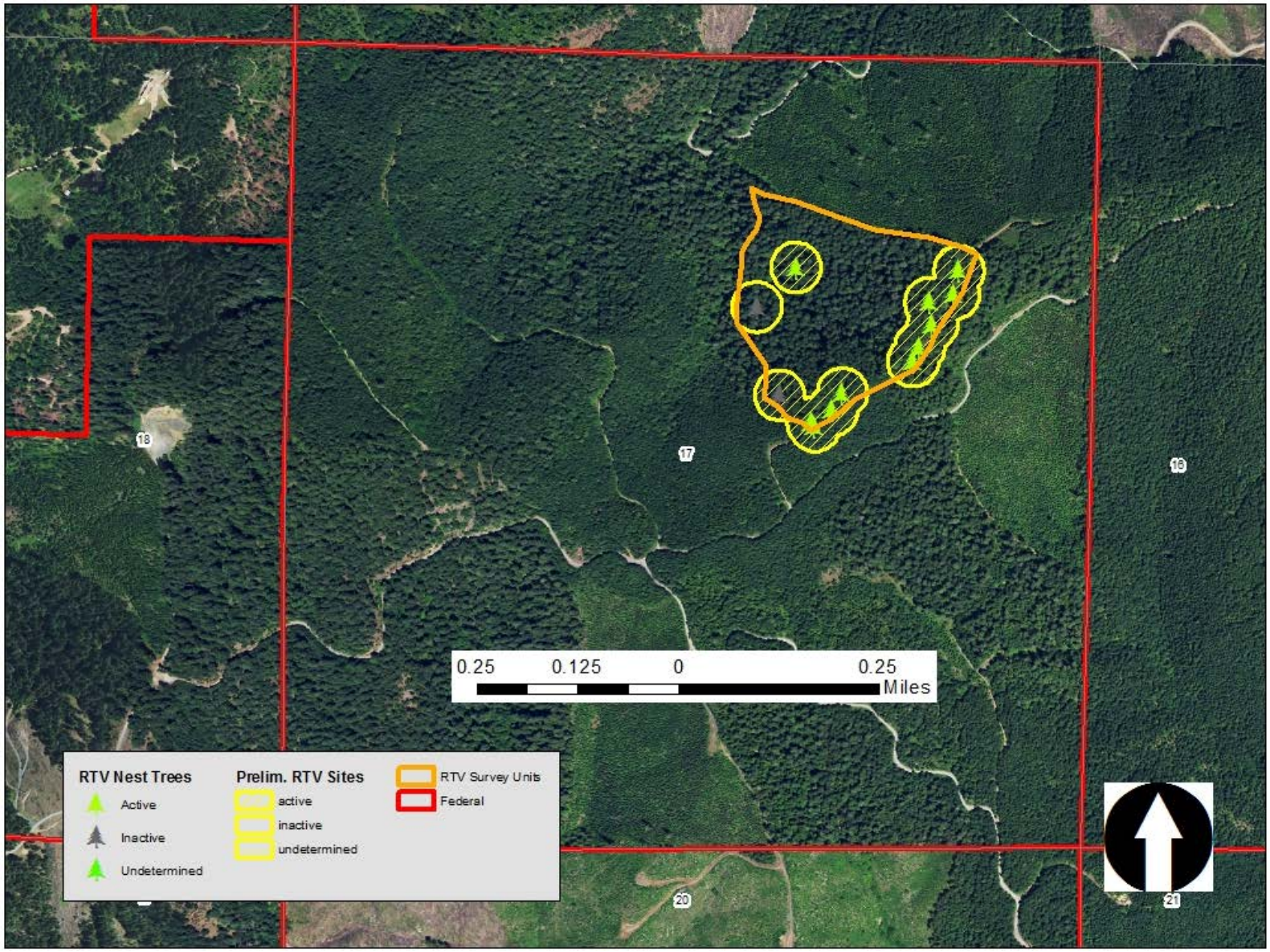


**Figure 4: Red tree vole survey results in Analysis Block 3 (Unit 28-5-27A).**

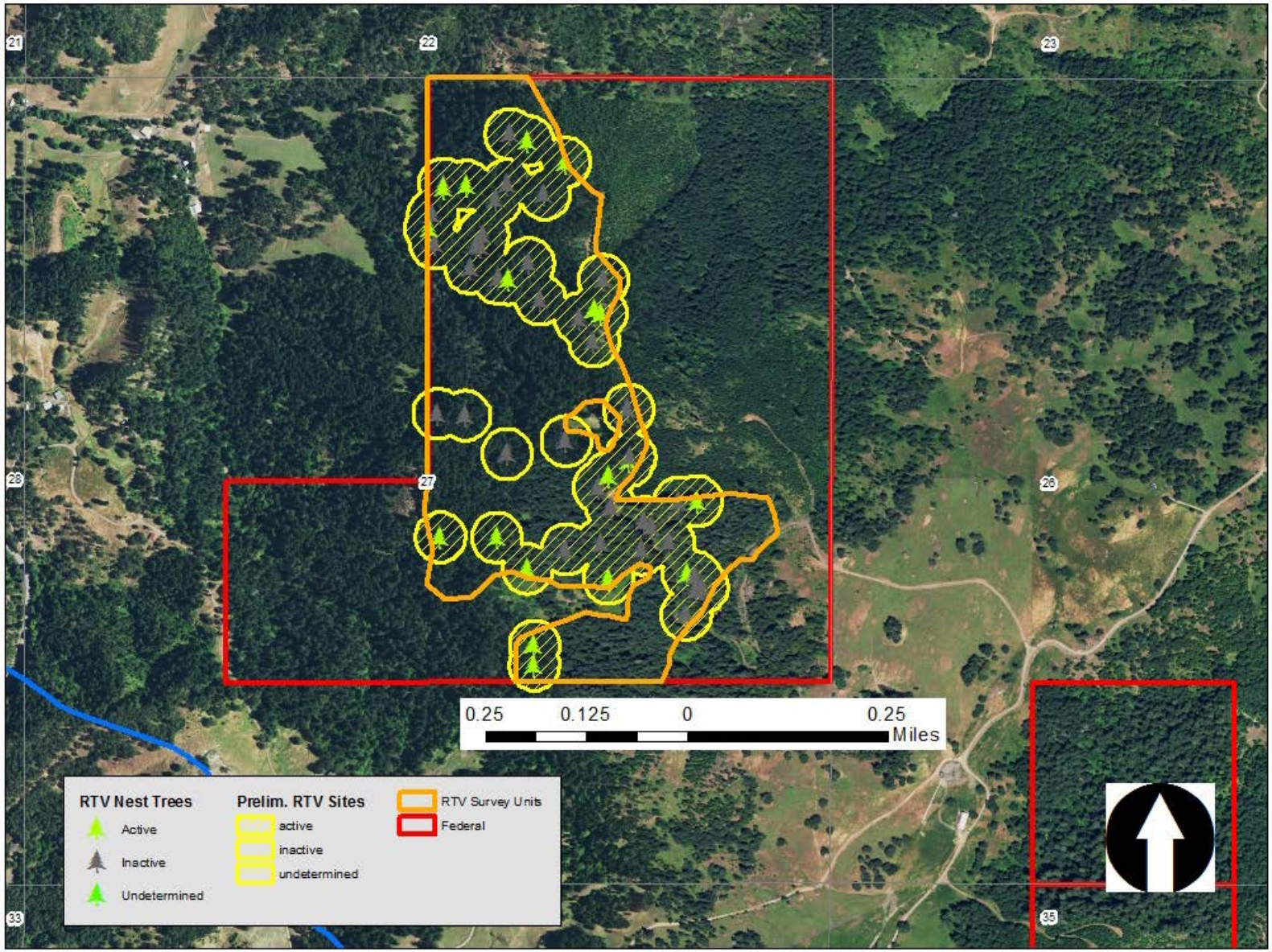


**Figure 5: Red tree vole habitat in Analysis Block 1 (units 28-4-9A, 28-4-9B, 28-4-10A, and 28-4-10B).**

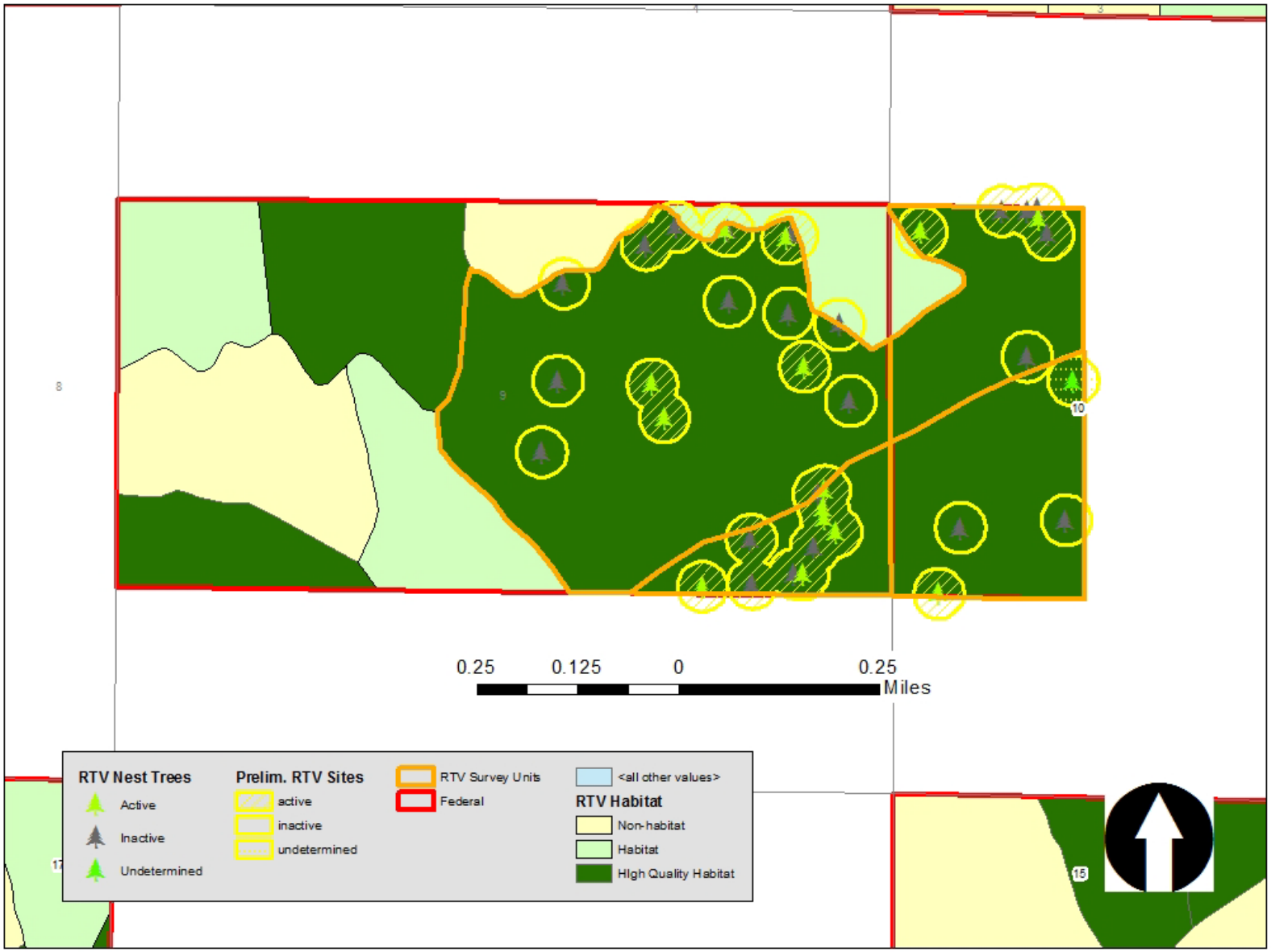


**Figure 6: Red tree vole habitat in Analysis Block 2 (Unit 28-4-17B).**

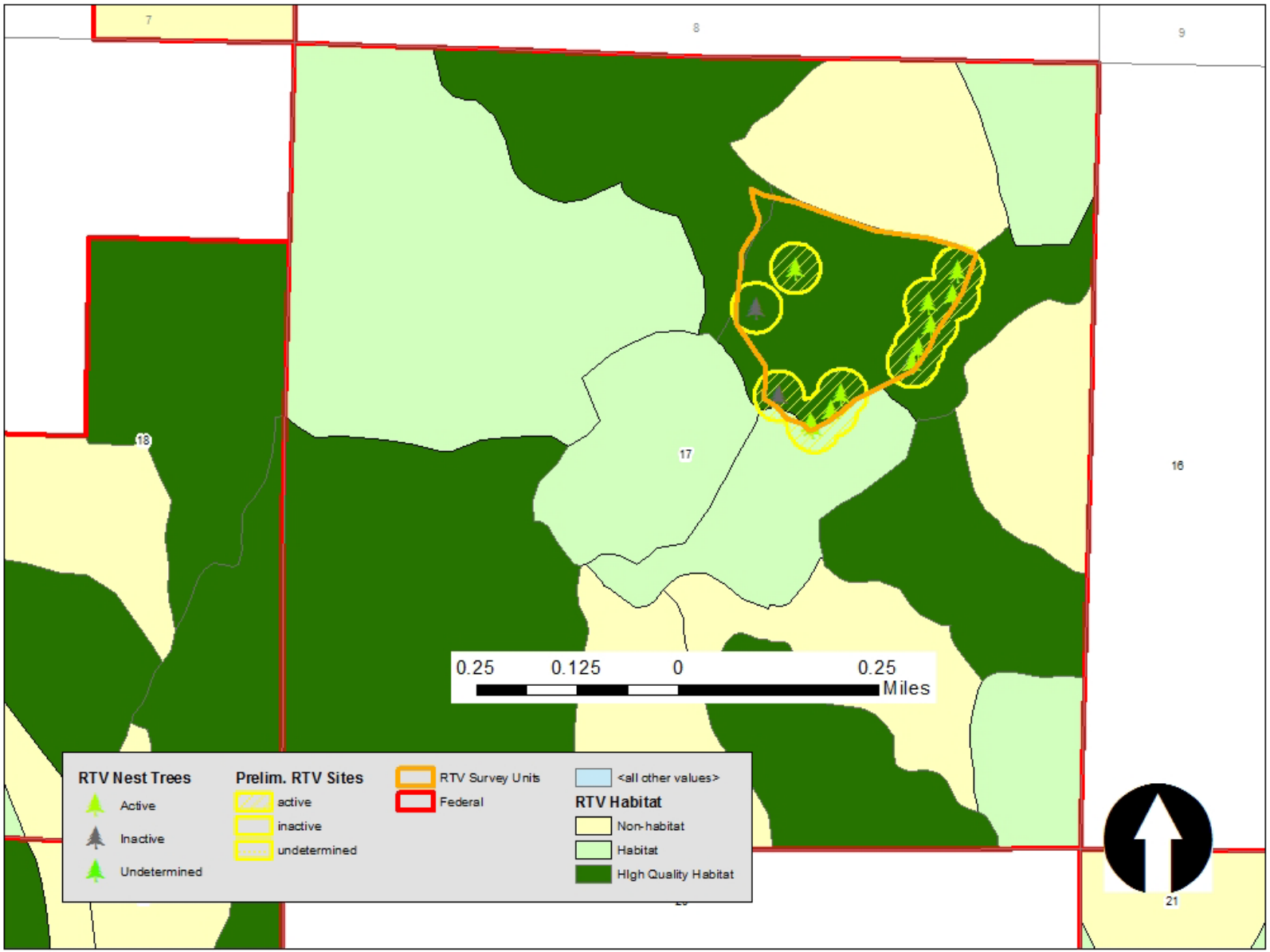


**Figure 7: Red tree vole habitat in Analysis Block 3 (Unit 28-5-27A).**

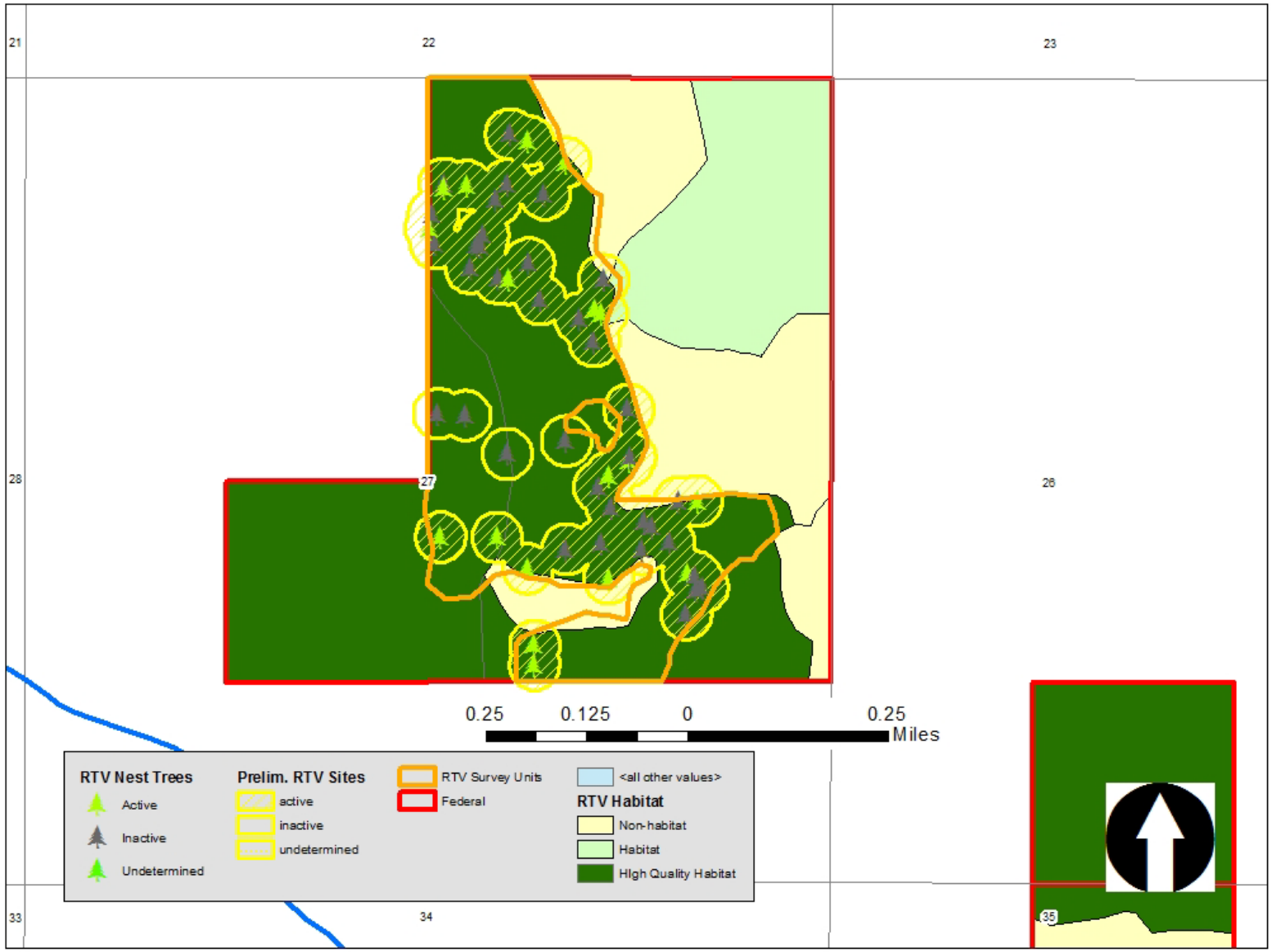


**Figure 8: RTV habitat and sites (or observations) on BLM lands in the Myrtle Creek Harvest Plan RTV analysis area.**

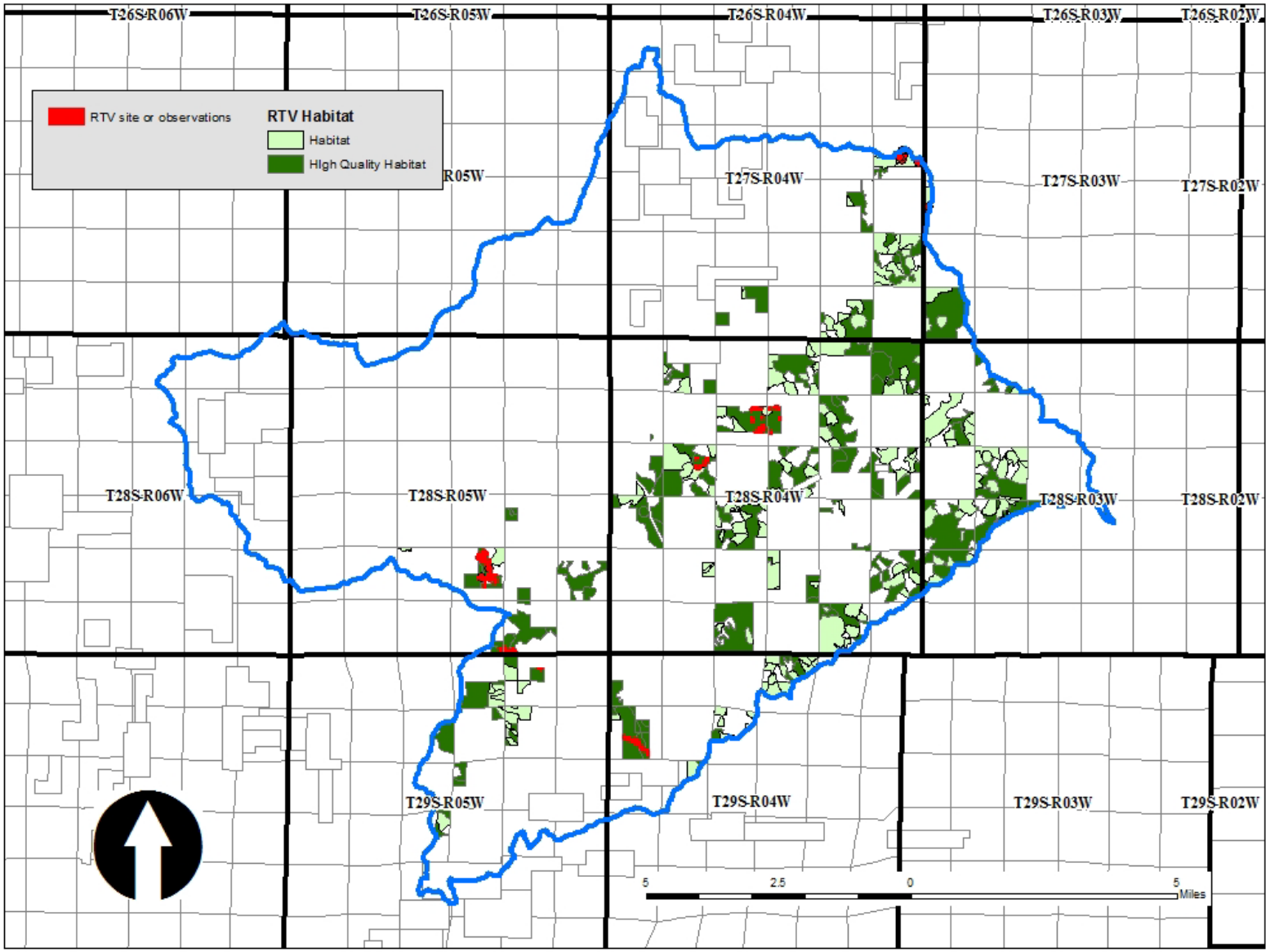


**Figure 9: High quality RTV habitat in, and adjacent to, the analysis area.**

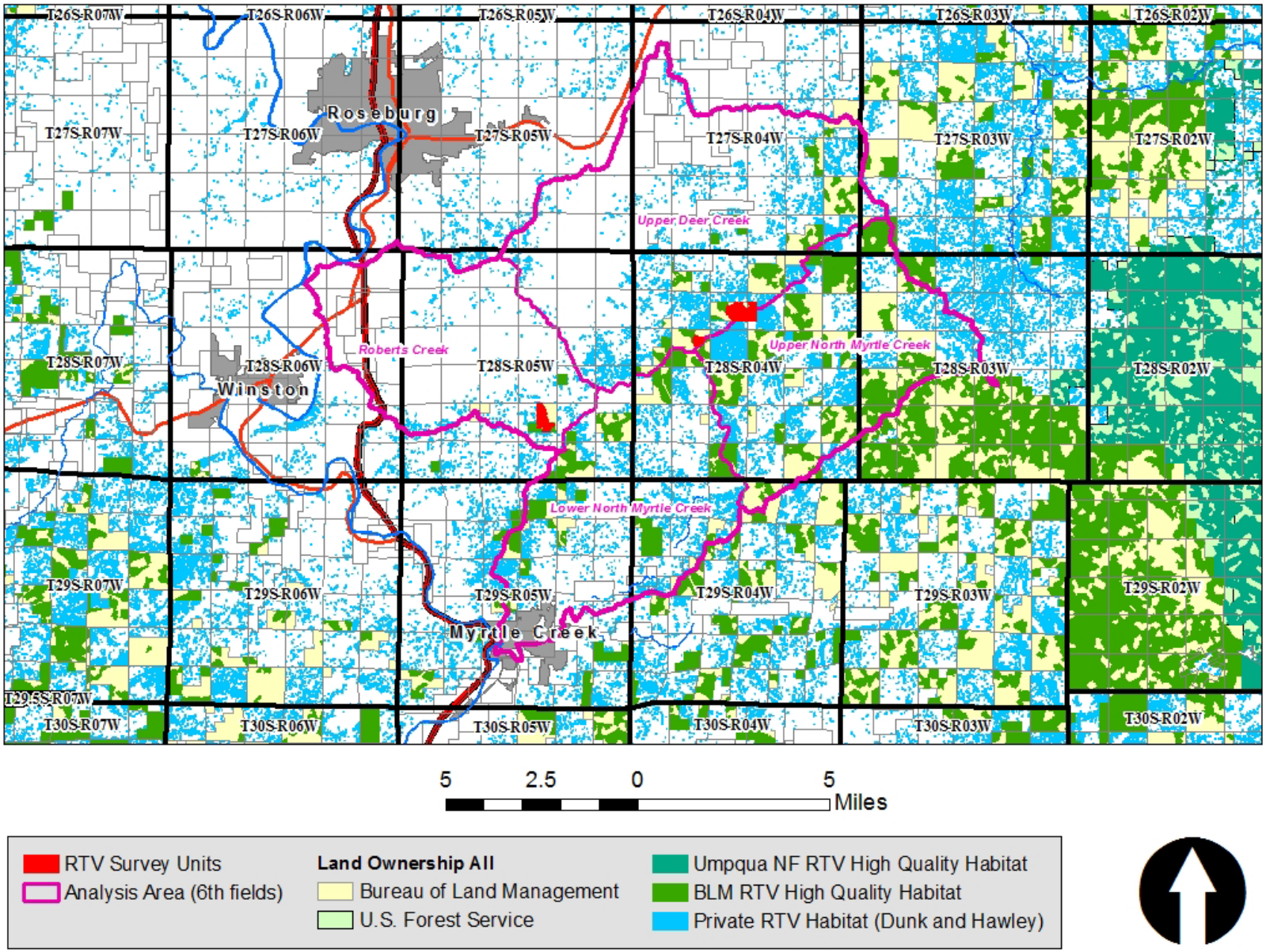
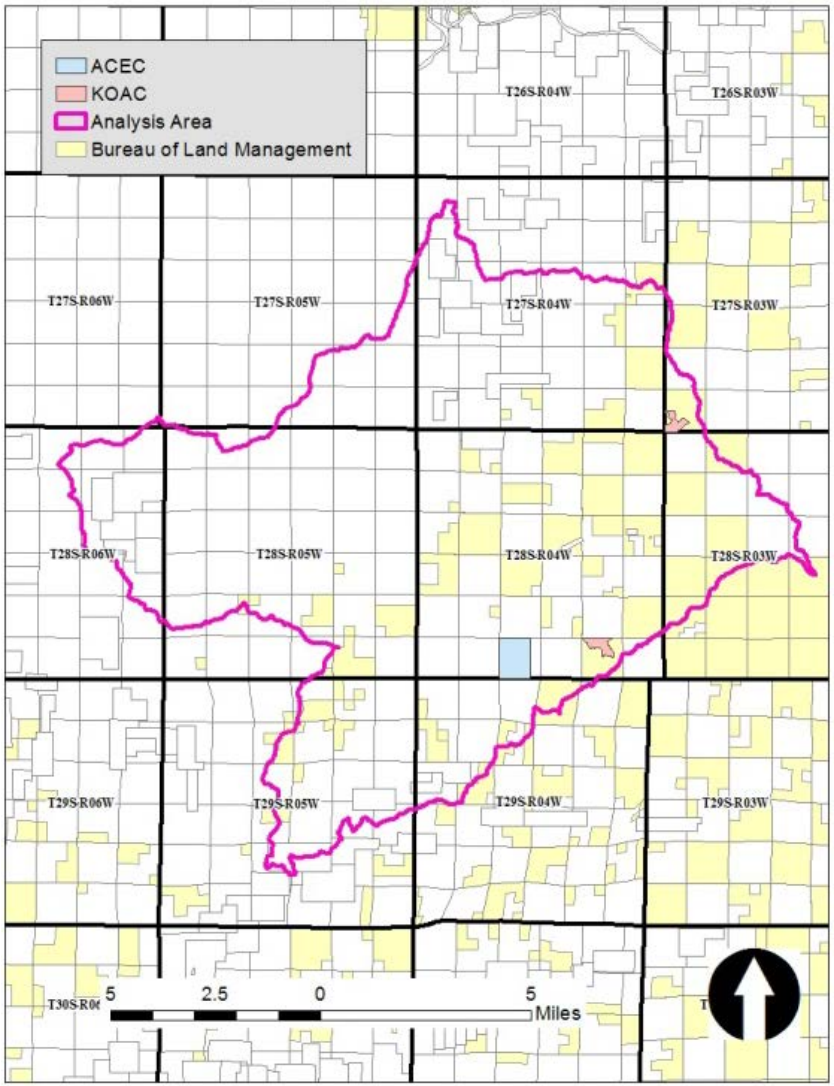


**Figure10 (A-B): Allocated reserves and other areas that will be managed to maintain and/or develop late-successional forests.**

**A. Allocated Reserves – ACEC and Known Owl Activity Centers**




**B. Riparian Reserves**