Roseburg Secretarial Demonstration Pilot Project Environmental Assessment

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Roseburg District Office
South River Field Office
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Roseburg District Office
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Roseburg, Oregon 97471

This environmental assessment analyzes variable retention harvest in the context of ecological restoration as proposed and developed by Drs. K. Norman Johnson and Jerry Franklin. The 1995 Roseburg Record of Decision and Resource Management Plan (ROD/RMP), as amended prior to December 30, 2008, provides general management direction and a framework for project design.

The BLM is providing a 30-day period for public review and comment on the documents, and will accept comments until the close of business (4:30 PM, PDT) on May 3, 2012.

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 www.blm.gov/or/districts/roseburg, 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 as internet use reduces paper consumption and administrative costs associated with copying and mailing.

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Chapter One
Purpose and Need for Action

This chapter provides a description of the purpose and need for the proposed action.

I. Introduction

In December 2010, the Secretary of the Interior directed Bureau of Land Management (BLM) Districts in southwest Oregon to develop Demonstration Pilot Projects for the purpose of illustrating the principles of ecological restoration developed by Drs. Jerry F. Franklin and K. Norman Johnson (Applying Restoration Principles on the BLM O&C Forests in Southwest Oregon 2010). Part of the intent of the Secretary's designation of these projects was to help inform long-term planning for management of the BLM Oregon and California Railroad (O&C) lands.

The Roseburg Secretarial Demonstration Pilot Project (Roseburg Pilot) would be implemented in an interior moist forest setting. Drs. Franklin and Johnson state, "Restoration of moist forests. . . is intended to accelerate the development of older complex forest and provide a modest amount of early successional communities and timber harvest" (Johnson and Franklin 2009).

Drs. Franklin and Johnson broadly define "restoration" to encompass activities designed to restore forests and landscapes to conditions more resistant and resilient to disturbances, and provide the diversity needed to restore and maintain native biodiversity and essential ecosystem functions. Restoration of ecosystems at the stand and landscape scale are a primary focus, rather than singular goals, such as fuel reduction and wildfire abatement, timber production, or wildlife habitat.

The Secretary of the Interior and the Oregon Congressional Delegation have expressed a need to move forward with ecosystem restoration and economic recovery in southwest Oregon. As such, the Roseburg Pilot is intended to illustrate various principles and tools of restoration to aid in gauging whether or not broader social support for active forest management can be achieved.

II. Purpose (Objectives)

Management of the O&C lands is governed by statutes that include the O&C Lands Act, Federal Land Policy and Management Act, Endangered Species Act, and Clean Water Act. The O&C Lands Act requires the Secretary of the Interior to manage the O&C lands for permanent forest production in accordance with the principles of sustained yield (ROD/RMP, p. 15).

The Roseburg Pilot is intended to demonstrate several things. Reasonable action alternatives must be consistent with Secretarial direction as well as objectives set forth in the Roseburg District *Record of Decision and Resource Management Plan* (ROD/RMP (USDI, BLM 1995)) for implementation of projects within the planning area.

The first objective is to demonstrate a variable retention harvesting model designed to create complex, early-successional habitat that will function for up to 30 years and: support birds that depend on flowering and fruiting plants, provide forage for ungulates (deer and elk), provide habitat for cavity-nesting birds, provide forage for a variety of moths and butterflies, and provide forage and habitat for small mammals (wood rats, deer mice, brush hares, etc.) that may provide greater prey abundance for the northern spotted owl.

The second objective is to design the sale with participation of the U.S. Fish and Wildlife for the purpose of applying Recovery Actions from the Northern Spotted Owl Recovery Plan.

The third objective is to design and offer timber sales that will provide jobs and contribute timber for manufacturing. Specific ROD/RMP management direction provides for:

- Conducting timber harvest and other silvicultural activities in that portion of the Matrix with suitable forest lands (ROD/RMP, p. 33).
- Planning and designing forest management activities to produce a sustained yield of products to support local and regional economic activity. A diversity of forest products (timber and non-timber) will be offered to support large and small commercial operations and provide for personal use (ROD/RMP, p. 55).
- Providing timber sale volume toward the Roseburg District Allowable Sale Quantity of 7.0 million cubic feet (45 million board feet (ROD/RMP, p. 60)).

III. Need

In the Myrtle Creek 5th-field watershed the BLM administers approximately 26,730 acres of forested land in the Matrix (General Forest Management Area and Connectivity/Diversity Blocks) and Riparian Reserve land use allocations. There has been no regeneration harvest in the watershed for over a decade. There are only 393 acres harvested under the standards and guidelines of the Northwest Forest Plan that would be considered complex early-successional habitat, accounting for slightly more than one percent of the forest land base administered by the BLM. No regeneration harvest has occurred in the Little River and Middle South Umpqua River-Dumont Creek 5th-field watersheds in over a decade. On BLM-administered lands there are no stands in the 10-year age-class in the Little River 5th-field watershed and only four percent in the Middle South Umpqua River-Dumont Creek 5th-field watershed.

The need for early successional habitat is addressed in the following management objectives.

- Enhance and maintain biological diversity and ecosystem health to contribute to healthy wildlife populations (ROD/RMP, p. 37).
- Manage forests so that over time landscapes trend toward a forest composed of stands containing a variety of structures, trees of varying age and size, and an assortment of canopy configurations (ROD/RMP, p. 150).
- Manage lands within the Connectivity/Diversity Block land use allocation on a 150-year area control rotation so that over time up to 15 to 16 age-classes are represented (ROD/RMP, p. 153).
- Maintain site productivity and wildlife values through the retention of structure and the design of practices required to maintain ecosystem processes throughout the management cycle (ROD/RMP, p. 150).

Populations of the northern spotted owl are in decline across the species' range. There is a need to incorporate Recovery Actions into the design and implementation of timber management activities consistent with the following management objectives (ROD/RMP, p. 41).

- Protect, manage, and conserve Federal listed species and proposed species and their habitats to achieve their recovery in accordance with the Endangered Species Act, approved recovery plans, and bureau special status species policies.
- Maintain or restore community structure, species composition, and ecological processes of special status plant and animal habitat.

Through statute and land use planning decisions, there is a need for forest lands administered by the Roseburg District BLM to provide a predictable and sustainable supply of timber that can be efficiently and economically harvested. Most timber sales offered by the Roseburg District BLM are purchased by small, independent logging contractors or locally-operated mills dependent on Federal timber for a substantial proportion of their raw material needs because they do not own forest lands of their own.

Logging and forest products manufacturing also support ancillary industries such as equipment manufacture, sales, and supply; road construction, and transportation, which in turn support additional jobs that provide wages spent on goods and services in local communities.

Revenues from timber sales help support local county governments and social services, and return monies to the U.S. Treasury that defrays, in part, the cost of management of the Federal lands. Taxes on wages and earnings provide further revenues for the operations of local, state and Federal governments.

IV. Decision Factors

Factors to be considered in alternative development and selection will include:

- The manner in which the described objectives would be achieved, including harvest prescription, yarding methods, seasons of operation, site preparation, and means of access.
- The nature and intensity of environmental impacts that would result from the proposed timber harvest, and the nature and effectiveness of measures to minimize impacts to resources present.
- Compliance with ROD/RMP management direction, terms of consultation on species listed and critical habitat designated under the Endangered Species Act, BLM programs such as Special Status Species, and laws that include the Clean Water Act and O&C Act.
- How to incorporate recovery actions from the Northern Spotted Owl Recovery Plan into the project design.
- How to provide timber resources in support of local industry, and provide revenue to the Federal and County governments from the sale of those resources while reducing short and long-term costs of managing the lands in the project area.

V. Scoping

A. Internal Scoping

An interdisciplinary team was assembled at initiation of the project analysis. 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 described in this document.

The proposed action and sub-alternatives developed in this environmental assessment (EA) analyze different aspects or variations of the demonstration of restoration forestry. The reference, or comparative, analyses discussed in Chapter Two are not considered to be selectable alternatives because they do not meet the stated purpose and need for action. They are intended to provide a generalized description of the outcomes if other more traditional treatments were applied.

B. External Scoping

A presentation was made by Drs. Johnson and Franklin at Seven Feathers Convention Center, in Canyonville, Oregon on February 16 and 17, 2011 to introduce the public to their principles of ecological restoration. This was followed by a series of public meetings at the Roseburg District BLM Office and field visits to the stands selected for potential treatment.

Notice of initiation of the project analysis was published in the Roseburg District Quarterly Planning Update (Spring 2011) on March 29, 2011 informing the general public of the nature of the proposed action. Letters were sent to landowners with property adjacent to BLM-administered lands where variable retention 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 harvest units. Recipients were encouraged to share any concerns or special knowledge of the project area that they may have.

Letters were also sent to the Cow Creek Band of Umpqua Indians, the Confederated Tribes of the Siletz, and the Confederated Tribes of Grand Ronde requesting identification of any special interests they might have in the lands in question.

The Roseburg District BLM provided a 30-day formal scoping period for public comment on the proposal between June 15 and July 15, 2011. Scoping comments were received from the Cow Creek Band of Umpqua Indians, Association of O&C Counties, Rocky Mountain Elk Foundation, American Forest Resources Council, Oregon Society of American Foresters, Association of Oregon Loggers, Douglas Forest Protective Association, Umpqua National Forest, Pacific Rivers Council, Cascadia Wildlands and Klamath Siskiyou Wildlands Center, Oregon Wild, Myrtle Creek Rural Community Partnership, and other individual members of the public. Informal discussions were also held with the Oregon Department of Fish and Wildlife.

Many comments were of a generic or philosophical nature that would not guide the development of alternatives. Numerous comments identified issues for consideration and analysis that are routinely addressed in environmental assessments for timber management activities. Other comments suggested analyses that cannot be addressed within the scope of this EA.

A smaller subset of comments was identified that might refine alternatives and project design. These are summarized in italics and addressed below.

Consider placement of aggregate retention to avoid eliminating all visual screening for deer and elk.

This would be done to the extent practical, taking into account operational constraints that could be created.

Treatments at a very minimum should include, but not be limited to, the disposal of all slash no less than 200 feet on each side of the main 29-2-32 [sic] *and 28-3-26.2 roads. These roads are of critical importance in our-multi-agency border strategies concept. Additionally, this 200 foot slash free buffer should also be utilized on all secondary roads constructed or opened to access proposed units.*

The BLM recognizes the importance of ridgetop roads as fuel breaks, as is the case with roads 29-2-32.1 and 28-3-26.2. The BLM proposes applying prescribed fire to portions of units outside of areas of aggregated retention. Creation of a minimum 200-foot buffer on either side of roads that is clear of all fuel would not be practical, however. There are areas where retention aggregates would border on roads, and post-harvest retention of large down wood distributed across the harvested areas is required by management direction.

Creating a broad fuel break, of the nature described, that is devoid of any woody material could require burning under extremely dry conditions where fire control could be difficult. Potential damage to other resources, particularly soils and aggregated retention areas, would not be acceptable.

Creating similar fuel breaks on secondary roads that are largely internal to the harvest units would not be an objective where these roads are not needed for long-term resource management and the intent is to decommission them upon completion of timber harvest, site preparation and reforestation.

I would like to see fuels breaks incorporated, when considering harvest areas.

As discussed above, the BLM is proposing to conduct prescribed burning which may be in the form of broadcast burning, or piling and burning. The primary focus would be in areas adjacent to roads to enhance their function as fuel breaks.

Please look at placing harvest areas near existing roads which could make the area a better fuel break.

As is discussed in Chapter Two (p. 10), a large pool of candidate units were eliminated from further consideration because major access issues existed. All but one of the proposed harvest units has some measure of existing access. Five of the proposed units, comprising slightly more than 70 percent of the proposed harvest acreage, are located along roads 29-2-32.1 and 28-3-26.2, which are principally located in ridge-top locations.

After harvest, our recommendation is to keep all access open and maintained. If there is a need to restrict the public access to certain areas, we would reluctantly recommend a gate be erected. A gate unfortunately would delay emergency responders, but not deny access to otherwise inaccessible areas.

Almost all of the 1.2 miles of new road construction associated with the proposed action is located within unit boundaries. Ten of the 14 proposed roads would be less than 500 feet in length and are intended to access landing sites necessary for effective and efficient unit harvest, or to move landings off of main roads to avoid traffic congestion and provide for emergency response.

None of these roads would be needed for long-term management. They would be decommissioned, which could include: sub-soiling where soil depth and structure allow, constructing waterbars, mulching with slash and planting in shrubs to restore the areas to productivity and discourage unauthorized off-highway vehicle use.

Please consider the slope and solar aspect, since north slopes tend to quickly regrow back in conifers. Maybe retaining trees in north-south strips would be better?

Slope and aspect would be considered in the location of retention aggregates and would be considered in development of the reforestation prescription. Arranging aggregates in north-south strips would not be consistent with the principle of combined aggregated and dispersed retention put forth by Drs. Franklin and Johnson and would be operationally impractical.

VI. Issues for Analysis

Through internal and external scoping, the interdisciplinary team identified the following issues for analysis. For some resources there may be no specific concerns because their protection is covered under program policy and no detailed discussion is necessary.

A. Timber Resources

- How would the alternatives meet requirements of the O&C Act for sustainable timber production from lands in the General Forest Management Area, Adaptive Management Area and Connectivity/Diversity Block allocations?
- How would the alternatives affect logging costs and timber yield?
- How would the alternatives meet the objective of maintaining the health and vigor of individual trees and forest stands?

B. Wildlife

- What would be the direct and indirect effects of the alternatives to the Federally-threatened northern spotted owl in terms of disturbance and modification of habitat?
- To what degree would the alternatives be consistent with Recovery Actions from the Northern Spotted Owl Recovery Plan and assist in recovery of the northern spotted owl?
- What would the direct and indirect effects of the alternatives be to Bureau Sensitive species?
- What would the direct and indirect effects of the alternatives be to Survey and Manage wildlife species?
- What would the direct and indirect effects of the alternatives be on landbirds and to the habitat provided by BLM-managed lands in the project area?
- What would be the direct and indirect effects on species that inhabit and utilize early-seral ecosystems?

C. Botany

- What would the direct effects of the alternatives be to Federally-listed vascular plants, and Bureau Sensitive and Survey and Manage vascular plants, lichens, bryophytes and fungi that may be present in the forested stands proposed for timber harvest?

D Fish, Aquatic Habitat and Water Resources

- What would the direct and indirect effects of the alternatives be to the Federally-threatened Oregon Coast coho salmon and other fish species that inhabit streams in proximity to proposed harvest units?
- What would the direct and indirect effects of the alternatives be to the Federally-threatened Oregon Coast coho salmon and other fish species that inhabit streams on which variable density thinning in Riparian Reserves is proposed?
- What effects would the alternatives have on the condition of aquatic habitat, including critical habitat designated for the Oregon Coast coho salmon and Essential Fish Habitat designated for Oregon Coast coho salmon and Oregon Coast Chinook salmon?
- What effects would the alternatives have on water quality, particularly 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?

E. Soils

- What would the direct effects of the alternatives be in terms of soil displacement and compaction?
- What would the indirect effects of the alternatives be in terms of increased potential for erosion and reductions in site productivity caused by soil displacement and compaction?
- What would the direct and indirect effects of the alternatives be on slope stability and risk of slope failures and landslides?
- What direct effects would application of prescribed fire have on soil productivity?

F. Fuels Management and Air Quality

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

G. Carbon Storage and Release

- What effects would the alternatives have on the release of carbon in the form of carbon dioxide (CO_2) at the project scale and in comparison to annual national and global CO_2 emissions?
- What would be the effects of the alternatives on future carbon sequestration in the forested stands that are proposed for harvest?

H. Cultural/Historical Resources

- What would the effects of the alternatives be on cultural or historical resources that may be present within proposed harvest units or road rights-of-way?

I. Recreation

- How would the alternatives affect authorized and unauthorized use of off-highway vehicles within the project area? How would unauthorized uses be discouraged?

VII. 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 (PRMP/EIS (USDI, BLM 1994). This EA will consider environmental consequences of no action and the proposed action 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.

- The *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 and USDI 1994a),
- The 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 and USDI 2000),
- The *Supplemental Environmental Impact Statement* (SEIS) *to Remove or Modify the Survey and Manage Mitigation Measures Standards and Guidelines* (USDA and USDI 2004);
- The *Final Supplement to the 2004* SEIS *to Remove or Modify the Survey and Manage Mitigation Measures Standards and Guidelines* (USDA and USDI 2007), and

- The *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 of actions proposed in this analysis would conform to management direction and management objectives from the Roseburg District 1995 ROD/RMP as amended by the following:

- The *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* (USDA and USDI 1994b), and
- The *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 and USDI 2001).

B. Applicable Laws and Regulations

Design and implementation of the proposed action would conform to applicable laws, regulations and Executive Orders which 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 . . ."
- **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, or 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.
- **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.
- **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.
- **National Historic Preservation Act, 1997 National Programmatic Agreement and 1998 Oregon State Historic Preservation Office Protocols:** Protection of resources of historic or cultural value.
- **Migratory Bird Treaty Act and Executive Order 13186:** Protection of migratory birds.

Chapter Two
Discussion of the Alternatives

This chapter describes the basic features of the alternatives being analyzed.

I. Stand Selection Process

The Myrtle Creek 5th-field watershed was selected as the site for the Roseburg Pilot to illustrate treatments in a moist interior forest. The watershed contains approximately 76,000 acres. BLM-administered lands account for roughly 31,000 acres, approximately 26,730 of which are considered forest lands.

Geographical information systems analysis and forest operational inventories were used for initial stand selection, resulting in the following acreage reductions:

- Stands in age-classes less than 50-years-old were eliminated because they were considered too young (-9,000 acres).
- Stands in age-classes 110-to-150 years-old, and those considered old-growth were eliminated because harvest was considered too controversial (-13,300 acres).
- "Dry site" forest stands (-4,100 acres).

The remaining pool of 4,600 acres was reduced to 1,500 acres by elimination of: stands with major access needs, stands within the home range of known reproducing northern spotted owl pairs, stands with a quadratic mean diameter[1] of less than ten inches, and stands with a projected volume per acre of less than 20 thousand board feet. The remaining acres were further reduced to 800 acres by elimination of isolated stands, and units where the extent of Riparian Reserves made them operationally infeasible.

Field reconnaissance and stand exams were used to further verify the suitability of the stands proposed for harvest. Delineation of units by stand type extended some proposed unit boundaries into the Little River and Middle South Umpqua River-Dumont Creek 5th-field watersheds. Additional units in these adjoining watersheds were added based on proximity, existing access and suitability for harvest given the criteria described above. Younger stands in Section 17, T. 28 S., R. 3 W., Willamette Meridian (W.M.) were selected to contrast treatments in managed plantations with those in native stands.

II. Alternative One - No Action

This alternative describes a baseline against which the effects of proposed action alternatives can be compared. It discusses the consequences of not taking any action and assumes that current resource trends will continue into the future. Under this alternative, no timber harvest would occur. There would be no application of prescribed fire to reduce activity fuels or prepare the sites for reforestation. Naturally occurring forest fuels would continue to increase through time unless subject to wildfire or future management actions.

[1] Quadratic mean diameter corresponds to the mean basal area of a stand. Basal area is the cross sectional area of a single stem, including the bark, measured at breast height (4.5 feet above the ground) Society of American Foresters. 1998.

There would be no road construction to provide access for yarding and timber hauling. Road renovation and/or improvements designed to reduce erosion, correct drainage deficiencies, improve water quality, and provide for user safety would not be undertaken. Roads would be maintained as needed to provide resource protection, accommodate reciprocal rights-of-way users, and protect the government's infrastructure investments.

Selection of the No-Action Alternative would not constitute a decision to reallocate these lands to non-commodity uses. The decision maker does not need to make a specific decision to select the "No-Action" Alternative. If that is the choice, the proposed action would simply 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.

III. Alternative Two – The Proposed Action

See *Appendix B – Silvicultural Terminology* for a glossary of definitions and seral stage descriptions.

A. Sub-Alternative A

Variable retention harvest would be applied to approximately 349 acres of upland stands. No treatments would occur in Riparian Reserves. Table 2-1 identifies approximate unit acres, harvest acres, acres in Riparian Reserves, and aggregate retention acres for each of the proposed harvest units. Section 17, T. 28 S., R. 3 W., W.M. is allocated as Connectivity/Diversity Block. Sections 23 and 25, T. 28 S., R. 3 W., W.M.; Sections 31 and 32, T. 28 S., R. 2, W., W.M.; and Section 4, T. 29 S, R. 2 W., W.M. are a mixture of General Forest Management and Adaptive Management Areas.

Table 2-1. Alternative Two General Unit Description*

Unit	Total Unit Acres	Harvest Acres	Untreated Riparian Reserve Acres		Treated Riparian reserve Acres		Aggregate Retention Acres
			Two A	Two B	Two A	Two B	
28-2-31A	26	22	0	0	0	0	4
28-2-31B	15	13	0	0	0	0	2
28-2-32A	71	52	13	13	0	0	6
28-2-32B	45	14	29		0	0	2
28-2-32C	9	7	0	29	0	0	2
28-2-32D	18	15	0	0	0	0	3
28-3-17A	24	14	9	4	0	5	1
28-3-17B	43	29	11	4	0	7	3
28-3-17C	41	23	13	4	0	9	5
28-3-23A	8	3	0	0	0	0	5
28-3-25A	138	93	14	14	0	0	31
Total	**438**	**285**	**89**	**68**	**0**	**21**	**64**

*Acres are approximates, subject to field refinement.

1. Marking Prescription

Riparian Reserves

Riparian Reserves in the Myrtle Creek, Middle South Umpqua River-Dumont Creek and Little River watersheds would be established based on a site-potential tree height calculated from the average site index of inventory plots throughout each of the individual watersheds that are located on lands capable of supporting commercial timber stands. The calculated site-potential tree heights for the three watersheds are 160 feet, 180 feet, and 180 feet, respectively.

On intermittent and perennial non-fish-bearing streams, Riparian Reserves 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 width would be two site-potential tree heights in width, slope distance, measured from the top of the stream bank. On wetlands greater than one-acre in size, Riparian Reserves and would be one site-potential tree height in width measured from the outer edge of riparian vegetation, or the extent of seasonally saturated soils. (ROD/RMP, p. 24)

Timber in adjacent upland stands would be felled away from Riparian Reserves to protect and maintain their physical integrity. No yarding or equipment operation would be allowed within them, although yarding may be allowed through them, subject to authorization by the contract administrator. Measures would be implemented to protect the tailhold trees in Riparian Reserves from serious damage by requiring the use of straps, plates or cribbing. If cutting was necessary, the trees would be left on site to supplement existing large wood for potential instream recruitment.

Aggregated and Dispersed Retention

Units would be designed to retain a minimum of 20 percent of the pre-harvest stand basal area through a combination of aggregates and dispersed retention trees. The majority of the retention would be in the form of aggregates one-quarter of an acre or larger in area, 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-quarter of an acre in area.

Candidate areas for aggregates would include:

- Representative patches of the pre-harvest forest stand;
- Structurally complex forest;
- Concentrations of trees that are older and larger than the prevailing stand conditions;
- Trees with uncommon characteristics (e.g., deformed boles, cavities, etc.);
- Concentrations of large down wood;
- Concentrations of snags;
- Special habitats such as seeps, rocky outcrops, and areas of high species diversity;
- Riparian Reserves; and
- Patches dominated by hardwood trees.

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 within the harvested area. As with aggregates, operational considerations would affect placement of dispersed retention.

Green tree retention required by the ROD/RMP, as described below, would be met at individual unit scale by summing qualifying trees in aggregate and dispersed retention.

In the General Forest Management Area, six to eight green conifers per acre would be reserved, averaged over entire unit acreage, consisting of individual trees, small clumps or stringers. Selection of trees would reflect the existing conifer species composition of the stands and full range of diameter classes greater than 20 inches diameter breast height (ROD/RMP, p. 64). Entries into younger stands would reserve the largest six to eight trees per acre (ROD/RMP, p. 151). Green tree retention in the Adaptive Management Area would mirror application in the General Forest Management Area.

In the Connectivity/Diversity Block land use allocation, an average of 12 to 18 green conifers per acre would be reserved, averaged over the entire unit and subject to the size and species criteria already noted, and distributed as individual trees, clumps and stringers to contribute to stand diversity (ROD/RMP p. 65). Entries into younger stands would reserve the largest 12 to 18 trees per acre (ROD/RMP, p. 153). Additionally, a minimum of two large hardwood trees per acre would be reserved where available.

In the Adaptive Management Area, the intent is that these measures would also be met (ROD/RMP. P. 154).

Snags and Large Down Wood

Snags 20 inches or greater in at diameter breast height would be reserved where operationally practicable and not a safety concern, to contribute toward achieving the analytical assumption of providing an average of at least 1.2 snags per acre (PRMP/EIS, Chapter 4-43) to support cavity nesting birds at 40 percent of potential population levels (ROD/RMP, pp. 34-35). This may include 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. Additional snags could be created by mechanical treatment where post-harvest assessment indicates a deficit in the desired numbers of snags.

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, or purposely felling retention trees, is allowance for logs 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.

2. Yarding Methods

Operation of ground-based yarding equipment would generally be restricted to slopes less than 35 percent on pre-designated skid trails, using any existing trails to the greatest degree practicable (ROD/RMP p. 131). Exceptions are allowed for small inclusions of steeper slopes or connecting trails to isolated ground-based harvest areas (USDI, BLM 2002b p. 70). Where necessary, skid trails would be sub-soiled where soil depth and structure allows.

Cable yarding systems would have the capacity to maintain a minimum one-end log suspension to minimize surface and soil disturbance where deemed necessary. Contract provisions may specify the type of equipment, such as logging carriage, to be used. In Unit 28-3-17A, whole tree yarding with limbs and tops attached would be authorized as a means of reducing activity fuels, in lieu of broadcast burning, given the smaller tree sizes and the prevalence of Category 1 soils which are highly sensitive to the effects of broadcast burning. No restrictions on log length would be imposed on other units, save that the logs would be topped and limbed prior to yarding.

Cable yarding frequently requires the use of trees outside of harvest unit boundaries for tailholds and guyline anchors. 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. Protection measures could include the use of tree plates, straps or cribbing.

Guyline trees are selected based on the appropriate placement of guylines to distribute haulback forces evenly in order to avoid snapping a guyline or toppling the yarder. Trees used as guyline anchors are generally cut because they are located in the guyline radius of cable yarding equipment, and if pulled over could strike equipment and personnel.

3. Access

Primary access would be provided by roads under the control of the BLM, the Umpqua National Forest, and Douglas County supplemented by the following:

- Construction of 14 spur roads with a combined length of 1.2 miles,
- Drainage upgrades on Douglas County Road 15,
- Improvements to 0.16 miles of existing system and non-system[2] roads, and
- Maintenance/renovation to 7.44 miles of existing system and non-system roads.

[2] Non-system roads are roads that were constructed in the past, but for which no records of their authorization and construction exist. These may include truck roads for previous timber harvest, tractor roads constructed for fire suppression access, and way roads and jeep roads.

Best Management Practices would be applied in road construction, road improvement, road renovation, road use, and road decommissioning. The following list is representative and not intended to be inclusive of all the Best Management Practices that would be implemented, nor applicable to all circumstances. Additional measures to address water quality issues, in the form of project design features, are addressed in the discussion of effects of the proposed action on **Aquatic Habitat, Oregon Coast Coho Salmon Critical Habitat, and Essential Fish Habitat** (pp. 114 and 118).

R 001 - Locate temporary and permanent roads and landings on stable locations, e.g., ridge tops, stable benches or flats, and gentle-to-moderate side slopes. Minimize construction on steep slopes, slide areas and high landslide hazard locations.

R 003 - Avoid locating roads and landings in wetlands, riparian management areas, floodplains and waters of the state. Avoid locating landings in areas that can contribute runoff to dry draws and swales.

R 007 - Design roads to the minimum width needed for the intended use as referenced in BLM Manual 9113.

R 008 - End-haul material excavated during construction, renovation, and/or maintenance where side slopes generally exceed 60 percent, and regardless of slope where side-cast material may enter wetlands, floodplains and waters of the state.

R 023 - Effectively drain the road surface by using crowning, insloping or outsloping, grade reversals (rolling dips) and waterbars or a combination of these methods. Avoid concentrated discharge onto fill slopes unless the fill slopes are stable and erosion proofed.

R 028 - Divert road and landing runoff water away from headwalls, slide areas, high landslide hazard locations or steep erodible fill slopes.

R 029 - Design landings to disperse surface water to vegetated stable areas.

R 031 - Disconnect the road runoff to the stream channel by outsloping the road approach. If outsloping is not possible, use runoff control, erosion control and sediment containment measures. These may include using additional cross drain culverts, ditch lining, and catchment basins. Minimize ditch flow conveyance to stream through cross drain placement above stream crossing.

R 032 - Locate cross drains to prevent or minimize runoff and sediment conveyance to wetlands, riparian management areas, floodplains and waters of the state. Implement sediment reduction techniques such as settling basins, brush filters, sediment fences and check dams to prevent or minimize sediment conveyance.

R 037 - Discharge cross drain culverts at ground level on non-erodible material. Install downspout structures and/or energy dissipaters at cross drain outlets or drivable dips where water is discharged onto loose material, erodible soils, fills, or steep slopes.

R 061 - Limit road and landing construction, reconstruction, or renovation activities to the dry season. Keep erosion control measures concurrent with ground disturbance to allow immediate stormproofing.

R 082 - Inspect closed roads to ensure that vegetational stabilization measures are operating as planned, drainage structures are operational, and noxious weeds are not providing erosion control. Conduct vegetation treatments and drainage structure maintenance as needed.

R 092 - Implement decompaction measures, including ripping or sub-soiling to an effective depth. Treat compacted areas including the roadbed, landings, construction areas, and spoils sites.

R 094 - On active haul roads, during the wet season, use durable rock surfacing and sufficient surface depth to resist rutting or development of sediment on road surfaces that drain directly to wetlands, floodplains and waters of the state.

R-095 – Prior to winter hauling activities, implement structural road treatments such as: increasing the frequency of cross drains, installing sediment barriers or catch basins, applying gravel lifts or asphalt road surfacing at stream crossing approaches, and cleaning and armoring ditchlines.

R 096 - Suspend commercial use where the road surface is deeply rutted or covered by a layer of mud or when runoff from the road surface is causing a visible increase in stream turbidity in the receiving stream.

Table 2-2 describes access needs by unit, including: construction, renovation, et cetera; current and proposed surfacing; road segment length; and disposition following completion of harvest operations, fuels treatments/site preparation and planting. Where it is necessary to carry over a temporary road into the following year to accomplish these activities, the road would be winterized by waterbarring, blocking and mulching.

When all management activities requiring the use of temporary roads have been completed and the roads are ready for final decommissioning, the following would apply.

Decommissioning of unsurfaced temporary roads would include sub-soiling road beds where soil depth and structure allows, constructing waterbars, mulching with slash and planting native non-conifer trees and shrubs to reestablish vegetation and discourage unauthorized off-highway vehicle use.

On inventoried, system roads proposed for renovation or improvements where the intent is to leave the road surfaces in a native (unsurfaced) state, decommissioning would take the form of waterbarring, covering with slash, and blocking to traffic.

For roads and spurs that are to be surfaced with aggregate and retained for future management entries, decommissioning would entail waterbarring, covering with slash, and blocking to traffic.

Table 2-2. Alternative Two Proposed Road Construction, Improvements, Maintenance/Renovation, and Disposition on Project Completion

Road/Spur Number	Unit Accessed	Road Work	Current Surfacing	Proposed Surfacing	Length (Miles)	Acres cleared	Disposition
BR1	28-3-17A	Construct	None	Rock	0.04	0.2	Decommission
BR2*	28-3-17B	Construct	None	Native	0.05	0.2	Decommission
BR4	28-3-17C	Construct	None	Rock	0.09	0.4	Decommission
WC2	28-3-25A	Construct	None	Native	0.199	0.9	Decommission
WC2A	28-3-25A	Construct	None	Native	0.06	0.3	Decommission
WC3	28-3-25A	Construct	None	Native	0.10	0.6	Decommission
WC4A	28-3-25A	Construct	None	Native	0.04	0.3	Decommission
WC7	28-3-23A	Construct	None	Native	0.06	0.3	Decommission
WC9	28-2-32A	Construct	None	Rock	0.16	0.8	Decommission
WC11	28-2-32B	Construct	None	Rock	0.04	0.3	Decommission
WC12	28-2-32D	Construct	None	Rock	0.30	1.4	Decommission
WC13	28-2-31A	Construct	None	Rock	0.02	0.1	Decommission
WC14	28-2-31B	Construct	None	Rock	0.02	0.1	Decommission
WC15	28-2-31B	Construct	None	Rock	0.03	0.2	Decommission
29-2-4.2	28-2-32A	Improve	Native	Rock	0.08	0.4	Decommission
BR3	28-3-17C	Improve	Native	Rock	0.04	0.2	Decommission
WC8	28-2-32A	Improve	Native	Rock	0.04	0.2	Decommission
USFS Rd. 2810000	28-2-32A	Renovation/Maintenance	Rock	Rock	0.59	NA	Retain
28-2-32.1	multiple	Renovation/Maintenance	Rock	Rock	1.70	NA	Retain
28-2-32.2	28-2-32B	Renovation/Maintenance	Rock	Rock	0.22	NA	Retain
28-3-8.1	28-3-17C	Renovation/Maintenance	Rock	Rock	0.30	NA	Retain
28-3-17	multiple	Renovation/Maintenance	Rock	Rock	0.10	NA	Retain
28-3-26	multiple	Renovation/Maintenance	Rock	Rock	0.33	NA	Retain
28-3-26.2	28-3-25A	Renovation/Maintenance	Rock	Rock	1.28	NA	Retain
28-3-35	multiple	Renovation/Maintenance	Paved	Paved	0.03	NA	Retain
29-2-4.9	28-2-32A	Renovation/Maintenance	Rock	Rock	0.30	NA	Retain
29-3-11.1	multiple	Renovation/Maintenance	Rock	Rock	1.44	NA	Retain
County Hwy15	28-3-17C	Renovation/Maintenance	Rock	Rock	0.32	NA	Retain
WC1	28-3-25A	Renovation/Maintenance	Native	Native	0.20	1.0	Decommission
WC4	28-3-25A	Renovation/Maintenance	Native	Native	0.04	0.2	Decommission
WC5	28-3-25A	Renovation/Maintenance	Native	Native	0.14	0.7	Decommission
WC6	28-3-23A	Renovation/Maintenance	Rock	Rock	0.21	NA	Retain
WC10	28-2-32A	Renovation/Maintenance	Native	Native	0.23	1.1	Decommission

*Optional construction at purchaser's discretion and expense

4. Seasonal Restrictions

The proposed action is subject to the following seasonal restrictions that are derived from Best Management Practices or terms of consultation under the Endangered Species Act. Unit-specific applicability and requirements would be identified in the Decision Document(s) at such time as a decision was made to go forward with the project.

a) Road construction, renovation, improvements and maintenance activities would be restricted to the dry season, typically between May 15 and October 15, both dates inclusive. The operating season may be extended in the event of dry spring conditions or a delay in the onset of autumn rains, subject to the issuance of a provisional waiver.

b) Yarding to and hauling over unsurfaced roads is restricted to the dry season, as described above.

c) Operations within applicable disruption threshold distances of known northern spotted owl sites, estimated sites or unsurveyed suitable habitat would be prohibited from March 1 to July 15, both dates inclusive. If two years of protocol surveys do not detect owl presence or activity, restrictions may be waived until March 1 of the following year subject to spot checks prior to or concurrent with operations.

d) Removal of suitable nesting, roosting and foraging habitat within one-quarter mile of known northern spotted owl sites, estimated sites, or unsurveyed suitable habitat would be prohibited from March 1 to September 30, both dates inclusive. If two years of protocol surveys do not detect owl presence or activity, restrictions may be waived until March 1 of the following year subject to spot checks prior to or concurrent with operations.

e) Broadcast burning within one-quarter mile of known northern spotted owl sites, estimated sites, or unsurveyed suitable habitat would be prohibited from March 1 to July 15, both dates inclusive. If two years of protocol surveys do not detect owl presence or activity, restrictions may be waived until March 1 of the following year subject to spot checks prior to or concurrent with operations.

f) With respect to the three preceding seasonal restrictions, if two years of protocol surveys have been completed, spot checks are not required if the following four conditions have been met:
   - No territorial northern spotted owls are detected during protocol survey visits,
   - No northern spotted owl activity centers are known to occur in the survey area,
   - No barred owls are detected in the survey area during protocol surveys or are otherwise known to occur in the survey area, and
   - All northern spotted owl habitat in the survey area has been completely covered during protocol surveys (i.e. no habitat omitted due to inaccessibility, landowner restrictions, incomplete survey, or other constraints.)

If any of the preceding conditions are not met, then spot checks are necessary in order to grant early waiver of seasonal restrictions.

Projects may be initiated during the breeding season, concurrent with spot checks, if:

- No territorial northern spotted owls are detected during protocol surveys, and there are no known northern spotted owl sites in the survey area, but barred owls are known to occur in the survey area, or
- No territorial northern spotted owls are detected during protocol surveys, but known northern spotted owl sites do occur in the survey area.

Spot checks would be required prior to initiation of operations occurring after February 1, if:

- No territorial northern spotted owls are detected during protocol surveys, no known northern spotted owl sites are known to occur within the survey area, but portions of northern spotted owl habitat within the survey area were unsurveyed during protocol surveys due to inaccessibility, landowner restrictions, incomplete survey, or other constraints,
- If territorial northern spotted owls are detected during protocol surveys.

5. Activity Fuels Reduction, Site Preparation and Reforestation/Revegetation

Activity Fuels Reduction and Site Preparation

Prescribed fire would be applied to all of the harvest units except for Unit 28-3-17A where the high proportion of Category 1 soils, consisting of both steep slopes and high proportion of granitic parent material, would pose a high risk for soil damage and loss of site productivity. Consequently, no restrictions would be placed on log lengths and whole tree yarding would be allowed.

Objectives of prescribed burning would be to reduce activity fuels created by timber harvest, emulate effects of natural disturbance to attain and enhance ecological processes and functions associated with normal and periodic return of wildfire, create additional snags, and prepare units for replanting.

Perimeter control lines would be provided by roads, and hand-constructed fire trails generally three to five feet in width. Fire trails would not be constructed at the perimeter of Riparian Reserves. Retention aggregates would be fire-trailed where the objective is to exclude fire to preserve current structural character and components, or protect other resource values. Fuels would be pulled back from fire control lines where necessary to improve the safety of the control lines.

Landings would be burned in the first wet season (late-autumn or early-winter) following completion of harvest. With the exception of Unit 28-3-17A, noted above, units would be broadcast burned using hand ignition methods in order to control the rate of fire spread, and selectively burn some areas while excluding others.

On units bounded by through-roads, activity fuels approximately 3-6 inches in diameter and within 100 feet of the road would be hand piled and burned at the same time as the landings. On the remaining roads, activity fuels less than 3 inches in diameter located within 50 feet of the roads would be hand piled and burned.

For Units 28-3-17B and C, and Unit 28-2-32B under-burning would be conducted within the Riparian Reserves to enhance biological diversity. Hand ignition would be conducted to the outer boundaries of the "no-treatment" areas, described below (p. 22) and allowing fire to back downslope. In all other cases, under-burning would be conducted with ignition to the outer boundaries of the Riparian Reserves and allowed to back downslope.

The seasonality of burning would be influenced by a number of factors. Historically, fires are ignited by lightning in July and August. As this is during the normal fire season, it would be unlikely that clearance to burn could be obtained, or that resource objectives could be met in a controlled manner. A potential for fall burning may exist after measurable precipitation, with results closely resembling a summer burn, but large fuels would be at their driest, and consumption of a higher percentage of large wood would be expected. For these reasons, fall burning opportunities would be limited.

Occasionally, weather conditions provide a suitable window for winter burning, but given the elevation of the project area the absence of snow would be highly unlikely.

Spring burning, typically between April and July, is more manageable in that there are more opportunities to burn based on weather conditions, fire behavior is more likely to achieve the majority of resource objectives, there is a decreased risk of unintended mortality in dispersed retention trees, and less risk for escapement from the burn unit. Fuel moistures would be such that there is little likelihood for erratic fire behavior, fuels less than three inches in diameter are largely consumed, and large fuels have sufficient moisture content to minimize consumption.

In the event that the necessary windows for broadcast burning did not materialize, there would still be a need to treat the logging residues to decrease fire risk and facilitate planting. In areas of ground-based harvest, an excavator would be used to pile slash up to six inches in diameter for burning. In other instances, slash up to six inches in diameter would be hand-piled and burned within 100 feet of through-roads and within 50 feet of secondary roads.

Reforestation and Stand Maintenance

Reforestation would utilize both artificial (planting) and natural regeneration. Planting would use a mixture of species at a variable density of approximately 150 to 200 trees per acre would meet minimal BLM reforestation goals (ROD/RMP, p. 63) while allowing for an extended period of early-seral forest condition. It is expected that some amount of 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. Table 2-3 describes the proposed species composition for planting.

Treatments to maintain survival and long-term dominance of tree species including mulching to reduce competition from grasses on drier south and west aspects, protection from herbivory (browsing), and limited conifer release from competing shrubs and hardwoods. Treatments and timing would be determined from follow-up evaluation exams conducted over the first 15 years following harvest.

Table 2-3. Recommended Species Composition Percentage for Planting

Unit	Land Use Allocation	Tree per Acre	DF	WRC	IC	SP	WWP
28-3-17A	Connectivity/Diversity Block	200	70	20	0	10	0
28-3-17B	Connectivity/Diversity Block	200	70	20	0	10	0
28-3-17C	Connectivity/Diversity Block	200	70	0	15	15	0
28-2-31A	Adaptive Management Area	150	50	0	10	20	20
28-2-31B	General Forest Management Area	200	50	0	10	20	20
28-2-32A (north slopes)	General Forest Management Area	200	50	50	0	0	0
28-2-32A (south slopes)	Connectivity/Diversity Block	150	50	10	10	15	15
28-2-32 B	General Forest Management Area	200	70	0	10	10	10
28-2-32C	General Forest Management Area	200	70	0	0	15	15
28-2-32D	Adaptive Management Area	150	70	0	0	15	15
28-3-23A	Adaptive Management Area	150	80	20	0	0	0
28-3-25A (north portion)	Adaptive Management Area	150	70	15	0	8	7
28-3-25A (south portion)	General Forest Management Area	200	60	0	15	12	13

(Douglas-fir/DF, western redcedar/WRC, incense-cedar/IC, sugar pine/SP, and western white pine/WWP).

Stand density would be monitored and density control treatments applied as needed to promote an extended period of early-seral condition. Stand density targets at age ten to 20 years are approximately 150 to 250 trees per acre (200±25%), based on the specific land use allocation (ROD/RMP, p. 64).

Non-coniferous Revegetation

Following sub-soiling of temporary natural surface roads, where soil depth and character allow, the road beds would be seeded and planted with native grasses, forbs, and deciduous shrubs appropriate to site conditions.

Some native forbs such as wild strawberry (*Fragaria virginiana*), black raspberry (*Rubus leucodermis*), Oregon bedstraw (*Gallium oreganum*), wild ginger (*Asarum caudatum*), twinflower (*Linnaea borealis*), and kinnikinnik (*Arctostaphylos uva-ursa*) are expected to re-colonize the road beds in a timely manner and would not be the focus of the treatments.

Supplemental seeding or planting of native vegetation, subject to availability, would include: grasses such as Romer's fescue (*Festuca roemeri*), western fescue (*Festuca occidentalis*) and Columbian brome (*Bromus vulgaris*); forbs such as false Solomon's seal (*Smilacina racemosa*), harebell (*Campanula scouleri*), inside-out flower (*Vancouveria hexandra*), and queen's cup (*Clintonia uniflora*); and deciduous shrubs such as red huckleberry (*Vaccinium parvifolium*), red and blue elderberry (*Sambucus racemosa* and *S. cerulean*), and wild rose (*Rosa gymnocarpa*).

Opportunistic native planting(s) could occur within units after harvest and post-management activities have taken place to re-establish representative non-conifer species. Examples could include: red-osier dogwood (*Cornus stolonifera*), Pacific dogwood (*Cornus nuttallii*), and chokecherry (*Prunus virginiana*).

6. Noxious Weeds and Invasive Non-Native Plants

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.

B. Sub-Alternative B

Under this sub-alternative, 349 acres of variable retention harvest would be applied consistent with the prescription described for Sub-Alternative A.

Approximately 21 acres of variable density thinning would also be conducted in Riparian Reserves in Units 28-3-17A (5 acres), 28-3-17B (7 acres), and 28-3-17C (9 acres) where the treatments would accelerate or enhance achievement of Aquatic Conservation Strategy objectives, and increase habitat diversity for associated terrestrial species. Variable density thinning would be limited to areas outside of streamside "no-treatment" areas, described below.

1. Marking Prescription

Riparian Reserves

Riparian Reserve widths described for Sub-Alternative A would apply. Within the Riparian Reserves selected for variable density thinning "no-treatment" areas would be established based upon the nature of individual streams. At a minimum, these "no-treatment" areas, measured from the top of the stream bank, would be 35-feet in width, slope distance, on intermittent and perennial non-fish-bearing streams and 60-feet in width, slope distance, on all other streams.

The "no-treatment" areas would be extended outward to enclose areas with unique geologic and hydrologic features or concerns, and to maintain unique structural and species diversity in the existing streamside forest.

Aggregated and Dispersed Retention

In the upland portions of the proposed harvest units aggregated and dispersed retention would be designated in the same manner as described for Sub-Alternative A.

Snags and Large Woody Debris

In upland portions of the stands, snags and large down woody debris would be provided for in the same manner described in Sub-Alternative A.

There are no requirements for snag and large down wood creation associated with variable density thinning but measures would be implemented in the marking prescription, described below (p. 24), which would be expected to supplement existing large down wood.

Variable Density Marking Prescription

A moderate variable density thinning prescription to a relative density of 25 to 30would be applied outside of the "no-treatment" areas within the Riparian Reserves based on a combination of basal area and number of trees per acre to encourage development of structural and species diversity. Target relative density (RD)[3] would range from 25 to 30 based on individual stand conditions. A minimum stand average canopy cover[4] of 50 percent would be retained outside of the "no treatment" areas to maintain effective stream shading.

Canopy gaps and skips would be employed, with the placement of skips focused on structural and habitat components such as snags, patches of hardwood trees, and deposits of down wood. Trees selected for retention would generally have a live crown ratio of at least 30 percent in order to increase the likelihood of release and increased growth after density management (Daniel, *et al.* 1979). As a means of promoting greater structural diversity, selection of trees for retention may include trees with broken or deformed boles and crowns.

Conifers such as western hemlock, western redcedar, incense-cedar, and pines would be retained in numbers reflecting historic percentages of stand composition, whenever possible. Hardwood trees greater than ten (10) inches diameter breast height would be prioritized for retention where present and considered likely to survive thinning operations.

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[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] 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).

2. Yarding Methods

Harvest operations in the upland portions of the stands would be conducted using ground-based equipment and skyline cable systems as described for Sub-Alternative A.

Variable density thinning in Riparian Reserves would utilize skyline cable yarding systems capable of maintaining a minimum of one-end log suspension, and a lateral yarding capacity of at least 100-feet to minimize the number of yarding corridors required and the overall area subject to soil disturbance and displacement.

Waterbars would be constructed in the yarding corridors if deemed necessary by the contract administrator in coordination with the soil scientist, to prevent erosion and channeling of runoff to streams.

Trees and snags felled in Riparian Reserves to clear yarding roads or provide for operational safety would be left on site to provide coarse wood for potential instream recruitment.

3. Access

Access needs and post-harvest disposition of temporary and/or unsurfaced system roads would be identical to those described under Sub-Alternative A. Previously described best management practices would apply to all road construction, renovation/maintenance, improvement, use, and decommissioning.

4. Seasonal Restrictions

Seasonal operating restrictions for timber harvest and hauling described under Sub-Alternative A would also apply to this sub-alternative.

5. Activity Fuels Reduction, Site Preparation and Reforestation/Revegetation

All facets of activity fuels reduction, site preparation, reforestation, and non-coniferous revegetation described for Sub-Alternative A would apply to this sub-alternative.

6. Noxious Weeds and Invasive Non-Native Plants

Preventative measures described under Sub-Alternative A that are designed to discourage weed introduction, establishment, or spread would also apply to this sub-alternative.

V. Reference Analysis One – Commercial Thinning and Variable Density Thinning Only

The two reference analyses discussed here and analyzed in Chapter Three are not considered selectable alternatives as they would not meet the purpose and need for the proposed action. They are intended solely for comparative purposes.

Under this reference analysis, commercial thinning and variable density thinning would only be conducted in units under the age of 80 years. Table 2-4 provides a general characterization of the units.

Table 2-4. Reference Analysis One General Unit Description

Unit	Total Unit Acres	Commercial Thinning Acres	Total Riparian Reserve Acres	Variable Density Thinning Acres in Riparian Reserve	Untreated Riparian Reserve Acres
28-3-17A	24	14	9	5	4
28-3-17B	43	31	11	7	4
28-3-17C	41	27	14	9	5
28-2-32A	29	29	0	0	0
28-2-32B	45	16	29	0	29
Total	**181**	**117**	**63**	**21**	**42**

A. Marking Prescription

Riparian Reserves

Riparian Reserve widths described under Alternative Two, Sub-Alternative A would apply, as would "no treatment" areas in Riparian Reserves described under Alternative Two, Sub-Alternative B.

Aggregated and Dispersed Retention

This reference analysis is limited to commercial thinning and variable density thinning. As it would be an intermediate entry, retention is provided by trees reserved under the marking prescription.

Snags and Large Woody Debris

There are no requirements for minimum numbers of snags, or lineal feet of large down wood at the time of intermediate entry in the General Forest Management Area and Connectivity/Diversity Block land use allocations.

Snags would be reserved, however, to the extent that they pose no operational and safety issues. It would be expected that operational damage would create additional snags.

Large down wood would be provided for by reservation of existing down wood in Decay Classes 3, 4 and 5; non-merchantable material left on site following thinning operations, and snags felled for operational and safety reasons.

Commercial Thinning and Variable Density Thinning Marking Prescriptions

Common to all of the land use allocations, thinning 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. Trees selected for retention would generally have a live crown ratio of at least 30 percent in order to increase the likelihood of release and increased growth after commercial thinning.

Older remnant trees that may be present are not the focus of the proposed commercial thinning and treatments and would be retained to the greatest degree practicable. Cutting of remnant trees would be limited to clearing road rights-of-way and landings, and providing for safe operations.

Conifers such as western hemlock, western redcedar and incense cedar would be retained in sufficient numbers to maintain them as stand components, reflecting historic percentages of stand composition, whenever possible. Hardwood trees that are greater than ten (10) inches diameter breast height would be retained where present and likely to survive thinning operations.

In the General Forest Management Area, units would be managed for full site occupancy to maximize future timber volume, by thinning on a generally uniform spacing to a target RD of 35 to 40. The healthiest and best-formed conifers would be retained regardless of species. Post-thinning canopy closure would range from 70 to 80 percent.

In the Connectivity/Diversity Block allocation a variable density prescription would be applied based on a combination of basal area and number of trees per acre to encourage development of structural diversity. Post-thinning, RD would be between 25 and 30 with a canopy closure of 50 to 60 percent. The healthiest, best-formed trees would be favored for retention. The marking prescription for, and conduct of variable density thinning in Riparian Reserves would be consistent with that described under Alternative Two, Sub-Alternative B.

B. Yarding Methods

Harvest would be conducted using similar equipment subject to the conditions described in Sub-Alternatives A and B of Alternative Two.

C. Access

Primary access provided by BLM, Forest Service and county roads would be supplemented by construction of five spur roads with a combined length of 0.38 miles, improvements to 0.12 miles of existing system and non-system roads, and maintenance/renovation to 3.41 miles of existing BLM, U.S. Forest Service, and Douglas County roads. Table 2-5 describes the type of access needs by unit, describing the types of road treatments (i.e. construction, renovation, et cetera; the present and proposed surfacing; length of the road segment; and disposition of the roads following the completion of harvest operations).

Previously described best management practices would apply to all road construction, renovation/maintenance, improvement, use, and decommissioning.

Road decommissioning would be completed in the same manner, using the same criteria described in Alternative Two, Sub-Alternative A.

Table 2-5. Reference Analysis One Road Construction, Improvements, Maintenance/Renovation, and Disposition on Project Completion

Road/Spur Number	Unit Accessed	Road Work	Current Surfacing	Proposed Surfacing	Length (Miles)	Acres cleared	Disposition
BR1	28-3-17A	Construct	None	Rock	0.04	0.2	Decommission
BR2*	28-3-17B	Construct	None	Native	0.05	0.2	Decommission
BR4	28-3-17C	Construct	None	Rock	0.09	0.4	Decommission
WC9	28-2-32A	Construct	None	Rock	0.16	0.8	Decommission
WC11	28-2-32B	Construct	None	Rock	0.04	0.3	Decommission
29-2-4.2	28-2-32A	Improve	Native	Rock	0.08	0.4	Decommission
BR3	28-3-17C	Improve	Native	Rock	0.04	0.2	Decommission
USFS Rd. 2810000	28-2-32A	Renovation/Maintenance	Rock	Rock	0.59	NA	Retain
28-2-32.1	28-2-32B	Renovation/Maintenance	Rock	Rock	1.70	NA	Retain
28-2-32.2	28-2-32B	Renovation/Maintenance	Rock	Rock	0.22	NA	Retain
28-3-8.1	28-3-17C	Renovation/Maintenance	Rock	Rock	0.30	NA	Retain
28-3-17	multiple	Renovation/Maintenance	Rock	Rock	0.10	NA	Retain
28-3-35	multiple	Renovation/Maintenance	Paved	Paved	0.03	NA	Retain
29-2-4.9	28-2-32A	Renovation/Maintenance	Rock	Rock	0.15	NA	Retain
County Hwy15	28-3-17C	Renovation/Maintenance	Rock	Rock	0.32	NA	Retain

*Optional construction at purchaser's discretion and expense

D. Seasonal Restrictions

Seasonal operating restrictions described under Alternative Two, Sub-Alternatives A and B would apply with the following exceptions. There would be no seasonal restrictions based upon removal of suitable nesting, roosting and foraging habitat for the northern spotted owl. No broadcast burning would be necessary for site preparation rendering a seasonal restriction on such activities moot. All thinning operations would be subject to restriction during the bark slip period from April 15 through July 15.

E. Activity Fuels Reduction

There would be no application of prescribed fire for site preparation as no reforestation would be necessary. Treatment of activity fuels would be limited to landing disposal and slash up to six inches in diameter would be hand-piled and burned within 100 feet of through-roads in Units 28-2-32 A and B, subject to a post-thinning assessment.

F. Noxious Weeds and Invasive Non-Native Plants

Preventative measures described under Alternative Two, Sub-Alternative A that are designed to discourage weed introduction, establishment, or spread would apply.

VI. Reference Analysis Two – Traditional Regeneration Harvest Consistent with the 1995 Roseburg District Record of Decision and Resource Management Plan

Under this reference analysis, regeneration harvest would be conducted in those units where stand age and land use allocation objectives are consistent with management direction. Specifically, stands in the General Forest Management Area over the age of 60 years would be available for regeneration harvest as would similarly-aged stands in the Adaptive Management Area. Stands in the Connectivity/Diversity Block land use allocation that are less than 120 years old would not be available for regeneration harvest. Table 2-6 provides a general characterization of the units.

Table 2-6. Reference Analysis Two General Unit Description

Unit	Total Unit Acres	Regeneration Harvest Acres	Total Riparian Reserve Acres	Sum of Riparian Reserve and Other Untreated Acres
28-2-31A	26	23	0	3
28-2-31B	15	15	0	0
28-2-32A	71	58	13	13
28-2-32B	45	16	29	29
28-2-32C	9	9	0	0
28-2-32D	18	18	0	1
28-3-23A	8	3	0	5
28-3-25A	138	104	14	34
Total	**330**	**242**	**56**	**88**

A. Marking Prescription

Riparian Reserves

Riparian Reserves would be established as described for Alternative Two, Sub-Alternative A (p. 12).

Aggregated and Dispersed Retention

Aggregated retention would be limited to the protection of Survey & Manage species, exclusion of areas of sensitive soils, water features such as the fens in Unit 28-3-25A, and retention of patches of structurally complex forest.

In the General Forest Management Area, six to eight green conifers per acre would be reserved, averaged over entire unit acreage, consisting of individual trees, small clumps or stringers.

Selection of trees would reflect the existing conifer species composition of the stands and full range of diameter classes greater than 20 inches diameter breast height (ROD/RMP, p. 64). Entries into younger stands would reserve the largest six to eight trees per acre (ROD/RMP, p. 151). Green tree retention in the Adaptive Management Area would mirror retention in the General Forest Management Area.

Snags and Large Woody Debris

As in Alternative Two, snags would be reserved to the greatest extent practicable, and it would be expected that additional snags would be created by yarding damage to retention trees, wind breakage, and mortality caused by burning.

Large down wood would be provided for in the same manner described under Alternative Two, Sub-Alternative A.

B. Yarding Methods

Harvest operations would be conducted with ground-based equipment and skyline cable systems subject to the conditions noted under Alternative Two, Sub-Alternative A.

C. Access

Primary access would be provided as previously described, supplemented by construction of five spur roads with a combined length of 0.38 miles, improvements to 0.12 miles of existing system and non-system roads, and maintenance/renovation to 2.94 miles of existing system roads. Previously described best management practices would apply to all road construction, renovation/maintenance, improvement, use, and decommissioning.

Table 2-7 describes the type of access needs by unit, describing the types of road treatments (i.e. construction, renovation, et cetera; the present and proposed surfacing; length of the road segment; and disposition of the roads following the completion of harvest operations). Road decommissioning would be completed in the same manner, using the same criteria described in Alternative Two, Sub-Alternative A.

D. Seasonal Restrictions

All seasonal operational restrictions described under Alternative Two, Sub-Alternative A would apply.

E. Activity Fuels Reduction, Site Preparation and Reforestation

Comparable measures for activity fuel reduction and site preparation described in Alternative Two, Sub-Alternative A (pp. 19 and 20) would apply. Hand and/or aerial ignition would be used to achieve a more complete burn than would be the case under Alternative Two. In addition to perimeter control lines, fire trails would be constructed around retention aggregates, and Riparian Reserves to exclude fire from these areas.

Approximately 400 trees per acre would be planted, consisting of a mix of approximately 89 percent Douglas-fir and 11 percent other conifers. Treatments to maintain survival could include mulching, protection from herbivory (browsing), brushing, and stand density control.

Table 2-7. Reference Analysis Two Road Construction, Improvements, Maintenance/Renovation, and Disposition on Project Completion

Road/Spur Number	Unit Accessed	Road Work	Current Surfacing	Proposed Surfacing	Length (Miles)	Acres cleared	Disposition
WC2	28-3-25A	Construct	None	Native	0.19	0.9	Decommission
WC2A	28-3-25A	Construct	None	Native	0.06	0.3	Decommission
WC3	28-3-25A	Construct	None	Native	0.10	0.6	Decommission
WC4A	28-3-25A	Construct	None	Native	0.04	0.3	Decommission
WC7	28-3-23A	Construct	None	Native	0.06	0.3	Decommission
WC9	28-2-32A	Construct	None	Rock	0.16	0.8	Decommission
WC11	28-2-32B	Construct	None	Rock	0.04	0.3	Decommission
WC12	28-2-32D	Construct	None	Rock	0.30	1.4	Decommission
WC13*	28-2-31A	Construct	None	Rock	0.02	0.1	Decommission
WC14*	28-2-31B	Construct	None	Rock	0.02	0.1	Decommission
WC15*	28-2-31B	Construct	None	Rock	0.03	0.2	Decommission
29-2-4.2	28-2-32A	Improve	Native	Rock	0.08	0.4	Decommission
WC8	28-2-32A	Improve	Native	Rock	0.04	0.2	Decommission
USFS Rd. 2810000	28-2-32A	Renovation/Maintenance	Rock	Rock	0.59	NA	Retain
28-2-32.1	multiple	Renovation/Maintenance	Rock	Rock	1.70	NA	Retain
28-2-32.2	28-2-32B	Renovation/Maintenance	Rock	Rock	0.22	NA	Retain
28-3-26	multiple	Renovation/Maintenance	Rock	Rock	0.33	NA	Retain
28-3-26.2	28-3-25A	Renovation/Maintenance	Rock	Rock	1.28	NA	Retain
28-3-35	multiple	Renovation/Maintenance	Paved	Paved	0.03	NA	Retain
29-2-4.9	28-2-32A	Renovation/Maintenance	Rock	Rock	0.30	NA	Retain
29-3-11.1	multiple	Renovation/Maintenance	Rock	Rock	1.44	NA	Retain
WC1	28-3-25A	Renovation/Maintenance	Native	Native	0.21	1.0	Decommission
WC4	28-3-25A	Renovation/Maintenance	Native	Native	0.04	0.2	Decommission
WC5	28-3-25A	Renovation/Maintenance	Native	Native	0.14	0.7	Decommission
WC6	28-3-23A	Renovation/Maintenance	Rock	Rock	0.21	NA	Retain
WC10	28-2-32A	Renovation/Maintenance	Native	Native	0.23	1.1	Decommission

*Optional construction at purchaser's discretion and expense

F. Noxious Weeds and Invasive Non-Native Plants

Preventative measures described under Alternative Two, Sub-Alternative A that are designed to discourage weed introduction, establishment, or spread would apply.

VII. Resources not Present or Unaffected by the Alternatives

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

VIII. Issues Considered but not Analyzed in Detail

Native American Religious Concerns

None have been identified by the interdisciplinary team or through correspondence with local tribal governments.

Cultural and Historical Resources

Inventories within the proposed harvest units and locations of proposed road construction have been completed. Three cultural resource sites were identified that would be affected by the project. An archaeological evaluation determined them to be ineligible for listing on the National Register of Historic Places.

There are five previously identified sites located within the project area (OR-10-296, OR-10-297, OR-10-298, OR-10-299, and 35DO88) that have been excluded from the proposed units by modification of unit boundaries. An additional site (35DO659) is located near the project area and would be avoided as well. As a consequence, there would be no effect to any eligible cultural or historic resources or National Register properties in the project area.

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

Compliance with Section 106 of the National Historic Preservation Act, under the guidance of the 1997 National Programmatic Agreement and the 1998 Oregon Protocol, has been documented with a Project Tracking Form dated October 11, 2011. It was determined that there would be no effect to any cultural or historical resources since no eligible sites would be included within the proposed harvest units or road locations.

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.

Visual Resource Management

The lands on which the proposed timber harvest is located are classified as Visual Resource Management (VRM) Class IV. There are no visual constraints applicable to this VRM class.

Recreation

There are no developed recreation sites or facilities in the project area. Recreational activities are limited to those of a dispersed nature which may include off-highway vehicle use on existing roads and trails, hiking, hunting, rock climbing, and wildlife watching. Opportunities of this nature are abundant on Federal lands within the Roseburg District and on adjoining BLM and U.S. Forest Service administrative units.

Off-Highway Vehicle Use

Off-highway vehicle (OHV) use is limited to existing roads and trails by the ROD/RMP (p. 58). None of the proposed alternatives would affect current opportunities for OHV recreational use as all new proposed roads would be sub-soiled and slash mulched, or water barred and slash mulched to discourage OHV use. It is recognized that unauthorized OHV can and does occur on the landscape. The timing and location of any such activities cannot be reasonably foreseen, however, so the effects of the alternatives on this activity cannot be projected.

Botany

Surveys were conducted for all Threatened or Endangered, Bureau Sensitive, and Survey & Manage species, documented in *Appendix C – Botany*, considered to have the potential to be present in the proposed harvest units. No Threatened or Endangered species or Bureau Sensitive species were identified where suitable habitat exists.

Predisturbance surveys for Survey and Manage species were conducted in the summer of 2011, resulting in the identification of two species of pin lichens.

Four occurrences of *Chaenotheca chrysocephala,* a Category B species, were located. Each site would be protected in accordance with the Conservation Planning Species Fact Sheet which recommends a 100-foot radius "no disturbance" buffer to maintain site microclimate. Two sites in Unit 28-2-31A would be incorporated into retention aggregates, while two sites in Unit 28-2-32C would be protected within Riparian Reserves.

A single occurrence of *Chaenotheca subrocida,* a category E species, was located Unit 28-2-31A and would be protected in accordance with the Conservation Planning Species Fact Sheet which recommends a 100-foot radius "no disturbance" buffer to maintain site microclimate. This site would be incorporated into a retention aggregate in the same manner as would be done for the two *Chaenotheca chrysocephala* sites in the stand.

Noxious Weeds and Non-Native Invasive Plants

In the absence of any proposed timber harvest, noxious weed and non-native invasive plant control measures would still be undertaken. Actions taken to contain, control and eradicate existing infestations are 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 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 either of the sub-alternatives of the proposed action, preventative measures described above (i.e. equipment washing, sequence of harvest) would be applied to reduce the risk of establishment of new weed infestations, or spread of existing infestations. 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 no perceptible difference in the risk of weed establishment and spread across the alternatives.

Chapter Three
The Affected Environment and Environmental Consequences

This chapter summarizes the current condition of resources present or potentially present in the project watersheds that could be affected by the proposed project, addressing 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 discussion is organized by resource, addressing the interaction of the effects of the alternatives with current baseline conditions of this environment. It 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). 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." The cumulative effects of the BLM timber management program on the Roseburg District have been described and analyzed in the PRMP/EIS (pp. 4-7 to 99), incorporated herein by reference.

I. Timber Resources

A. Affected Environment

Land Ownership and Forest Conditions in the Myrtle Creek, Little River and Middle South Umpqua River/Dumont Creek 5th field watersheds.

Landownership and current forest condition on Federal lands were analyzed in ArcMap 10 using the Roseburg BLM Forest Operation Inventory, and the Umpqua National Forest Age Classes layer created in 1997 based on the 1988 Pacific Meridian Resource vegetation data. Information on age-class distribution on private lands is limited and was not analyzed.

Most private lands in the Little River and Middle South Umpqua River/Dumont Creek watersheds are industrial timber lands. By contrast, approximately half of the private lands in the Myrtle Creek watershed are owned by small land owners. It is assumed that large industrial owners will continue to manage primarily for timber production on a rotation of 40 to 65 years. Harvesting would follow the Oregon Forest Practices Act, and stands will likely remain in early and mid-seral stages across the landscape.

The following tables illustrate land ownership, age class distribution on all Federally-managed lands, and age-class distribution specific to BLM lands.

Table 3-1. Land Ownership in the Project Area 5th-Field Watersheds

Land owner	Little River		Middle South Umpqua River/Dumont Cr.		Myrtle Cr.	
	Acres	%	Acres	%	Acres	%
BLM	19,313	15%	9,672	10%	27,738	36%
Forest Service	73,020	55%	81,055	82%	149	1%
Private	39,513	30%	8,111	8%	48,319	63%
Total	**131,845**		**98,838**		**76,205**	

Table 3-2. Age-Class Distribution on Federally-Managed Lands

5th-Field Watershed	Number of Acres by Age-Class and Percent of Total								
	Non-Forest		0 to 30		30 to 80		80+		Total
	Acres	%	Acres	%	Acres	%	Acres	%	
Little River	1,070	1	29,023	31	18,913	20	43,326	47	92,332
Myrtle Creek	606	2	6,361	23	7,083	25	13,836	50	27,886
Middle South Umpqua River/Dumont Cr.	1,144	1	21,268	23	20,269	22	48,046	53	90,727
Totals	**2,819**	**1**	**56,653**	**27**	**46,265**	**22**	**105,208**	**50**	**210,945**

Table 3-3. 10-Year Age -Class Distribution for BLM Managed Lands

10 yr. Age-Class	Little River		Myrtle Creek		Mid. South Umpqua River/Dumont Creek		Total	
	Acres	%	Acres	%	Acres	%	Acres	%
10	0	0	393	1	397	4	790	1
20	3,737	19	3,457	12	1,033	11	8,227	15
30	1,980	10	2,500	9	1,544	16	6,024	11
40	2,243	12	2,187	8	1,009	10	5,439	10
50	2,058	11	2,323	8	1,361	14	5,742	10
60	439	2	1,327	5	27	0	1,793	3
70	49	0	858	3	146	2	1,053	2
80	140	1	318	1	79	1	536	1
90	284	1	665	2	163	2	1,111	2
100	57	0	154	1	55	1	266	0
110	412	2	559	2	124	1	1,096	2
120	323	2	884	3	34	0	1,241	2
130	197	1	331	1	100	1	627	1
140	39	0	1,355	5	240	2	1,634	3
150+	7,243	38	9,820	35	3,263	34	20,325	36
Non-Forest	114	1	606	2	97	1	817	1
Total	**19,313**		**27,738**		**9,672**		**56,722**	

Vegetative conditions within the proposed units.

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 proposed harvest units are classified as western hemlock plant 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).

Timber stand exams were conducted in 2009, 2010, and 2011 using the BLM Ecosurvey Stand Exam Program, for data collection and analysis of current stand conditions. The Organon growth and yield model version 8.3 (Hann *et al.* 2009) was used to estimate future stand growth, development, and characteristics such as trees per acre, diameter breast height, relative density, canopy closure, mortality and stand volume. Table 3-4 summarizes current stand conditions.

Table 3-4. Summary of Current Stand Conditions

Unit ID	Age	Site Class	Total Trees/ Acre	Trees/Acre >6" DBH	Basal Area ft^2/acre	Relative Density Index	Quadratic Mean Diameter Trees >6" DBH)
28-2-31A	103	5	646	276	180	.69	10.9
28-2-31B	108	5	582	244	159	.60	10.9
28-2-32A	68	4	675	282	223	.81	12
28-2-32B	62	4	500	199	179	.62	12.8
28-2-32C	89	4	350	284	249	.73	12.7
28-2-32D	104	5	431	260	263	.83	13.6
28-3-17A	50	2	394	212	212	.65	13.5
28-3-17B	40	2	581	261	181	.65	11.3
28-3-17C	52	2	383	255	197	.63	11.9
28-3-23A	100	4	207	157	258	.68	17.4
28-3-25A above Rd. 28-3-26.2	98	4	204	151	269	.70	18.1
28-3-25A below 28-3-26.2	98	4	51	51	208	.43	27.5

28-3-17A, B and C

The proposed harvest units are dense, even-aged stands approximately 40 to 50 years old that originated after clearcut harvest. They are dominated by Douglas-fir, with some minor components of incense-cedar, western redcedar, and western hemlock.

Pacific madrone, bigleaf maple, golden chinquapin, and red alder are the primary hardwood trees but they are few in numbers and are being overtopped and suppressed by conifers. Ground cover and understory development is generally patchy and sparse due to the dense overstory and lack of sunlight reaching the forest floor, the exception being Unit 28-3-17C which has a few small areas within the stand dominated by hardwood trees and shrubs. Unit 28-3-17C has more Pacific madrone than the other two proposed units. The majority of the Riparian Reserves associated with the three proposed units are dense and even-aged conifer with little hardwood tree development and species or structural diversity.

28-2-31A and B

The proposed harvest units are generally dominated by Douglas-fir, with some sugar pine, western white pine, western hemlock and incense-cedar. Hardwood tree species include golden chinquapin, canyon live oak, and Pacific madrone. The stands are approximately 100 to 110 years of age and most likely originated following wildfire. Some scattered older, remnant trees that pre-date the current stands are present. Stumps were located that indicate that some salvage occurred after 1950. High stand relative density and white pine blister rust have caused mortality in the sugar pine and western white pine.

28-2-32A and B

The proposed harvest units are between 60 and 70 years of age, originating from a previous regeneration harvest. Douglas-fir is the numerically dominant species with grand fir, western hemlock, incense-cedar, sugar pine, and western white pine present in lesser numbers. Some scattered older, remnant trees that were not harvested in the previous entry are present. Golden chinquapin is common.

28-2-32C, D, 28-3-23A and 28-3-25A

These stands, ranging from about 90 to 110 years of age, probably originated following fires around 1900. Scattered individual trees and small clumps of trees that survived the fires are still present. Unit, 28-2-32C, shows evidence of past harvest activities that were most likely salvage logging. In 1999, the portion of proposed Unit 28-3-25A that is located below Road No. 28-3-26.2 was commercially thinned.

Douglas-fir is dominant in numbers but western hemlock and western redcedar can also be found. The primary hardwood species found is golden chinquapin.

Vegetation Modeling

The southwestern Oregon edition of the Organon growth and yield model was used to simulate stand development over the next 100 years for analysis of environmental consequences relative to changes in selected stand attributes. Organon is an individual-tree, distance-independent model developed by Oregon State University using data collected in western Oregon forest stands (Hann, 2009). The architecture of the model makes it applicable to simulations of traditional and non-traditional silvicultural applications (Hann, 1998). For simulation purposes, proposed units were stratified into four groups based on current stand structure, age and site productivity, as illustrated in Table 3-5.

Table 3-5. Unit Modeling Groups

Group	Units #	Site Productivity	Current Age Classes
A	28-2-31A and B	Low	100
B	28-2-32A and B	Moderate	60-70
C	28-3-23A, 28-3-25A, 28-2-32C and D	Moderate	90-100
D	28-3-17A, B and C	High	40-50

B. Alternative One – Effects

Stand Development

Absent treatment or substantial natural disturbance, stands would continue on their current developmental trajectories. Canopy cover and relative density would remain high. The crowns of less competitive trees would continue to recede (Chan *et al.*, 2006), resulting in increased suppression mortality and decreasing diameter growth as trees compete for water, nutrients, and sunlight (Oliver and Larson, 1990). Rates of change would vary between stands depending on current structure, age and site productivity.

Inter-tree suppression or regular-mortality would occur primarily in the smaller size-classes. Non-suppression or irregular-mortality from insects, disease, windthrow, and stem breakage could occur across all crown classes at any age. As stands age, regular mortality declines and irregular mortality factors become more important (Oliver and Larson, 1990).

Continued high relative densities would reduce the competitive status of sugar and western white pines predisposing them to bark beetle attack and mortality (SWOFIDTC, 1995).

In the short-term, shrub density and cover would remain generally stable (Chan *et al.*, 2006). Over the long-term, shrubs and shade-tolerant tree species (e.g. western hemlock) would gradually increase in numbers as receding overstory tree crowns and tree mortality allow increased light in the understory (Oliver and Larson, 1990).

Without substantial disturbance, conditions would become more conducive to establishment and growth of shade-tolerant tree species on Units 28-3-17A, B, and C; 28-3-23A; 28-3-25A; and 28-2-32C and D. This process would be slow, however, and unlikely to provide for understory tree development sufficient to cause a shift from a single-storied to a two-storied or multi-layered structure within 100 years (Oliver and Larson, 1990; Munger, 1940). Portions of Units 28-2-32A and B, and 28-2-31A and B, contain established understories of shade-tolerant conifers that could potentially contribute to the development of a two-storied or multi-storied stand structure over the next 50 to 100 years.

Tables 3-6 and 3-7 illustrate the predicted stand attributes 50 and 100 years into the future based on simulations of stand development.

Table 3-6. Predicted Stand Conditions 50 Years - Alternative One

Unit-group	Structural Class	Trees/Acre		Basal Area (feet^2/ac)	Basal Area (minor spp.)	# of Trees/Acre (≥ specified DBH)				Canopy Cover	Cumulative Mortality Trees/Acre ≥ 16" DBH	Cumulative Mortality* (feet^3/acre)
		All	≥ 6"			≥ 20"	≥ 30"	≥ 36"	≥ 40"			
A	*	422	292	251	16%	20	2	1	0	80%	7	1,400
B	*	268	261	336	29%	49	7	0	0	85%	6	1,500
C	*	126	119	326	2%	59	16	7	4	80%	14	2,100
D	*	192	150	334	2%	65	2	0	0	95%	9	2,600
Combined results reflect weighted averages												

* Cumulative mortality includes snags and coarse wood

Table 3-7. Predicted Stand Conditions 100 Years - Alternative One

Unit-group	Structural Class	Trees/Acre		Basal Area (feet^2/ac)	Basal Area (minor spp.)	# of Trees/Acre (≥ specified DBH)				Canopy Cover	Cumulative Mortality Trees/Acre ≥ 16" DBH	Cumulative Mortality* (feet^3/acre)
		All	≥ 6"			≥ 20"	≥ 30"	≥ 36"	≥ 40"			
A	*	303	266	297	12%	28	2	1	1	80%	12	2,500
B	*	166	165	375	27%	66	19	7	2	85%	34	6,200
C	*	100	95	358	2%	59	24	11	6	90%	23	4,700
D	*	150	125	380	3%	83	17	2	0	90%	34	7.800
Combined results reflect weighted averages												

* Cumulative mortality includes snags and coarse wood

Consistency with the Purpose and Need for Action

This alternative would not meet the described purpose and need for action for the following reasons.

There would be no creation of complex, early-seral habitat that will function for an extended period of time. Hardwood trees would decline as stand components through suppression. In the short-term, the age-class distribution of forest stands administered by the BLM in the project watersheds would remain unchanged.

As illustrated in Table 3-3, only one percent of BLM-administered acres in the project watersheds are in the 10-year age-class, and representative of regeneration harvest with structural legacies conducted under the standards and guidelines of the Northwest Forest Plan and management direction of the 1995 Roseburg District ROD/RMP. As these acres transition into the 20-year age-class in the next few years, the 10-year age-class will be unrepresented in the project watersheds.

Stands in the 20-year age class represent 15 percent of BLM-administered lands in the project watersheds. These lands were primarily harvested before 1990 and reflect traditional clearcut harvest followed by intensive reforestation and silvicultural treatments intent on maximizing forest production, rather than habitat complexity. Within the next five years most of these stands will transition into the 30-year age-class and have already or will soon attain a state of full conifer dominance and canopy closure.

The Roseburg District has a statutory responsibility to provide a predictable and sustainable supply of timber in support of logging and forest products manufacturing, at the local and regional scales. This alternative would not generate any timber volume. This would not meet the statutory responsibility of the Roseburg District. There would be no revenues generated to help support local county governments and social services, and return monies to the U.S. Treasury that defrays, in part, the cost of management of the Federal lands.

C. Alternative Two – Effects

1. Sub-Alternative A

Stand Development

It is common, following the application of different treatments to a stand, to view each treatment area as a separate entity, based on the classical definition of a stand as a group of trees relatively homogenous in structure and composition. Ecologically, it is more useful to view an entire treatment area, including both harvested and unharvested areas, as a functional stand consisting of a mosaic of structural units (Franklin *et al.* 2002). The effects analyses that are unique to each sub-alternative or reference analysis incorporate that concept of a synergism between treatments, although common effects are described separately for each treatment type.

Table 3-8 depicts in-unit stand condition, with respect to tree retention, immediately post-harvest. “Unconstrained Accounting” is a tally of all retention equivalent acres within units, including Riparian Reserves associated with them, whereas, “Constrained Accounting” recognizes only a partial contribution to creditable retention of the Riparian Reserves.

Table 3-8. Predicted Retention Levels Immediately Post-Harvest - Alternative Two, Sub-Alternative A

Group	Unit #	Pre-harvest Structural Class	Post-harvest Structural Class[a]	Retention (% of unit equivalent acres) Unconstrained Accounting[1]			Retention (% of unit equivalent acres) Constrained Accounting[2]		
				Aggregate	Dispersed	Total	Aggregate	Dispersed	Total
A	31AB	MSC	SEL	14	10	24	14	10	24
B	32A	YH	SEL	27	1	28	19	1	20
B	32B	YH	SEL	69	6	75	14	6	20
C	23A	MSC	SEL	63	0	63	63	0	63
C	25A	MSC	SEL	32	9	41	32	9	41
C	32C	MSC	SEL	17	4	21	17	4	21
C	32D	MSC	SEL	16	5	21	16	5	21
D	17A	YH	SEL	44	5	49	15	5	20
D	17B	YH	SEL	33	4	37	18	4	22
D	17C	YH	SEL	43	3	46	21	3	24
Weighted Totals				35	6	41	23	6	28

[a] based on least common denominator, e.g. units with any amount of variable-retention r harvest are classified as "SEL"
[1] all stand acres considered in calculating percentages
[2] limited Riparian Reserve acres considered in calculating percentages per Franklin and Johnson Retention Marking Guidelines (4-24-2011)

Aggregate Retention Areas

Within areas of aggregated retention, timber 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, these aggregates would produce the highest amount of dead wood through passive recruitment, compared to the treated areas.

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

Weather-induced mortality 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).

Figures 3-1 and 3-2 illustrate two variable retention harvests with features such as blocks, peninsulas, aggregates, and stringers of retention.

Figure 3-1. Aerial View of a Variable Retention Harvest Treatment

Figure 3-2. Ground View of a Variable Retention Harvest Treatment

Dispersed Retention Areas and Understory Development

Harvesting would change the current vegetation structure and composition to one resembling *early-seral* stage (ROD/RMP 1995, p. 112). The structural classification would change to *stand establishment with structural legacies* (2008 FEIS).

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. Unit-group A would be the exception, lagging considerably in development due to very low site productivity affecting the potential development of a substantial number of large trees within the time frame.

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 based 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".

Based on the studies cited above, a mortality rate for dispersed retention trees of ten percent per decade for the first two decades is assumed, with estimated rates of three percent per decade in subsequent years (Lewis and Pierle, 1991). Based on data from Busby *et al.* (2006) it is assumed that approximately 70 percent of mortality in any period would initially be in the form of snags and 30 percent as down wood. Surviving trees would expected be to maintain pre-harvest basal area growth rates (Garber et al. 2011) or exhibit a short-term decrease (North et al., 1996). Increased growth rates in low density mature trees following harvest begins within the range of about five to 25 years post-harvest (Latham and Tappeiner, 2002).

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).

Tables 3-9, 3-10, and 3-11 summarize projected stand conditions immediately after harvest, 50 years after harvest, and 100 years after harvest. At 100 years, the cumulative number of large snags (≥ 16 inches diameter breast height), is predicted to be 40 to 75 percent of that predicted for Alternative One in Table 3-6, while the cumulative volume of dead wood is predicted to be 45 to 60 percent of that predicted for Alternative One.

Table 3-9. Predicted Stand Conditions Immediately Post-Harvest — Alternative Two, Sub-Alternative A

Unit-group	Structural Class	Trees/Acre		Basal Area (feet²/ac)	Basal Area (minor spp.)	# of Trees/Acre (≥ specified DBH)				Canopy Cover	Cumulative Mortality Trees/Acre ≥ 16" DBH	Cumulative Mortality (feet³/acre)
		All	≥ 6"			≥ 20"	≥ 30"	≥ 36"	≥ 40"			
Aggregate Retention Areas												
A	*	646	276	202	30%	9	1	0	0	85%	n/a	n/a
B	*	500	199	189	37%	8	0	0	0	80%	n/a	n/a
C	*	189	155	267	5%	43	7	4	2	80%	n/a	n/a
D	*	394	212	214	3%	2	0	0	0	95%	n/a	n/a
Dispersed Retention Areas												
A	*	13	13	41	74%	9	1	0	0	15%	n/a	n/a
B	*	30	16	22	60%	4	0	0	0	15%	n/a	n/a
C	*	18	9	38	8%	4	4	4	2	10%	n/a	n/a
D	*	24	8	16	3%	2	0	0	0	10%	n/a	n/a
Combined Results												
A	SEL	108	53	65	67%	9	1	0	0	25%	n/a	n/a
B	SEL	232	95	94	50%	5	0	0	0	45%	n/a	n/a
C	SEL	73	56	111	7%	16	5	4	2	30%	n/a	n/a
D	SEL	168	87	93	3%	2	0	0	0	45%	n/a	n/a

Combined results reflect weighted averages

Table 3-10. Predicted Stand Conditions 50 Years — Alternative Two, Sub-Alternative A

Unit-group	Structural Class	Trees/Acre		Basal Area (feet²/ac)	Basal Area (minor spp.)	# of Trees/Acre (≥ specified DBH)				Canopy Cover	Cumulative Mortality Trees/Acre ≥ 16" DBH	Cumulative Mortality (feet³/acre)
		All	≥ 6"			≥ 20"	≥ 30"	≥ 36"	≥ 40"			
Aggregate Retention Areas												
A	*	422	292	251	16%	20	2	1	0	80%	7	1,400
B	*	268	261	336	29%	49	7	0	0	85%	6	1,500
C	*	126	119	326	2%	59	16	7	4	80%	14	2,100
D	*	192	150	334	2%	65	2	0	0	95%	9	2,600
Dispersed Retention Areas												
A	*	193	6	34	50%	4	2	1	0	35%	7	1,100
B	*	199	137	88	41%	5	3	1	0	70%	2	300
C	*	205	15	53	25%	3	3	1	3	40%	1	400
D	*	190	176	123	15%	5	2	0	0	80%	2	400
Combined Results												
A	YLL	227	49	67	45%	6	2	1	0	40%	7	1,100
B	MMC	229	190	195	36%	24	5	1	0	75%	4	800
C	MMC	180	48	140	18%	21	7	3	3	50%	5	900
D	MMC	191	166	205	10%	28	2	0	0	85%	4	1,200

Combined results reflect weighted averages

Table 3-11. Predicted Stand Conditions 100 Years — Alternative Two, Sub-Alternative A

Unit-group	Structural Class	Trees/Acre		Basal Area (feet²/ac)	Basal Area (minor spp.)	# of Trees/Acre (≥ specified DBH)				Canopy Cover	Cumulative Mortality Trees/Acre ≥ 16" DBH	Cumulative Mortality (feet³/acre)
		All	≥ 6"			≥ 20"	≥ 30"	≥ 36"	≥ 40"			
Aggregate Retention Areas												
A	*	303	266	297	12%	28	2	1	1	80%	12	2,500
B	*	166	165	375	27%	66	19	7	2	85%	34	6,200
C	*	100	95	358	2%	59	24	11	6	90%	23	4,700
D	*	150	125	380	3%	83	17	2	0	90%	34	7.800
Dispersed Retention Areas												
A	*	128	123	78	31%	2	2	1	1	65%	9	1,300
B	*	163	163	257	18%	35	3	3	1	90%	6	1,300
C	*	156	156	168	13%	3	2	2	2	80%	2	900
D	*	160	152	278	9%	54	5	1	0	90%	11	2,200
Combined Results												
A	MSC	154	144	111	28%	6	2	1	1	70%	9	1,500
B	MMC	164	164	308	22%	48	10	5	1	90%	18	3,400
C	MMC	138	136	229	10%	21	9	5	3	80%	9	2,100
D	MMC	151	146	318	7%	66	9	1	0	90%	20	4,400
Combined results reflect weighted averages												

Schoonmaker and McKee (1988) reported that post-harvest cover of 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.

After logging and burning, herbs first become established, followed by shrubs. Conifer dominance is achieved within 20 to 30 years. In two years, 53 percent of relative ground cover consisted of invading herbs. Invading and residual herbs combined represented 72 percent relative ground cover. At 15 years, relative ground cover was 24 percent herbs, 46 percent shrubs, and 28 percent conifers. At 20 years it was 15 percent herbs, 38 percent shrubs, and 43 percent conifers. After 40 years, absolute cover was 53 percent herbs, 57 percent shrubs, and 82 percent conifers.

Species heterogeneity and composition peaked between 15 to 20 years and declined to the lowest values by 40 years. 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 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. About 34 percent was disturbed by harvest activities, but not burned. The remaining 16 percent was harvested without ground disturbance.

Plant cover within the harvested area on undisturbed ground tended to be dominated by residual species. Disturbed but unburned area was characterized by a large number of species, both invaders and residuals. Cover on burned areas was dominated by both herbs and invading shrubs. Residual herbs were present in numbers substantially lower, when compared to unburned areas. 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.

Planted commercial conifer species would enhance the potential for the development of a conifer dominated forest stand (Tappeiner *et al.*, 2007). Mortality rates of planted conifers would be expected to range between 15 to 30 percent in the first three to four years following planting, then substantially decline after that.

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). Canopy closure for the proposed action is estimated at 30 years or more.

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).

Regeneration growth rates would be expected to be substantially less than that found with clearcut harvesting due to competition 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 and Goudie, 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 present forest age-class distribution in the project watersheds would be modified. Within the entire Connectivity/Diversity Block land use allocation there are presently no acres of age-class zero. The ROD/RMP (p. 153) set forth and objective of a generally even distribution, over time, of 15 to 16 10-year age classes (0 to 150 years). This would be approximately 6.25 percent or 2,150 acres of the 34,400 acres in the land use allocation.

Harvest of 66 acres in Section 17, T. 28 S., R. 3 W., W.M. would provide approximately three percent of the desired 2,150 acres of age-class zero. For all of the BLM-administered lands in the project watersheds this forest age-class would constitute approximately 0.1 percent of the land base, post-harvest.

The harvest of 285 acres over the entire project area would remove 66 acres in the 40 and 50 year ages classes, 116 acres in the 60 and 70 year age classes, and 103 acres in the 90 and 100 year age classes. When compared against the age class distribution on BLM-administered lands within the project watersheds, this amounts to reduction of 0.6, 4.1, and 7.5 percent of these age classes, respectively.

Economics

Expenses associated with road work, timber yarding, timber hauling, other miscellaneous activities, and the pond value (delivered log value) of the timber influence the economic viability of a timber sale. Other factors affecting the viability of a sale are the harvest volume per acre, log grades, seasonal restrictions, and winter logging opportunities. If there is a decision to implement this project, BLM would conduct a field cruise and an analytical appraisal to establish a minimum appraised price. Forest products are not to be offered for sale at less than 10 percent of pond value or wholesale selling value, if other than log form. (BLM Manual 9351.14) The overall value of the timber removed would be determined based on the final bid price at auction.

This analysis will focus on a comparison of the yarding costs, per thousand board feet, for each of the action alternatives and reference analyses. Yarding costs are the sum of costs for felling and bucking trees, yarding logs to a landing, and loading logs on a truck.

For this alternative, the assumptions were based on the use of small and medium towers for cable yarding, and a wheeled skidder for ground-based harvest. Estimated daily production rates were ten loads per day for cable yarding regardless of wood size, except in Unit 28-2-31B where production of two loads per day with a small tower was used due to low volume per acre, ten loads per day for ground-based yarding, and six loads per day for ground-based yarding of small wood. Small wood was assumed to average 12 inch in diameter.

A weighted average was derived that considered: an average cost per thousand board feet for felling and bucking; an average yarding distance of 400 feet; average of 4,500 board feet per load; type of equipment used; type of yarding, uphill vs. downhill; and average volume per acre to be harvested. For this alternative, the average weighted yarding cost was estimated to be $87.85 per thousand board feet for cable yarding, and $80.21 for ground-based yarding. Costs per thousand board feet were calculated using Pacific Northwest Logging Costs program (World Forest Institute 1997) prior to being weighted.

Operational restriction can affect the desirability and value of a sale based on days available for harvest operations. Table 3-12 identifies the available operational periods and constraints on harvest operations under this sub-alternative.

Table 3-12. Seasonality of Operations - Alternative Two, Sub-Alternative A

Unit	Total Net Acres	Subject to Seasonal Restriction for Northern Spotted Owl March 1 through July 15	Acres Subject to Dry Season Restrictions[2]	Acres Available for Wet Season Operations[3]
28-3-17A	14	Yes	0	14
28-3-17B	29	Yes	0	29
28-3-17C	23	No	0	23
28-3-23A	3	No	3	0
28-3-25A	93	No	83	10
28-2-31A	22	No[1]	16	6
28-2-31B	13	No[1]	0	13
28-2-32A	51	No[1]	25	26
28-2-32B	14	No[1]	0	14
28-2-32C	7	No[1]	7	0
28-2-32D	15	No[1]	0	15
			134	150

[1]Subject to spot checks, to be completed between February 1st and April 15th.
[2]May 15th through October 15th, subject to waiver if spring or autumn weather conditions allow.
[3]From October 15th through January 31st.

Consistency with the Purpose and Need for Action

The project would generate an estimated 10.5 million board feet of timber in an assortment of sizes and log grades that could be manufactured into a variety of different forest products, consistent with the statutory responsibility of the Roseburg District to provide a predictable and sustainable supply of timber in support of logging and forest products manufacturing, at the local and regional scales.

This would, in turn, generate revenues to help support local county governments and social services, and return monies to the U.S. Treasury that defrays, in part, the cost of management of the Federal lands.

2. Sub-Alternative B

The consequences of variable retention harvest under Alternative Two, Sub-Alternative B would be consistent with those described for Sub-Alternative A. Specific to variable density thinning in Riparian Reserves in Units 28-3-17A, B, and C the following effects would be expected.

Thinning can increase live crown ratios (Oliver and Larson 1990), maintain live crown ratios (Chan *et al.*, 2006), or reduce rates of live crown recession (Marshall and Curtis, 2002). Maintenance of live crown ratios greater than 30 percent prevents a substantial reduction in vigor and diameter growth (Smith 1962). Thinning can also increase crown ratio through stimulation of epicormic branching in species such as Douglas-fir, true firs, and big-leaf maple (Tappeiner *et al.*, 2007).

Canopy closure measured as skylight visible through the canopy has been shown to increase two percent per year in stands of higher productivity than those on the project area (Chan *et al*., 2006).

Adjusting for poorer site productivity, the estimated rate of canopy closure in the proposed units, post-harvest, would range from 33 to 80 percent of the rate observed in Chan *et al.* (2006). Thinning can also stabilize height to diameter ratios, or prevent increases to a point that predisposes trees to stem bending, windsnap, and windthrow (Wonn and O'Hara, 2001; Oliver and Larson, 1990).

Thinning can initially reduce shrub and herbaceous cover due to disturbance caused by harvest activities. However, cover and plant diversity would be expected to increase following thinning activities to levels exceeding pre-treatment conditions until canopy recloses (Chan *et al*., 2006; Bailey *et al*., 1998). Natural regeneration of tree species is common after thinning, depending on seed availability and other factors. Distribution and density are highly variable, generally increasing with increased thinning intensity (Chan *et al*., 2006; Nabel, 2008). Growth of regeneration is correlated with residual density and rate of canopy closure (Bailey and Tappeiner, 1998; Nabel, 2008).

Thinning to a Relative Density of 25 to 30 would produce high diameter growth rates at the expense of stand volume production (Curtis and Marshall, 1986). It is uncertain if overstory would remain open enough to maintain light levels conducive to long-term growth and survival of understory vegetation providing a layered structure (Chan *et al*., 2006; Newton and Cole, 2009). Some empiric evidence suggests development and persistence of a layered structure is possible for at least 50 years after thinning (Tappeiner et al. 2007) when a moderate thinning is combined with the presence of regeneration of shade tolerant species.

As in Sub-Alternative A, weather-induced mortality would be expected to occur along the edges of aggregates bordering harvested areas, and along the edges of untreated stands (Maguire *et al*., 2006). Adjacent to thinned areas, however, no substantial effect on edge growth or mortality would be expected (Roberts and Harrington, 2008).

Effects of this sub-alternative on forest age-class distribution on BLM-administered lands in the project watersheds would be consistent with those identified in Sub-Alternative A, as acres of variable retention harvest would remain the same, and variable density thinning would not alter the age-class of the stands treated in the Riparian Reserves.

Figure 3-3 depicts variable density thinning of the nature described above.

Figure 3-3. Variable Density Thinning to RD 25-30

Economics

The assumptions used to estimate the yarding costs derived for Alternative Two, Sub-Alternative A would also apply to the variable retention harvest component of this sub-alternative. When approximately 21 acres of cable yarding associated with Riparian Reserve variable density thinning are factored in, the average yarding cost increased to $90.23 per thousand board feet for cable yarding, and remained $80.21 for ground-based yarding. Seasonality of operations under this sub-alternative would remain the same as in Alternative Two, Sub-Alternative A, with variable density thinning available for wet season operations.

Consistency with the Purpose and Need for Action

This alternative would also meet the described purpose and need for action as addressed under Sub-Alternative A, and provide an estimated 369 thousand board feet of timber from variable density thinning in 21 acres of Riparian Reserves, total volume to an estimated 10.9 million board feet of timber.

D. Reference Analysis One – Effects

Variable density thinning in Riparian Reserves would be conducted in a manner consistent with Riparian Reserve treatments described in Alternative Two, Sub-Alternative B, with effects on stand structure and development consistent with those already described.

Table 3-13 summarizes stand conditions similar to those depicted Figure 3-4.

Upland stands thinned to RD 30-40 would produce moderately-high volume growth rates at the expense of individual tree diameter growth rates (Curtis and Marshall, 1986). A single light thinning would offer minimal opportunity to create diverse, multi-storied (i.e. layered structure) stands. Understory conifer and hardwood tree and shrub vigor and survival would diminish as the overstory canopy closes (Chan *et al*., 2006; Cole and Newton, 2009). Figure 3-4 depicts the post-treatment conditions of thinning in upland stands on a generally uniform spacing to RD 35-40.

Table 3-13. Stand Conditions Immediately Post-Harvest - Reference Analysis One

Thinning Areas												
Unit Group	**Structural Class**	**Trees/Acre**		**Basal Area (feet^2/ac)**	**Basal Area (minor spp.)**	**# of Trees/Acre (≥ specified DBH)**				**Canopy Cover**	**Cumulative Mortality Trees/Acre ≥ 16" DBH**	**Cumulative Mortality (feet^3/acre)**
		All	**≥ 6"**			≥ 20"	≥ 30"	≥ 36"	≥ 40"			
B	*	122	98	110	35%	8	0	0	0	70%	n/a	n/a
D	*	112	105	119	2%	2	0	0	0	65%	n/a	n/a

Figure 3-4. Uniform-Spaced Thinning to Relative Density 35-40

Table 3-14. Predicted Stand Conditions 50 and 100 Years in the Future
Reference Analysis One

Unit-group	Structural Class	Trees/Acre		Basal Area (feet²/ac)	Basal Area (minor spp.)	# of Trees/Acre (≥ specified DBH)				Canopy Cover	Cumulative Mortality Trees/Acre ≥ 16" DBH	Cumulative Mortality (feet³/acre)
		All	≥ 6"			≥ 20"	≥ 30"	≥ 36"	≥ 40"			
At 50-Years Post-Treatment												
B	*	99	95	223	25%	41	8	0	0	85%	6	900
D	*	71	71	191	2%	45	2	0	0	75%	4	800
At 100-Years Post-Treatment												
B	*	79	79	276	24%	57	17	7	3	90%	18	3,200
D	*	58	58	233	2%	50	18	15	0	80%	16	3,700

Economics

Under this Reference Analysis, the assumptions were based on the use of a small tower for cable yarding and a wheeled skidder for ground based harvest. Estimated daily production rates were four loads per day for cable yarding and six loads per day for ground based yarding. In consideration of other factors previously described and the lower volume per acre to be harvested, cable yarding costs are estimated at $151.19 per thousand board feet, and ground-based yarding costs at $102.95 per thousand board feet.

Consistency with the Purpose and Need for Action

As discussed in Chapter Two (p. 24) this reference analysis is not selectable because it would not implement the principles of ecological restoration.

Estimated timber volume would be 1.9 million board feet. Logs would be of smaller sizes and lower grades, resulting in higher handling costs and lower returns per thousand board feet. The character and size of the logs would greatly limit manufacturing options. Revenues would not cover the costs of sale preparation, and revenues to county government would be negligible.

Table 3-15. Seasonality of Operations - Reference Analysis One

Unit	Total Net Acres	Subject to Seasonal Restriction for Northern Spotted Owl March 1 through July 15	Acres Subject to Dry Season Restrictions[2]	Acres Subject to Bark Slip Restrictions[4]	Acres Available for Wet Season Operations[3]
28-3-17A	20	Yes	0	20	20
28-3-17B	38	Yes	0	38	38
28-3-17C	36	No	0	36	36
28-2-32A	29	No[1]	9	29	20
28-2-32B	16	No[1]	0	16	16
			9	139	130

[1]Subject to spot checks, to be completed between February 1st and April 15th.
[2]May 15th through October 15th, subject to waiver if spring or autumn weather conditions allow.
[3]From October 15th through January 31st.
[4]April 15 through July 15th

E. Reference Analysis Two – Effects

The effects of regeneration harvest would be similar to, but not identical to those that would derive from Alternative Two, Sub-Alternative A.

Aggregate and Dispersed Retention Areas

Within areas of aggregated retention, timber would be subject to the same processes of regular and irregular mortality previously discussed, and would produce the highest amount of dead wood through passive recruitment, compared to treated areas. Aggregates with low edge to area ratios ≥ 2.5 acres in extent, though fewer in number, would be expected to support core areas with micro-climates indistinguishable from interior forest, and ameliorate microclimate in adjacent harvested areas. Weather-induced mortality would be expected to occur along the edges of aggregates and untreated stands bordering harvested areas.

Table 3-16 depicts in-unit stand condition, with respect to tree retention, immediately post-harvest, compared to those depicted in Table 3-8 for Alternative Two.

Table 3-16. Predicted Retention Levels Immediately Post-Harvest, Reference Analysis Two

Group	Unit #	Pre-harvest Structural Class	Post-harvest Structural Class	Retention (% of unit equivalent acres) Unconstrained Accounting			Retention (% of unit equivalent acres) Constrained Accounting		
				Aggregate	Dispersed	Total	Aggregate	Dispersed	Total
A	31AB	MSC	SEL	7	11	18	7	11	18
B	32A	YH	SEL	18	4	22	1	4	5
B	32B	YH	SEL	65	7	72	0	7	7
C	23A	MSC	SEL	63	0	63	63	0	63
C	25A	MSC	SEL	25	10	35	15	10	25
C	32C	MSC	SEL	0	5	5	0	5	5
C	32D	MSC	SEL	4	5	9	2	5	7
Weighted Totals				26	8	34	9	8	17

[a] based on least common denominator, e.g. units with any amount of variable-retention harvest are classified as "SEL"
[1] all stand acres considered in calculating percentages
[2] limited Riparian Reserve acres considered in calculating percentages per Franklin and Johnson Retention Marking Guidelines (4-24-2011)

Figures 3-5 and 3-6 are representative of regeneration harvest conducted under the standards and guidelines of the Northwest Forest Plan, and management direct from the 1995 Roseburg District ROD/RMP.

Figure 3-5. Example of a Northwest Forest Plan Regeneration Harvest

Figure 3-6. Second Example of a Northwest Forest Plan Regeneration Harvest

Table 3-17 and 3-18 describes stand conditions at 50 and 100 years post-harvest.

Table 3-17. Predicted Stand Conditions 50 Years, Reference Analysis Two

Unit-group	Structural Class	Trees/Acre		Basal Area (feet^2/ac)	Basal Area (minor spp.)	# of Trees/Acre (≥ specified DBH)				Canopy Cover	Cumulative Mortality Trees/Acre ≥ 16" DBH	Cumulative Mortality (feet^3/acre)
		All	≥ 6"			≥ 20"	≥ 30"	≥ 36"	≥ 40"			
Aggregate Retention Areas												
A	*	422	292	251	16%	20	2	1	0	80%	7	1,400
B	*	268	261	336	29%	49	7	0	0	85%	6	1,500
C	*	126	119	326	2%	59	16	7	4	80%	14	2,100
Dispersed Retention Areas												
A	*	242	9	42	11	6	0	0	0	50	2	300
B	*	229	195	120	12	6	2	0	0	85	2	200
C	*	227	220	129	5	5	6	4	1	80	2	400
Combined Results												
A	YLL	255	29	57	11	7	0	0	0	50	3	400
B	YHL	243	219	198	18	21	4	0	0	85	3	700
C	YHL	204	197	174	4	17	8	5	2	80	5	800
Combined results reflect weighted averages												

Table 3-18. Predicted Stand Conditions 100 Years, Reference Analysis Two

Unit-group	Structural Class	Trees/Acre		Basal Area (feet^2/ac)	Basal Area (minor spp.)	# of Trees/Acre (≥ specified DBH)				Canopy Cover	Cumulative Mortality Trees/Acre ≥ 16" DBH	Cumulative Mortality (feet^3/acre)
		All	≥ 6"			≥ 20"	≥ 30"	≥ 36"	≥ 40"			
Aggregate Retention Areas												
A	*	303	266	297	12%	28	2	1	1	80%	12	2,500
B	*	166	165	375	27%	66	19	7	2	85%	34	6,200
C	*	100	95	358	2%	59	24	11	6	90%	23	4,700
Dispersed Retention Areas												
A	*	222	212	108	11	5	1	0	0	80	3	500
B	*	189	189	308	7	42	4	2	0	90	6	1,300
C	*	208	205	242	3	5	5	2	1	90	3	800
Combined Results												
A	MSC	228	216	121	11	6	1	0	0	80	4	600
B	MMC	181	180	332	14	51	9	4	1	90	16	3,100
C	MMC	183	180	269	3	17	9	4	2	90	8	1,700
Combined results reflect weighted averages												

Economics

Under this Reference Analysis the assumptions used to estimate the yarding costs derived for Alternative Two, Sub-Alternative A would apply. In consideration of other factors previously described, cable yarding costs are estimated at $89.96 per thousand board feet, and ground-based yarding costs at $79.49 per thousand board feet.

Consistency with the Purpose and Need for Action

The action would provide a an estimated 9.1 million board feet of timber in an assortment of sizes and log grades that could be manufactured into a variety of different forest products, in support of logging and forest products manufacturing, at the local and regional scales. Revenues generated would help support local county governments and social services, and return monies to the U.S. Treasury that defrays, in part, the cost of management of the Federal lands.

As discussed in Chapter Two (p. 24) this reference analysis is not considered selectable because it would not implement the Secretarial direction to employ the principles of ecological restoration developed by Drs. Jerry F. Franklin and K. Norman Johnson. The objective of creating long-lasting early-seral habitat not be achieved, because following harvest intensive reforestation efforts would be undertaken to achieve full conifer stocking in the harvested areas, shortening the period of grass, forbs, herb, and shrub dominance and diversity by ten to fifteen years.

Table 3-19. Seasonality of Operations - Reference Analysis Two

Unit	Total Net Acres	Subject to Seasonal Restriction for Northern Spotted Owl March 1 through July 15	Acres Subject to Dry Season Restrictions[2]	Acres Available for Wet Season Operations[3]
28-3-23A	3	No	3	0
28-3-25A	104	No	94	10
28-2-31A	23	No[1]	16	7
28-2-31B	15	No[1]	0	15
28-2-32A	58	No[1]	23	35
28-2-32B	16	No[1]	0	16
28-2-32C	9	No[1]	7	2
28-2-32D	18	No[1]	0	18
			142	103

[1]Subject to spot checks, to be completed between February 1st and April 15th.
[2]May 15th through October 15th, subject to waiver if spring or autumn weather conditions allow.
[3]From October 15th through January 31st.

II. Wildlife

A. Affected Environment

Four categories of wildlife species receive special consideration in the planning and implementation of BLM management actions. The first two consist of special status species which include: species listed by the U.S. Fish and Wildlife Service as Threatened or Endangered, candidate species, or species proposed for listing; and BLM Special Status Species managed under Bureau Manual 6840 policy which includes species eligible for Federal or state listing, or for candidate status under the Endangered Species Act (ESA).

BLM Special Status Species include Bureau Sensitive and Bureau Strategic species. Manual policy does not apply to Bureau Strategic species (IM-OR-2007-072); and as such they are not discussed in this environmental assessment. The Oregon/Washington State Director's Special Status Species list (http://www.or.blm.gov/isssp/) was last updated in January 2012. Several species covered by this program are also designated for management under the Survey and Manage program identified below.

Twenty-four special status wildlife species are known or suspected to occur on the Roseburg District. Fifteen of the species are eliminated from further discussion because the project area is outside their accepted range, the species has not been documented on the Roseburg District, suitable habitat is not present; or Riparian Reserves would provide adequate protection. (Table C-1, *Appendix C - Wildlife*)

The third category consists of land birds which include: bird species subject to protection under the Migratory Bird Treaty Act of 1918, as amended in 1936, 1974, and 1978; bald eagles and golden eagles subject to protection under the Bald and Golden Eagle Protection Act; and "Birds of Conservation Concern" and "Game Birds Below Desired Condition," as defined by the U.S. Fish and Wildlife Service.

The fourth category consists of wildlife species designated for protection under the Survey and Manage Standards and Guidelines established in the Northwest Forest Plan.

A fifth category of wildlife species considered to be early-seral obligates is addressed, as one of the intended outcomes of the proposed variable retention harvest is to demonstrate and provide the need for additional pre-forest habitat on the landscape.

1. Threatened and Endangered Species

The Federally-threatened **northern spotted owl** (*Strix occidentalis caurina*) is a forest-dwelling raptor present throughout the Roseburg District. It preys primarily on small mammals (Forsman et al. 1984), generally inhabiting 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 (Forsman et al 1984, Hershey *et al*. 1997).

Stands containing features that provide for nesting, roosting, and foraging are referred to as "**suitable habitat**." On the Roseburg District, suitable habitat is typically provided by forest stands 80 years or greater in age.

Younger stands that provide sufficient canopy closure and sub-canopy space for northern spotted owl movement, but that do not provide sufficient late-seral components to support northern spotted owl nesting are referred to as "**dispersal habitat**." On the Roseburg District, dispersal habitat is typically represented by stands 40-79 years old, which may also provide limited roosting and foraging opportunities, depending on site-specific conditions and stand structure. Dispersal habitat near northern spotted owl nest patches is important for connectivity with other nearby patches of suitable habitat.

Forested stands that currently provide no function for northern spotted owls, but will develop into dispersal or suitable habitat in the future are called "**unsuitable habitat**." On the Roseburg District, these are typically less than 40 years old. Non-forested areas that will never be capable of supporting northern spotted owl use are "**non-habitat**."

Proposed Units 28-3-17A, B and C are 40-to-52 years of age. The quadratic mean diameter of these stands ranges from 11.3-to 13.5 inches and they are devoid of remnant large trees and snags. Consequently, their function is as dispersal-only habitat. Proposed Units 28-2-32A and B are under 70 years of age and may provide some limited roosting and foraging opportunities. The remaining proposed units are over 80 years of age and provide habitat suitable for nesting, roosting and foraging.

Occupancy status and nesting activity in the project area over the past five years is documented in Table 3-20. For the purpose of this analysis, only the most recently occupied activity centers were considered. Survey information indicates that the Deadman Mountain (2291O), Lucky Buck (0258O) and Blue Oyster Cultus sites are occupied, whereas Curtin Creek (2381O) and High Riser (0292O) are not.

Table 3-20. Northern Spotted Occupancy in the Proposed Project Area.

Site number (IDNO)	2006	2007	2008	2009	2010	2011
Curtin Creek (2381O)	Unoccupied	Pair	Unoccupied	Unoccupied	Unoccupied	Unoccupied
Deadman Mountain (2291O)	Male (floater)	Unoccupied	Unoccupied	Female (floater)	Pair	Male and Female, nesting status unknown
High Riser (0292O)	Unknown	Unoccupied	Unoccupied	Unoccupied	Pair	Unoccupied
Lucky Buck (0258O)	N/A	N/A	N/A	N/A	Female and Male, nesting status unknown; first year of site existence	Pair, nesting w/ 1 fledgling
Blue Oyster Cultus (9581)	N/A	N/A	N/A	N/A	N/A	Female (resident) and Male (floater); first year of site existence

"Unoccupied" typically indicates that protocol surveys did not detect any northern spotted owl activity in the home range, while "Uunknown" typically indicates limited survey effort.
"Floaters" are non-territorial northern spotted owls. "Pair" indicates birds that did not breed or were unsuccessful.

Figure 3-7 Northern Spotted Owl Home Ranges Overlapping Units in Section 17, T. 28 S., R. 3 W., W.M.

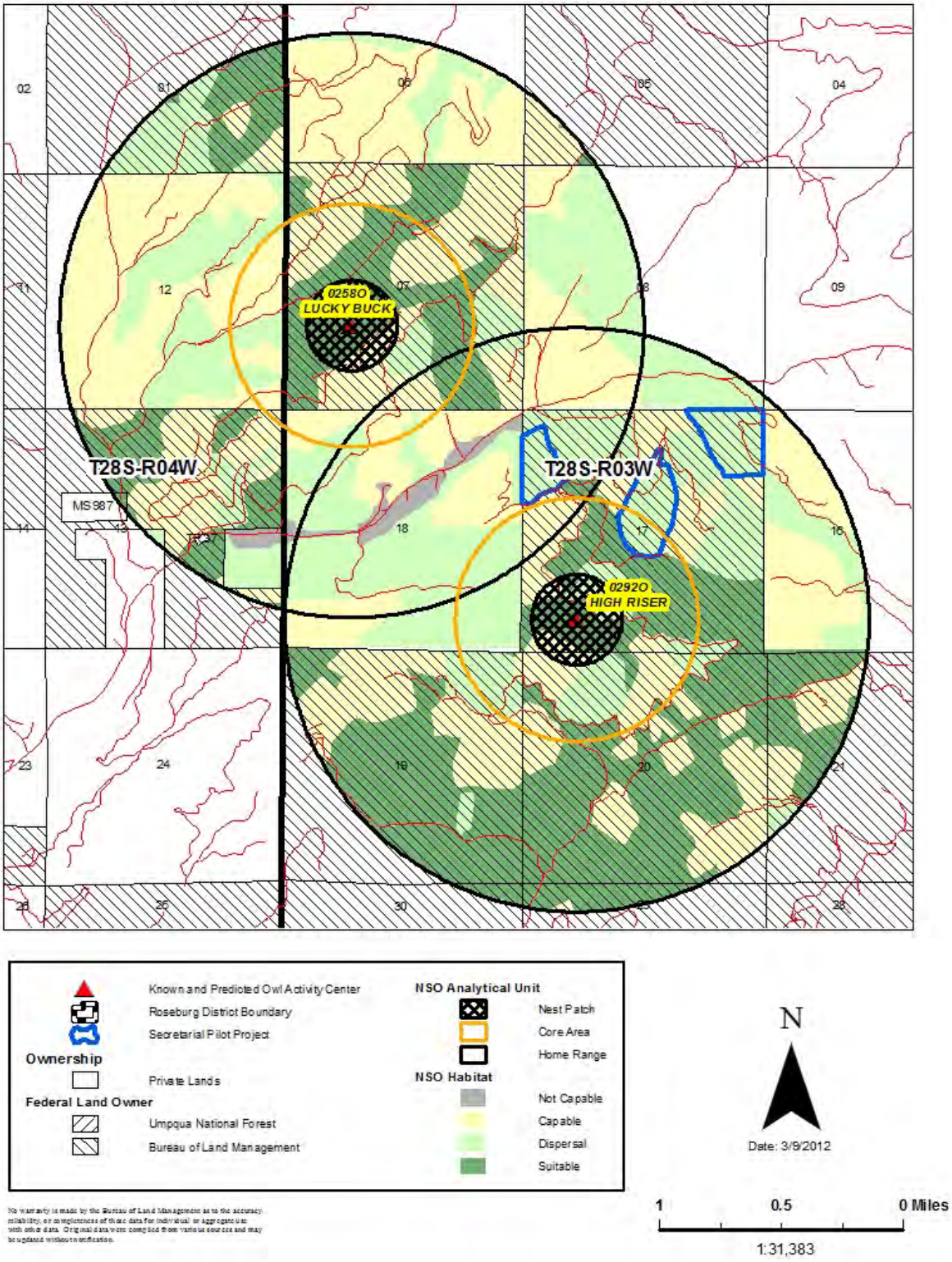
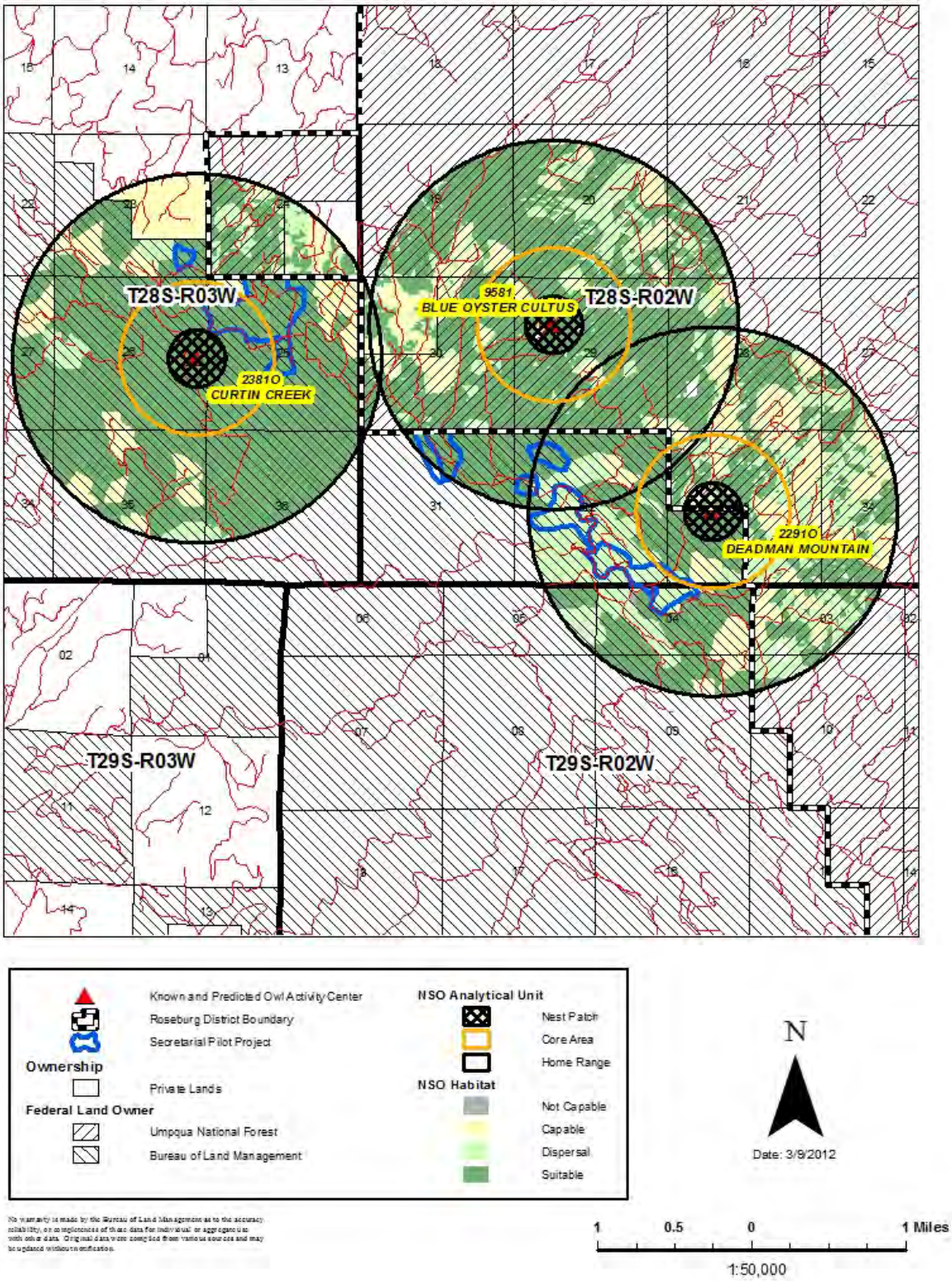


Figure 3-8 Northern Spotted Owl Home Ranges Overlapping Units in Sections 23 and 25, T. 28 S., R. 3 W.; and Sections 31 and 32, T. 28 S., R. 2 W., W.M.



Effects of habitat modification on individual northern spotted owl sites are assessed at three spatial scales: the home range, core area, and nest patch. There are five northern spotted owl home ranges that overlap the project area. In addition to the five known sites, there are two "estimated sites" not known to contain northern spotted owls which currently will be used for consultation with the U.S. Fish and Wildlife Service, but will not be discussed in this environmental assessment.

Home Range – A home range in the Oregon Cascades Province is a 1.2 mile radius circle (2,955 acres) centered on an activity center (i.e. nest site). It provides food, as well as cover and other structures necessary survival, reproduction and the rearing of young. Home ranges of multiple northern spotted owl pairs may overlap with habitat shared between adjacent resident northern spotted owl pairs. Non-resident northern spotted owls in this shared space while seeking out mates in unoccupied habitat. The five northern spotted owl home ranges that overlap the proposed project area are illustrated in Figures 3-7 and 3-8.

Core Area – Within the home range, the core area (500 acres) is a 0.5 mile radius circle centered on the activity center, representing the area most heavily utilized during the nesting season (USDI USFWS *et al*. 2008). The core area is defended by territorial spotted owls and generally does not overlap the core areas of other pairs. Proposed units 28-3-17B, 28-3-25A and 28-2-32A fall partially within core areas of known activity centers.

Nest Patch – Within the core area, the nest patch (70 acres) is defined as a 300 meter radius circle around the activity center (USDI USFWS *et al*. 2008). The two key habitat elements within a nest patch are: (1) canopy closure of dominant, co-dominant, and intermediate conifer and hardwood trees and (2) down wood (USDI USFWS *et al.* 2008). Modification of habitat within a nest patch is considered likely to affect the reproductive success of nesting northern spotted owls (USDI USFWS *et al*. 2008). There are no proposed units that overlap nest patches.

The U.S. Fish and Wildlife Service has determined viability thresholds of 50 percent suitable habitat in the core area and 40 percent suitable habitat in the home range, respectively. Suitable habitat levels below these thresholds may compromise the reproductive success of owls (USDI USFWS *et al*. 2008).

The amount and character of habitat provided by Federal lands within the identified northern spotted owl home ranges are described in Table 3-21. Potential contributions from private lands were not considered, as they are not expected to provide any more than dispersal habitat in the long term. As illustrated, suitable habitat levels in the Lucky Buck and High Riser northern spotted owl home ranges are currently below this viability threshold.

Table 3-21 Northern Spotted Owl Habitat Availability Federal Lands in the Home Ranges.

Owl Site (IDNO)	*Total Federal Acres	Percent of Total Home Range Acres	Habitat Acres on BLM Federal Lands and Percent of Federal Acres					
			Home Range		Core Area (500 Acres)		Nest Patch (70 Acres)	
			Suitable	Dispersal-Only	Suitable	Dispersal-Only	Suitable	Dispersal-Only
Curtin Creek (2381O)	2,741	91%	2,235 (75%)	227 (8%)	467 (92%)	19 (3%)	70 (100%)	0
Deadman Mountain (2291O)	2,861	99%	1,481 (50%)	926 (31%)	318 (64%)	113 (23%)	56 (80%)	9 (13%)
High Riser (0292O)	1,902	66%	968 (33%)	406 (14%)	169 (34%)	122 (24%)	40 (57%)	16 (23%)
Lucky Buck (0258O)	1,228	42%	480 (16%)	233 (8%)	205 (41%)	24 (5%)	56 (77%)	1 (1%)
Blue Oyster Cultus (9581)	2765	94%	2045 (69%)	427 (14%)	412 (82%)	45 (9%)	57 (81%)	6 (9%)

* Acres that will never be capable of supporting the northern spotted owl are excluded from this summary.

2008 Designated Critical Habitat

Critical Habitat is defined as the habitat on which the physical and biological features essential to the conservation of a species are found. Critical Habitat includes forest land that is currently unsuitable habitat, but has the capacity to become suitable habitat in the future. The nearest Critical Habitat Unit is approximately 1.7 miles from Unit 28-2-32A. It would not be affected by any of the alternatives or reference analyses, and will not be discussed further in this environmental assessment.

A new proposed Critical Habitat rule was issued on February 28, 2012 which would designate lands in the project area as Critical Habitat. At present, this is only a proposal. It will be subject to analysis in both an environmental assessment and economic analysis, and consideration of public comment on both before a final rule is issued, at which time these lands may or may not be designated as Critical Habitat.

Primary Prey for the Northern Spotted Owl

The two principal prey species for the northern spotted owl found in the proposed project area are northern flying squirrels (*Glaucomys sabrinus*) and woodrats (*Neotoma spp.*).

Habitat use also is influenced by prey availability. Ward (1990) found that spotted owls foraged in areas with lower variance in prey densities (*i.e.*, where the occurrence of prey was more predictable) within older forests and near ecotones of old forest and brush seral stages. Zabel *et al.* (1995) showed that spotted owl home ranges are larger and smaller where flying squirrels and woodrats, respectively, are the predominant prey.

Forsman *et al.* (2004), measured northern spotted owl prey biomass composition from 1970-2003 in the Central Cascades and interior southwest of Oregon. In the Central Cascades northern flying squirrels and woodrats accounted for 45 percent and 21 percent of prey biomass, respectively. In interior southwest Oregon, northern flying squirrels and woodrats accounted for 30 percent and 50 percent of prey biomass, respectively. Research by Carey *et al*. (1992) in mixed conifer forests of southwest Oregon also measured northern spotted owl prey biomass composition. Results indicate the northern flying squirrel made up 19 percent of prey biomass, while woodrats accounted for 53 percent of prey biomass.

Forests supporting abundant northern flying squirrel populations generally exhibit multi-dimensional structure in the mid and overstory layers, low to moderate amounts of understory, and few canopy gaps (Wilson and Carey 1996, and Wilson 2008).

Northern flying squirrels forage on the ground for truffles and other items which provide essential nutrients (Wilson 2008). .Truffle development is largely dependent upon downed wood and a diversity of trees, forbs and shrubs, in particular, those within the Ericaceae (Heath) Family which include huckleberry, manzanita, ceanothus, madrone, salal, prince's pine, and indian pipe (Wilson 2008). These ecological requirements lend to the need for a landscape that is heterogeneous in nature.

Recent landscape-level analyses in portions of southwest Oregon and California Klamath Province suggest that a mosaic of late-successional habitat interspersed with other seral conditions may benefit spotted owls more than large, homogeneous expanses of older forests in areas where woodrats are a major component of spotted owl diets (Meyer *et al.* 1998, Franklin *et al.* 2000, Zabel *et al.* 2003).

Woodrats are most often associated with hardwood trees, downed wood, and brush fields in forest habitats typical of early and mid-seral stands less than 80 years of age resulting from past clearcut harvest or stand replacement events such as fire (Maser *et al*., 1981; Sakai and Noon, 1993; Carey *et al*. 1999).

Other prey species, in descending order of importance include brush rabbits (*Sylvilagus bachmani*), snowshoe hares (*Lepus americanus*), red tree voles (*Arborimus longicaudus*), deer mice (*Peromyscus maniculatus*), and Western red-backed voles (*Clethrionomys occidentalis*). With the notable exception of the red tree vole, these species are largely associated with early-seral forest stages and are addressed under *Early-seral Obligates.*

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 (USFWS 2011a, I-6 thru 9).

Lint (2005) indicated 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 less than expected.

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

Currently, the primary source of habitat loss is catastrophic wildfire (Courtney et al. 2004). 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. 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.

Courtney *et al*. (2004) stated 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).
Barred owls are known to compete directly with the northern spotted owl for both prey and habitat. Barred owls have been detected in the Curtin Creek northern spotted owl home range since 1998 and have been regularly and incidentally detected during spotted owl surveys, throughout the project area.–Though more definitive studies are needed, there is substantial evidence that northern spotted owl populations decline in areas where barred owls have moved into their range (USFWS 2011a, p. B-10 & 11).

Research by Weins *et al.* (2011) confirms the abundance of barred owls in coniferous forests of the Pacific Northwest and provides the most accurate sense of barred owl populations to date. The researchers developed specific survey methods for barred owls, making it possible to more accurately assess their occurrence and distribution over an extensive landscape. The research also found that barred owls were most likely to be found in structurally diverse forests containing mature and old trees.

2. *Bureau Sensitive Species*

The **peregrine falcon** (*Falco peregrinus anatum*) nests on sheer cliffs and rocky outcrops, often near water (White *et al*. 2002). Peregrine falcons prey on other birds, which they catch in flight. There is an occupied and reproductive pair nesting on a cliff approximately one-half mile west of Unit 28-2-31A. Because of proximity, it might be expected that peregrine falcons would hunt within the proposed project area.

The **purple martin** (*Progne subis*) is a secondary cavity nester that utilizes cavities excavated by woodpeckers, as well as birdhouses and other artificial structures. Nest trees are typically found in open areas near water (Brown 1997, Horvath 2003).

The **fringed myotis** (*Myotis thysanodes*) is an insectivorous bat found throughout the western U.S., in a range of habitats that includes Douglas-fir forest (reviewed in Verts and Carraway 1998). Hibernacula and roost sites include caves, mines, buildings, and large snags (Weller and Zabel 2001).

The **Pacific pallid bat** (*Antrozous pallidus pacificus*) is insectivorous and also found in the Pacific Northwest. It generally inhabits arid or semi-arid environments with rock, brush, or forest edge (reviewed in Verts and Carraway 1998). Hibernacula and roost sites are of the same nature as those used by the fringed myotis.

The **Townsend's big-eared bat** (*Corynorhinus townsendii*) is also found in the western U.S. in habitats that include conifer forest (reviewed in Verts and Carraway 1998). They typically roost and hibernate in mines and caves, but have been found roosting in hollow trees as well (Fellers and Pierson 2002).

3. Land Birds

Bald eagles and golden eagles are subject to protection under the Bald and Golden Eagle Protection Act. Bald eagles will not be included in this analysis due to lack of all suitable habitat components. Golden eagles will not be included as they are not found in the vicinity of the proposed project area.

Executive Order 13186, "Responsibilities of Federal Agencies to Protect Migratory Birds," directs agencies, including the BLM, to integrate bird conservation principles, measures, and practices into agency planning processes to restore and enhance habitat of migratory birds, as practicable, and ensure that environmental analysis considers effects of agency actions and plans on migratory birds, with emphasis on species of concern.

Guidance is provided in a Memorandum of Understanding between the BLM and U.S. Fish and Wildlife Service (USFWS) dated April 12, 2010. The Memorandum directs the BLM to consider "Birds of Conservation Concern" and "Game Birds Below Desired Condition," as defined by the U.S. Fish and Wildlife Service, as species to be addressed in project-level NEPA documents.

Sixteen bird species from the "Birds of Conservation Concern" and "Game Birds Below Desired Condition" lists are present on the Roseburg District. The project area is outside of the range of the marbled murrelet. The bald eagle is discussed above, and the peregrine falcon is discussed under "Bureau Sensitive Species." Habitat is not currently present and would not develop under any of the alternatives for the horned lark, Oregon vesper sparrow, band-tailed pigeon, harlequin duck, ring-necked duck, wood duck, or northern pintail.

The remaining species are the band-tailed pigeon, rufous hummingbird, Allen's hummingbird, olive-sided flycatcher, willow flycatcher, purple finch, and mourning dove. These species could be affected by the proposed action and are discussed below.

The BLM & USFWS Memorandum also directs the BLM to evaluate and consider management objectives and recommendations for migratory birds resulting from comprehensive planning efforts such as those undertaken by Partners in Flight. Partners In Flight is an international coalition of government agencies, conservation groups, academic institutions, private organizations, and citizens dedicated to the long-term maintenance of healthy populations of native landbirds.

Partners In Flight's Conservation Strategy for Landbirds in Coniferous Forests of Western Oregon and Washington (Altman 1999) provides information on the habitat attributes used by species found in the region. This conservation plan is one of many that may be used as guidelines by the BLM, and was used to identify focal species addressed in this analysis.

In the Partners In Flight Conservation Strategy, the following sixteen focal bird species represent the suites of bird species associated either with current conditions in the areas being analyzed, or with conditions that may develop under alternatives analyzed here. Two other species, the American pipit, and Lincoln's sparrow are dependent on unique habitats either not present in the units analyzed or in areas that would not be altered under any of the alternatives being considered.

Vaux's swift (*Chaetura vauxi*) requires large diameter snags and hollow live trees for nesting. The species is a neo-tropical migrant that breeds throughout coniferous forests in western Oregon. It forages above the forest canopy and in open areas, feeding on flying insects. Other species associated with similar habitat attributes include primary and secondary cavity nesters such as the pileated woodpecker, hairy woodpecker, brown creeper, red-breasted nuthatch, chestnut-backed chickadee, red-breasted sapsucker, and northern pygmy owl. Remnant features of the type needed for nesting are found in appreciable numbers in Units 28-2-31A, 28-2-32A and D, 28-3-23A, and 28-3-25A.

The **brown creeper** (*Certhia Americana*) requires large trees with deeply fissured or furrowed bark, particularly Douglas-fir trees greater than 200 years old. A resident species, it generally nests in cavities or between peeling bark and the tree bole, and is a bark-gleaning insectivore. Other species with similar habitat requirements include the red-breasted nuthatch, golden-crowned kinglet, chestnut-backed chickadee, hermit warbler, pine siskin, and red crossbill. Remnant features in Units 28-2-31A, 28-2-32A and D, 28-3-23A, and 28-3-25A are most likely to provide suitable bark structure.

The **red crossbill** (*Loxia curvirostra*) feeds on conifer cones, particularly Douglas-fir and western hemlock within the project area. It is a resident nomadic cup-nester that depends heavily on cone crop production. It is generally associated with mature and old-growth trees with substantial crown surface area. Other species with similar requirements include the pine siskin, evening grosbeak, and purple finch. Trees with substantial crown surface area are currently found in small portions of Units 28-2-31A; 28-2-32A, C and D; 28-3-23A; and 28-3-25A.

The **pileated woodpecker** (*Dryocopus pileatus*) requires snags, large live trees, and to a lesser extent downed wood, for foraging habitat. It is a resident species that nests in large snags and decadent live trees. It is an insectivore that forages on both hard and soft snags as well as live, particularly defective, trees. Early-seral habitat can be used for foraging when snags and/or down logs are present. Other species associated with similar features include primary cavity nesters such as the hairy woodpecker and red-breasted sapsucker, and secondary cavity nesters such as northern pygmy owl, Vaux's swift, red-breasted nuthatch, brown creeper, chestnut-backed chickadee, and northern saw whet owl. Features of the type needed are currently found in Units 28-2-31A, 28-2-32A and D, 28-3-23A, and 28-3-25A.

The **varied thrush** (*Ixoreus naevius*) requires tree layering in the mid-story of mature conifer forests. A short-distance migrant, it generally nests in young understory Douglas-fir and western hemlock. As an understory gleaning omnivore, it requires berry-producing shrubs and invertebrates found in soft, loose debris on the forest floor. Other species associated with similar habitats include warbling vireo, Wilson's warbler, hermit thrush, and Swainson's thrush. Conditions of the type used by the species are found in very low amounts in Units 28-2-31A; 28-2-32A, C and D; 28-3-23A; and 28-3-25A.

The **hermit warbler** (*Dendroica occidentalis*) requires closed canopy coniferous forest with high foliage volumes. The species is a neo-tropical migrant cup-nester and foliage-gleaning canopy dweller that is generally not associated with stands of any specific age. Other species associated with similar habitat conditions include the golden-crowned kinglet and chestnut-backed chickadee. Closed canopy conditions are currently found in all of the proposed units, although high foliage volume is currently found only in portions of Units 28-2-31A; 28-2-32A, C and D; 28-3-23A; and 28-3-25A.

The **Pacific-slope flycatcher** (*Empidonax difficilis*) requires deciduous canopy and/or subcanopy trees. The species is a neo-tropical migrant that nests in a variety of locations ranging from cavities to cup nests between exfoliated bark. It is an aerial insectivore that requires open space beneath or within the canopy and a substantial hardwood component, especially in association with wet or riparian areas. Other species associated with these habitats include warbling vireo, black-headed grosbeak, and black-throated gray warbler. Conditions of these types are currently found in Units 28-2-31A and B; 28-2-32A, B and C; 28-3-23A; and 28-3-25A.

Hammond's flycatcher (*Empidonax hammondii*) requires open mid-story conditions characterized by low tree density in mature stands. A neo-tropical migrant, the species builds cup nests on large conifer limbs. It is an aerial insectivore that requires substantial open space beneath the canopy and between trees. Other species associated with similar habitats include hairy woodpecker, hermit warbler, golden-crowned kinglet, and chestnut-backed chickadee. Conditions of the type needed are not currently found in any of the units.

Wilson's warbler (*Wilsonia pusilla*) is a neo-tropical migrant that nests in low deciduous vegetation in mature conifer forests. It is a foliage-gleaning insectivore, requiring a diverse deciduous shrub and/or mid-canopy layer. Species associated with similar habitats include winter wren, orange-crowned warbler, Swainson's thrush, and warbling vireo. Patches of deciduous understory are currently found in small areas of Units 28-2-31A and B; 28-2-32A, B and C; 28-3-23A; and 28-3-25A.

The **winter wren** (*Troglodytes troglodytes*) requires complex vegetative structure on the forest floor. A resident species, it nests in concealed natural cavities in root wads, stumps and downed logs. It is a ground and low understory insectivore. Although typically associated with more complex forest vegetation winter wrens are commonly found throughout the project units and typically anywhere there is downed wood, including slash piles. Species associated with similar habitats include Wilson's warbler, orange-crowned warbler, and rufous hummingbird. Quality and quantity of habitat of this type is currently not present in sufficient amounts any of the proposed units.

The **black-throated gray warbler** (*Dendroica nigrescens*) is a neo-tropical migrant that nests in deciduous trees. A foliage gleaning insectivore, it is generally associated with younger stands from 25 to 40 years old. Other species associated with these habitat types include black-headed grosbeak, Pacific-slope flycatcher, and warbling vireo. Conditions of this type are not currently found in any of the proposed units.

Hutton's vireo (*Vireo huttoni*) requires deciduous shrubs and trees in the understory of coniferous forests. This resident species nests in forks of tree limbs generally seven to twenty-five feet above the forest floor. While primarily insectivorous, it also feeds on berries provided by deciduous shrubs and trees. It is not generally associated with forests of any specific age. Other species associated with this habitat type include Swainson's thrush, winter wren, warbling vireo, and Wilson's warbler. Deciduous understory currently exists in portions of Units 28-2-31A and B; 28-2-32A, B and C; 28-3-23A; and 28-3-25A.

The **olive-sided flycatcher** (*Contopus borealis*) requires juxtaposition of late and early-seral habitat, particularly with high-contrast edges. It is a neo-tropical migrant that typically nests in western hemlock and true firs. An aerial insectivore, it generally forages in early-seral areas, but requires tall adjacent trees for singing perches. Species associated with these habitat types include western tanager, Steller's jay, purple finch, evening grosbeak, red crossbill, mourning dove, and western wood-pewee. Habitat of this type currently exist along some edges of Units 28-2-32A, 28-3-17A and 28-3-25A.

The **western bluebird** (*Sialia Mexicana*) requires snags within areas of early-seral condition for nesting habitat. It is a short distance migrant, primarily insectivorous, and highly dependent on early-seral conditions for foraging habitat. Other primary and secondary cavity nesters that will nest in early-seral habitats include northern flicker, red-breasted sapsucker, house wren, violet-green swallow, and tree swallow. Non-cavity nesters that use snags in early-seral habitat for foraging or singing perches include olive-sided flycatcher, western tanager, western wood-pewee, red crossbill, Steller's jay, evening grosbeak, and red-tailed hawk. Conditions of this type are not currently found in any of the proposed units.

The **orange-crowned warbler** (*Vermifora celata*) requires early-seral conditions. The species is a ground-nesting neo-tropical migrant. A foliage gleaning insectivore, it is highly dependent on dense deciduous shrubs. Other species associated with these habitat conditions include rufous hummingbird, Wilson's warbler, MacGillivray's warbler, willow flycatcher, wrentit, Bewick's wren, song sparrow, and spotted towhee. Conditions of this type are not currently found in any of the proposed units.

The **rufous hummingbird** (*Selasphorus rufus*) requires early-seral habitat for foraging. This neo-tropical migrant generally nests in shrubs and small trees, and is highly dependent on nectar producing flowering plants. Insects are also required for feeding young. Other species associated with these habitat conditions include the orange-crowned warbler, Allen's hummingbird, Wilson's warbler, MacGillivray's warbler, willow flycatcher, wrentit, Bewick's wren, song sparrow, and spotted towhee. Conditions of this type are not currently found in any of the proposed units.

The **band-tailed pigeon** is a fruit- and seed-eating bird widely distributed across North and South America. In Oregon it generally nests and roosts in mature, closed canopy conifer stands, while more open forest stands and agricultural lands are used for foraging. Band-tailed pigeons travel widely in search of food, giving the species a nomadic nature. Mature forests stands these species could utilize for nesting and roosting are found within the project area and most specifically 28-3-23A, 28-3-25A, and 28-2-31A.

4. *Survey and Manage*

The **red-tree vole** (*Arborimus longicaudus*) is a small rodent found primarily in older, structurally complex forests in western Oregon and northwestern California. It is listed as sensitive-vulnerable by the State of Oregon in the Coast Range Eco-region.

Populations of red tree voles found within the project area are not part of the North Oregon Coast distinct population segment identified as a candidate for Federal Endangered Species Act protection in October 2011 (USFWS. 2011b), and are well outside of their range. This project would have no impact on the North Oregon Coast red tree vole populations and they will not be discussed further.

Red tree voles are restricted to conifer forests due to their exclusive diet of conifer needles. Though they use a variety of tree species, they primarily feed on Douglas-fir needles and nest in Douglas-fir trees. Red tree voles are sometimes found in younger forest stands, and these are primarily thought to be dispersing juveniles. It is unlikely that these red tree voles can persist in these areas. The home range of a red tree vole is very limited, often less than one-half an acre, and typical dispersal distance is often less than the length of a football field. Expanses of land without suitable forest cover can be a barrier to their movement and population connectivity. Red tree voles are vulnerable to habitat loss and fragmentation from timber harvest, wildfire, development, recreation, roads, and other human-caused disturbance.

Under Survey and Management Guidelines, habitat screens are used to assess and determine surveys requirements. For the red tree vole, there are three criteria for determining the need for pre-disturbance surveys. All three conditions must be met in order to trigger surveys.

1) The proposed activity (project) is within the known or suspected geographic range of the species;

2) Suitable habitat that may potentially contribute to a reasonable assurance of persistence occurs within the proposed project area (ROD S&G, p 23); the Roseburg BLM District falls within the Mesic forest distribution zone and thus the quadratic mean diameter (QMD) or arithmetic mean diameter (ADM) for this zone were used as part of suitable habitat criteria determination; and

3) The proposed activity has the potential to "cause a significant negative effect on the species habitat or the persistence of the species at the site" (ROD S&G, p 22). Suitable habitat descriptions do not include all stand conditions where red tree vole sites have been discovered.

Unit 28-3-25A is the only proposed unit that meets the protocol triggers for surveys. Surveys were conducted as described in the "Survey Protocol For The Red Tree Vole" Version 2.1 (Biswell *et al*. 2002). All portions of the unit were surveyed by transect, including areas designated as Riparian Reserves or"aggregate retention." Where trees were assumed to contain active nests, or where activity was confimed by climbing, additional surveys withi a 100-meter radius were conducted. This process continued until 100 percent of the unit area and additional adjoining areas had been surveyed.

Ground surveys located 84 potential nest trees. Climbing determined that eight trees were active, 11 were inactive, and eighteen did not contain red tree vole nests.

In addition to Roseburg BLM efforts, an interested citizen group, the Northwest Ecosystem Survey Team (NEST) climbed trees within Unit 28-3-25A to loofk for evidence of red tree vole occupancy. They reported finding 14 active nest trees, and eight inactive nest trees, in addition to those identified by the BLM.

It is not known what criteria members of NEST used to select trees for climbing, and their reported sites have not been climbed by agency personnel for verification. Additionally, NEST members' training, their credentials, and the chain of custody of the samples are self-reported and have not been verified. For these reasons, their reported site locations are included here for informational puposes, but are not considered to be protocol survey data.

The **Crater Lake tightcoil** snail (*Pristiloma arcticum crateris*) inhabits wet areas such as perennial springs, seeps, and wetlands in mature conifer forests at altitudes above 2000 feet. Habitat features include large coarse woody debris, rocks, surface vegetation, moss, and uncompacted soil (Duncan *et al.* 2003). The series of fens associated with proposed Unit 28-3-25A are representative of suitable habitat for this species. One set of protocol surveys has been completed with negative results. A second set of protocol surveys will be conducted in the spring of 2012 under the appropriate soil temperature and humidity conditions specified in the survey protocols.

The **Chace sideband snail** (*Monadenia chaceana*) and **Oregon shoulderband snail** (*Helminthoglypta hertlieni*) are endemic to northwest California and southwest Oregon. They are believed to forage on leaf litter, fungi, and/or detritus. They require refugia (i.e., crevices in rock-on-rock habitat, soil fissures, or the interior of large woody debris) to avoid desiccation during hot and dry weather (Weasma 1998a and b; Frest and Johannes 2000). When active, these snails can be found in herbaceous vegetation, ferns, leaf litter, or moss mats in shaded areas near refugia.

Although suitable habitat is present in Units 28-3-17A and B, surveys are not required as they were previously cleared in 2006 surveys. The presence of suitable habitat triggers the need for protocol surveys in all remaining units. Two sets of protocol surveys on Unit 28-3-17C were completed in the fall of 2011 with negative results.

One set of surveys on the remaining units was completed in the fall of 2011, resulting in the location of a Chace sideband snail in Unit 28-3-25A. A second set of surveys will be conducted in the spring of 2012 under the appropriate soil temperature and humidity conditions specified in the survey protocols.

5. *Early-seral Obligates*

Large Mammals

The **Roosevelt elk** (*Cervus elaphus roosevelti*) is highly valued in Oregon as a game species and for public viewing. The Roseburg District ROD/RMP (p. 39) states that "Roosevelt elk habitat management will be emphasized in the Tyee, Deadman Mountain, and Canton Creek elk areas." Portions of the project area lie within the Deadman Mountain elk area.

The Oregon Department of Fish and Wildlife's Oregon's Elk Management Plan (2003) states, "…federal forestlands in Western Oregon are increasingly lacking in adequate forage conditions…Quality foraging habitat is considered to be the causal factor in declining herd health for Southwest Oregon." Elk population declines and reductions in hunter success have been directly correlated to reduced harvest on Forest Service and BLM-administered lands in Douglas County,Oregon and across Southwest Oregon. The impact of nutritional limitations on elk populations in the Cascades rain forests of western Oregon have been documented by researchers over the last half century. Reproductive success is closely related to nutrition, body condition, physical health, and the age of females (Cook 2002).

Summer elk forage consists of a combination of lush forbs, grasses, and shrubs high in nutrients and easily digestible. Generally, higher elevation wet meadows, springs, and riparian areas in close proximity to forested stands offer these conditions for the longest period. Elk achieve peak body condition during late-summer and fall. Winter survival depends on fat reserves animals are able to store during summer and fall, so quality forage is crucial.

Elk were once also thought to require thermal cover in order to maintain body temperature. Recent work in northeast Oregon has shown this is not the case (Cook *et al.* 1998). No positive effects of thermal cover were demonstrated.

In their current condition, the units being analyzed offer only very low levels of forage for Roosevelt elk.

The **Columbian black-tailed deer** (*Odocoileus hemonius columbianus*) is also valued as a game species and for public viewing. On the west side of the Cascades, black-tailed deer prefer dense, early-seral communities (Verts and Carraway 1998). The Oregon Department of Fish and Wildlife has found populations of Columbian black-tailed deer to be in decline in part, for reasons consistent with their findings on Roosevelt elk.

Black-tailed deer are browsers, foraging in the younger seral stages (Verts and Carraway 1998). Timber harvest has a varied effect on black-tailed deer habitat. Five to eight years following clearcutting, food supplies increase and deer use of an area peaks. A gradual decline in deer use follows, as preferred browse plants grow out of reach and are eventually shaded out by conifers (Edgerton 1972).

In their current condition, the units being analyzed offer only very low levels of forage for Columbian black-tailed deer.

The **black bear** is also valued as a game species and for wildlife watching, and is common throughout the Roseburg District. Black bears are omnivorous, depending mostly on succulent grasses, sedges and forbs in the spring and summer, and berries, nuts, roots, and insects in the summer and fall. Logging stimulates forage production for foods such as salmonberry, blackberry, hazel, and huckleberry, and improves foods like grasses and forbs for up to 15 years (PRMP/EIS p. 3-29).

The **mountain lion** (*Puma concolor*) is of high public interest primarily because its presence is viewed as an indicator of the wildness of an area. While deer are their preferred prey, mountain lions also pursue elk, porcupine, hares, rabbits, rodents, skunk, and birds. Mountain lions typically inhabit mountainous terrain with mature, open forest with boulder areas, rim ledges and ridges (PRMP/EIS p. 3-30).

Butterflies and Moths

Over 200 species of butterflies and 2,200 species of moths of the Order Lepidoptera have been identified in the woodlands and forests of the Pacific Northwest (Miller 1995; Miller and Hammond 2000, 2003).

Many Lepidoptera occur in old-growth forests, but are not old-growth dependent and may be common in thinned, second-growth forests that display some characteristics of old-growth forests, such as canopy openings and strong development of understory vegetation.

Caterpillars of most butterflies and moths feed on angiosperms. In a study conducted on the H.J. Andrews Experimental Forest, on the west slope of the Oregon Cascades, researchers found that 57 percent of the species in light-trap samples fed on one species of hardwood or another, particularly species of Fagaceae (Beech), Salicaceae (Willow), Ericaceae (Heath), and Rhamnaceae (Buckthorn). Thirty-one percent fed on herbs and grasses; and only 9 percent fed on conifers in the forest canopy (Hammond and Miller 1998, Miller and Hammond 2003).

Dense conifer forests, with fewer species of flowering plants, offer some of the most unsuitable habitat for most forest butterflies and moths (Muir *et al.* 2002).

In sharp contrast to the few species that are dependent on late-seral forest, there exists a relatively large number of butterfly and moth species that require open meadow-like habitats. About 30 species of rare or uncommon butterflies and moths have been identified that require open areas in the forest where the environment favors either forage plants for the caterpillars or the nectar-producing plants for the adults.

Prior to the period of European settlement of the Pacific Northwest, large wildfires and aboriginal clearing fires produced much of this open habitat. After decades of wildfire suppression in the Pacific Northwest, it is the practice of timber harvesting that has created a majority of the early successional plant communities. Without natural and/or induced disturbances, open habitats are becoming less common on the Federal landscape in western Oregon, and species that depend on them are becoming uncommon or rare.

Small mammals

The Pacific pallid bat, fringed myotis and Townsend's big-eared bat are Bureau Sensitive Species, and the red-tree vole is a Survey and Manage species. Based on their status, these species are discussed in their relative sections of the affected environment.

The northern spotted owl has been known to prey on a number of different small mammal species. The relative proportions of these species in terms of biomass are discussed under the affected environment for the northern spotted owl, as are the most prominent prey items, the northern flying squirrel and wood rat. Other northern spotted owl prey species include the brush rabbit, snowshoe hare, deer mouse, Western red-backed vole, western pocket gopher, and red-tree vole which combined account for one-quarter to one-third of total prey biomass.

The **brush rabbit** (*Sylvilagus bachmani*) inhabits dense, brushy cover, most commonly in shrub habitat, but will also inhabit forested habitats with sufficient shrub understory to provide adequate shelter and food. They do not dig their own burrows or dens, but rather use the burrows of other species, brush piles, or forms. The brush rabbit feeds mainly on grasses and forbs, and will also eat berries and browse on shrubs. Units 28-2-31A and B; 28-2-32A, B, C, and D; 28-3-17C; 28-323A; and 28-3-25A currently contain areas of understory shrub habitat, albeit with low levels of available forage.

The **snowshoe hare** (*Lepus americanus*) inhabits dense conifer forests, preferring young stands for daytime sanctuary with abundant understory for cover and food. They nest in shallow depressions in cover, and browse on green grasses, forbs, and the leaves of deciduous trees and shrubs. During the winter, snowshoe hares forage on buds, twigs, bark, and evergreens. Habitat for this species is not currently found in the units being analyzed, but would develop under some of the alternatives and reference analyses.

The **deer mouse** (*Peromyscus maniculatus*) is a habitat generalist, but prefers areas with abundant deciduous vegetation. They generally nest in stumps, downed wood, brush piles, or tree cavities, but will dig burrows or utilize the burrows of other species. It is omnivorous, eating a wide variety of plant and animal matter including seeds, fruits, flowers, nuts, and insects and other invertebrates. Habitat currently exists in all units, but areas of abundant deciduous vegetation do not currently occur in any of the units.

The **western red-backed vole** (*Myodes californicus*) occurs in forested riparian habitats, particularly those dominated by older, naturally degenerate forests with moist soils and abundant large downed wood. They nest in burrows made by other animals, under logs, or under old leaves. Their diet is dominated by truffles, other fungus fruiting bodies and lichens. They will sometimes eat green vegetation, grass, seeds, and insect larvae. Habitat for the species currently exists only in small portions of Unit 28-3-25A.

The **western pocket gopher** (*Thomomys mazama*) inhabits open grassy areas and early-seral forest habitat. It is a burrowing mammal, spending much of its time underground, but sometimes foraging on the surface at night. Diet includes roots, tubers, bulbs and some surface vegetation. Habitat for this species is not currently found in the units being analyzed, but would develop under some alternatives and reference analyses.

Other species representative of habitat types currently present in the areas analyzed or which would develop under some alternatives and reference analyses include the Pacific jumping mouse, dusky shrew and Townsend's chipmunk.

The **Pacific jumping mouse** (*Zapus trinotatus*) lives in deciduous riparian woodlands, peaty wet meadows, and brushy riparian Douglas-fir and mixed evergreen forests. It builds hollow nests on the ground. Its diet consists mainly of seeds, but also fruit, berries, insects, fungi, and mollusks. Habitat currently exists in all units, but areas of abundant deciduous riparian vegetation are currently absent.

The **dusky shrew** (*Sorex monticolus*) inhabits forested riparian areas with dense ground cover, particularly in areas with large downed wood. Nests are generally constructed under rocks or downed wood. Its diet consists primarily of insects and their larvae, earthworms, spiders, and snails. Habitat currently exists in portions of Units 28-2-32A and B, and 28-3-25A.

Townsend's chipmunk (*Tamias townsendii*) habitat consists of dense shrub habitat, independent of overstory conditions, particularly areas with abundant decaying logs, evergreen herbs, shrubs, and trees, and a variety of fungi and lichens. Talus slopes with loose rocks are preferred as nest sites. It has a diverse diet eating seeds, nuts, fruits, insects, roots, green vegetation, and fungi. Areas of dense shrub habitat currently exist in Units 28-2-31A and B; 28-2-32A, B, C, and D; 28-3-17C; 28-3-23A; and 28-325A.

B. Alternative One – Effects

There would be no direct effects to wildlife species on BLM-managed lands if the proposed action was not undertaken. 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.

In the long term, conditions in younger stands such as 28-3-17 A, B and C would be most affected by competition among 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 dominant trees would soon expand their crowns into the newly-available growing space, limiting the ability of understory vegetation to become established in response to the temporary increase in available light. Multiple waves of mortality would be necessary before dominant tree densities would be low enough to allow for understory reinitiation. This growth trajectory would be unfavorable to development of mature and late-successional forest attributes.

In the late-seral stands, habitat is more complex with large trees, snags, and coarse downed wood. Trees within these stands would continue to age and increase in size, developing increasingly complex structural characteristics such as senescent trees and snags that provide a diversity of niches for wildlife. Trees and snags furnish substrates for primary and secondary cavity nesters, attributes such as large limbs, and decay and disease infestation sites. Complex bark structure is positively associated with tree size. Species such as brown creepers, pacific slope flycatchers, and bats use these trees for nesting and roosting. Large-diameter limbs associated with mature trees would provide resting and nesting platforms for many species of arboreal mammals and birds such as spotted owls, northern flying squirrels, and red tree voles.

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. For species dependent on early-seral forests, private lands are not expected to provide quality habitat as these lands are intensively managed for conifer growth employing practices such as heavy replanting or herbicide application, to the exclusion of competing vegetation that includes flowering plants, shrubs and hardwood trees.

1. Threatened and Endangered Species

Absent any timber harvest, there would be no direct effects to the **northern spotted** owl. The forest stands that make up the proposed project area would continue to provide suitable and dispersal habitat as currently exists.

In younger stands, such as those in Section 17, T. 28 S., R. 3 W. and stands on low productivity soils, such as in Section 31, T. 28 S., R. 2 W., northern spotted owls would be indirectly affected by continued slow development of structural diversity and complexity that would provide future suitable habitat for northern spotted owls and some of their prey species. This trajectory would be unfavorable to the development of canopy openings and vertical stratification of vegetation that aid northern spotted owls in predator avoidance, and provide foraging and dispersal opportunities for some northern spotted owl prey species.

Primary Prey Species for the Northern Spotted Owl

Under this alternative, the current growth trajectory of the stands would not change. Northern flying squirrels would be unaffected, as existing habitat would neither be augmented nor reduced. Woodrats would be indirectly affected as shade intolerant hardwoods and shrubs present in some areas would be suppressed and eventually die, leading to a decline in forage and habitat.

Consistency with the Northern Spotted Owl Recovery Plan

Under this alternative, no treatments would be conducted, and the identified forest stands would continue to develop along current growth trajectories. There would be no removal or modification of existing habitat features and structure. This could not be inconsistent with the intent of the Recovery Plan to focus on preservation of high priority existing habitat features and areas. This may, however, be inconsistent with recommendations contained in the Recovery Plan to apply ecological forestry principles to manage moist forest habitat in uniform, even-aged stands in order to promote development of structural complexity (USFWS 2011a, p. III-14 and 18), and to use pilot projects to demonstrate techniques and principles of ecological forestry (USFWS 2011a, p. III-19).

2. *Bureau Sensitive Species*

Effects to the **peregrine falcon** would be indirect. Current forest conditions that do not support abundant bird populations could result in declining prey abundance over time.

The **purple martin** would not be directly affected as those areas that currently provide nesting opportunities would continue to for the foreseeable future. In the younger stands without remnant trees or snags, such as in Section 17, T. 28 S., R. 3 W. and stands on low-productivity sites in Section 31, T. 28 S., R. 2 W., growth trajectories would not provide an abundance of large trees favored by primary cavity nesters that would eventually provide habitat for the purple martin.

For **Townsend's big-eared bats**, **Pacific pallid bats** and **fringed myotis,** development of large trees with deeply fissured bark that may provide roosting opportunities during foraging periods would continue to develop as described in the beginning of this alternative. This trajectory would continue to support current insect populations that are important for these species. This would be at a reduced rate when compared to Alternative Two, as low species complexity, particularly hardwood trees and flowering plants are directly related to lower species diversity and productivity.

3. *Land Birds*

Under this alternative, there would be no effect on **Vaux's swift, brown creeper, red crossbill, pileated woodpecker, varied thrush, hermit warbler, Wilson's warbler,** or **olive-sided flycatcher, winter wren, black-throated gray warbler**, or their associated species, as the specific habitat features utilized by those species, described under the affected environment, would be neither augmented nor reduced.

The **Pacific-slope flycatcher** and **Hutton's vireo**, and their associated species, would be indirectly affected, as shade intolerant hardwoods would gradually be suppressed and die, reducing foraging habitat for the species.

This alternative would have no effect on **Hammond's flycatcher, western bluebird, orange-crowned warbler,** or **rufous hummingbird**, or their associated species, as the units analyzed do not currently provide habitat for these species, and would not be expected to develop absent unpredictable stand altering events.

4. *Survey and Manage*

No suitable habitat for the **red-tree vole** would be affected under this alternative and any species sites in or adjacent to the project area would be expected to persist.

No suitable habitat for the **Crater Lake tightcoil**, **Chase sideband**, or **Oregon Shoulderband** would be affected under this alternative and any species sites in or adjacent to the project area would be expected to persist. The development of suitable habitat characteristics for these species, such as coarse woody debris, would continue to occur as trees age and fall, or natural disturbances such as blow down or disease occur.

5. *Early-seral Obligates*

Large Mammals

Taking no action would have no effects on **Roosevelt elk**, **Columbian black-tailed deer** or **black bear,** because foraging habitat would be neither augmented nor removed. Similarly, there would be no effects on **mountain lion** because the current abundance of prey species supported by the units would be unchanged.

Butterflies and Moths

Under this alternative, the current growth trajectory of the stands would not change. As a result, shade intolerant hardwoods and shrubs present in some areas would be suppressed and eventually die. This would indirectly affect the majority of butterfly and moth species, as they are dependent on such habitat features. Those species that feed on herbs and grasses would be largely unaffected, as these features are largely absent in the units analyzed. The minority of species, which feed on conifers in the forest canopy, would also be largely unaffected, as this habitat type would continue to dominate the units.

Small Mammals

Under this alternative, there would be no effect on the **brush rabbit, western red-backed vole, Pacific jumping mouse, dusky shrew,** and **Townsend's chipmunk**, as the specific habitat features utilized by those species, described under the affected environment, would be neither augmented nor reduced.

The **deer mouse** would be indirectly affected, as shade intolerant hardwoods would gradually be suppressed and die, reducing the quality of foraging habitat for the species.

The is alternative would have no effect on the **snowshoe hare** or **western pocket gopher**, as units analyzed do not currently provide habitat for these species, and would not be expected to develop absent unpredictable stand altering events.

C. Alternative Two – Effects

A variable retention harvest prescription with retained aggregates results in uneven-aged stand management over time. Uneven-aged management is defined as a forest or stand composed of a variety of tree ages. It maintains different age classes of trees within the stand and promotes structural diversity. Large trees that survive stand-replacing disturbances can provide critical habitat for species associated with older forests, allowing persistence or facilitating dispersal following disturbance events. These legacy trees function as refugia for small organisms with limited dispersal ability, such as amphibians, arthropods (Wessell 2005), and lichens (Neitlich and McCune 1997). The protection of gaps, "wolf trees", and remnant old-growth trees has been recommended for maintaining diversity and distribution of epiphytic macrolichens (Nietlich and McCune 1997), many of which are important forage for wildlife in conifer forests of the Pacific Northwest. Retained trees also facilitate dispersal through otherwise unsuitable habitat for some forest-associated species. Relatively even dispersal of large trees in harvested areas can facilitate movement of forest interior species such as the brown creeper (Rosenberg and Raphael 1986, Brand and George 2001).

1. Sub-Alternative A

a. Threatened and Endangered Species

No effects to the **northern spotted owl** from disturbance would be anticipated, as seasonal restrictions would be applied, when and where appropriate, as described in Chapter Two (pp. 18 and 19). Effects would be solely associated with modification or removal of suitable and dispersal habitat.

The **Blue Oyster Cultus** home range currently has 2,045 acres of suitable habitat and 427 acres of dispersal habitat, making up 69 and 14 percent of the home range, respectively (Table 3-19, p. 61). Within the 500-acres core area, there are 412 acres of suitable habitat and 45 acres of dispersal habitat, making up 82 and nine percent of the core area, respectively. Compared to the estimated site viability thresholds of 50 percent suitable habitat within the core area and 40 percent suitable habitat within the home range, both the core area and home range contain sufficient suitable habitat to maintain site viability.

Units 28-2-31A and B, 28-2-32C and D are located entirely or partially within the home range, but entirely outside of the core area. Variable retention harvest would remove 54 acres of suitable habitat. Removal of standing timber and reduction of canopy closure to an estimated 10 to 15 percent in areas of dispersed retention area would convert these areas from suitable habitat to unsuitable habitat.

Aggregate retention blocks would continue to provide conditions suitable for dispersing owls, but dispersed retention would not. Long term, these aggregate retention blocks would provide important structural diversity elements, potentially accelerating the re-attainment of suitable habitat conditions.

The harvest of 54 acres of suitable habitat could result in an increased risk of predation to resident or dispersing northern spotted owls as they move across the landscape. Harvest would also reduce suitable habitat within the home range to approximately 67 percent. No changes to levels of suitable habitat would occur within the core area. The home range would be expected to remain viable, however, as suitable habitat would remain above the 40 percent threshold.

The **High Riser** home range currently has 968 acres of suitable habitat and 406 acres of dispersal habitat, making up 33 and 14 percent of the home range, respectively. Within the 500-acre core area, there are 169 acres of suitable habitat and 122 acres of dispersal habitat, making up 34 and 24 percent of the core area, respectively. Compared to the estimated site viability thresholds of 50 percent suitable habitat within the core area and 40 percent suitable habitat within the home range, both the core area and home range are deficient in suitable habitat.

Unit 28-3-27A, B, and C are located within the home range, and approximately 13 acres of Unit 28-3-17B within the core area. Variable retention harvest would remove 65 acres of dispersal habitat. Removal of standing timber and reduction of canopy closure to an estimated 10 percent in areas of dispersed retention area would convert these areas to unsuitable habitat. Aggregate retention blocks would continue to provide habitat for dispersing owls but dispersed retention would not. Long term, these aggregate retention blocks would provide important structural diversity elements, potentially accelerating the re-attainment of suitable habitat conditions.

Loss of dispersal habitat should not affect viability of the home range. Thirteen acres of dispersal habitat would be removed from within the core area, however. In core areas with less than 50 percent suitable habitat, dispersal habitat plays an important role in allowing owls to move between patches of suitable habitat and forage. Even though 13 acres represents only 2.6 percent of the core area, the removal of dispersal habitat would further affect both short and long term site viability.

The **Lucky Buck** home range currently has 480 acres of suitable habitat and 233 acres of dispersal habitat, making up 16 and 8 percent of the home range, respectively (Table 3-19, p. 61). Within the 500-acre core area, there are 205 acres of suitable habitat and 24 acres of dispersal habitat, making up 41 and five percent of the core area, respectively. Compared to the estimated site viability thresholds of 50 percent suitable habitat within the core area and 40 percent suitable habitat within the home range, both the Lucky Buck home range and core area are deficient in suitable habitat.

Unit 28-3-2-17A is located within the home range, but not the core area. Variable retention harvest would remove 14 acres of dispersal habitat, which should not have any effect upon the viability of the home range. Removal of standing timber and reduction of canopy closure to an estimated 10 percent in areas would make this area unusable as dispersal habitat. Aggregate retention blocks would continue to provide conditions suitable for dispersing owls, but dispersed retention would not. Long term, aggregate retention blocks would provide important structural diversity elements, potentially accelerating the re-attainment of suitable habitat conditions.

The **Curtin Creek** home range currently has 2,235 acres of suitable habitat and 227 acres of dispersal habitat, making up 75 and eight percent of the home range, respectively (Table 3-19, p. 61). Within the 500-acre core area, there are 467 acres of suitable habitat and 19 acres of dispersal habitat, making up 92 and four percent of the core area, respectively. Compared to estimated site viability thresholds of 50 percent suitable habitat within the core area and 40 percent suitable habitat within the home range, both the Curtin Creek core area and home range contain sufficient suitable habitat to maintain site viability

Units 28-3-23A and 28-3-25A are located entirely within the home range, and partially within the core area. Variable retention harvest would remove 96 acres of suitable habitat from within the home range. Of these 96 acres, 42 would be removed with the core area. Removal of standing timber and reduction of canopy closure to an estimated 10 to 15 percent in areas of dispersed retention area would convert these areas from suitable habitat to unsuitable habitat. Aggregate retention blocks would continue to provide conditions suitable for dispersing owls, but dispersed retention would not. Long term, aggregate retention blocks would provide important structural diversity elements, potentially accelerating the re-attainment of suitable habitat conditions.

The harvest of 96 acres of suitable habitat could result in an increased risk of predation to resident or dispersing northern spotted owls as they move across the landscape. Harvest would also reduce suitable habitat within the home range and core area to approximately 72 and 84 percent, respectively. The home range and core area would be expected to remain viable, however, as suitable habitat would remain above the 40 and 50 percent thresholds.

The **Deadman Mountain** home range currently has 1,481 acres of suitable habitat and 926 acres of dispersal habitat, making up 50 and 31 percent of the home range, respectively (Table 3-19, p. 61). Within the 500-acres core area, there are presently 318 acres of suitable habitat and 113 acres of dispersal habitat, making up 64 and 23 percent of the core area, respectively. Compared to estimated site viability thresholds of 50 percent suitable habitat within the core area and 40 percent suitable habitat within the home range, both the core area and home range contain sufficient suitable habitat to maintain site viability

Units 28-2-32A, B, C and D are located entirely or partially within the home range, and Unit 28-2-32A partially within the core area. Variable retention harvest would remove 21 acres of suitable habitat and 70 acres of dispersal habitat.

Removal of standing timber and reduction of canopy closure to an estimated 10 to 15 percent in areas of dispersed retention area would convert these areas from suitable habitat to unsuitable habitat. Aggregate retention blocks would continue to provide conditions suitable for dispersing owls, but dispersed retention would not. Long term, these aggregate retention blocks would provide important structural diversity elements, potentially accelerating the re-attainment of suitable habitat conditions.

The harvest of 21 acres of suitable habitat and 70 acres of dispersal habitat could result in an increased risk of predation to resident or dispersing northern spotted owls as they move across the landscape. Harvest would also reduce suitable habitat within the home range to approximately 49 percent. No measurable changes levels of suitable habitat would occur within the core area. The home range and core area would be expected to remain viable, however, as suitable habitat would remain above the 40 and 50 percent thresholds.

Prey Species for the Northern Spotted Owl

The units analyzed generally do not exhibit multidimensional structure in the mid and overstory layers, although areas providing such structure do exist in portions of some stands. The majority of such areas would be retained in aggregates. Some of these areas would be harvested, as well as larger areas of lower quality existing habitat, and the northern flying squirrel would be affected as a result.

Woodrats are primarily associated with early-and mid-seral forest habitat (Maser et al. 1981, Sakai and Noon 1993, Carey et al. 1999) and would benefit in response to increased understory and shrub development. This would benefit spotted owls if increasing numbers of prey move into forest stands where they are available for capture.

Consistency with the Northern Spotted Owl Recovery Plan

Under the proposed action, harvest would be conducted following principles of ecological forestry as recommended throughout the recovery plan (USFWS 2011a pp. III-11 thru 14, 19, and 20). It would emulate natural disturbance processes through prescriptive actions (USFWS 2011a p. III-13), promoting spatial heterogeneity within patches on local landscapes, and restore lost species and structural diversity within the historical range of variability, including early successional ecosystems (USFWS 2011a pp. III-14 and 18). Additionally, it is consistent with the recommendation to use pilot projects to demonstrate techniques and principles of ecological forestry (USFWS 2011a p. III-19).

Units 28-3-23A, 28-3-25A, and 28-2-32D contain primarily simple structure, single canopy forest with limited understory diversity. However, intermixed with this are habitat patches that meet the criteria recommended for retention, as well as individual valuable habitat features (e.g., large standing snags).

For this reason, prescriptions for these proposed units have been designed to preserve these habitat patches, and to the degree practicable, individual features, while increasing the overall abundance of snags and down wood within the treatment areas. As recommended in the Recovery Plan, this design has been conducted in coordination with Fish and Wildlife Service biologists (USFWS 2011a pp. III-19, 44, 67, and 68).

The Recovery Plan recommends conserving northern spotted owl sites and high-value northern spotted owl habitat (USFWS 2011a pp. III-42 thru 47). However, , the Recovery Plan identifies a number of activities that could have short-term effects to northern spotted owls, but which would still be consistent with the Recovery Plan. Among these are restoration activities that would reduce threats from stochastic disturbance (USFWS 2011a pp. III-13 thru 14, and 45thru 46) and restoration of high quality early-seral habitat (USFWS 2011a pp. III-14 and 46), both of which would be accomplished by the proposed action. Given this, the proposed action is consistent with the Recovery Plan.

b. Bureau Sensitive Species

Variable retention harvest would not be expected to directly affect **peregrine falcons** as the closest proposed harvest unit, 28-2-31B. The unit is approximately one-half of a mile from the peregrine nest site, is not within line-of-site, and activities would not be visually disturbing. Topographical features, vegetation, elevation, and aspect would mitigate noise levels at this distance. Additionally, Peregrine falcons may indirectly benefit from creation of habitat for songbirds on which they prey.

The **purple martin** is not known to be nesting in the stands proposed for harvest. Effects of variable retention harvest would be indirect, associated with the removal of trees and snags, suitable for nesting.

There are no known communal roosts, nurseries or hibernacula for **Townsend's big-eared bats**, **Pacific pallid bats** or **fringed myotis** in the project stands. These species could be indirectly affected by the proposed variable retention harvest in two ways, however. Variable retention harvest would remove some large trees potentially used for roosting and during foraging. These bats could benefit, though, as a diversified environment with hardwoods, forbs and shrub species support increased insect populations that provide prey for these species.

c. Land Birds

Chambers and McComb (1997) tested bird richness and abundance within three timber management practices (modified clearcut, two-story, and small patch group selections) in Oregon. Species richness and abundance was highest in small-patch stands and lowest in control and clearcut stands. In British Columbia, a study comparing bird abundance and diversity in clearcut, partial forest retention, and uncut mature forest indicated that bird species preferred tree-containing habitat types; retention harvesting succeeded in maintaining most of the forest bird community and increasing total avian diversity (Lance and Phinney 2001).

Migratory habitat is critical in fulfilling the feeding and energy renewal needs of migrating birds. Fruit, berry, and nectar producing plants are essential to birds for fat accumulation in order to make long-distance flights, without stopping, across land and large bodies of water (Yong et al. 1998).

Vaux's swift and associated species would be minimally affected. As discussed under the affected environment, the species requires large snags for nesting. A small number of existing large snags would be lost in harvest areas where impracticable to reserve for operational or safety reasons. Additional large snags would be created through incidental mortality of large reserved trees due to sunscald or broadcast burning, or deliberate mortality for snag creation. Overall number of large snags would be expected to be similar post-harvest.

The **brown creeper** and associated species would be subject to minimal adverse effects in the short term, but benefit in the long term. As discussed under the affected environment, the species requires large green trees, generally over 200 years old, with deeply fissured or furrowed bark for nesting, roosting, and feeding. A small number of trees meeting these criteria may be lost where impracticable to reserve for operational or safety reasons. However, large, dispersed retention trees would develop necessary bark habitat features more quickly in open conditions.

The **red crossbill** and associated species would benefit as cone crops needed for feeding would be substantially increased in both the short and long term. Dispersed retention trees and trees along edges of retained aggregates would receive increased sunlight, stimulating cone crop production in western hemlock and crown development in both western hemlock and Douglas-fir, which would increase cone crop potential in future years.

The **pileated woodpecker** and associated species would incur both adverse and beneficial effects. A small number of existing large snags needed for nesting would be lost in harvest areas where impracticable to reserve for operational or safety reasons. Additional large snags would be created, however, through incidental mortality of large reserved trees due to sunscald or broadcast burning, or deliberate mortality for snag creation. Overall number of large snags would be expected to be similar post-harvest. Numbers of smaller snags, which are valuable for foraging habitat, would be created through incidental mortality due to sunscald or broadcast burning and some snag patches would be created by deliberate mortality via fire or girdling.

The **varied thrush** and associated species would benefit, as sunlight reaching into aggregate edges would promote establishment and development of understory trees used by the species for nesting, and berry producing shrubs needed for foraging.

The **hermit warbler** and associated species would benefit in the long term, as understory trees established in areas of sunlight penetration along aggregate edges begin to mature and join with the existing canopy, providing high foliage volume needed for foraging, which is largely lacking under current conditions.

The **Pacific-slope flycatcher** and associated species would benefit in the long term, as areas of deciduous canopy needed for foraging would be expected to develop in harvested areas. Existing hardwood subcanopy patches would be retained under this alternative.

Hammond's flycatcher and associated species would not be affected, as mature, low tree density areas do not currently exist in the units, and would not develop under this sub-alternative.

Wilson's warbler and associated species would benefit, as sunlight reaching into aggregate edges would promote establishment and development of understory trees used by the species for nesting and foraging. However, benefits would be minimal, as the majority of subcanopy trees establishing in these areas would most likely be conifers.

The **winter wren** and associated species would benefit, as sunlight reaching into aggregate edges would promote establishment of a more diverse shrub layer under the existing canopy, as well as a greater deciduous shrub component that would support greater insect abundance needed for foraging.

The **black-throated gray warbler** and associated species would benefit in the long-term, as areas of deciduous canopy needed for foraging would be expected to develop in harvested areas. Existing hardwood subcanopy patches would be retained under this alternative.

Hutton's vireo and associated species would benefit, as sunlight reaching into aggregate edges would promote establishment and development of understory trees used by these species for nesting and foraging, and a more diverse shrub layer under the existing canopy. However, benefits would be minimal, as the majority of subcanopy trees, needed for nesting, establishing in these areas would most likely be conifers.

The **olive-sided flycatcher** and associated species would benefit, as areas of juxtaposed mature and early-seral habitat would be created along edges of aggregates throughout units 28-2-31A, B and C, 28-3-32A, and 28-3-25A. This would provide early-seral habitat needed for foraging adjacent to larger trees needed for singing perches.

The **western bluebird** and associated species would benefit as additional snags, needed for foraging, would be created through incidental mortality due to sunscald or broadcast burning and some snag patches would be created by deliberate mortality via fire or girdling. These features would be within areas of early-seral habitat, developed in harvested areas, which would provide foraging habitat.

The **orange-crowned warbler** and associated species would benefit as extensive areas of early-seral habitat needed for nesting habitat, as well as associated insect abundance and diversity needed for foraging, would develop in harvested areas.

The **rufous hummingbird** and associated species would benefit as extensive areas of early-seral habitat needed to provide nesting habitat and nectar producing flowering shrubs and forbs needed for foraging would develop in harvested areas.

The **band-tailed pigeon** would benefit as extensive areas of early-seral habitat needed to provide seed and berry producing grasses and shrubs for foraging would develop in harvested areas.

d. Survey and Manage

"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" provides several situations where specific projects may be exempted from the Standards and Guidelines. These provisions are varied, and are intended for very specific sets of conditions. The identification of non-high priority sites (Standards and Guidelines, Page 10) is one such example."

The Roseburg District proposes to designate a portion of the **red tree vole** sites discussed in the Affected Environment (p. 71) as non-high priority. The detailed analysis, contained in *Appendix C – Wildlife*, is summarized below.

By grouping all possible nest trees within 100 meters of each other and buffering nest trees by at least one-site potential tree height of 180 feet, nine red tree vole sites were created; seven active sites and two inactive sites. Individual red tree vole sites range from a single tree to 55 trees (Figure 1). The two inactive sites do not require protection under Management Recommendations. Management areas were designated for the seven active sites, individually ranging from approximately three to 51 acres in size and totaling 97 acres in area, 75 acres within the unit boundaries.

To maintain the persistence of red tree voles within and adjacent to Unit 28-3-25A, the Roseburg District proposes to designate Management Areas 1, 3, 6, 7 and portions of 5 as non-high priority sites, but to maintain Management Areas 2 and 4 in their entirety and a portion of 5 (Figure 4). To maintain north-south connectivity for red tree voles, the District is proposing additional land withdrawals, the goal being to maintain a well-connected corridor of habitat from north to south within and around the timber sale unit.

One large Management Area would be designated that encompasses the entire stand of suitable habitat north and east of Road No. 28-2-32.1 road, where it passes through the unit (Figure 4). This Management Area would protect 41 of the 88 potential nest trees identified by the BLM. Aggregate retention blocks within the unit would protect an additional 11 nest trees identified by the BLM (6 active, 1 inactive) and four trees (inactive) identified by N.E.S.T. RTV trees (4 inactive). An additional seven of the 88 potential nest trees are located outside of the timber sale unit boundaries. In total 52 of 88, or 59 percent of potential nest trees would be protected. Based upon the survey results within the timber sale area it is highly likely that the area within the Management Area outside of the unit boundaries supports additional potential.

As previously described (p. 69), suitable habitat for the **Crater Lake tightcoil** snail is present in association with the fens in proposed Unit 28-3-25A are representative of suitable habitat for this species. One set of protocol surveys (Burke *et al.* 1999) has been completed with negative results. A second set of protocol surveys will be conducted in the spring of 2012 under the appropriate soil temperature and humidity conditions specified in the survey protocols.

In the event individuals of the species are found, sites would be protected within aggregates that may include portions of Riparian Reserves, at least two-and-a-half acres in size. These aggregates would maintain: temperature and humidity regimes, soil moisture or water table at the site, woody debris, natural ground cover of low vegetation, litter and duff, and uncompacted soils.

As previously describe (p. 70), suitable habitat for the **Chace sideband snail** and **Oregon shoulderband snail** is present in all of the proposed harvest units.

Units 28-3-17A and B were previously cleared in 2006 surveys. Two sets of protocol surveys on Unit 28-3-17C were completed in the fall of 2011 with negative results. Harvest of these units would have no effect on these species.

One set of surveys on the remaining units was completed in the fall of 2011. One Chace sideband snail was located in Unit 28-3-25A. A second set of surveys will be conducted in the spring of 2012 under the appropriate soil temperature and humidity conditions specified in the survey protocols.

The identified site would be protected in a retention aggregate at least two-and-a-half acres in size in order to maintain: uncompacted soil in and near populated sites; undisturbed talus and rocky outcrops; vegetation; shading, soil moisture, and soil temperature in populated areas, food sources, and refugia. Additional sites that may be located would be protected in similar fashion.

e. Early-seral Obligates

Large Mammals

Development of early-seral habitat in the harvest areas of the proposed units would substantially increase available foraging habitat for **Roosevelt elk**, **Columbian black-tailed deer** and **black bear**. Sunlight reaching into aggregate edges and Riparian Reserves would promote establishment and development of understory vegetation that would provide both food resources and cover for these species. Visual barriers along roads would be incorporated to the degree practicable, but open conditions and increased sight distance may increase hunting pressure on these species in the harvest areas.

Improved deer forage in the harvest areas would increase the number of deer that could be supported in the area. This, in turn, would increase the potential for use of these areas by **mountain lion**.

Butterflies and Moths

Development of early-seral habitat in the units would support a variety of hardwoods, flowering shrubs, forbs, and some grasses. This would result in a substantial increase in available habitat for the large majority of butterfly and moth species that require such plants for foraging, including species that are becoming increasingly uncommon or rare due to decreased availability of such habitats on the landscape. Sunlight penetrating into edges of aggregates and Riparian Reserves would support increased development of hardwoods, flowering shrubs, and forbs in the understory of these areas. The minority of species, which feed on conifers in the forest canopy, would have proportional reductions in available habitat as a result.

Small Mammals

Shrub dominated early-seral habitat would develop across harvested areas, providing cover and food resources for the **brush rabbit, western pocket gopher** and **Townsend's chipmunk**. Sunlight reaching into aggregate edges would promote establishment and development of food resources as well as increases in shrub layer cover.

Habitat for the **snowshoe hare** would develop as sunlight reaching into aggregate edges in Units 28-3-17A, B, and would promote establishment and development of food resources as well as increases in shrub layer cover. Abundant, albeit temporary, habitat would be provided in harvest areas of all units from the time that tree canopy closure is eventually reestablished until resulting reduced sunlight suppresses the deciduous shrub layer.

As a generalist, habitat for the **deer mouse** currently exists across all units. However, increased prevalence of deciduous vegetation in harvest areas and aggregate edges would improve the quality of habitat in those areas.

The **western red-backed vole** and **dusky shrew** would not be affected under this sub-alternative, as existing habitat would be well within aggregate areas and Riparian Reserves not proposed for entry.

The **Pacific jumping mouse** could benefit to a small degree, as harvest to the edges of Riparian Reserves would allow some sunlight penetration into the understory, enhancing development of the shrub layer in those areas.

2. Sub-Alternative B

a. Threatened and Endangered Species

No effects to the **northern spotted owl** from disturbance would be anticipated, as seasonal restrictions would be applied, when and where appropriate, as described in Chapter Two (pp. 18 and 19). Effects would be solely associated with modification or removal of suitable and dispersal habitat.

Effects to the **Blue Oyster Cultus**, **Curtin Creek**, and **Deadman Mountain** home ranges for the **northern spotted owl** would be the same as in Sub-Alternative A.

Additional effects to the **High Riser** and **Lucky Buck** home ranges would accrue in associated with variable density thinning in Riparian Reserves.

Variable density thinning in the **High Riser** core area, would maintain dispersal habitat conditions through the retention of a minimum, on average, 50 percent canopy closure. The modification of 13 acres of dispersal habitat within the core area would have similar effects to those noted for Sub-Alternative A.

Variable density thinning in the **Lucky Buck** core area would maintain dispersal habitat conditions through the retention of a minimum, on average, 50 percent canopy closure. The modification of five acres of dispersal habitat would have no additional effects on the viability of the home range noted in Sub-Alternative A.

Prey Species for the Northern Spotted Owl

Northern flying squirrel habitat does not currently exist in the areas proposed for variable density thinning in portions of Riparian Reserves in Units 28-3-17A, B and C. As a result, thinning in these areas would not directly affect northern flying squirrels. There would be indirect effects, as thinning in these areas would allow more rapid development of northern flying squirrel habitat in the long term.

In addition to the effects on woodrats described under Sub-Alternative A, variable density thinning in portions of Riparian Reserves would allow sunlight to penetrate canopy gaps, supporting development of hardwoods and shrubs until canopies reclose, and providing temporary increases in available woodrat habitat in these areas.

Consistency with the Northern Spotted Owl Recovery Plan

Under this alternative, in addition to the variable retention harvest in Sub-Alternative A, approximately 21 acres of variable density thinning would be conducted in portions of Riparian Reserves in Units 28-3-17A, B, and C. The intent is to promote tree and understory species diversity (USFWS 2011a pp. III-14 and 18), increase structural complexity (USFWS 2011a pp. III-14), and facilitate development of large structures in young stands (USFWS 2011a pp. III-18 and 19), all of which are recommended in the Northern Spotted Owl Recovery Plan.

This would accelerate development of habitat components and characteristics that would increase the availability of suitable habitat, placing the stands on a growth trajectory more amenable to the development of forest structure that would provide nesting, roosting and foraging habitat. As a result, this sub-alternative would be consistent with the Recovery Plan.

b. Bureau Sensitive Species

As discussed under Sub-Alternative A, variable retention harvest would not be expected to directly affect **peregrine falcons** as the closest proposed harvest unit, 28-2-31B, is approximately one-half of a mile from the peregrine nest site and topographical features, vegetation, elevation, and aspect would mitigate noise levels at this distance. Additionally, the unit is not within line-of-site of the eyrie and activities would not be visually disturbing to the birds. Peregrine falcons may indirectly benefit from creation of habitat for songbirds on which they prey.

As discussed under Sub-Alternative A, the **purple martin** is not known to be nesting in the stands proposed for harvest and any effects of variable retention harvest would be indirect, associated with the removal of trees and snags, suitable for nesting.

Effects to the **peregrine falcon**, **purple martin**, **Townsend's big-eared bat**, **Pacific pallid bat**, and the **fringed myotis** would be relatively unchanged from those described for Sub-Alternative A. Variable density thinning in portions of Riparian Reserves could indirectly affect the three bat species, as a more diverse plant community with hardwood trees and deciduous shrubs could support more abundant populations of insects on which they prey.

c. Land Birds

Effects to all species discussed would be as described under Alternative Two, Sub-Alternative A, with the addition of the following effects resulting from variable density thinning in portions of Riparian Reserves in Units 28-3-17A, B, and C:

There would be no additional effects to**Vaux's swift, pileated woodpecker, Hammond's flycatcher, Wilson's warbler, olive-sided flycatcher, western bluebird,** and their associated species as habitat components necessary for these species are not currently present in the areas where variable density thinning would occur, and variable density thinning in these stand areas would neither promote nor retard development of these habitats.

The **brown creeper** and associated species may experience additional effects as reduced tree density in thinned areas would allow remaining trees to develop fissured/furrowed bark conditions at a faster rate than without thinning.

The **red crossbill** and associated species would benefit from variable density thinning, as remaining trees would develop fuller crowns, resulting in future increased cone crop potential, providing additional food base for the species.

The **hermit warbler** and associated species would not be adversely affected by variable density thinning in the proposed units, as they do not currently have high foliage volume. It would benefit in the long term as individual trees develop fuller crowns and increased foliage density as the canopy closes. This would provide additional foraging habitat.

The **Pacific-slope flycatcher** and associated species would benefit from variable density thinning, as deciduous components present in the treatment areas would be released to develop canopy structure that would provide additional nesting and foraging habitat.

The **winter wren** and associated species would benefit as canopy gaps would allow development of complex vegetative structure on the forest floor until canopies close. This would provide additional nesting and foraging habitat.

The **black-throated gray warbler** and associated species would benefit from variable density thinning, as deciduous components present in the treatment areas would be released to develop canopy structure, providing additional nesting and foraging habitat.

Hutton's vireo and associated species would benefit as deciduous shrubs and trees would be allowed to develop with increased light reaching the forest floor, providing additional nesting and foraging habitat.

The **orange-crowned warbler** and associated species would benefit as canopy gaps would allow development of early-seral habitat until canopies close. This would provide additional foraging habitat.

The **rufous hummingbird** and associated species would benefit as canopy gaps would allow development of early-seral habitat, including flowering shrubs and forbs, until canopies close. This would provide additional foraging habitat.

The **band-tailed pigeon** would benefit as extensive areas of early-seral habitat needed to provide seed and berry producing grasses and shrubs for foraging would develop in harvested areas.

c. Survey and Manage Species

Effects of variable retention harvest in Unit 28-3-25A on **red tree voles** would be identical to those for Alternative Two. The Roseburg District BLM would protect 59 of 88 active and inactive red tree vole sites in aggregate retention, Riparian Reserves and forest stands adjacent to the unit, while designating 29 sites as non-high priority, as discussed under Alternative Two, and in *Appendix C – Wildlife*.

Effects to the **Crater Lake tightcoil** snail, **Chace sideband snail** and **Oregon shoulderband snail** and measures to maintain their habitat and site persistence would be the same as described in Sub-Alternative A.

e. Early-seral Obligates

Large Mammals

In addition to effects discussed under Sub-Alternative A, variable density thinning in selected Riparian Reserves areas would result in increased sunlight penetrating the canopy, promoting development of shrubs and forbs. This would increase forage potential for **Roosevelt elk**, **Columbian black-tailed deer** and **black bear**. Rock outcroppings of the types used by **mountain lions** are very limited in Units 28-3-17A, B and C, so the species would likely be unaffected.

Butterflies and Moths

In addition to the effects described under Alternative Two, Sub-Alternative A, variable density thinning in portions of Riparian Reserves Units 28-3-17A, B and C would allow sunlight to penetrate canopy gaps, supporting development of hardwoods, flowering shrubs and forbs until canopies reclose. This would provide temporary increases in foraging habitat for the majority of butterfly and moth species, which depend on these habitat features for foraging. Conifers would still dominate the thinned areas. However, species that require conifer habitats may be affected by reduced canopy density until canopies reclose. Following canopy closure, food resources for these species may be increased as a result of larger crowns and reduced competition between individual trees.

Small Mammals

This sub-alternative includes the variable retention harvest in Sub-Alternative A, as well as variable density thinning in portions of the Riparian Reserves in Units 28-3-17A, B and C. As a result, the following effects would occur in addition to those effects discussed under Sub-Alternative A.

Increased sunlight penetration through the canopy would promote development of shrubs and forbs. This would provide increased cover and food resources in those areas for the **brush rabbit**, **western pocket gopher**, and **Townsend's chipmunk**.

Habitat development for the **snowshoe hare** and **Pacific jumping mouse**, and increased food resources for the **deer mouse** would be facilitated, as increased sunlight would allow increased recruitment and release of existing deciduous vegetation.

The **western red-backed vole** could be indirectly affected in the long term by variable density thinning in these young stands, as the treatment would accelerate development of habitat features relative to the current stand trajectories.

While large downed wood is not prevalent in the units, increased sunlight penetration would improve habitat for the **dusky shrew** due to increased groundcover development.

D. Reference Analysis One – Effects

1. *Threatened and Endangered Species*

No effects to the **northern spotted owl** from disturbance would be anticipated, as seasonal restrictions would be applied, when and where appropriate, as described in Chapter Two (pp. 18 and 19). Effects would be solely associated with modification or removal of suitable and dispersal habitat. Effects would be limited to those associated with habitat modification.

Thinning, under this reference analysis, would modify approximately 181 acres of dispersal-only habitat in four northern spotted owl home ranges.

Thinning in upland portions of units would yield a more uniform tree-spacing with post-treatment evenly spaced trees and a post-treatment canopy cover averaging 70 to 80 percent Table 3-2, p. 50), while variable density thinning in Riparian Reserves would result in an average canopy cover of at least 50 percent (p. 48). Northern spotted owls would be expected to continue to use these stands because post-treatment canopy cover would remain above 40 percent. The quadratic mean diameter of trees in the stands presently exceeds 11 inches (Table 3-4, p. 36). These figures are widely used as a threshold for dispersal function (Thomas et al. 1990). However, northern spotted owls would likely utilize thinned stands less than unthinned stands until canopy cover returns to pre-project levels in approximately 10-20 years.

Thinning would reduce vertical and horizontal cover by removing trees from suppressed and intermediate canopy classes, resulting in varying levels of residual tree density and canopy cover based on the marking prescription employed. Harvest could also damage shrubs, forbs and herb layers presently exist, and damage or destroy existing coarse woody debris and snags.

Thinning in the **High Riser** home range would modify 95 acres of dispersal habitat, but would not modify its function at the scale of the home range. As discussed at Alternative Two, Sub-Alternative B, in core areas with less than 50 percent suitable habitat, dispersal habitat plays an important role in allowing northern spotted owls to move between patches of suitable habitat and forage. The modification of this dispersal habitat could affect both short and long term site viability.

Thinning in the **Lucky Buck** home range would modify 19 acres of dispersal habitat, but would not cause any change in function because the canopy cover would remain well in excess of the 50 percent functional viability threshold.

Thinning in the **Deadman Mountain** home range would modify approximately 45 acres of dispersal habitat but would not alter its function, as canopy cover would remain above the 40 percent functionality threshold.

Prey Species for the Northern Spotted Owl

Northern flying squirrel habitat does not currently exist in the areas identified for thinning in this Reference Analysis. As a result, thinning would not directly affect northern flying squirrels. There would be indirect effects, as thinning in these areas would allow more rapid development of northern flying squirrel habitat in the long term. Thinning would also accelerate the development of a diversity of understory shrubs, truffles, and lichens which northern flying squirrels depend on for forage (Wilson and Carey 1996, and Wilson 2008).

Consistency with the Northern Spotted Owl Recovery Plan

Under this reference analysis, commercial thinning would be conducted in upland portions of Units 28-3-17A, B, and C, and Units 28-2-32A and B, with variable density thinning in associated Riparian Reserves. The intent of variable density thinning in the Riparian Reserves is to promote tree and understory species diversity (USFWS 2011a pp. III-14 and 18), increase structural complexity (USFWS 2011a pp. III-14), and facilitate development of large structures in young stands (USFWS 2011a pp. III-18 and 19), all of which are recommended in the Northern Spotted Owl Recovery Plan. This would accelerate development of habitat components and characteristics that would increase the availability of suitable habitat, placing the stands on a growth trajectory more amenable to the development of forest structure that would provide nesting, roosting and foraging habitat. As a result, this reference analysis would be consistent with the Recovery Plan.

2. *Bureau Sensitive Species*

There would be no direct effect to the **peregrine falcon.** The closest unit in this reference analysis, 28-2-32B, is approximately one and one-half miles east of the peregrine falcon nest site and topographical features, vegetation, elevation, and aspect would mitigate noise levels at this distance. Additionally, the unit is not within line-of-site of the eyrie and activities would not be visually disturbing to the birds. Peregrine falcons may indirectly benefit from creation of habitat for songbirds on which they prey.

The **purple martin** is not known to be nesting in the stands proposed for harvest and any effects of commercial and variable density thinning would be indirect, associated with the accelerated growth of trees that may provide future cavity nesting opportunities.

There would be no direct effects to the **Townsend's big-eared bat**, **Pacific pallid bat**, and the **fringed myotis.** Commercial and variable density thinning in could indirectly affect the three bat species, as a more diverse plant community with hardwood trees and deciduous shrubs could support more abundant populations of insects on which they prey.

3. *Land Birds*

Vaux's swift, pileated woodpecker, and their associated species may be affected to a small degree, as some large existing snags in unit 28-2-32A could be lost because they constitute a danger to operator safety or operations.

The **brown creeper** and associated species may indirectly benefit, in the long term, as reduced tree density in thinned areas under this sub-alternative would allow remaining trees to develop fissured/furrowed bark conditions at a faster rate than without thinning.

The **red crossbill** and associated species would benefit from variable density thinning, as remaining trees would develop fuller crowns. This would result in future increased cone crop potential, providing additional food base for the species.

The **varied thrush** and associated species would be adversely affected in the short term as areas with existing tree layering in Unit 28-2-32A would be commercially thinned. There would be substantial benefits in the long term as commercial thinning would promote tree layering not currently present in Units 28-2-32A, and 28-3-17A, B, and C, and over a larger area within Unit 28-2-32A.

The **hermit warbler** and associated species would be adversely affected in the short term, to a small degree, as small patches of high canopy volume currently present in Unit 28-2-32A would be commercially thinned. There would be substantial benefits in the long term as individual trees would develop fuller crowns and increased foliage density in all treated units as the canopy closes, providing additional foraging habitat.

The **Pacific-slope flycatcher** and associated species would benefit from variable density thinning, as deciduous components present in the treatment areas would be released to develop canopy structure that would provide additional nesting and foraging habitat.

Hammond's flycatcher and associated species may benefit in the long term, as commercial thinning in Units 28-2-32A and B would promote development of open mid-story conditions and widely spaced trees once crown closure has reestablished. This would provide foraging habitat not currently present in these units.

Wilson's warbler and associated species would benefit for several decades, as thinned areas would support release and recruitment of deciduous understory trees necessary for foraging habitat. These features would be temporary in nature, as they would be suppressed once conifer crown closure reestablishes.

The **winter wren** and associated species would benefit as canopy gaps would allow development of complex vegetative structure on the forest floor until canopies close. This would provide additional foraging habitat.

The **black-throated gray warbler** and associated species would benefit from commercial thinning, as deciduous components present in the treatment areas would be released to develop canopy structure. This would provide additional nesting and foraging habitat.

Hutton's vireo and associated species would benefit as deciduous shrubs and trees would be allowed to develop with increased light reaching the forest floor. This would provide additional nesting and foraging habitat.

The **olive-sided flycatcher** and associated species would benefit for a short time from commercial thinning in Units 28-2-32A and B, as additional light reaching the forest floor would allow limited early-seral habitat to develop in juxtaposition with larger trees. This habitat would only persist until the canopy reclosed, after which, reduced light reaching the forest floor would cause deciduous components of the shrub layer to gradually die out.

The **western bluebird** and associated species would not be affected, as required habitat does not currently exist in any of the units and would not be developed by commercial thinning.

The **orange-crowned warbler** and associated species would benefit as canopy gaps would allow development of early-seral habitat until canopies close. This would provide additional foraging habitat.

The **rufous hummingbird**, **band-tailed pigeon** and associated species would benefit as canopy gaps would allow development of early-seral habitat, including flowering shrubs and forbs, until canopies close. This would provide additional foraging habitat.

4. Survey and Manage

On December 17, 2009, the U.S. District Court for the Western District of Washington issued an Order in *Conservation Northwest, et al. v. Rey, et al.*, No. 08-1067 (W.D. Wash.) (Judge Coughenour), granting Plaintiffs' motion for partial summary judgment and finding a variety of NEPA violations in the BLM and USFS 2007 Record of Decision eliminating the Survey and Manage mitigation measure. Previously, in 2006, the District Court (Judge Pechman) had invalidated the agencies' 2004 RODs eliminating Survey and Manage due to NEPA violations. Following the District Court's 2006 ruling, parties to the litigation had entered into a stipulation exempting certain categories of activities from the Survey and Manage standard (hereinafter referred to as "Pechman Exemptions").

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

- Thinning projects in stands younger than 80 years old;
- 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;
- Riparian and stream improvement projects where the riparian work is riparian planting, obtaining material for placing in-stream, and road or trail decommissioning; and where the stream improvement work is the placement large wood, channel and floodplain reconstruction, or removal of channel diversions; and

- 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."

Following the Court's December 17, 2009 ruling, the Pechman exemptions remain in effect. Judge Coughenour deferred issuing a remedy in his December 17, 2009 order until further proceedings and did not enjoin the BLM from proceeding with projects. Even if the District Court sets aside or otherwise enjoins use of the 2007 *Survey and Manage Record of Decision*, the Pechman Exemptions would remain valid.

On July 5, 2011, the Court approved a settlement agreement resolving the litigation. The terms of the settlement included a series of exemptions from Survey and Manage requirements that BLM could implement on certain types of projects. The agreement also left the Pechman exemptions in effect.

There would be no variable retention or regeneration harvest. The stands that would be thinned under this reference analysis are between 42 and 50 years of age and, hence, would meet exemption "a" described above.

5. *Early-seral obligates*

Large Mammals

Commercial and variable density thinning would result in increased sunlight penetrating the canopy, promoting development of shrubs and forbs. This would provide a short term increase in forage potential for **Roosevelt elk**, **Columbian black-tailed deer** and **black bear** until the forest canopy closes again in ten to 20 years.

Improved deer forage in the harvest areas would increase the number of deer that could be supported in the area. This, in turn, would increase the potential for use of these areas by **mountain lion**.

Butterflies and Moths

Thinning would allow sunlight to penetrate canopy gaps, supporting development of hardwoods, flowering shrubs and forbs until canopies reclose. This would provide temporary increases in foraging habitat for the majority of butterfly and moth species, which depend on these habitat features for foraging. Conifers would still dominate the thinned areas. However, species that require conifer habitats may be affected by reduced canopy density until canopies reclose. Following canopy closure, food resources for these species may be increased as a result of larger crowns and reduced competition between individual trees.

Small Mammals

Increased sunlight penetration through the canopy would promote development of shrubs and forbs. This would provide increased cover and food resources in those areas for the **brush rabbit**, **western pocket gopher**, and **Townsend's chipmunk**.

Habitat development for the **snowshoe hare**, and increased food resources for the **deer mouse** would be facilitated, as increased sunlight would allow increased recruitment and release of existing deciduous vegetation.

While large downed wood is not prevalent in the units, increased sunlight penetration would improve habitat for the **dusky shrew** due to increased groundcover development.

Effects to the **western red-backed vole**, **Pacific jumping mouse** and **dusky shrew** would be consistent with those described for variable density thinning in Riparian Reserves associated with Alternative Two, Sub-Alternative B.

E. Reference Analysis Two – Effects

1. Threatened and Endangered Species

No effects to the **northern spotted owl** from disturbance would be anticipated, as seasonal restrictions would be applied, when and where appropriate, as described in Chapter Two (pp. 18 and 19). Effects would be solely associated with modification or removal of suitable and dispersal habitat. Effects would be limited to those associated with habitat modification.

No harvest would occur in the **High Riser** or **Lucky Buck** home ranges.

Regeneration harvest would remove approximately 62 acres of suitable habitat from within the **Blue Oyster Cultus** home range, but none within the core area. The function of the retention aggregates and dispersed retention would be comparable to that described in Alternative Two, Sub-Alternative A (pp. 79 and 80). Compared to the estimated site viability threshold of 40 percent suitable habitat within the home range, the 67 percent suitable habitat level would remain well above the threshold that would maintain site viability.

Regeneration harvest would remove 104 acres of suitable habitat from within the **Curtin Creek** home range. The effects would be essentially identical to those described for Alternative Two, Sub-Alternative A (p. 81). The additional eight acres of suitable habitat removed would not perceptibly change the availability of suitable habitat described there.

Regeneration harvest would remove 73 acres of dispersal habitat and 21 acres of suitable habitat from within the **Deadman Mountain** home range. The effects would be essentially identical to those described for Alternative Two, Sub-Alternative A (pp. 81 and 82). The amount of suitable habitat that would be removed does not differ for that proposed in Alternative Two, Sub-Alternative A, so suitable habitat would still constitute 49 percent of habitat in the home range.

Prey Species for the Northern Spotted Owl

Effects on woodrats would essentially be the same as in Alternative Two, Sub-Alternative A. Woodrats are primarily associated with early-and mid-seral forest habitat (Maser et al. 1981, Sakai and Noon 1993, Carey et al. 1999) and would benefit in response to increased understory and shrub development. This would benefit spotted owls if increasing numbers of prey move into forest stands where they are available for capture.

Consistency with the Northern Spotted Owl Recovery Plan

Under this reference analysis, traditional regeneration harvest would be conducted in Units 28-3-23A, 28-3-25A, 28-2-31A and B, and 28-2-32A, B, C, and D. Harvest would not be conducted following principles of ecological forestry as recommended for regeneration harvest in the recovery plan (USFWS 2011a pp. III-19 and 20).

Habitat patches meeting the criteria for retention under the Recovery Plan (USFWS 2011a pp. III-67 and 68) would still be retained, but many individual high value habitat features would not. Additional actions would not be taken to create snags and large downed wood unless necessary to meet minimum requirements for these features identified in the ROD/RMP.

The Recovery Plan recommends conserving northern spotted owl sites and high-value northern spotted owl habitat. It identifies a number of activities that could be undertaken that would reduce or remove such habitat in the short term, while remaining consistent with the overarching goals of the Recovery Plan. These do not include traditional regeneration harvest and rapid reestablishment of closed canopy conditions, as would be conducted under this Reference Analysis. Therefore, this would not be consistent with Recovery Plan.

2. *Bureau Sensitive Species*

Effects would be identical to those for Alternative Two.

As described under Sub-Alternative A of Alternative Two (p. 83), regeneration harvest would not be expected to directly affect **peregrine falcons** as the closest proposed harvest unit, 28-2-31B, is approximately one-half of a mile from the peregrine nest site and topographical features, vegetation, elevation, and aspect would mitigate noise levels at this distance. The unit is not within line-of-site of the eyrie and activities would not be visually disturbing to the birds. Peregrine falcons may indirectly benefit from creation of habitat for songbirds on which they prey.

As described under Sub-Alternative A of Alternative Two (p. 83), the **purple martin** is not known to be nesting in the stands proposed for harvest. Effects of regeneration harvest would be indirect, associated with the removal of trees and snags, suitable for nesting.

As described in the Affected Environment (p. 83), there are no known communal roosts, nurseries or hibernacula for **Townsend's big-eared bats**, **Pacific pallid bats** or **fringed myotis** in the project stands. The effects of regeneration harvest would be consistent with those for Alternative Two, Sub-Alternative A. Large trees potentially used for roosting and during foraging would be removed. These bats could benefit, though, as a diversified environment with hardwoods, forbs and shrub species support increased insect populations that provide prey for these species.

3. Land Birds

Vaux's swift and associated species would be minimally affected. As discussed under the affected environment, the species requires large snags for nesting. A small number of existing large snags would be lost in harvest areas where impracticable to reserve for operational or safety reasons. Additional large snags would be created through incidental mortality of large reserved trees due to sunscald or broadcast burning, or deliberate mortality for snag creation. Overall number of large snags would be expected to be similar post-harvest.

The **brown creeper** and associated species would be affected by the loss of large green trees, generally over 200 years old, with deeply fissured or furrowed bark on which these species forage. While some of these trees would be retained, many would be harvested, resulting in loss of nesting and foraging habitat.

The **red crossbill** and associated species would be affected by removal of older remnant trees that provide cones for foraging. Some contrasting benefits may be realized as dispersed retention trees and trees along edges of retained aggregates would receive increased sunlight, stimulating cone crop production in western hemlock and crown development in both western hemlock and Douglas-fir, which would increase cone crop potential in future years.

The **pileated woodpecker** and associated species would incur both adverse and beneficial effects. A small number of existing large snags needed for nesting would be lost in harvest areas where impracticable to reserve for operational or safety reasons. Additional large snags would be created through incidental mortality of large reserved trees due to sunscald or broadcast burning, or deliberate mortality for snag creation. Overall number of large snags would be expected to be similar post-harvest. Numbers of smaller snags, which are valuable for foraging habitat, would be created through incidental mortality due to sunscald or broadcast burning.

The **varied thrush** and associated species would be affected as areas with existing understory trees, used by these species, would be harvested. Some beneficial effects would occur, as sunlight reaching into aggregate edges would promote establishment and development of understory trees used by the species for nesting, and berry producing shrubs needed for foraging.

The **hermit warbler** and associated species would be affected in the short term as small patches of high canopy volume, upon which they depend, present in Units 28-2-31A, 28-2-32A, C and D, 28-3-23A and 28-3-25A would be harvested. This would be balanced by beneficial effects that would occur in the long term, as understory trees established in areas of sunlight penetration along aggregate edges begin to mature and join with the existing canopy, providing high foliage volume needed for foraging.

The **Pacific-slope flycatcher** and associated species would be adversely affected, as conifer planting density would be designed to exclude deciduous trees to the degree practicable, and existing hardwood subcanopy patches would not be retained. **Hammond's flycatcher** and associated species would not be affected, as mature, low tree density areas do not currently exist in the units.

Wilson's warbler and associated species would be affected, as patches of existing subcanopy deciduous trees, upon which they depend, would not be retained. Some beneficial effects may occur, as sunlight reaching into aggregate edges would promote establishment and development of understory trees used by the species for nesting and foraging. However, benefits would be minimal, as the majority of subcanopy trees establishing in these areas would most likely be conifers.

The **winter wren** and associated species would benefit, as sunlight reaching into aggregate edges would promote establishment of a more diverse shrub layer under the existing canopy, as well as a greater deciduous shrub component that would support greater insect abundance needed for foraging.

The **black-throated gray warbler** and associated species would be affected, as existing hardwood subcanopy patches, upon which they depend, would not be retained, and density of conifer replanting would be designed to largely exclude deciduous components in the harvest areas.

Hutton's vireo and associated species would be affected, as patches of existing subcanopy deciduous trees, upon which they depend, would not be retained. Some beneficial effects may occur, as sunlight reaching into aggregate edges would promote establishment and development of understory trees used by the species for nesting and foraging. However, benefits would be minimal, as the majority of subcanopy trees establishing in these areas would most likely be conifers. Density of conifer replanting would be designed to largely exclude deciduous components in the harvest areas.

The **olive-sided flycatcher** and associated species would be substantially benefitted, as areas of juxtaposed mature and early-seral habitat would be created along edges of aggregates throughout Units 28-2-31A, 28-2-31B and C, 28-3-23A and 28-3-25A. This would provide early-seral habitat needed for foraging adjacent to larger trees needed for singing perches.

The **western bluebird, orange-crowned warbler, rufous hummingbird**, **band-tailed pigeon** and their associated species would be largely unaffected, as no early-seral habitat currently exists in the harvest units, and conifer planting density would be designed to exclude deciduous trees and shrubs to the degree practicable.

4. *Survey and Manage Species*

Effects of regeneration harvest in Unit 28-3-25A on **red tree voles** would be identical to those for Alternative Two (p. 86). The Roseburg District BLM would protect 59 of 88 active and inactive red tree vole sites in aggregate retention, Riparian Reserves and forest stands adjacent to the unit, while designating 29 sites as non-high priority, as discussed under Alternative Two, and in *Appendix C – Wildlife*.

Effects to the **Crater Lake tightcoil** snail, **Chace sideband snail** and **Oregon shoulderband snail** and measures to maintain their habitat and site persistence would be the same as described in Sub-Alternative A (p. 87).

5. *Early-seral obligates*

Large Mammals

Development of early-seral habitat in harvest areas of the proposed units would substantially increase available foraging habitat for **Roosevelt elk**, **Columbian black-tailed deer** and **black bear**. Sunlight reaching into edges of Riparian Reserves would promote establishment and development of understory vegetation that would provide both food resources and cover for these species.

Improved deer forage in the harvest areas would increase the number of deer that could be supported in the area. This, in turn, would increase the potential for use of these areas by **mountain lion**.

Conditions of improved foraging would only persist for 15 to 20 years, however, as the application of intensive silvicultural practices aimed at promoting conifer dominance would shorten the period of complex early-seral habitat that would exist under Alternative Two.

Butterflies and Moths

In contrast to Alternative Two, Sub-Alternative A, increased conifer planting density would be designed to exclude hardwoods and shrubs to the degree practicable. As a result, increases in availability of these habitat features would be limited and of short duration. This would still provide increased foraging for the large majority of butterfly and moth species that require such plants for foraging, including species that are becoming increasingly uncommon or rare due to decreased availability of such habitats on the landscape. Sunlight penetrating into edges of aggregates and Riparian Reserves would support increased development of hardwoods, flowering shrubs, and forbs in the understory of these areas. The minority of species, which feed on conifers in the forest canopy, would have proportional reductions in available habitat as a result.

Small Mammals

Shrub dominated early-seral habitat would develop across harvested areas, providing cover and food resources for the **brush rabbit, western pocket gopher** and **Townsend's chipmunk**. This would be available for a short time, as high planting densities would be used to ensure rapid canopy closure.

Abundant, albeit temporary, habitat for the **snowshoe hare** would be provided in harvest areas of all units from the time that tree canopy closure is eventually reestablished until resulting reduced sunlight suppresses the deciduous shrub layer.

As a generalist, habitat for the **deer mouse** currently exists across all units. However, a short-term increase in prevalence of deciduous vegetation in harvested areas would improve the quality of habitat until tree canopy closure.

The **western red-backed vole** and **dusky shrew** would not be affected under this sub-alternative, as existing habitat would be well within Riparian Reserves not proposed for entry.

The **Pacific jumping mouse** could be affected to a small degree, as harvest to the edges of Riparian Reserves would allow some sunlight penetration into the understory, enhancing development of the shrub layer in those areas.

III. Fish, Aquatic Habitat and Water Resources

A. Affected Environment

The proposed project area is located in the Myrtle Creek, Little River and Middle South Umpqua River-Dumont Creek 5th-field watersheds. For analysis purposes, unless otherwise noted, the scale of analysis includes the following hydrologic units, which total 37,713 acres (~59 square miles): Buck Fork, Curtin, Headwaters South Myrtle, Lally, Riser, Upper South Myrtle and Weaver Creeks 7th-field drainages of the Myrtle Creek 5th-field watershed; Cultus and Middle Cavitt Creeks 7th-field drainages of the Little River 5th-field watershed; and the Middle Fork Deadman Creek 7th-field drainage of the Middle South Umpqua River-Dumont Creek 5th-field watershed. Streams adjacent to and downstream from units or portions of the haul route were surveyed by BLM fisheries and hydrology specialists.

1. Fish Species

Salmonid species found in project watersheds include winter-run Oregon Coast steelhead trout and resident rainbow trout (*Oncorhynchus mykiss*), resident and sea-run Coastal cutthroat trout (*O. clarki clarki*), fall and spring Oregon Coast Chinook salmon (*O. tshawytscha*), and the Oregon Coast coho salmon (*O. kisutch*). Current fish distribution is based on sources of information that include historical surveys, Oregon Department of Fish and Wildlife (ODFW) Aquatic Inventory observations, Streamnet, Watershed Analyses for Myrtle Creek (USDI, BLM 2002a) and Little River (USDA, Forest Service and USDI, BLM 1995), and site surveys conducted by BLM fisheries biologists.

Coastal cutthroat trout are commonly found in many higher gradient streams, often above barriers to anadromous fish, and are present in all reaches where Oregon Coast coho salmon or Oregon Coast steelhead trout are also found.

Fish-bearing streams located in proximity to proposed timber sale units include a tributary to South Myrtle Creek on the south edge of Unit 28-2-32B, Buck Fork to the north of Unit 28-3-17A, and a tributary to Buck Fork on the western edge of Unit 28-3-17C. Stacy Gulch, a tributary to Buck Fork, is fish-bearing above and below a stream-crossing on County Road 15.

Federally-Threatened Species

On February 12, 2008, the National Marine Fisheries Service published a Notice of Intent proposing to list the Oregon Coast coho salmon as a threatened species under the Endangered Species Act ((ESA) Federal Register 2008a). Designation of Critical Habitat became effective on May 12, 2008, concurrent with the ESA listing of Oregon Coast coho salmon. Oregon Coast coho salmon are present in all three 5th-field watersheds downstream from proposed units and haul routes. Proposed harvest Units 28-3-17A and C share a Riparian Reserve with Buck Fork, which is occupied by Oregon Coast coho salmon. All other units are located greater than 0.4 miles upstream from occupied Oregon Coast coho salmon habitat or are several miles upstream from a waterfall barrier on South Myrtle Creek below the Tater Hill landslide.

Bureau Sensitive Species

The Umpqua chub (*Oregonichthys kalawatseti*) is a Bureau Sensitive Species present on the Roseburg District, and is found predominantly in larger order streams and rivers throughout the Umpqua River basin (Markle et al. 1991). Umpqua chub historically have been found in the main-stem of the South Umpqua River below the mouth of Myrtle Creek, more than ten miles downstream from the project area.

Oregon Coast steelhead trout are located throughout the Umpqua Basin with habitat preferences similar to those of other salmonids. Oregon Coast steelhead trout tend to occupy streams with higher gradients than do Oregon Coast coho salmon, and their distribution is similar to resident cutthroat trout, where access is not blocked by manmade or natural barriers. As noted above, upstream access for anadromous fish on South Myrtle Creek ends at the waterfall barrier at the Tater Hill slide.

2. Aquatic Habitat, Oregon Coastal Coho Salmon Critical Habitat, and Essential Fish Habitat

Sediment and Substrate

Availability of spawning substrate is important to fish productivity. The suitability of spawning habitat varies with amount, size and quality of substrate. Gravel and small cobble substrate relatively free from embedded fine sediment is ideal spawning substrate for resident and anadromous salmonids.

In reaches where spawning size gravel is present, bedload fine sediment can fill interstitial spaces within redds reducing oxygen flow to eggs, or forming an armor layer preventing emergence of alevin (Waters 1995). Accumulation of fine sediment can also reduce availability of macroinvertebrate prey which in turn affects fish growth and survival (Suttle et al. 2004). Fine sediment suspended in the water column can affect visibility, foraging ability and breathing capacity in fish (Waters 1995).

Buck Fork, below Unit 28-3-17A and adjacent to County Road 15, is a low to moderate gradient stream dominated by cobble and gravel substrate. Fine sediment transported from upstream reaches or from the adjacent road system has become embedded in streambed gravels reducing the quality of spawning habitat provided. The tributary to Buck Fork adjacent to Unit 28-3-17C is also dominated by small cobble and gravel.

Unit 28-2-32B is bordered on the south by a fish-bearing tributary of South Myrtle Creek. The stream has a moderate to high gradient and the streambed is dominated by cobble with some gravel. Very little fine sediment was observed.

Functional Instream Wood

Large woody debris plays an important role in stream morphology. Wood in headwater streams can capture sediment, control channel morphology, form deep scour pools and retain gravel substrate (Bilby and Ward 1989). In higher order fish-bearing streams, wood retains gravel substrate 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 main-stem reaches over time and, absent a source of future recruitment of large wood from riparian stands, these larger fish-bearing reaches become depleted of habitat forming wood.

Buck Fork, where it passes through Section 17, is currently lacking in large functional wood capable of retaining and storing sediment and creating scour and backwater pools. Small functional wood was observed on the channel margins. However, these pieces alone were not capable of forming larger debris jams. Historically, large wood would have entered Buck Fork from adjacent riparian stands or from side tributary debris flows.

The fish-bearing reach adjacent to Unit 28-2-32B is higher in gradient and is deficient in pieces and volume of small functional wood and large wood capable of trapping and storing gravel and creating deep pool habitat suitable for rearing juvenile fish.

The BLM has completed or planned over five miles of stream restoration on Federal lands in the Myrtle Creek 5th-field watershed, including large wood placement and fish passage improvement on many of the larger Oregon Coast coho salmon bearing reaches of North Myrtle Creek and South Myrtle Creek. Private partners and landowners have completed additional large wood placement and stream passage projects in the watershed.

Pool Habitat

Pools are important habitat features for juvenile salmonids, providing cooler waters during low flow months when high stream temperatures add to stress, 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 order headwater streams, pool habitat is formed by steps and cascades over large wood or boulders. Pool habitat in fish-bearing reaches downstream of proposed harvest units has been affected by past removal of large wood, and pool habitat created by large debris jams is entirely absent.

Habitat Access

Access for migrating fish can be restricted at stream crossings where culvert outlet jumps exceed six inches in height, 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 by jumps exceeding six inches. Culverts sized less than one bank-full width or installed on gradients of over one-half percent can also limit fish passage at higher stream flows by accelerating water velocities within the culvert (Watershed Professionals Network 1999).

There are no proposed new road segments that would cross fish-bearing streams and there are no plans to replace any fish-bearing crossing culverts along the haul route.

Throughout the analysis area, there are culverts on private and Federally-controlled roads that potentially block access for resident and anadromous fish to historically occupied habitat. The BLM has worked on Federal lands and with private landowners to replace culverts that block or impede fish passage with crossing structures that allow fish to pass at a range of stream flows. This has improved access to about 20 miles of anadromous and resident fish habitat in the affected watersheds.

Critical Habitat

As previously discussed, Critical Habitat for Oregon Coast coho salmon was designated in the final Federal Register listing which also designated Oregon Coast coho salmon as threatened (Federal Register 2008b). Occupied Critical Habitat for Oregon Coast coho salmon is located in Buck Fork adjacent to two proposed harvest units in Section 17 and several miles downstream from the rest of the units in the upper reaches of each watershed. Critical Habitat is also adjacent to County Road 15.

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 salmon and Oregon Coast coho salmon. Essential Fish Habitat for Oregon Coast coho salmon is coincident with designated Critical Habitat for Oregon Coast coho salmon in Buck Fork.

3. Water Resources

Water Quality

Within the analysis area, Buck Fork, Cavitt, Johnson, Middle Fork Deadman, Riser, South Myrtle, and Weaver Creeks are listed by the Oregon Department of Environmental Quality (ODEQ) on the Clean Water Act 303(d) list (ODEQ 2008) for exceeding year-round stream temperature as core cold water habitat for fish.

In 2006, the ODEQ completed the Umpqua Basin Total Maximum Daily Load (TMDL) which was approved by the U.S. Environmental Protection Agency on April 12, 2007. Approved BLM actions include land management activities addressed in the 1995 ROD/RMP, providing that Best Management Practices and project design features are implemented to prevent exceedance of the TMDL.

Aside from salmonid spawning and rearing, and utilization by resident fish and other aquatic life, beneficial uses of water include domestic, irrigation, livestock, and storage. There are no registered rights for domestic surface water use within one mile of any of the proposed harvest units.

The municipal water intakes for the cities of Myrtle Creek and Roseburg are more than 19 and 35 miles, respectively, downstream of any of the proposed harvest units, well beyond any potential influence from the proposed harvest.

The manner of road surfacing, or lack thereof, can affect drainage, erosion, and runoff with resultant effects on water clarity and turbidity levels. Highly compacted road surfaces affect water infiltration rates and drainage patterns. The following discussion is based on those roads that are currently identified in BLM transportation records and may not include un-inventoried roads and/or recently constructed roads on private lands. Additional analysis of roads accessing Section 17, T. 28 S., R. 3 W. was conducted by the project's road engineer.

The existing road network in the analysis area is approximately 267 miles in length. Approximately 138 miles are surfaced with rock or asphalt while the remaining 129 miles are natural surface. Many roads are overgrown due to lack of use and maintenance. They are relatively stable, but are compacted and subject to drainage and erosion problems.

Within the analysis area there are approximately 309 stream crossings. Roads that cross streams represent potential sources for sediment delivery depending upon the condition of road surfaces, road 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). Unpaved roads that constitute portions of the proposed haul routes cross five perennial streams, two of which are fish-bearing. In addition to these, there are also 29 crossings over intermittent streams.

There are three primary roads[5] providing access to Section 17, T. 28 S., R. 3 W. that are of specific hydrologic concern, due to their proximity to and greater concern for perennial streams and Essential Fish Habitat and Critical Habitat for Oregon Coast coho salmon. Each of the road segments is crowned and composed of competent aggregate material. The roads all have intact subgrades and a relative hardness, as measured by California Bearing Ratio (CBR), in excess of 127 percent. For reference purposes, BLM guidelines require a newly constructed aggregate road to have a CBR of at least 55 percent.

Drainage problems were identified on the segment of County Road 15 from Stacey Gulch east to the juncture with Road No. 28-3-8.1. Road, ditch, and stream integrity are threatened by ditch flow and subsequent sediment flux caused by a lack of drainage structures. The road itself is in excellent condition, but the ditch line shows signs of erosion, is not vegetated, and drains directly into Stacey Gulch; a fish-bearing tributary to Buck Fork (Albin, pers. obs. 2011). With the exception County Road 15, drainage above stream crossings is adequate to disperse run-off, rather than collect and discharge large volumes sediment laden water directly into stream channels.

Both Road No. 28-3-17.0 where it crosses Buck Fork and several intermittent streams immediately northwest of Unit 28-3-17B and Road No. 28-3-8.1 to the northeast of Unit 28-3-17C are in excellent condition. Road crowns are intact and drainage structures are functioning well. The ditch line in these locations is generally well vegetated and cross-drain spacing is within BLM guidelines (Albin, pers. obs. 2011). Although the ditch line of Road 28-3-8.1 south of Buck Fork shows some sign of erosion, sediment does not reach the stream due to a well- vegetated buffer between it and the road.

Water Quantity

Average annual precipitation in the analysis area ranges between 41 and 77 inches, occurring primarily between October and April. Elevation in the analysis area ranges from 1,040 feet at the mouth of Riser Creek to 4,480 feet at the summit of Deadman Mountain. The analysis area is primarily split between the rain-dominated and rain-on-snow dominated hydroregions. In the rain-on-snow dominated hydroregion, some transient snow accumulation is expected to occur throughout the wet season. Only one percent of the analysis area is found within a snow-dominated hydroregion.

[5] County Road 15 between Stacey Gulch and its juncture with Road No. 28-3-8.1; Road No. 28-3-17.0 from its intersection with County Road 15 to its intersection with the Road No. 28-3-17.2; and the first 1,500 feet of Road No. 28-3-8.1.

Stream flows are dependent upon the capture, storage and runoff of precipitation. Timber harvest can alter the amount and timing of peak flows by changing site-level hydrologic processes. These hydrologic processes include changes in evapotranspiration, snowmelt, forest 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 openings in a forest canopy greater than two tree heights across can affect precipitation, snow melt and peak flows (2008 FEIS, p. 355). However, in the rain-on-snow hydroregion, variations in climate conditions would have more effect on susceptibility to peak flow increases than timber harvest (2008 FEIS, p. 757). 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 and 757).

Perennial stream channels pass some volume of water throughout the year, including potentially warm water during the warmer months of summer and fall. Conversely, at some point in the year, flow ceases in intermittent stream channels and potentially warm water is no longer transported downstream.

In the analysis area there are approximately 74 miles of perennial streams and another 268 miles of intermittent streams. Groundwater was also observed during field stream surveys of Unit 28-3-25A (Parker, pers. obs. 2011). Groundwater along the southwest border of the unit was observed in the form of interrupted flow emerging and submerging in an area of shallow, rocky soils. Riparian vegetation was present in the immediate vicinity of the water despite the area being disconnected from the stream network (Parker, pers. obs. 2011).

Along the eastern border of Unit 28-3-25A there are four wetlands supplied almost entirely by groundwater. Despite being located along a watershed divide and receiving little to no precipitation during the dry season, these wetlands remain saturated throughout the summer and fall.

Water chemistry shows that these wetlands are not acidic and based on the pH, composition, and botanical diversity are likely fens (Parker, pers. obs. 2011). Fens are a unique form of peat-accumulating wetland that receives drainage from surrounding mineral soil and hosts pH values between 4.8 and 6.0 (Mitsch and Gosselink 2000).

Average road density, an index of the relative amount of road in the analysis area, is 4.53 miles per square mile. Roads under BLM-administration account for 45 percent of the total road mileage. Based on an assumed average right-of-way width of 40-feet, roads cover approximately 1,293 acres, representing approximately 3.43 percent of the analysis area. Increases in peak flow can be found when the roads and other impermeable areas occupy more than 12 percent of a catchment scale watershed (Harr et al. 1975).

B. Alternative One – Effects

1. Fish Species

Under this alternative, there would be no BLM authorized road construction, road renovation, road decommissioning, timber harvest or log hauling. Absent any of these activities, there would be no direct effects to aquatic habitat, anadromous or resident fish, or Essential Fish Habitat adjacent to or downstream of proposed timber harvest areas.

Fish species, including the threatened Oregon Coast coho salmon, and aquatic habitat would continue to be indirectly affected by existing conditions on BLM-administered lands, and ongoing activities on adjoining private lands.

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

Sediment and Substrate

Aquatic habitat would continue to be affected by runoff and sediment generated from road segments with improperly functioning drainage, native surfacing, or inadequate rock surfacing. These road segments would continue to contribute sediment to headwater stream reaches that could later be released to downstream reaches occupied by fish.

Lacking renovation, poorly surfaced mainline forest roads would continue to contribute small but unquantifiable amounts of sediment to stream channels at stream crossings. This fine sediment would be stored locally, however, in stream channels with adequate wood and depositional areas and would not reach fish-bearings reaches downstream.

County Road 15 would continue to be a source of fine sediment to Buck Fork, as road generated sediment reaching Stacey Gulch would be transmitted downstream to fish-bearing reaches occupied by Oregon Coast coho salmon.

Functional Instream Wood

There would be no direct or short-term effect on the availability of functional instream wood. Headwater streams would periodically move wood through the stream system to downstream reaches, and ultimately to fish-bearing reaches.

Absent variable density thinning, overstocked conditions in the dense plantations that comprise the Riparian Reserves in Units 28-3-17A, B and C would persist for several decades retarding the development of larger trees greater than 24 inches diameter breast height that would provide large wood capable of forming complex pool habitat for resident and juvenile anadromous fish. In the interim, these riparian stands would continue to supply small functional wood, but the delayed growth of larger trees would limit the amount of large wood available to Buck Fork that could store sediment, provide channel stability, and create pool habitat.

Where timber harvest occurs in riparian areas on private lands, loss of existing wood coupled with decreased recruitment of large wood into streams would further limit the replacement of existing complex pool habitat and creation of new pool habitat.

Pool Habitat

Pool habitat in fish-bearing reaches would remain generally unaffected in the near term, but over the longer term, existing pool habitat in streams adjacent to units would alternately develop and dissipate in the absence of large wood recruited from adjacent stands or from downstream transport from headwater streams.

Smaller trees and logs that enter stream channels would provide temporary pool habitat and slow-water refugia, but this would generally not create deep and complex habitat, and would not persist for long periods of time as the smaller wood deteriorates and is flushed through the stream system. This cycle would persist until trees of the larger sizes, described above, are available to streams allowing for development of more complex and longer persisting pools and instream habitat.

Where timber harvest occurs in riparian areas on private lands, decreased recruitment of large wood into streams would limit replacement of existing complex pool habitat and creation of new pool habitat.

Habitat Access

Absent any new road construction or renovation involving the installation of new stream crossings or replacement of existing stream crossings, there would be no change in habitat accessibility for resident and anadromous fish in the project watersheds.

Critical Habitat and Essential Fish Habitat

Critical Habitat for Oregon Coast coho salmon and Essential Fish Habitat for Oregon Coast coho salmon and Oregon Coast Chinook salmon would continue to be indirectly affected by existing conditions and activities on private lands.

3. Water Resources

Water Quality

Water temperatures would be maintained as streams in the project area are typically well-shaded by dense forest stands. Streams on privately-managed timber lands experiencing thermal impairment, resulting from reduction and removal of streamside canopy cover and lack of canopy cover on agricultural lands, are likely to remain impaired. The interaction of groundwater with the fens in Section 25, T. 28 S., R. 3 W. would remain unchanged.

Routine road maintenance would not fully correct existing sediment problems associated with culvert failures, erosion from natural surface roads, and failure of road cuts and fills. This would be most prominent on roads that are infrequently used or which have been blocked.

As existing roads and drainage structures age, they are subject to degradation and an increased risk of failure, particularly during major winter storm events. Some road and culvert failures would result in direct inputs of sediment into the stream network. The amount of introduced sediment would vary depending on the severity of the storm event and the condition, stability and proximity of the roads or culverts to a stream.

Along the section of County Road 15 between Stacey Gulch and the juncture with BLM Road No. 28-3-8.1, discussed on page 108, runoff would continue to actively erode and degrade the ditch line and sediment directly routed into Stacey Gulch, and would continue to increase stream turbidity in Buck Fork, at least on a seasonal basis.

Water Quantity

The potential for peak flow effects varies for different stream types (Grant et al. 2008). The 2008 FEIS (p. 758) found that within the high gradient cascade and step-pool stream types, common to the project area, there is little potential to affect sediment transport or enhance peak flows. The 2008 FEIS (pp. 755 and 757) found none of the subwatersheds in the analysis area to be susceptible to peak flow enhancement, and without any changes in current vegetative cover there would be no change in the magnitude or rate of surface water runoff and delivery to the stream network.

Existing roads and landings may modify storm peaks by reducing infiltration, allowing more rapid surface runoff (Ziemer 1981). 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 3.43 percent of the land base, and no perceptible increase in peak flows would be expected.

C. Alternative Two – Effects

1. Sub-Alternative A

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 that can reduce foraging ability, impair respiration by clogging gill membranes, and increase overall stress levels (Waters 1995). Fine sediment that becomes embedded in spawning substrate can also affect fish by reducing survival of eggs and alevin still buried in gravel (Waters 1995).

No direct effects to any fish species inhabiting streams adjacent to or downstream from proposed variable retention harvest in upland stands would be anticipated. Most of the proposed units are generally located along ridges or do not border fish-bearing streams. On fish-bearing reaches that do border proposed harvest units, full Riparian Reserve and Riparian Management Area widths of two site-potential tree heights would be maintained, which would be sufficient to trap and retain any overland transmission of sediment before it could reach streams and increase turbidity levels.

Where haul routes are paved or well-removed from streams, or in instances where timber haul is limited to the dry-season, there is no mechanism for mobilization and transport of sediment to stream channels that could result in increased turbidity.

Gravel-surfaced portions of the haul route that parallel or cross Buck Fork or other tributary streams have the potential to deliver sediment. Installation of cross drains and ditch relief on County Road 15 would reduce or eliminate the transport of fine sediment to Stacey Gulch and from there to Buck Fork. Use of Best Management Practices and project design features described in Chapter Two (pp. 15-16) would eliminate the mechanism for sediment transport and the amount of sediment entering streams, and aid in reducing turbidity levels during frequent winter high flows.

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

Sediment and Substrate

Stream substrate would not be affected, as any fine sediment generated by soil erosion within the harvest units would be intercepted, trapped and stored outside of stream channels by the vegetated strips provided by Riparian Reserves. Non-compacted forest soils in the Pacific Northwest have very high infiltration capacities and are not effective in transporting sediment overland by rain splash or sheet erosion (Dietrich et al. 1982) and vegetated buffers 33-feet or greater in width have been shown as effective in trapping and storing sediment (Rashin et al. 2008).

Effects on aquatic systems also come from activities such as road maintenance and renovation, construction, decommissioning and timber haul, which can contribute sediment to streams that can affect spawning substrate (Furniss et al. 1991). Maintenance and renovation of existing roads would include application of rock lifts where needed, installation of cross drains and ditch relief structures (i.e. ditch outs), grading, and brushing to make roads more accessible. All construction and renovation activities would be restricted to the dry season, and absent seasonal precipitation, there would be no manner for transport of sediment to stream crossings that could affect spawning substrate in downstream reaches.

Intermittent stream channels along the haul route are generally steep gradient with sediment storage capacity sufficient to retain small amounts of sediment that could be generated locally.

Most stream reaches have both large woody material and small functional wood sufficient to trap and store sediment in headwater reaches upstream of fish-bearing reaches. Ephemeral stream channels with woody debris are effective at storing coarse sediment delivered from road surfaces (Duncan *et al*. 1987).

Unsurfaced roads can transmit sediment to streams at channel crossings. Roads crossing over intermittent tributaries of Buck Fork in Section 8, T. 28. S., R. 3 W. have sound surfacing and are not expected to generate sediment. Ditch lines are vegetated and installation of cross drains and ditch relief would eliminate the transport of road-derived sediment to live stream channels where it could be transported downstream to Critical Habitat and Essential Fish Habitat for the Oregon Coast coho salmon.

Dry-season haul would neither generate nor deliver road-derived sediment to live stream channels. Absent substantial precipitation, no mechanism would exist for moving fine sediment from road surfaces into ditch lines and potentially into nearby stream channels. Additionally, absent surface flow no mechanism exists by which intermittent streams would transport sediment downstream to fish-bearing reaches.

As previously described, haul routes could contribute small amounts of fine sediment at stream channel crossings at a time of year when sediment is transported from headwater streams by high winter flows, resulting in small amounts of sediment becoming entrained in spawning substrates, reducing the quality of spawning habitat. Where haul roads are paved, no mechanism exists for sediment to be generated or carried to stream channels via ditch lines or stream crossings.

To further reduce the potential for sediment reaching streams and being transported from headwater streams to downstream fish-bearing reaches, the following project design features could be implemented:

- Following road renovation actions, but prior to wet season haul, areas of potential sediment delivery (stream crossings) would be identified by fisheries, hydrology, and/or engineering staff to determine if additional sediment retention devices are warranted. These devices could include the following: silt fences, straw bales, or geo-fabric rolls. If deemed necessary, these devices would be installed prior to commencement of wet season haul activities.

- The contract administrator would suspend operations before and after periods of rainfall that would result in saturated road surfaces, or create standing water in the ditchline. The intent would be to prevent road surface degradation and generation of sediment from haul actions.

- During wet season haul, road conditions would be periodically inspected by fisheries and hydrology staff during use to assess conditions and make recommendations for sediment reduction when and where necessary.

Functional Instream Wood

Variable retention harvest in upland stands would not affect the recruitment of large wood or small functional wood important to creating fish habitat, as full Riparian Reserve and Riparian Management Area widths would be maintained on streams and no harvest activity would occur within these areas.

Most instream wood comes from within a site-potential tree height of stream channels (Naiman et al. 2002), although large wood can also come from distances greater than 90 meters in steeply confined channels (Reeves et al. 2003). Current large and small functional wood sources would be retained in the Riparian Reserves allowing for natural recruitment into stream channels over time and potential transportation to downstream fish-bearing reaches.

Absent any variable density thinning in overstocked riparian stands in in proposed Units 28-3-17A, B and C, the growth of large trees would be delayed for several decades until natural disturbance opens the stands allowing for release and accelerated growth of dominant trees. Such natural disturbances are unpredictable and may not occur for decades. Still, in the event of a channel flushing debris flow, functional wood from headwater streams could be delivered downstream where it could aid in the creation of high quality, complex pool habitat in fish-bearing reaches.

Large wood provided by larger trees is an important habitat features in downstream fish-bearing reaches. Small functional wood capable of creating pool habitat in smaller stream systems (Bilby and Ward 1989) would continue to provide stream structure and some aquatic habitat as it is moved downstream by episodic channel flushing.

Establishment and growth of diverse deciduous communities adjacent to stream channels would be suppressed absent management in Riparian Reserves. Deciduous leaf litter provides important nutrient sources for aquatic and terrestrial insect species that serve as forage for fish species.

Road construction would not affect recruitment of large wood to streams as none is proposed which would bisect Riparian Reserves, or be sited near streams. Smaller diameter trees that would be removed in association with road maintenance or improvements would not contribute large wood to downstream fish-bearing reaches.

Pool Habitat

Pool habitat availability would be unaffected by variable retention harvest over the short term. Absent any harvest in the Riparian Reserves, functional wood that presently contributes to formation of pool habitat would be reserved.

In proposed Units 28-3-17A, B and C contributions of pool-forming functional wood from riparian stands would be suppressed for decades until natural disturbance opens the canopy allowing for the release and growth of larger trees.

In the event of a channel flushing debris flow, functional wood from headwater streams could be delivered downstream where it could aid in the creation of high quality, complex pool habitat in fish-bearing reaches.

There would be no change in pool availability resulting from road maintenance and renovation, construction, and decommissioning as these activities would take place outside of Riparian Reserves, and would not affect recruitment of pool-forming wood or impact the capacity of stands adjacent to streams to contribute large and small functional wood in the future.

Habitat Access

As no road construction across fish-bearing streams, and no replacement of stream crossings on fish-bearing streams are proposed, there would be mechanism in which current habitat access would be affected.

Critical Habitat

As described above (*Aquatic Habitat, Oregon Coast Coho Salmon Critical Habitat, and Essential Fish Habitat* pp. 113 and 114), there would be no anticipated effects to aquatic habitat from variable-retention harvest and associated road activities. Riparian Reserves on streams tributary to Buck Fork would prevent overland transport of sediment to streams, help maintain stream bank and channel integrity, provide sources of large and small functional wood, and maintain streamside shade.

Project design features and Best Management Practices would be employed to effectively eliminate the transmission of road-derived sediment to streams. Ditch lines would be left vegetated, where practical, and sediment traps such as straw bales or Terra tubes could be deployed to slow runoff and trap sediment in ditches, should circumstances dictate. Timber hauling would be suspended ahead of forecast periods of heavy precipitation or if sediment-laden water is running in ditch lines. Project design features and Best Management Practices that would be implemented would result in long-term reductions in sediment reaching streams designated as Critical Habitat.

Essential Fish Habitat

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

• *Water quality/Water quantity* – There would be no measurable or detectable effect on water quality and/or quantity as a result of the proposed variable retention harvest. Riparian Reserves would prevent delivery of sediment to streams and preserve streamside shading essential to the maintenance of water temperatures. Equivalent Clearcut Area (ECA) would not reach threshold levels for peak flow enhancement (*Water Resources* pp. 120 and 121).

• *Substrate characteristics* – Streams designated as Essential Fish Habitat would have full Riparian Reserves established and there would be no mechanism for the harvest to affect stream substrates. The width of the Riparian Reserves is adequate to filter and retain any small amount of fine sediment generated from within harvest units (*Water Resources* p. 118).

Use of the haul route during the dry season or on paved segments would have no mechanism to introduce fine sediment into stream channels. Where a haul route crosses streams designated as Essential Fish Habitat, application of project design criteria and Best Management Practices would minimize or arrest any mechanism for sediment entering stream channels (*Aquatic Habitat, Oregon Coast Coho Salmon Critical Habitat, and Essential Fish Habitat,* p. 114). Use of the existing road network, the lack of proximity of new road construction and use of Best Management Practices for haul route use would reduce or eliminate the magnitude of fine sediment that could enter the stream.

• *Channel geometry* – Stream channels are stable and have riparian vegetation sufficient to prevent bank erosion caused by high stream flow. There would be no measurable increase in peak stream flows that would affect channel geometry (*Water Quantity* p. 120).

• *Large woody debris within the channel and large woody debris source areas* – Where variable retention harvest units are adjacent to Essential Fish Habitat, full Riparian Reserves would maintain the present and future abundance of wood for instream recruitment. Use of the existing road system would not affect large wood as no trees would be cut to maintain the haul route near or adjacent to streams designated as Essential Fish Habitat (*Aquatic Habitat, Oregon Coast Coho Salmon Critical Habitat, and Essential Fish Habitat* p. 115).

• *Fish passage* – There would be no effect on fish passage as the proposed project would not include construction or replacement of stream crossings on any streams designated as Essential Fish Habitat (*Aquatic Habitat, Oregon Coast Coho Salmon Critical Habitat, and Essential Fish Habitat* p. 116).

• *Forage species (aquatic and terrestrial invertebrates)* – Forage for Oregon Coast coho and Oregon Coast Chinook salmon would remain unaffected. Where variable retention harvest units are adjacent to Essential Fish Habitat, there would be no mechanism for affecting forage species given the establishment of full Riparian Reserves two site-potential tree heights in width.

Streamside riparian vegetation, protected within Riparian Reserves would continue to provide sources of terrestrial invertebrates. Aquatic invertebrate populations would be unaffected by any negligible increases in sediment that may arise.

c. Water Resources

Water Quality

There would be no timber harvest conducted within Riparian Reserves. All vegetation that provides primary and secondary shading for perennial stream channels would be preserved, and the moist microclimate gradient found between riparian and upland ecosystems would be unchanged (Rykken et al., 2007). For this same reason, stream sediment regimes would also be maintained. 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. Groundwater interaction of the fens in proposed harvest Unit 28-3-25A would be maintained as mechanical entry into the surrounding Riparian Reserve would be prohibited.

Because of past clearcut harvest and intensive reforestation efforts, Riparian Reserves in proposed Units 28-3-17A, B and C have become ecologically imbalanced, being dominated by stands of dense, single-storied Douglas-fir. While some deciduous trees and other riparian vegetation exist, is scant and progressively disappearing through conifer suppression.

Cross-channel yarding of timber could occur where timber may not be accessible from the existing road network. When yarding across stream channels, the following Best Management Practices would be implemented.

- (TH2) Design yarding corridors so as to limit canopy loss in Riparian Management Areas (2008 FEIS) 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 workable, require full suspension over flowing streams, non-flowing streams with erodible bed and bank, and jurisdictional wetlands.

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 (Reid 1981, Reid and Dunne 1984). 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.

During the wet season, sediment inputs from surfaced roads would be negligible because of durable road surfaces, and drainage systems that 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, having the potential to briefly increase turbidity, but the amounts would not exceed levels from naturally occurring erosion and runoff. All streams would be expected to stabilize rapidly, and sediment delivery would be indistinguishable from background levels after a short distance.

The three primary haul routes providing access to proposed harvest units in Section 17, T. 28 S., R. 3 W. do not show signs of subgrade failure, have crowned road shapes that effectively drain road surfaces, and have a relative hardness well in excess of requirements for a newly constructed, aggregate-surfaced BLM road (Albin per. obs. 2011). These are all indicators that the roads can sustain timber haul throughout the year. Based on road hardness, durability and the predicted harvest volume that would be hauled, the maximum predicted rut depth would be below the BLM maintenance threshold of two inches (Albin per. obs. 2011).

To address drainage problems associated with County Road 15, two additional cross drains and two ditch-outs would be installed to mitigate sediment transport in the existing ditch line. These actions would bring culvert spacing up to BLM haul route standards, reduce erosion and eliminate direct inputs of runoff to Stacey Gulch, and from there into Buck Fork. Direct sediment transport to Buck Fork on this section of road would not occur, due to a fully vegetated buffer capable of filtering sediment.

An additional cross drain would be installed on Road No. 28-3-17.0 in conjunction with some re-shaping of the road to route collected water near its intersection with County Road 15 away from Buck Fork into a vegetated buffer. An additional cross drain would also be installed on Road No. 28-3-8.1 to facilitate drainage, reduce ditch line erosion, and bring the road up to BLM haul route standards.

The potential exists for localized soil disturbance and erosion associated with road maintenance/renovation or decommissioning where these roads cross streams. Approximately 1.7 miles, or slightly less than one-quarter, of all proposed road maintenance/renovation would occur within Riparian Reserves. Only 0.01 miles, or one-half of one percent of road decommissioning would occur within Riparian Reserves. Best Management Practices described in this environmental assessment (pp. 15-16) would be applied to effectively eliminate any potential for sedimentation associated with these actions.

Prescribed fire would be applied to Riparian Reserves to accomplish multiple goals including promoting ecological diversity and creating snags. On Units 28-3-17 B and C and Unit 28-2-32B ignition would occur outside of "no-treatment" areas to avoid fuel or chemical contaminants from entering streams. On the remaining units, ignition would only be conducted to the outer boundaries of Riparian Reserves. If applied in the spring, as generally preferred, burn intensity would be low because of the cool and moist nature of Riparian Reserves. Moister, cooler microclimates can lower the intensity and severity of fires in riparian areas (Reeves et al. 2006).

Similarly, fire intensity would not be high enough to remove all vegetation, and the Riparian Reserves would still provide an adequate filtering mechanism for any sediment generated from upslope activities.

Snags that might be created by broadcast burning would provide long-term sources of small and large woody debris that may enter the stream network and improve upon geomorphic conditions (e. g. pool creation, sediment retention, etc.)

Fire may also increase aquatic productivity by stimulating primary productivity in the form of increased growth of deciduous shrubs and plants, and secondary production in the form of invertebrate biomass (Reeves et al. 2006).

Disturbance, like that seen from prescribed fire, is important to maintaining biological diversity, and the resilience and productivity of many aquatic populations and communities (Poff and Ward, 1990). 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.

Water Quantity

Openings in a forest canopy greater than two tree heights in diameter, roughly two acres in size, can affect precipitation, snow melt and peak flows (2008 FEIS, p. 355). Peak flows in a rain-dominated or rain-on-snow dominated hydroregion are not observed until the Equivalent Clearcut Area (ECA) exceeds 29 or 19 percent respectively (Grant et al., 2008).

Approximately 285 acres of actual harvest are proposed, split between both hydroregions, which would result in canopy openings. Assuming a 40-foot clearing limit, 1.35 acres of unrecovered openings would result from construction of portions of Roads WC-7 and WC-12 situated outside of harvest unit boundaries, which would not be sufficient in scale to affect peak flows from the perspective of canopy opening.

Table 3-22 summarizes the existing ECA and resultant ECA from implementation of this alternative. None of the resultant ECAs would exceed the thresholds identified

Table 3-22. Effects of Alternative Two, Sub-Alternative A on ECA in the Project Area

6th-field Subwatershed	Existing ECA (acres)	Harvest openings (acres)	Resulting ECA	
			(acres)	Percent of subwatershed
*Upper North Myrtle Creek**	3,262	65	3,327	18.0
*Upper South Myrtle Creek**	4,232	144	4,376	16.4
Deadman Creek	810	4	814	4.4
Lower Cavitt Creek	1,127	42	1,169	5.1
Upper Cavitt Creek	182	30.0	212	1.5

*Rain-dominated

Proposed road construction would not have any long-term effect to drainage density and flow routing. All of the 1.2 miles of new construction and another 0.78 miles of existing roads would be decommissioned after use. Decommissioning, at a minimum, would include removing drainage structures, constructing waterbars to disconnect the roads from the drainage network, slash mulching to prevent surface erosion and deter unauthorized use and closing the roads to traffic. Where soil depth and structure allow, unsurfaced roads would also be sub-soiled which would facilitate infiltration of precipitation. Total roaded area would remain relatively unchanged, at approximately 3.43 percent, well below the 12 percent threshold for risk of peak flow enhancement identified by Harr *et al*., (1975).

High intensity fire not only removes vegetation, but can reduce soil infiltration capacity, both of which can lead to enhancement of peak flows if the spatial extent of the fire is great enough. The application of prescribed fire in Riparian Reserves would be managed at a low intensity to minimize loss of vegetation and potential reductions in soil infiltration capacity. Peak flows are not expected to measurably increase as a result of the use of prescribed fire.

2. Sub-Alternative B

a. Fish Species

Direct effects to fish species would be comparable to those described for Alternative Two, Sub-Alternative A. Variable density thinning in Riparian Reserves would not directly affect fish in adjacent or downstream reaches. "No-treatment" areas of 35 and 60-feet wide at a minimum would prevent any sediment generated by timber harvest from entering streams and affecting fish. Road construction and renovation would be the same as for Sub-Alternative A and the potential for effects on turbidity and stream substrate for spawning would be identical.

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

Sediment and Substrate

Effects of variable retention harvest in upland stands would be identical to those described for Alternative Two, Sub-Alternative A (pp. 113-114).

Variable density thinning would be applied in Riparian Reserves along some intermittent and perennial fish-bearing streams in Section 17, T. 28 S., R. 3 W., W.M. "No treatment" areas established along these streams would be, on the average, greater than 70 to 100 feet in width on either side of the streams. These "no treatment" areas would provide sufficient filtering capacity to prevent any sediment from reaching the stream channels, as at this distance adequate vegetation and undisturbed ground would retain and store any small amount of fine sediment that might be transported by overland flow from disturbed thinned areas (Rashin et al. 2008).

There would be no additional maintenance, renovation, and construction compared to Alternative Two, Sub-Alternative A that would pose an increased potential for sediment transport. The estimated 369 thousand board feet of timber volume generated by variable density thinning in Riparian Reserves in Units 28-3-17A, B and C would increase road use, but with the proposed improvements to these roads, this would not pose any additional risk for sediment transport.

Functional Instream Wood

Effects to functional instream wood would be similar to that for Alternative Two, Sub-Alternative A (p. 115). Variable retention harvest in upland stands would have no mechanism to affect availability of instream wood, as all activity would take place outside of Riparian Reserves. As previously described, road use, construction and renovation would have no mechanism to affect instream functional wood.

In proposed Units 28-3-17A, B and C, where riparian stands are overstocked variable density thinning would create small openings that would allow for the survival of deciduous trees and growth of larger conifers by reducing competition and increasing light and nutrient availability. Over time, increased diversity in riparian areas would provide a greater level of deciduous leaf litter for consumption by aquatic and terrestrial insects which are important food sources for fish. Accelerated growth of larger conifers would provide large instream wood capable of being transported downstream to fish-bearing reached during episodic debris flows.

Pool Habitat

Effects to pool habitat availability would be similar to those described in Alternative Two, Sub-Alternative A (pp. 115-116), as there would be no mechanism for affecting existing pool habitat. Thinning in the selected Riparian Reserves, as described above, would retain sufficient sources of small functional wood as well as create large functional wood in the long-term capable of recruitment into fish-bearing streams. There would be no road construction or renovation that would have any affect to pool-forming functional wood.

Habitat Access

Absent any additional road and stream crossing construction, effects on habitat access for salmonids would be identical to those described in Alternative Two, Sub-Alternative A (p. 116).

Critical Habitat

As previously described under Sub-Alternative A (p. 116), there would be no mechanism for effects to Critical Habitat for Oregon Coast coho salmon.

Essential Fish Habitat

As previously described under Sub-Alternative A (pp. 116 and 117), there would be no mechanism for effects to critical components of Essential Fish Habitat for Oregon Coast coho salmon and Oregon Coast Chinook salmon.

c. Water Resources

Water Quality

In addition to the upland harvest proposed under Alternative Two, Sub-Alternative A variable density thinning would be applied to approximately 21 acres of Riparian Reserves in Units 28-3-17 A, B, and C. Vegetation that provides primary shading for perennial stream channels would be protected by "no-treatment" buffers previously described. These buffers would maintain the cool, moist microclimate gradient found between riparian and upland ecosystems (Rykken et al., 2007).

Variable retention treatments can be used as a surrogate for natural disturbances (Christensen et al., 2000). The selection of Riparian Reserves to be treated was based on field stream surveys which identified stands of overstocked, homogenous timber adjacent to stable stream channels and banks where structural diversity was lacking (Parker pers. obs., 2011).

Variable density thinning would focus on enhancing structural diversity of these Riparian Reserves by reducing conifer competition and releasing deciduous trees such as bigleaf maple and alder. Reducing current stand densities would allow necessary light filtration through an otherwise dense canopy that would foster the growth of deciduous trees and shrubs. 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).

Establishment of "no-treatment" areas for the purpose of shading streams and minimizing impacts to stream temperatures is often given priority, when in fact the function of streams up through at least third order should be providing essential energy and structural inputs (Franklin et al., 1981). Variable density thinning in Riparian Reserves would not impact effective shade or stream temperatures as the establishment of streamside "no-treatment" areas astride streams and maintenance of a minimum average of 50 percent canopy closure would provide effective shading.

"No-treatment" areas effectively reduce or eliminate disturbance to stream channels and stream banks, and also filter surface run-off allowing sediment to be deposited on the forest floor before entering a stream, while preserving the functionality of primary shade zones.

Project design and Best Management Practices described in Alternative Two, Sub-Alternative A (pp. 12, 15, 114 and 118) would apply to this sub-alternative. These measures would prevent disturbance to stream channels and stream banks. 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.

Water Quantity

Openings in a forest canopy greater than two tree heights in diameter, roughly two acres, can affect precipitation, snow melt and peak flows (2008 FEIS, p. 355). In the variable density thinning proposed in Riparian Reserves under this alternative, there would be no canopy openings greater than 0.25 acres. Impacts to peak flows from ECA would be the same as described in Alternative Two, Sub-Alternative A.

As in Alternative Two, Sub-Alternative A, total roaded area would remain stable or decrease in each drainage of the analysis area (p. 121), remaining at approximately 3.43 percent well below the 12 percent threshold for risk of peak flow enhancement identified by Harr et al. (1975).

Prescribed burning and its impacts would be the same as described in Alternative Two, Sub-Alternative A (p. 121).

D. Reference Analysis One – Effects

1. Fish Species

Direct effects to fish species are similar to Alternative Two, Sub-Alternatives A and B. Commercial thinning of upland stands would not directly affect fish species in adjacent or downstream reaches. Application of "no-treatment" areas previously described would prevent any sediment generated from variable density thinning operations in Riparian Reserves from reaching stream courses and increasing turbidity that could impact fish or spawning substrates downstream.

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

Sediment and Substrate

Commercial thinning in upland stands would have no effects on sediment and stream substrate in stream channels adjacent to units. The effects of variable density thinning in Riparian Reserves associated with units in Section 17, T. 28 S., R. 3 W., W.M. would be consistent with those described for the variable density thinning component of Alternative Two, Sub-Alternative B. "No treatment" areas, 70 to 100 feet in width on either side of the streams would provide sufficient filtering capacity to prevent any sediment from reaching the stream channels (*Water Quality* p. 123), as at this distance adequate vegetation and undisturbed ground would retain and store any small amount of fine sediment that might be transported by overland flow from disturbed thinned areas (Rashin et al. 2008).

Road maintenance, renovation, and construction would be less than half of that proposed under Alternative Two. The amount of timber harvest would be roughly one-fifth the estimated volume for Alternative Two, resulting in reduced road use. These latter two factors would further reduce any potential for sediment transport to stream channels.

Functional Instream Wood

Effects to functional instream wood would be similar to that for Alternative Two, Sub-Alternatives A and B. Thinning in upland stands would have no mechanism to affect availability of instream wood as all activity would take place outside of Riparian Reserves. As previously described (p. 115), road use, construction and renovation would have no mechanism to affect instream functional wood.

In Section 17, T. 28 S., R. 3 W., W.M. where riparian stands are overstocked, variable density thinning would create small openings for survival of deciduous trees and accelerated growth of larger conifers by reducing competition and increasing light and nutrient availability. Over time, diversity in riparian areas would provide a greater level of deciduous leaf litter for consumption by aquatic and terrestrial insects which are important food sources for fish. Larger conifers would provide large instream wood capable of being transported downstream to fish-bearing reached during episodic debris flows.

Pool Habitat

Effects to pool habitat availability would be similar to those described in Alternative Two, Sub-Alternatives A and B (pp. 115, 116, and 122). There would be no additional mechanism to affect pool habitat. Thinning in Riparian Reserves would retain sufficient sources of small functional wood as well as creating large functional wood in the long term capable of recruiting to fish-bearing streams.

Habitat Access

Absent any construction or replacement of stream crossings, effects on habitat access would be identical to those for Alternative Two (p. 114).

Critical Habitat

As previously described, there would be no mechanism for additional effects to Critical Habitat for Oregon Coast coho salmon as a result of riparian thinning, and the effects would be identical to those described for Alternative Two, Sub-Alternative B.

Essential Fish Habitat

As previously described, there would be no mechanism for additional effects to critical components of Essential Fish Habitat for Oregon Coast coho salmon and Oregon Coast Chinook salmon.

3. Water Resources

Water Quality

"No-treatment" areas would be established within Riparian Reserves as described in Alternative Two, Sub-Alternative B (p. 22). A minimum average of 50 percent canopy cover outside the buffers would be maintained to prevent any increases to stream temperatures as in Alternative Two, Sub-Alternative B. Harvest would not occur in naturally wet areas, springs or seeps within the extent of riparian vegetation or seasonally saturated soils, whichever is greatest.

In addition to upland thinning, variable density thinning in Riparian Reserves, identical to that proposed in Alternative Two, Sub-Alternative B, is examined in this Reference Analysis.

The potential need for cross-channel yarding would exist, as previously described. Proposed work on County Road 15, Road 28-3-17.0 and 28-3-8.1 to correct drainage deficiencies, and the beneficial nature of this work on water quality would be identical to that described in Alternative Two, Sub-Alternatives A and B. Potential sedimentation where road work and the stream network intersect would be addressed by the application of Best Management Practices described in Chapter Two of this environmental assessment (pp. 15-16), which would reduce or eliminate potential for sedimentation associated with these actions.

Timber hauling could occur in both the dry and wet seasons. Stream crossings and ditch lines, associated sediment issues, and the project design features and Best Management Practices intended to address season of haul are detailed in the discussion of effects for Alternative Two, Sub-Alternative A.

"No-treatment" areas on either side of all streams paired with variable density thinning in the remainder of the Riparian Reserves that maintain a minimum average of at least 50 percent canopy cover would prevent changes to stream temperature and sediment regimes while potentially increasing stream production. Prescribed burning would not occur within Riparian Reserves. These measures would prevent disturbance to stream channels and stream banks. 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.

Water Quantity

Openings in a forest canopy greater than two tree heights in diameter (approximately two acres) can affect precipitation, snow melt and peak flows (2008 FEIS, p. 355). In the variable density thinning in Riparian Reserves and commercial thinning in upland stands described in this Reference Analysis, there would be no canopy openings greater than 0.25 acres. There would be 0.05 acres of unrecovered canopy openings resulting from new road construction in the Middle Fork Deadman Creek 7th-field drainage.

None of these actions would measurably change the current ECA of the project area which is well below the 29 percent threshold for peak flow enhancement, and there would be no expected effects to peak flow resulting from unrecovered canopy openings.

The proposed road construction would not have any long-term effect to drainage density and flow routing. All of the 0.38 miles of new construction and 0.12 miles of selected existing roads would be decommissioned after use. Decommissioning, at a minimum, would include the removal of drainage structures, construction of waterbars to disconnect the roads from the drainage network, slash mulching to prevent surface erosion and unauthorized use, and closing the roads to traffic. Where soil depth and structure allow, unsurfaced roads would also be sub-soiled which would facilitate infiltration of precipitation. Total roaded area would remain well below the 12 percent threshold for risk of peak flow enhancement.

There would be no application of prescribed fire in Riparian Reserves, so there would be no effect on infiltration capacity and no potential for affecting peak flows.

E. Reference Analysis Two – Effects

1. Fish Species

Units in Section 17, T. 28 S., R 3 W., W.M. that are in proximity to Buck Fork, and several streams tributary to it, would not be harvested because they do not meet the minimum age prescribed by the ROD/RMP.

Direct effects to fish species from the actions described in this reference analysis would be consistent with those described for Alternative Two, Sub-Alternatives A. The establishment of Riparian Reserves on streams would prevent any sediment from units reaching the stream and creating additional turbidity.

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

Sediment and Substrate

Effects of regeneration harvest in upland stands on sediment and stream substrate for salmon would be the same as those described for Alternative Two, Sub-Alternative A, except that there would be no harvest in units in Section 17, T. 28 S., R 3 W. W.M., Absent any timber harvest in this area, there would be no affect to sediment supply and turbidity in tributaries to Buck Fork.

There would be no additional road construction or renovation that would increase the amount of sediment that could be transported to stream channels. Absent harvest in Section 17, T. 28 S., R 3 W., W.M. approximately 0.66 miles of road renovation in the form of spot surfacing, cross-drain installation, and ditch relief would not be implemented. As a result, sediment input to Stacey Gulch would persist, resulting in continuation of elevated stream turbidity in Buck Fork.

Functional Instream Wood

Effects on existing functional instream wood and recruitment sources would be identical to those described for Alternative Two, Sub-Alternative A, as all harvest and yarding activity would take place outside of Riparian Reserves.

Continuation of suppressed stand growth and development in Section 17, T. 28 S., R 3 W. W.M, the result of overstocking, would result in the delayed growth of large trees close to stream channels. Long-term, this would reduce the availability of large wood for recruitment into streams that are tributary to Buck Fork, and transportation of that large wood downstream to Buck Fork.

As described under Alternative Two, Sub-Alternative A, road use, construction and renovation would have no mechanism to affect functional instream wood as clearing of road rights-of-way would occur entirely outside of Riparian Reserves.

Pool Habitat

Effects to pool habitat availability would be comparable to those described in Alternative Two, Sub-Alternative A. Regeneration harvest in upland stands has no mechanism to affect pool habitat directly or indirectly by reducing instream functional wood. Riparian Reserves would retain all current and future sources of instream functional wood adjacent to or upstream of fish-bearing streams.

Habitat Access

Absent any construction or replacement of stream crossings, there would be no potential effect on existing habitat access.

Critical Habitat

Absent any activities in Section 17, T. 28 S., R. 3 W., W.M., there would be no means for effecst to Critical Habitat for Oregon Coast coho salmon located in Buck Fork.

Essential Fish Habitat

Absent any activities in Section 17, T. 28 S., R. 3 W., W.M., there would be no mechanism for effects to critical components of Essential Fish Habitat for Oregon Coast coho salmon and Oregon Coast Chinook salmon located in Buck Fork.

3. Water Resources

Water Quality

Absent timber harvest within Riparian Reserves, effects to riparian vegetation, primary and secondary stream shading, riparian microclimate, stream channels and banks, stream temperature, and sediment regimes would be the same as described in Alternative Two, Sub-Alternative A.

Naturally wet areas, springs or seeps would be similarly protected. 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.

Cross-channel yarding of timber and associated Best Management Practices BMPs could occur as described in Alternative Two, Sub-Alternative A. Drainage problems associated with County Road 15, previously described, would not be corrected and ditch lines would continue to deliver sediment to Stacey Gulch and, hence, to Buck Fork.

There would be the potential for localized soil disturbance and erosion associated with approximately one mile of road renovation within Riparian Reserves. Best Management Practices identified in Chapter Two (pp. 15-15) would reduce or eliminate any potential for stream sedimentation associated with these actions.

Timber hauling could occur in both the dry and wet seasons. Best Management Practices described in Chapter Two with respect to Alternative Two, Sub-Alternative A (pp. 15-16), addressing the effects on sediment and substrate (*Aquatic Habitat, Oregon Coast Coho Salmon Critical Habitat, and Essential Fish Habitat,* p. xx) would be implemented to prevent degradation of water quality.

Water Quantity

Peak flows in a rain-dominated or rain-on-snow dominated hydroregion are not observed until the ECA exceeds 29 or 19 percent respectively (Grant et al., 2008). There are 246 acres of regeneration harvest considered in this reference analysis in the rain dominated and rain-on-snow hydroregion which would result in openings in the forest canopy for the purpose of peak flow assessment. There would also be 1.26 acres of unrecovered canopy openings resulting from new road construction, the same as in Alternative Two, Sub-Alternatives A and B. Current and resultant ECAs are illustrated in Table 3-23.

Table 3-23. Effects of Reference Analysis Two on ECA in the Project Area

6th-field Subwatershed	Existing ECA (acres)	Harvest openings (acres)	Resulting ECA	
			(acres)	Percent of subwatershed
*Upper South Myrtle Creek**	4232	164	4396	16.5
Deadman Creek	810	6	816	4.4
Lower Cavitt Creek	1127	44	1171	5.1
Upper Cavitt Creek	182	33	215	1.5

*Rain-dominated

Road construction would not have any long-term effect to drainage density and flow routing. All of the 1.02 miles of new construction and another 0.12 miles of existing roads would be decommissioned after use, in a manner previously described. Where soil depth and structure allow, unsurfaced roads would also be sub-soiled which would facilitate infiltration of precipitation. Total roaded area would remain relatively unchanged, at approximately 3.43 percent well below the 12 percent threshold for risk of peak flow enhancement identified by Harr *et al*., (1975).

As described for Alternative Two, Sub-Alternative A, high intensity fire not only removes vegetation, but can reduce soil infiltration capacity, both of which can lead to enhancement of peak flows if the spatial extent of the fire is great enough. The application of prescribed fire would be excluded from Riparian Reserves and would be managed in upland areas at a low intensity to minimize potential reductions in soil infiltration capacity. Peak flows are not expected to measurably increase as a result of the use of prescribed fire.

IV. Soils

A. Affected Environment

Geology, Soils, Slope Stability and Past Harvest Effects

<u>Units 28-3-17A, B and C</u>

About ten percent of the area within the proposed units consists of soils developed over granodiorite bedrock, an intrusive, igneous rock (Johnson et al., 2004). Pockets of deeply weathered soils, three feet deep or greater, with moderate to high amounts of clay in this rock type can be subject to slope failures on slopes of 30 percent or greater. Slope failures can occur naturally or as a result of surface disturbance associated with management activities. These soils are classed as fragile, but manageable with the application of Best Management Practices intended to minimize soil and organic matter losses (USDI, BLM 1986, Rel. No. 5-179, pp. 7-8). The remaining soils within Section 17 have developed over metamorphic and sedimentary rocks and tend to be stable to moderately stable, depending on slope steepness.

The stands proposed for harvest in this analysis were roaded and clearcut in the late-1950s to early-1960s as indicated on 1962 aerial photos. Harvest was conducted with a combination of tractor and high-lead cable yarding equipment. In Unit 28-3-17A there are old landings, tractor trails with cut banks two feet or greater in height, and skid roads along the ridges and sideslopes still identifiable from the previous harvest entry. Portions of Unit 28-3-17B were downhill yarded. There were also three road fill failures within Unit 28-3-17B associated with side cast road construction.

At the lower end of Unit 28-3-17A, there is an old slide-slump deposit astride an intermittent stream course. Soil material within the stream channel has been down-cut, in some places by four to six feet. Large stumps situated within the lower stream terrace indicate that a large slope failure occurred before the current and previous conifer stands were established.

Further downslope, the stream has cut down eight to ten feet through the fill from an old tractor road created at the first harvest entry. A residence with several outbuildings is located downstream and downslope on an adjacent depositional terrace across Buck Fork.

Two small slope failures or areas of exposed soil are present in Unit 28-3-17A, one adjacent to the stream that roughly bisects the unit, and the second in the northeastern corner of the unit. In Unit 28-3-17C, three slope failures were noted on aerial photographs, no more than 0.05-acres in size, on lower and mid-slope locations. A slow land flow was also visible. The origin of these slope failures cannot be determined.

Despite storm events of December 1964 through January 1965, there were no noticeable changes in slope stability indicated in 1965 aerial photos on Units 28-3-17A and C, associated with tractor skid roads, trails and landings, or existing slope failures. Two road fill failures did occur in Unit 28-3-17B in association with the storm events. Examination of aerial photographs through 1994 and field review of the units indicated no additional slope failures. These areas are all partially to fully revegetated.

Category 1 soils consist of the following; soils less than 20 inches deep, soils with less than four inches of "A" horizon, granite and schist soils on slopes greater than 35 percent, and other soils on slopes greater than 70 percent. Roughly half of the soils in the proposed harvest units in Section 17, T. 28 S., R. 3 W. are considered Category 1 soils. These consist of granodiorite soils on slopes over 35 percent, already noted, and smaller areas and inclusions of other soils that are considered highly sensitive based on shallow depths or location on slopes exceeding 70 percent. The remaining unit acres are divided more or less equally into Categories 2 and 3. Category 1 soils are considered highly sensitive, Category 2 soils are moderately sensitive, and Category 3 soils are the least sensitive to the effects of prescribed fire (USDI, BLM Handbook 1734-1).

Broadcast burning and hand piling and burning are allowed on Category 1 soils if it is considered essential for resource management (USDI, BLM. 2001, pp. 66-67). Any burning would be accomplished under site specific prescriptions designed to accomplish the resource objectives while minimizing adverse impacts on soil properties. The allowable amount of mineral soil exposed by the burning is 15 percent of unit area for Category 1 soils, 30 percent for Category 2 soils, and 40 percent for Category 3 soils.

Units 28-3-23A and 25A; Units 28-2-31A and B; and Units 28-2-32A, B, C and D

The predominant rock type is hard, competent volcanic rock with smaller inclusions of welded tuff, which is also generally hard. The soils that have developed over these materials are generally stable. The 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).

Roughly half the acreage in this grouping of units is located on broad, stable ridges or on gentle to moderately sloping convex to concave sideslopes, with slope gradients of 30 percent or less. Soil rock content ranges from less than ten percent up to 70 percent. The soils contain moderate to high amounts of clay. Susceptibility to displacement and compaction by ground-based harvest equipment ranges from low to high, depending on clay and rock proportions (Johnson et al., 2004, Williamson and Neilsen, 2000).

About 30 percent of the acreage in this grouping of units is located on convex and concave slopes of 30 to 60 percent gradient. The soils range from 20 inches to greater than 60 inches deep. Textures are loams, clay loams, and clays with 35 to more than 70 percent gravels and cobbles. Slopes are generally stable, but may be moderately susceptible to displacement, based on steepness. Potential for erosion would be greater on steeper slopes.

The remaining 15 percent of the acreage in this grouping of units consists of steep sideslopes with gradients of 60 to more than 90 percent. Soils are moderately deep to shallow and include rock outcrops surrounded by very shallow soils, less than 10 inches deep. The soils are not well developed, with amounts of gravels and cobbles ranging from 35 to 90 percent. Soil textures generally range from sandy loams to loams.

The soils on the steep to very steep slopes are classified as fragile based on the steepness of the slope gradients. They are subject to soil and organic matter losses from surface erosion and some mass movement, unless site-specific project design features and Best Management Practices are employed to protect them (USDI/BLM, 1986).

Units 28-3-23A, 28-3-25A, 28-2-31A and B, and 28-2-32D have been subject to previous salvage entry, as evidenced by the presence of tractor skid trails. The running surfaces of major skid trails exhibit heavy compaction. Where the topsoil has been scraped off or otherwise displaced, compaction of exposed subsoil is five inches or greater in the form of dense masses and compressed plates. Soil compaction on secondary skid trails is generally three to four inches in depth along the tread areas, which are three to four feet wide per tread. These secondary trails are vegetated with varying levels of forbs, moss, shrubs, and conifers, with few signs of erosion in most places.

The December 1964 through January 1965 storm event produced several slides adjacent to a stream that runs along the western end of Unit 28-2-32A and southern border of Unit 28-2-32B. One of the slides, near the westernmost end of Unit 28-2-32B, resulted in a debris flow almost one-half mile long. In 1983, a small failure occurred on a recently-constructed section of Road 28-2-32.0. No other notable failures were identified from 1965 to 1994 aerial photos, and field review.

The units are divided in roughly equal proportions between Category 2 and 3 soils with respect to susceptibility to effects from prescribed fire. There are small inclusions of Category 1 soils on slopes exceeding 70 percent and in pockets of shallow soils.

B. Alternative One – Effects

<u>Soil Displacement and Compaction</u>

There would be no direct effects on any soils in the project 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 the old skid trails and skid roads would recover slowly, especially at depths below 6 inches (Amaranthus et al., 1996; Powers et al., 2005).

Slope Stability

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

Prescribed Burning

Much of the nitrogen and other nutrients in forest ecosystems come from decomposition and recycling of organic matter, including 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).

The degree of change in levels of organic matter and nitrogen is directly related to the magnitude of soil heating and the severity of the 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 burning. Large amounts are lost through direct volatilization in moderate to high-severity fires. 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. However, soil temperature increases generated during a cool-burning prescribed fire in mixed conifer forests are low and of short duration. Low-severity fires generally have a low effect on soil microorganisms as well (Neary et al. 2005).

Under this alternative, no timber would be harvested, and no activity fuels would be generated which would require disposal by prescribed burning. As a consequence, no changes in the current levels of soil organic matter and nutrients would occur.

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 wildland fire of sufficient intensity to consume the material.

C. Alternative Two – Effects

1. Sub-Alternative A

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, Best Management Practices 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 2002b, p. 70).

Monitoring, from 2000 through 2010, of ground-based harvest operations that included rubber-tired skidders, tractors, and harvester/forwarder systems has shown that with the application of appropriate project design features and Best Management Practices, such as dry season operations and pre-designation of skid trails, the areal extent of effects ranged from three to nine percent of the ground-based harvest area (USDI, BLM 2004 and 2006, 2007 and 2008b; W. Fong per. obs 2008-2009). Effects included compaction deeper than four inches, and/or soil displacement deeper than the organic surface layer. The extent varied with the equipment used, number of passes over individual trails, terrain, access routes, climatic conditions, and operator skill.

The amount of detrimental soil compaction and displacement associated with the proposed variable retention harvest would trend toward the middle or upper end of the range noted above, principally due to the higher volume of timber to be removed, requiring more equipment passes over skid trails. Some units, such as 28-3-25A, have larger timber which could require the use of larger yarding equipment with resultant higher ground pressures.

To reduce compaction, native-surface landings free of logging slash, and heavily compacted skid trails would be sub-soiled, except in areas of shallow, skeletal soils with high cobble and gravel content, or rocky soils. This would reduce bulk soil density and provide some soil aeration, allowing for natural reseeding of trees, and contributing to growth of both natural and planted seedlings. Sub-soiling help prevent runoff and erosion by increasing infiltration capacity.

Although tillage does not bring about complete percent recovery from soil compaction, 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

As discussed in Chapter Two (p. 14), cable yarding systems would have the capacity to maintain a minimum one-end log suspension to minimize surface and soil disturbance where deemed necessary. Where full log suspension is deemed necessary, contract provisions may specify the type of equipment, such as logging carriage, to be used.

Both uphill and downhill cable yarding would cause localized disturbance characterized by duff and mineral soil displacement in yarding corridors, and in some instances displacement of the subsoil.

Monitoring of commercial thinning and variable density thinning has shown that application of appropriate project design features and Best Management Practices limits the areal extent of ground affected to one to two and a half- percent (USDI, BLM 2007, p. 97; 2008b, pp. 86-87; 2009, pp. 72-73; W. Fong pers. obs. 2006 and 2010). This includes disturbed areas disturbed within yarding corridors, landings, and equipment areas.

The extent of displacement would be greater for variable retention harvest, and would be dependent on site conditions, volume of timber yarded over any given haulback road, topography, and operator/equipment factors. Greatest disturbance would occur within 100 to 150 feet of landings where individual haulback roads merge. The extent of disturbance is expected to be two to four percent of the cable-yarded area, but would vary across units, primarily based upon log size. In Unit 28-3-25A, where the average log diameter is estimated at 18 inches, surface disturbance would tend toward the higher end of the anticipated range. In Units 28-3-17B and C, or 28-2-31A and B where average log diameter would range from 11 to 12 inches, surface disturbance would be expected to be less.

On Unit 28-3-17A, whole trees yarding would be authorized. This would result in the removal of tops, branches and limbs in conjunction with the tree bole, to eliminate the need for broadcast burning the unit, approximately 75 percent of which consists of Category 1 soils. Whole tree yarding would remove a large portion of organic litter and nutrients that would otherwise remain on site, but existing duff and litter would be retained by elimination of burning. This would result in a higher percentage of the harvested acres being subject to duff and soil displacement, but with less compaction, as attached branches would afford suspension of the tree bole above the ground and limit displacement of duff and topsoil.

Slope Stability

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

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 (2008 FEIS, p. 769).

The Oregon Department of Forestry (Robison et al, 1999) studied shallow, rapid slope failures in stands ranging in age from reinitiation to 100 years and older, 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 to 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.

Unstable areas identified within units during field reconnaissance would be incorporated in retention aggregates or clumps of dispersed retention to avoid surface disturbance that could contribute toward a slope failure.

Riparian Reserves would be established on all streams, so that the more steeply incised and seasonally saturated slopes would be protected from soil disturbance. The stands proposed for harvest range in age from approximately 40 to 110 years. As a consequence of these factors and measures, the risk for slope failure and landslides would be considered low.

Prescribed Burning

Areas subject to ground-based harvest could be machine piled to reduce activity fuels. The maximum area subject to compaction would be ten percent of the piled area, including skid trails and landings. Piling would be conducted in a manner that keeps the piles free of duff and topsoil (USDI, BLM. 2001, p. 66). During machine piling, designated or selected skid trails could also be subsoiled as the equipment retreats from the treated areas.

Landings and piles would be burned in late-autumn or winter after periods of extended precipitation. Under these circumstances, soil and duff moisture would be high. Burning of landings and piles would more likely 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 would be largely consumed, but high soil moistures would moderate loss of soil carbon, nitrogen and other nutrients.

Mineral soil exposed by prescribed burning could be subject to surface erosion, including dry ravel on the steeper slopes, for several years until the areas are revegetated. The rate would vary depending on burn severity and vegetation recovery (Neary et al. 2005). The erosion rates would be greater on the steeper slopes, with possible longer recovery rates. Vegetative recovery in general would be fairly rapid in disturbed areas (Rapp 2000).

Watersheds that periodically experience low severity wildfires can achieve vegetative recovery in one to three years, whereas watersheds that are moderately to severely burned can take seven or more years for vegetative recovery (Neary et al. 2005).

Prescribed burning would be conducted in the spring under cooler conditions, when soil moisture is high, and the moisture content of large fuels is high. Burning would be done by hand ignition, applied to approximately 50 percent of unit acres and focused on finer fuels less than three inches in diameter, resulting in a mosaic of burned and unburned areas. Under these circumstances, fire duration would be short and burn intensity low, resulting in limited duff consumption and exposure of mineral soil. Loss of soil nutrients would also be low.

Any erosion of exposed soils that occurred would principally remain within the boundaries of the harvest units. Any eroded soil that moved beyond unit boundaries would be intercepted by adjacent vegetated, non-treated areas (Neary et al. 2005).

2. Sub-Alternative B

Soil Displacement and Compaction

Ground-Based Yarding

Acres proposed for variable retention harvest would not differ from those identified for Sub-Alternative A, as none of the variable density thinning conducted in Riparian Reserves would utilize ground-based equipment. Potential effects to soil productivity and slope stability would be consistent with those already described for Sub-Alternative A. The project design features and Best Management Practices to be employed to address these concerns would be consistent with those described for Sub-Alternative A.

Cable Yarding

The effects of cable harvest associated with variable retention harvest would be consistent with those previously described for Sub-Alternative A.

All variable density thinning in Riparian Reserves would consist of uphill yarding. In addition to the requirement that a minimum of one-end log suspension would be maintained, a lateral yarding capacity of at least 100-feet would be specified to minimize the number of yarding corridors that would be required and the overall area that would be subject to soil disturbance and displacement. As a consequence, it is expected that the area affected would tend toward the low end of the one to two and- a half- percent previously observed in post-operational monitoring. Soil displacement and compaction averaging three inches in depth would be expected in yarding corridors, with isolated areas of higher compaction to a depth of six inches possible.

Slope Stability

No differences in the potential for slope instability would exist from those identified for Sub-Alternative A. The same measures would be applied to provide protection to selected areas from disturbance, reducing the potential for slope failures and landslides.

Prescribed Burning

There would be no change in the scope of activity fuels treatments or in the manner of their application from those described for Alternative Two, Sub-Alternative A. Consequently, no difference in effects would be expected.

D. Reference Analysis One – Effect

Soil Displacement and Compaction

Ground-Based Yarding

The action described in this reference analysis would include nine acres of ground-based harvest. Pre-designation of skid trails, limitation of operations to the dry season, and limitation of operations to gentler slopes, as would be the case for Alternative Two, would minimize the displacement and compaction of soils. Application of measures to prevent erosion and ameliorate compaction, already described, would maintain soil productivity as previously discussed.

Cable Yarding

As previously discussed, monitoring of commercial thinning and variable density thinning has shown that application of appropriate project design features and Best Management Practices limits the areal extent of ground affected to one to two and a half- percent. Requiring a minimum of one-end log suspension and lateral yarding capacity of at least 100-feet would minimize the number of yarding corridors and overall area subject to soil disturbance and displacement. As a consequence, the area affected would tend toward the low end of the one to two and- a half- percent previously described, with soil displacement and compaction averaging three inches in depth would be expected in yarding corridors, with isolated areas of higher compaction to a depth of six inches possible.

Slope Stability

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 will 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.

As described in Chapter Two, commercial thinning on a relatively uniform spacing for full-site occupancy would maintain canopy cover of 70 to 80 percent (p. 26), while variable density thinning in Riparian Reserves would maintain a minimum average of at least 50 percent canopy cover (p. 23). The residual stand would continue to intercept rainfall and transpire water through the tree canopies, and live roots would maintain soil strength and 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.

Prescribed Burning

The application of prescribed fire would be limited to the burning of landings, and piling and burning of material up to six inches in diameter alongside roads that pass through units. Landings and piles would be burned in late-autumn or winter after periods of extended precipitation.

Burning of landings and piles would more likely create higher temperatures that can cause adverse effect to soils, compared to broadcast burning. However, these effects would be limited to areas directly under the piles.

E. Reference Analysis Two – Effects

Soil Displacement and Compaction

Ground-Based Yarding

Project design features and Best Management Practices described for Alternative Two, Sub-Alternative A (pp. 14 and 18) would apply to the action described in this reference, with effects consistent with those described for Alternative Two, Sub-Alternative A.

Cable Yarding

Cable yarding would be conducted in a manner consistent with that described for Alternative Two, Sub-Alternative A. With the application of the same project design features and Best Management Practices, no differences in effects would be expected.

Slope Stability

The potential for slope instability would exist, as described for Alternative Two, but to a lesser extent, as the three proposed units in Section 17, T. 28 S., R. 3 W. would not be harvested under this reference analysis, eliminating the potential for slope disturbance. The same measures would be applied to provide protection to selected areas in other units from disturbance to reduce the potential for slope disturbance in other locations.

Prescribed Burning

The manner and timing of landing and pile burning would be consistent with those described for Alternative Two, with similar consequences to soils anticipated.

Prescribed burning would be accomplished by aerial ignition with the objective of completely burning the harvested acres, to better facilitate reforestation efforts. Under this scenario, there would be greater consumption of soil organic material, and exposure of mineral soil. Fire intensity would be greater than with hand ignition, and higher losses of soil carbon and nitrogen would be expected. Since burning would still occur under cooler spring conditions, however, it would be expected that fire duration would remain relatively short, and that objectives for minimizing exposure of mineral soil would be met.

V. Fuels Management and Air Quality

A. Affected Environment

1. Fuels Management

Portions of the project area located within the Little River Adaptive Management Area are outside of the Wildland Urban Interface, while those portions in the Myrtle Creek and Middle South Umpqua River-Dumont Creek watersheds are. There is heavy recreational use in the area which can contribute to an increased fire risk, especially along ridgetop through-roads.

The project area is considered Historical Fire Regime III[6], which is classed as Mixed Severity and varies widely in characteristics. Fire return interval can be anywhere from frequent to long-term, and fire behavior can vary from severe crown fire to very light surface fire. Using this coarse-scale classification does not actually help to describe the area due to this variability.

The project area is in a transition zone between more moist forests dominated by western hemlock, and drier forests on south and west facing slopes where Douglas-fir is dominant, dry site conifers such as sugar pine and incense-cedar are present, and deciduous species such as Pacific madrone, golden chinquapin and canyon live oak are common.

The drier south and west slopes would have burned more readily with a historical fire return interval of approximately 11-30 years (Agee 1993). Prior to the 1930s, the three principal causes of wildfires were: fires set by Native American tribes to manage vegetation providing food staples and forage for game animals; settlers' clearing fires used to convert lands to agricultural use; and fires ignited by lightning. The area in which the proposed project is located experiences a very high frequency of lightning storms in the summer and early-autumn. Fire has been actively excluded from these areas for many years, resulting in an accumulation of fuels that may exceed historic levels, resulting in the area being assessed as Fire Regime Condition Class (FRCC) 3.[7]

In remaining portions of the project area, on moister east and north-facing slopes, the presence of western hemlock and rhododendron suggests that these areas have burned far less frequently and at lower intensities. Predictions of fire return interval in the Hemlock Zone vary widely for several reasons. It is believed the Native American tribes did not burn these areas as frequently. In normal years, conditions would remain moister, so that lightning-caused fires would more likely burn at lower intensities over smaller areas.

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[6] Fire Regime is a general classification of the role fire would play across a landscape in the absence of modern human intervention, including the possible influence of aboriginal fire use. Fire Regime is expressed as Group I V. Generally, the higher the group number, the greater the fire-return interval and higher likelihood of stand replacement.

[7] Fire Regime Condition Class is the degree of departure by the current condition from modeled reference conditions assessed according to fire regime and associated vegetation types. FRCC is generally expressed as the percent of departure from reference conditions. FRCC 1 is a 20 percent departure, FRCC 2 is 30 percent departure, and FRCC 3 is 50 percent departure.

The presence of western hemlock also suggests a long period of fire exclusion as it is less adapted to fire than Douglas-fir. Because of the more rapid decay rate of western hemlock, finding evidence of historical fire is also more difficult. Consequently, applying a cyclical interval is less meaningful as fire is not considered a major influence to site development (Agee 1993).

Current fuel loading in the project area averages between 11 to 20 tons per acre, although portions of units exhibit fuels accumulations above and below this range (Maxwell & Ward 1980). The overall tonnage does not vary much between moist and dry aspects within individual units, although there are some distinctions. Moister sites are efficient in rapid degradation of small fuels resulting in large fuels constituting a higher percentage of total fuel loading. Conversely, vegetation growth, fuel accumulation and fuel degradation tends to be slower on drier sites. This results in higher percentage of total fuel load expressed in the finer fuels that are less than 3 inches in diameter. Differences also exist in fuel loading based on elevation. Units in Section 17, T. 28 S., R. 3 W. are less likely to receive snow in the winter. The weight of snow can compact downed fuels which can, in turn, increase moisture retention and decay rate.

Fine fuels are most susceptible to ignition and most responsible for rate of fire spread. These are referred to as 1-hour (< ¼-inch diameter), 10-hour (¼ to 1-inch in diameter) and 100-hour (1 to 3-inches in diameter) fuels. The hours correspond to the length of time it takes the moisture content of individual fuels to reach equilibrium with changes in relative humidity. Large fuels are those greater than 3 inches in diameter and are most responsible for fire intensity, duration and difficulty of control. Larger fuels are typically described as 1000-hour or 10,000- hour fuels because of the lengthy time required to reach equilibrium with changes in relative humidity.

2. Air Quality

The Oregon Department of Forestry Smoke Management Plan (Oregon SMP) identifies areas of air quality concerns where smoke impacts to air quality should be avoided. The areas of concern in proximity to the project area are the city of Roseburg, the city of Grants Pass, and Crater Lake National Park.

B. Alternative One – Effects

1. Fuels Management

No activity fuels would be generated. Present Fire Regime and Condition Class would remain unchanged in the near term. Fuel loads would increase over time, however, through: the natural accumulation of needles, twigs and limbs from self-pruning; stem breakage; and suppression mortality. Increases in fuel load associated with suppression mortality could be as much as 15 tons per acre, over the next 20 to 30 years, based on estimates from Maxwell and Ward (1976). With this increase in fuel loading would come a corresponding increase in fire risk.

Timber harvest on private lands in the project watersheds would continue, generating activity fuels that may elevate fire risk. The extent of increased risk is difficult to gauge, however, as there is no way forecasting: the type, scale and manner of harvest; the extent of utilization; or the manner and extent of fuel treatments that might be applied.

2. Air Quality

There would be no potential impact to air quality from agency lands because there would be no need for the post-harvest application of prescribed fire, and no generation of smoke and other atmospheric particulates.

C. Alternative Two – Effects

1. Sub-Alternative A

1. Fuels Management

Fuel loading would increase in all of the units as a consequence of timber harvest, amounts varying based on the prescription particular to individual units (i.e. dispersed vs. aggregate retention). For purposes of illustration, Table 3-24 compares the estimated current fuel load for proposed Unit 28-2-32B with that would be expected post-harvest, and post-burn. Estimates are based on Maxwell & Ward (1976 and 1980).

Table 3-24. Estimated Fuel Loading for Unit 28-2-32 Pre and Post-treatment

	Estimated Fuel Loading (tons/acre)		
Size Class (inches)	**Pre-Treatment**	**Post-Harvest – openings**	**Post-Harvest – aggregates**
0.0 – 0.25	0.7	n/a	n/a
0.26 – 1.0	1.1	5.6	3.5
1.1 – 3.0	1.5	7.6	5.8
3.1 – 9.0	3.1	7.3	16.0
9.1 – 20.0	4.7	10.7	2.6
20.1 +	0	5.8	0
Total	**11.1**	**37.0**	**27.9**

n/a = data not collected

Some activity fuels are collected at landings. These are predominantly larger fuels piled by machine, covered, and burned during the ensuing autumn or winter during periods of extended precipitation. These landing piles are generally not fully consumed, but the remaining material is no longer a concern to fire managers. Piles along roads would be burned at the same time to further reduced fire risk, particularly if no opportunity to broadcast burn the remaining portions of units materialized.

Broadcast burning would employ hand-ignition targeting the smaller activity fuels and brush remaining in the units. Areas with snags and accumulations of large down wood 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 it did would not be fully consumed. Table 3-25 displays data collected by the Umpqua National Forest on two broadcast burns conducted in 1979 and 1980. Both burns were conducted in May when larger fuels were less likely to be consumed but under conditions that would substantially reduce fine fuel loading. In both instances, fuel loads in fuels less than 3 inches in diameter, were reduced by approximately 80 percent.

Table 3-25. Pre and Post-Burn Fuel Load from Plot Samples on the Umpqua National Forest with the Objective of Consuming Fuels less than 3 Inches Diameter

	Cloverview # 2			White Camp # 1		
Size Class (inches)	**Pre-Burn tons/acre**	**Post-Burn tons/acre**	**Percent Reduction**	**Pre-Burn tons/acre**	**Post-Burn tons/acre**	**Percent Reduction**
0.0 – 0.25	3.35	0.27	92	6.4	0.3	95
0.26 – 1.0	3.01	0.33	89	10.1	1.5	85
1.1 – 3.0	8.29	1.93	77	7.8	3.5	55
3.1 – 9.0	12.97	12.68	2	36.5	12.3	66
9.1 – 20.0	27.83	20.5	26	15.6	32.5	**
20.1 +	24.03	7.43	69	33.4	11.9	64
Total	**79.48**	**43.14**	**46**	**109.8**	**62.0**	**43**

** Increase in tonnage can likely be attributed to partial consumption of larger diameter materials.

Activity fuels would remain in portions of the units that would be excluded from burning for resource concerns which would include small inclusions of sensitive soils, maintaining intact aggregates established to protect unique forest structure, and aggregates protecting Survey and Manage species. Fuels in these areas would be allowed to degrade naturally.

The combination of harvest and prescribed fire would emulate natural disturbance in a safe manner that should accomplish treatment objectives. Fire risk would be largely reduced to one of Fire Regime Condition Class I within the harvested portions of the units.

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 the planting of trees. Openings would occur randomly based upon fire effects. Areas with heavy fuel loads 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, creating localized habitat diversity benefiting many species. As described in Chapter Two (p. 20), the use of prescribed fire in Riparian Reserves would be limited.

2. Air Quality

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

Landing piles would be burned 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. Potential impacts to air quality within one-quarter to one mile of units would persist for one to three days, characterized by some haziness.

Emissions were estimated for the broadcast burning by using the First Order Fire Effects Model (FOFEM) based on estimated fuel loading postharvest. Under the conditions planned for the burning, the pm10 particulate would be on the order of 180 to 225 lbs./acre, pm 2.5 particulate would be 150 to 190 lbs./acre, and carbon monoxide 1100 to 1750 lbs./acre.

State of Oregon smoke management restrictions limit or prohibit burning during periods of stable atmospheric conditions when residual smoke from previously burned units may become trapped by a surface inversion. Where surface inversions develop within 24 hours of unit ignitions, aggressive mop-up would be conducted to minimize the potential for residual smoke affecting the local airshed

With the application of the smoke management restriction, described above, broadcast burning would not have cumulative and long-term effects to local air quality.

2. Sub-Alternative B

1. Fuels Management

Activity fuel load from variable retention harvest would be identical to that under Sub-Alternative A. In portions of Riparian Reserves where a variable density thinning is applied, could increase to as much as 27 tons per acre, depending on the pre-harvest fuel load and size of trees cut.

The manner of activity fuels treatments would not differ from that described in Alternative Two, Sub-Alternative A. Consequently, there would be no differences in effects or anticipated outcomes.

2. Air Quality

Burning would be conducted in a manner consistent with that described in Alternative Two, Sub-Alternative A. The same measures required to address air quality concerns would be employed, so that no differences in effects on air quality would be anticipated.

D. Reference Analysis One – Effects

1. Fuels Management

Post-harvest treatment of activity fuels would be limited to the burning of landing, and the hand-piling and burning of activity fuels along through-roads. The remaining activity fuels within the units would not be treated, increasing overall post-harvest loading to as much as 27 tons per acre depending on pre-harvest fuel load and size of trees harvested. Fire risk would remain unchanged at Fire Regime Condition Class III.

2. Air Quality

Burning landings 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. Potential impacts to air quality within one-quarter to one mile of units would persist for 1 to 3-days and would be characterized by some haziness.

With the application of Oregon smoke management restriction, previously discussed, prescribed burning would not have cumulative and long-term effects to local air quality.

E. Reference Analysis Two – Effects

1. Fuels Management

Under the 1995 Roseburg District ROD/RMP, regeneration harvest units would be broadcast burned over the entire harvested area and would be designed to reduce the remaining fuels as much as possible with the following sideboards.

- AMA – minimize consumption of litter and coarse woody debris

- Matrix
  - retain and protect coarse woody debris,
  - minimize intensive burning unless appropriate including minimizing consumption of litter and coarse woody debris
  - avoid burning on Category 1 soils unless justified for resource management. If justified then must burn under conditions that will minimize disturbance. Under this reference analysis, very little Category 1 soils would be treated.

Table 3-26 displays data collected by the Umpqua National Forest on two broadcast burns where the primary objective was to reduce all activity fuels regardless of size, as would be the case in this reference analysis.

Table 3-26. Pre and Post-Burn Fuel Load from plot samples on the Umpqua National Forest with the Objective of Consuming as much Fuel as Possible

	Upper Cavitt #3			Shelter Salvage #3		
Size Class (inches)	**Pre-Burn tons/acre**	**Post-Burn tons/acre**	**Percent Reduction**	**Pre-Burn tons/acre**	**Post-Burn tons/acre**	**Percent Reduction**
0.0 – 0.25	7.3	0.3	96	3.7	0.13	96
0.26 – 1.0	2.6	1.1	58	3.5	0.5	85
1.1 – 3.0	7.0	4.7	33	8.3	0.5	93
3.1 – 9.0	20.6	10.1	51	19.8	9.7	51
9.1 – 20.0	29.5	14.3	51	23.9	8.5	64
20.1 +	53.1	21.0	60	16.4	14.7	10
Total	**120.1**	**51.5**	**57**	**75.6**	**34.0**	**55**

2. Air Quality

Burns would generally need to be of greater intensity so that fuels would be quickly and almost completely consumed, but would still be conducted in a manner consistent with the Oregon Smoke Management Plan to minimize potential impact to air quality.

Overall fuel consumption under this reference analysis would be approximately 28 percent greater than for Alternative Two, so it is assumed that the amount of particulates and carbon monoxide emissions would be accordingly higher.

VI. 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), the OR/WA BLM State Director (Instruction Memorandum OR-2010-012, January 13, 2010), and by the general public through comments on numerous project analyses.

Forster et al. 2007 (pp. 129-234), incorporated here by reference, reviewed scientific information on greenhouse gas emissions and climate change, and concluded 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 and concluded 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 gas emissions and storage, in the context of carbon release and sequestration.

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 deforestation and conversion of lands to non-forest condition, or a means for storing carbon through forest growth or afforestation (2008 FEIS, p. 220).

Values in this analysis, in terms of carbon stored and released, are generally expressed as tonnes, the unit of measure most commonly used in scientific literature to express carbon storage and release. One tonne of carbon is equivalent to 3.67 tons of carbon dioxide (U.S. EPA 2005).

The 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.

Even though a causal link between the Roseburg Pilot project and specific climate change effects cannot be assigned, the amount of carbon released or stored under the alternatives analyzed can be estimated. Site specific data from stand exams was input into the ORGANON Growth Model (Hann et al. 2005). The outputs from the model were then used to calculate amounts of carbon that would be released or sequestered, and the resulting net carbon balance that would result under the alternatives. The modeled results are displayed in Table 3-27 Effects of the Alternatives on Carbon Release and Storage.

Modeling was conducted for intervals extending out 50 years. The net carbon balance for the Roseburg Pilot project was analyzed by calculating: 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 under the proposed action alternatives. The methodology used to estimate the net carbon balance is described in *Appendix F- 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 carbon dioxide (EPA, 2010; Table 2-3). Within the United States, fossil fuel combustion accounted for 94.1 percent of CO_2 emissions in 2008 (EPA, 2010; Executive Summary p. 6).

Land use, land use change and forestry, such as the proposed action, nationally resulted in a net sequestration of 940 million tons of CO_2 in 2008 (EPA, 2010; Table 2-3). Forest management, alone, resulted in net CO_2 sequestration of 792 million tonnes (EPA, 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 currently stored in live trees (2008 FEIS, p. 221). For this same area, 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 Roseburg Pilot project area consists of 437 acres of mid-seral and late-seral forest stands. Modeling projects that there are currently 75,599 tonnes of carbon held by the stands comprising the Pilot Project, indicated as the "Current Condition" Table 3-27. This carbon is held in either the pool of "standing, live trees" (44,807 tonnes) or in the pool of "other than live trees" (30,791 tonnes). The total amount of carbon currently held in proposed project represents approximately 0.02 percent of the estimated 417 million tonnes of carbon stored on BLM administered lands in western Oregon.

B. Alternative One – Effects

Under this alternative, 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. Absent the creation of any logging slash, no carbon would be released by the burning and/or decomposition of activity fuels. No wood products would be produced which would release carbon over time.

Forest stands comprising the proposed Roseburg Pilot project area would continue to grow and develop along a trajectory described in **Timber Resources/Alternative One Effects** (pp. 38-39). 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 fixes atmospheric carbon dioxide through the process of photosynthesis. As illustrated in Table 3-27, over the course of the next 50 years the total carbon stored on-site would increase to 142,986 tonnes, an 89 percent increase from current conditions.

Under this alternative, the stands would sequester an average of 1,348 tonnes of carbon annually, representing an offset of 0.00002 percent of current annual global emissions estimated at 6.8 billion tonnes, and 0.00008 percent of current annual United States emissions estimated to be 1.7 billion tonnes. Annual carbon sequestration in the proposed project area would constitute 0.0007 percent of the net annual sequestration of 196 million tonnes by all forest management in the United States. In approximately 50 years (ca. 2062), carbon sequestration in the proposed project area would represent 0.03 percent of the 596 million tonnes of carbon stored on BLM-administered lands in western Oregon.

C. Alternative Two – Effects

Table 3-27 displays the current levels of carbon storage on-site, and the effects of the alternatives and reference analyses on these carbon pools in terms of direct (immediate) and indirect (long-term) releases of carbon.

1. **Sub-Alternative A**

Based on Smith et al., 2006, 13.5 percent of gross saw log carbon and 14.8 percent of gross pulpwood carbon (1911 tonnes) would be immediately released into the atmosphere at time of harvest. Other direct carbon release would occur through the consumption of approximately 51,392 gallons of gasoline and diesel (141 tonnes), and carbon released by broadcast burning and burning of landings piles (1,991 tonnes). Carbon in "Other than Live Trees" pool would also be reduced by 712 tonnes.

While an estimated 4,756 tonnes of carbon would be directly released by the variable retention harvest, the estimated annual carbon released in the United States is 1.6 billion tonnes (U.S. EPA, 2009; pgs. 2-3) and 6.8 billion tonnes globally (IPCC, 2007; p. 513). Carbon released by implementation of this alternative would represent only 0.0003 percent of annual emissions in the United States, and 0.00008 percent of annual global emissions.

Approximately 12,182 tonnes of carbon would be stored in wood products, and another 8,606 tonnes in untreated logging slash. As illustrated by Table 3-27, both of these carbon pools would gradually release carbon over time through processes of decay, sublimation and disposal of wood products by burning. This release, modeled out 50 years, would average 140 tonnes annually.

While there would be a direct release of 4,756 tonnes of carbon, and an indirect release of 140 tonnes annually from wood products and unburned slash, growth of remaining trees would sequester atmospheric carbon and store it on site in the form of additional standing volume. As illustrated in Table 3-27, re-sequestration of direct carbon release would occur in just under 16 years.

In the first 50 years, post-harvest, on-site carbon storage would increase approximately 22,450 tonnes, or an average of about 4,490 tonnes per decade, representing a 23 increase over the current condition, and a 31 percent increase over post-harvest conditions.

The total carbon balance 50 years following harvest would be 93,292 tonnes, an amount approximately 49,700 tonnes less than the No Action alternative after 50 years. Carbon stored within the units, including the uncut aggregates, would average approximately 103 tonnes less per acre compared to no action.

2. **Sub-Alternative B**

Using the same factors for carbon release from saw logs and pulpwood described above, approximately 1,999 tonnes of carbon would be immediately released at the time of harvest. Other direct carbon release would come from the consumption of approximately 54,426 gallons of gasoline and diesel (149 tonnes), and carbon released by broadcast burning and burning of landings piles (2,010 tonnes). Carbon in "Other than Live Trees" pool would also be reduced by 712 tonnes.

While an estimated 4,870 tonnes of carbon would be directly released by the combined variable retention harvest and variable density thinning in selected Riparian Reserves, the estimated annual carbon released in the United States is 1.6 billion tonnes (U.S. EPA, 2009; pgs. 2-3) and 6.8 billion tonnes globally (IPCC, 2007; p. 513). Carbon released by implementation of this alternative would represent only 0.0003 percent of annual emissions in the United States, and 0.00007 percent of annual global emissions.

Approximately 12,738 tonnes of carbon would be stored in wood products, and another 9,218 tonnes in untreated logging slash. As illustrated by Table 3-27, both of these carbon pools would gradually release carbon over time through processes of decay, sublimation and disposal of wood products by burning. This release, modeled out 50 years, would average 150 tonnes annually.

In the first 50 years, post-harvest, on-site carbon storage would increase approximately 20,520 tonnes, representing an increase at an average rate of about 4,104 tonnes per decade, or a total of approximately 20,521 tonnes. This would represent a 27 percent increase from the current condition, and a 29 percent increase from post-harvest conditions.

The total carbon balance 50 years following treatment would be 91,250 tonnes, an amount approximately 51,740 tonnes less than the No Action alternative after 50 years, Carbon stored within the units, including the uncut aggregates, would average approximately 118 tonnes less per acre compared to no action.

D. Reference Analysis One – Effects

Using the same factors for carbon release from saw logs and pulpwood described above, approximately 471 tonnes of carbon would be immediately released at the time of harvest. Other direct carbon release would come from the consumption of approximately 20,373 gallons of gasoline and diesel (56 tonnes), and carbon released by broadcast burning and burning of landings piles (125 tonnes). Carbon in "Other than Live Trees" pool would remain unchanged.

While an estimated 652 tonnes of carbon would be directly released by the commercial thinning and variable density thinning in selected Riparian Reserves, the estimated annual carbon released in the United States is 1.6 billion tonnes (U.S. EPA, 2009; pgs. 2-3) and 6.8 billion tonnes globally (IPCC, 2007; p. 513). Carbon released by implementation of this alternative would represent only 0.00004 percent of annual emissions in the United States, and 0.00001 percent of annual global emissions.

Approximately 3,003 tonnes of carbon would be stored in wood products, and another 2,466 tonnes in untreated logging slash. As illustrated by Table 3-27, both of these carbon pools would gradually release carbon over time through processes of decay, sublimation and disposal of wood products by burning. This release, modeled out 50 years, would average 42 tonnes annually.

While there would be a direct release of 652 tonnes of carbon, and an indirect release of 38 tonnes annually from wood products and unburned slash, growth of remaining trees would sequester atmospheric carbon and store it on site in the form of additional standing volume. As illustrated in Table 3-27, re-sequestration of direct carbon release would occur in slightly less than one year.

In the first 50 years, post-harvest, on-site carbon storage would increase approximately 20,520 tonnes, representing an increase at an average rate of about 4,104 tonnes per decade, or a total of approximately 20,521 tonnes. This would represent a 27 percent increase from the current condition, and a 29 percent increase from post-harvest conditions.

In the first 50 years, post-harvest, on-site carbon storage would increase at an average rate of about 11,315 tonnes per decade, or a total of approximately 56,575 tonnes. This would represent a 74 percent increase from current conditions and a 75 percent increase from post-harvest conditions.

The total carbon balance 50 years post-thinning would be 131,521 tonnes, an amount approximately 11,465 tonnes less than under the No Action alternative after 50 years. Potential carbon storage would be reduced by 63 tonnes per acre at 50 years compared to no action.

E. Reference Analysis Two – Effects

Using the same factors for carbon release from saw logs and pulpwood described above, approximately 1,781 tonnes of carbon would be immediately released at the time of harvest. Other direct carbon release would come from the consumption of approximately 45,074 gallons of gasoline and diesel (124 tonnes), and carbon released by broadcast burning and burning of landings piles (2,194 tonnes). Carbon in "Other than Live Trees" pool would also be reduced by 615 tonnes.

While an estimated 4,714 tonnes of carbon would be directly released by the variable retention harvest and variable density thinning in selected Riparian Reserves, the estimated annual carbon released in the United States is 1.6 billion tonnes (U.S. EPA, 2009; pgs. 2-3) and 6.8 billion tonnes globally (IPCC, 2007; p. 513). Carbon released by implementation of this alternative would represent only 0.0003 percent of annual emissions in the United States, and 0.00007 percent of annual global emissions.

Approximately 11,350 tonnes of carbon would be stored in wood products, and another 7,687 tonnes in untreated logging slash. As illustrated by Table 3-27, both of these carbon pools would gradually release carbon over time through processes of decay, sublimation and disposal of wood products by burning. This release, modeled out 50 years, would average 127 tonnes annually.

While there would be a direct release of 4,714 tonnes of carbon, and an indirect release of 127 tonnes annually from wood products and unburned slash, growth of remaining trees would sequester atmospheric carbon and store it on site in the form of additional standing volume. As illustrated in Table 3-27, re-sequestration of direct carbon release would occur in just over nine years.

In the first 50 years, post-harvest, on-site carbon storage would increase approximately 14,915 tonnes, representing an increase at an average rate of about 4,104 tonnes per decade, or a total of approximately 20,521 tonnes. This would represent a 27 percent increase from the current condition, and a 29 percent increase from post-harvest conditions.

In the first 50 years, post-harvest, on-site carbon storage would increase at an average rate of about 7,450 tonnes per decade, or a total of approximately 37,245 tonnes. This would represent a 43 percent increase from current conditions and a 52 percent increase from post-harvest conditions.

The total carbon balance 50 years post-harvest would be 108,131 tonnes, an amount approximately 11,465 tonnes less than under the No Action alternative after 50 years. Potential carbon storage would be reduced by 63 tonnes per acre at 50 years compared to no action.

Table 3-27 Effects of the Alternatives and Reference Analyses on Carbon Release and Storage (all values expressed in tonnes)

Alternative One – No Action

Timestep	Standing, Live Carbon	Wood Products	Logging Slash*	Other Than Live Trees*	Fossil Fuels	Slash Burning	Carbon Balance	Net Change (+/-)
Current Condition	44,807	0	0	30,791	0	0	75,599	
At Harvest	44,807	0	0	30,791	0	0	75,599	0
10 years	56,204	0	0	30,791	0	0	86,995	11,396
20 years	68,542	0	0	38,632	0	0	107,173	20,178
50 years	101,464	0	0	41,522	0	0	142,986	35,813

Alternative Two – Proposed Action, Sub-Alternative A

Timestep	Standing, Live Carbon	Wood Products	Logging Slash*	Other Than Live Trees*	Fossil Fuels	Slash Burning	Carbon Balance	Net Change (+/-)
Current Condition	44,807	0	0	30,791	0	0	75,599	
At Harvest	19,977	12,182	10,738	30,079	(141)	(1,991)	70,843	(4,756)
10 years	23,482	11,174	7,452	30,079	0	0	72,186	1,343
20 years	28,366	10,678	6,350	32,818	0	0	78,211	6,025
50 years	44,963	9,862	3,927	34,540	0	0	93,292	15,081
						Carbon Neutral Time (yrs.)=		15.7

Alternative Two - Proposed Action, Sub-Alternative B

Timestep	Standing, Live Carbon	Wood Products	Logging Slash	Other Than Live Trees*	Fossil Fuels	Slash Burning	Carbon Balance	Net Change (+/-)
Current Condition	44,807	0	0	30,791	0	0	75,599	
At Harvest	18,844	12,738	11,228	30,079	(149)	(2,010)	70,729	(4,870)
10 years	21,937	11,684	7,853	30,079	0	0	71,552	824
20 years	26,383	11,165	6,692	32,818	0	0	77,058	5,505
50 years	42,259	10,312	4,139	34,540	0	0	91,250	14,192
						Carbon Neutral Time (yrs.)=		17.4

Reference Analysis One

Timestep	Standing, Live Carbon	Wood Products	Logging Slash	Other Than Live Trees*	Fossil Fuels	Slash Burning	Carbon Balance	Net Change (+/-)
Current Condition	44,807	0	0	30,791	0	0	75,599	
At Harvest	38,687	3,003	2,647	30,791	(56)	(125)	74,947	(652)
10 years	47,908	2,754	2,148	30,791	0	0	83,602	8,655
20 years	57,900	2,632	1,831	38,632	0	0	100,994	17,392
50 years	86,435	2,431	1,132	41,522	0	0	131,521	30,527
						Carbon Neutral Time (yrs.)=		0.8

Reference Analysis Two

Timestep	Standing, Live Carbon	Wood Products	Logging Slash	Other Than Live Trees	Fossil Fuels	Slash Burning	Carbon Balance	Net Change (+/-)
Current Condition	44,807	0	0	30,791	0	0	75,599	0
At Harvest	21,672	11,350	10,005	30,176	(124)	(2,194)	70,885	(4,714)
10 years	28,808	10,411	6,654	30,176	0	0	76,050	5,165
20 years	36,539	9,949	5,670	33,613	0	0	85,771	9,722
50 years	59,940	9,189	3,507	35,495	0	0	108,131	22,360
						Carbon Neutral Time (yrs.)=		9.1

*Consists of soil carbon; snags; down, dead wood; and understory and forest floor vegetation.

VII. Monitoring

Monitoring of the effects of the proposed action, if implemented, would be done in accordance with provisions contained in the ROD/RMP, Appendix I (p. 84-86 and 190-199), focusing on the effects of timber harvest on: Riparian Reserves, Adaptive Management Areas, Matrix, Air Quality, Water and Soils, Wildlife Habitat, Fish Habitat, and Special Status Species Habitat.

Chapter Four
Agencies and Individuals Contacted; Preparers; and Literature Cited

Initiation of the project was published in the Spring 2011 Quarterly Planning Update. Upon completion of the EA, an electronic Notice of Availability for public review and comment will be posted to individuals and organizations having expressed interest in these types of projects.

I. Agencies & Persons Contacted:

Adjacent Landowners & Down-stream Water Users
Confederated Tribes of the Siletz
Confederated Tribes of Grand Ronde
Cow Creek Band of Umpqua Tribe of Indians
NOAA Fisheries
Oregon Department of Fish and Wildlife
U.S. Fish and Wildlife Service

II. Agencies, organizations, and individuals to be notified of the completion of the EA:

American Forest Resources Council
Association of O&C Counties
Associated Oregon Loggers
Cascadia Wildlands Project
Cow Creek Band of Umpqua Tribe of Indians
Dennis Morgan
Douglas Forest Protective Association
Douglas Timber Operators, Robert Ragon - Executive Director
Javier Goirigolzarri – Resource Management Services
Klamath Siskiyou Wildlands Center
Myrtle Creek Rural Community Partnership
National Marine Fisheries Service
Oregon Department of Environmental Quality
Oregon Department of Fish and Wildlife
Oregon Society of American Foresters
Oregon Wild
Pacific Northwest 4-Wheel Drive Association
Pacific Rivers Council
Rocky Mountain Elk Foundation
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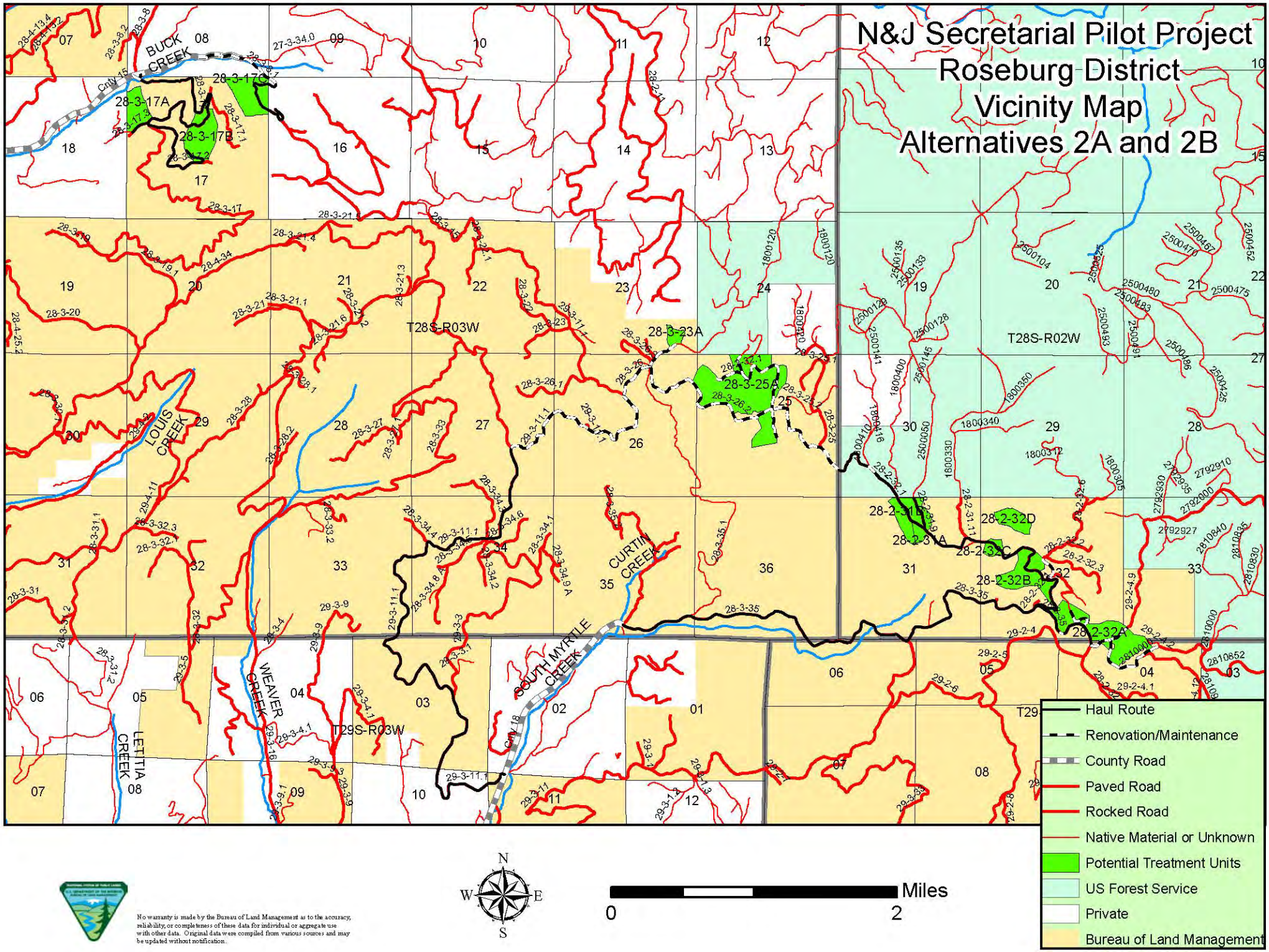
Appendix A - Maps of the Proposed Alternative and References Analyses

N&J Secretarial Pilot Project
Roseburg District
Vicinity Map
Alternatives 2A and 2B



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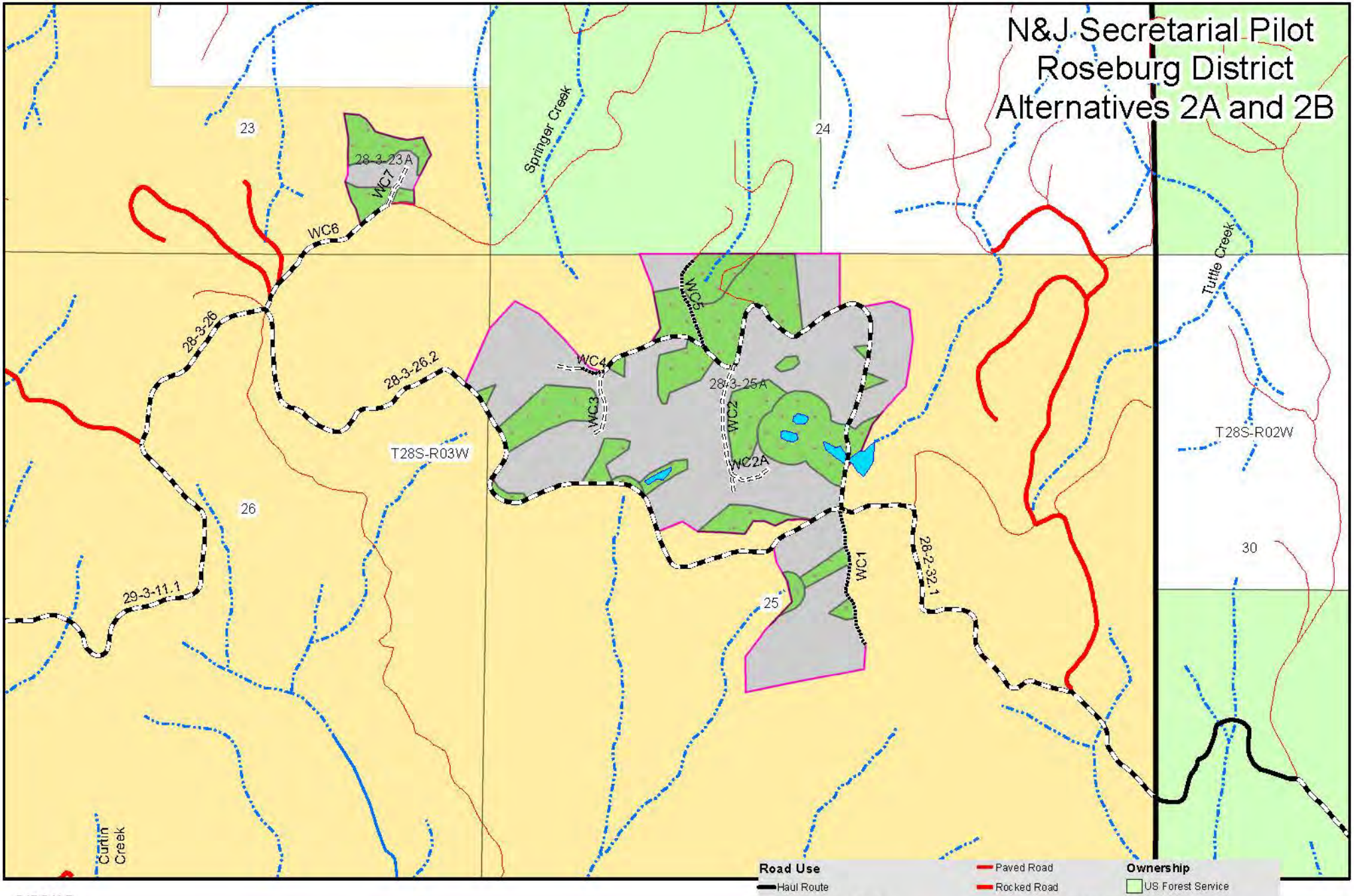
N&J Secretarial Pilot
Roseburg District
Alternatives 2A and 2B



3/26/12

0 1,000 Feet

Road Use
- Haul Route
- Construct Native Surface
- Construct Rock Surface
- Improve Rock Surface
- Renovate/Maintain Native Surface
- Renovate/Maintain Rock or Paved Surface
- Paved Road
- Rocked Road
- Native Material or Unknown

Streams
- Intermittent
- Perennial
- Wet Area
- No Harvest Area
- Potential Treatment Units

Ownership
- US Forest Service
- Private
- Bureau of Land Management

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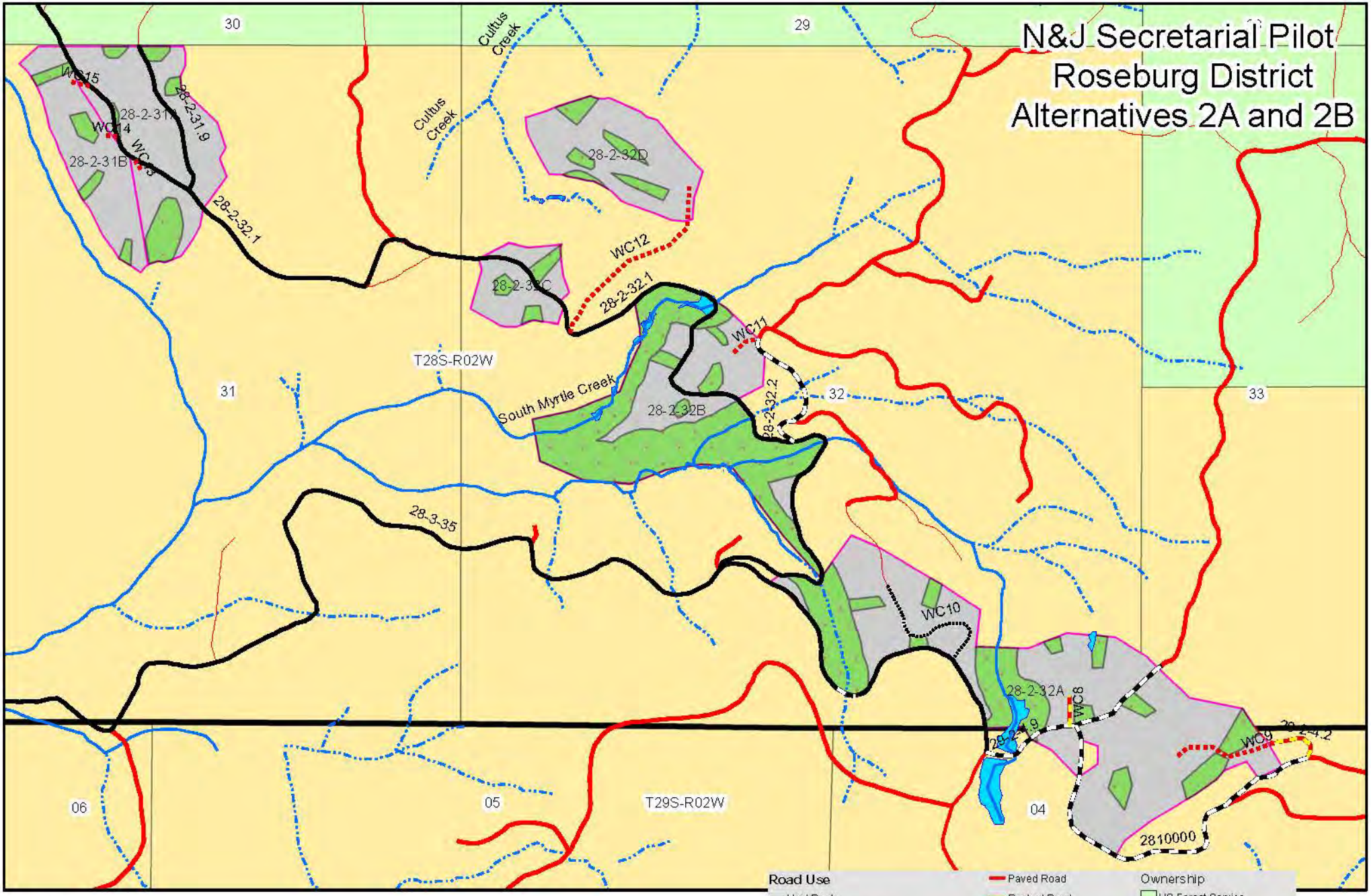
N&J Secretarial Pilot
Roseburg District
Alternatives 2A and 2B



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Road Use
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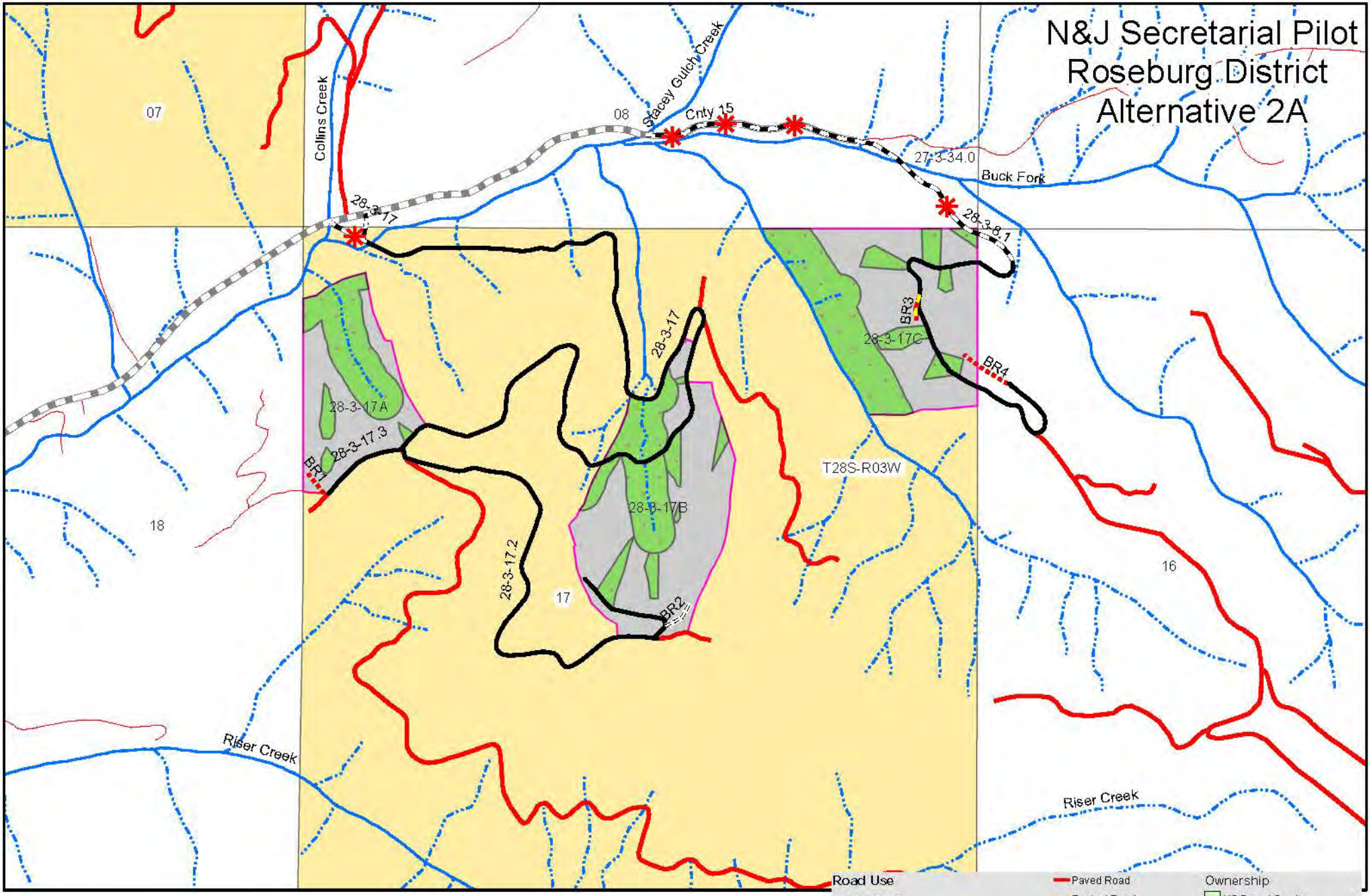
N&J Secretarial Pilot
Roseburg District
Alternative 2A



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Road Use
- Haul Route
- Construct Native Surface
- Construct Rock Surface
- Improve Rock Surface
- Renovate/Maintain Native Surface
- Renovate/Maintain Rock or Paved Surface
- Additional Road Drainage
- Paved Road
- Rocked Road
- Native Material or Unknown

Streams
- Intermittent
- Perennial
- No Harvest Area
- Potential Treatment Units

Ownership
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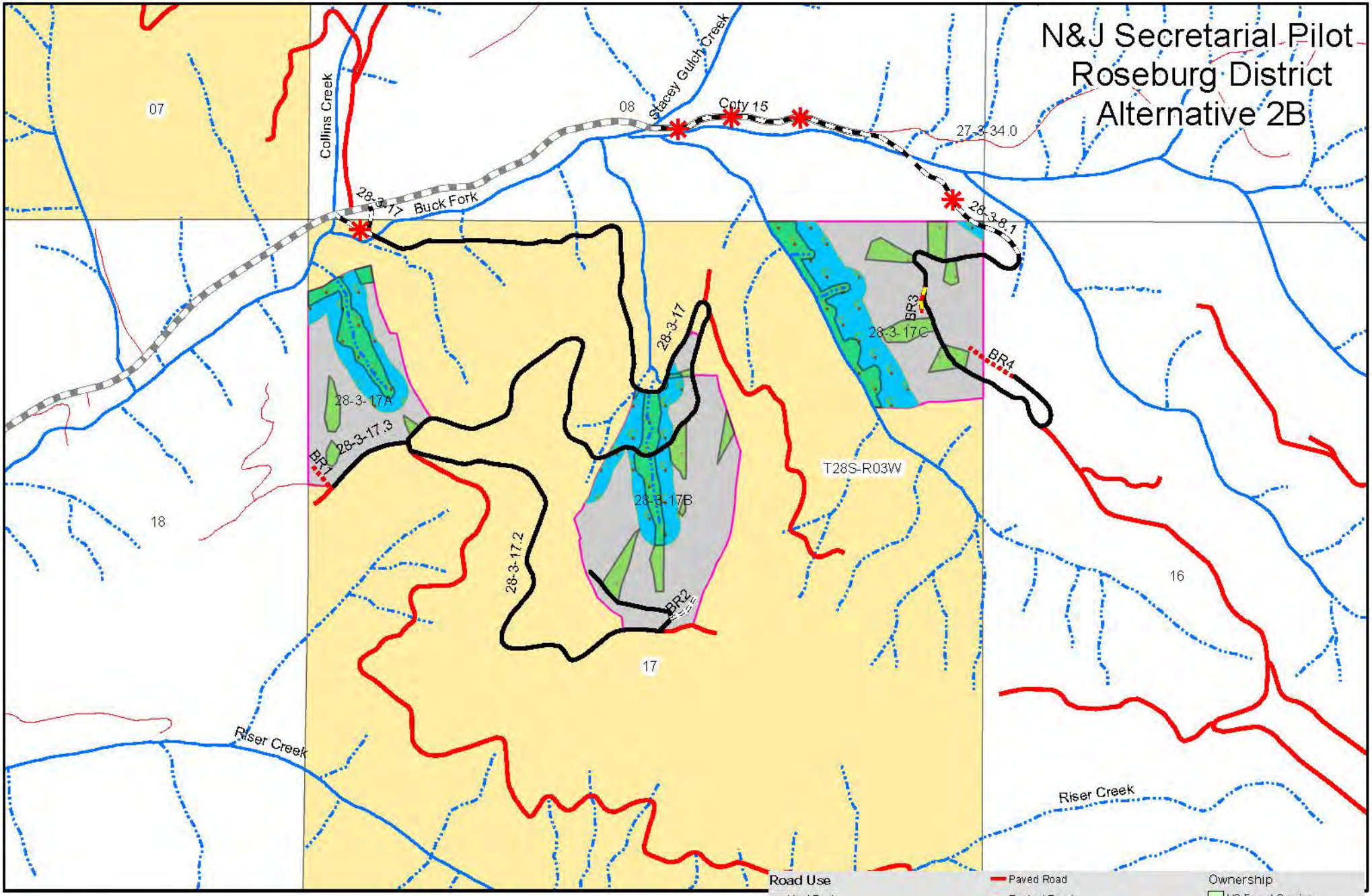
- Bureau of Land Management

N&J Secretarial Pilot
Roseburg District
Alternative 2B



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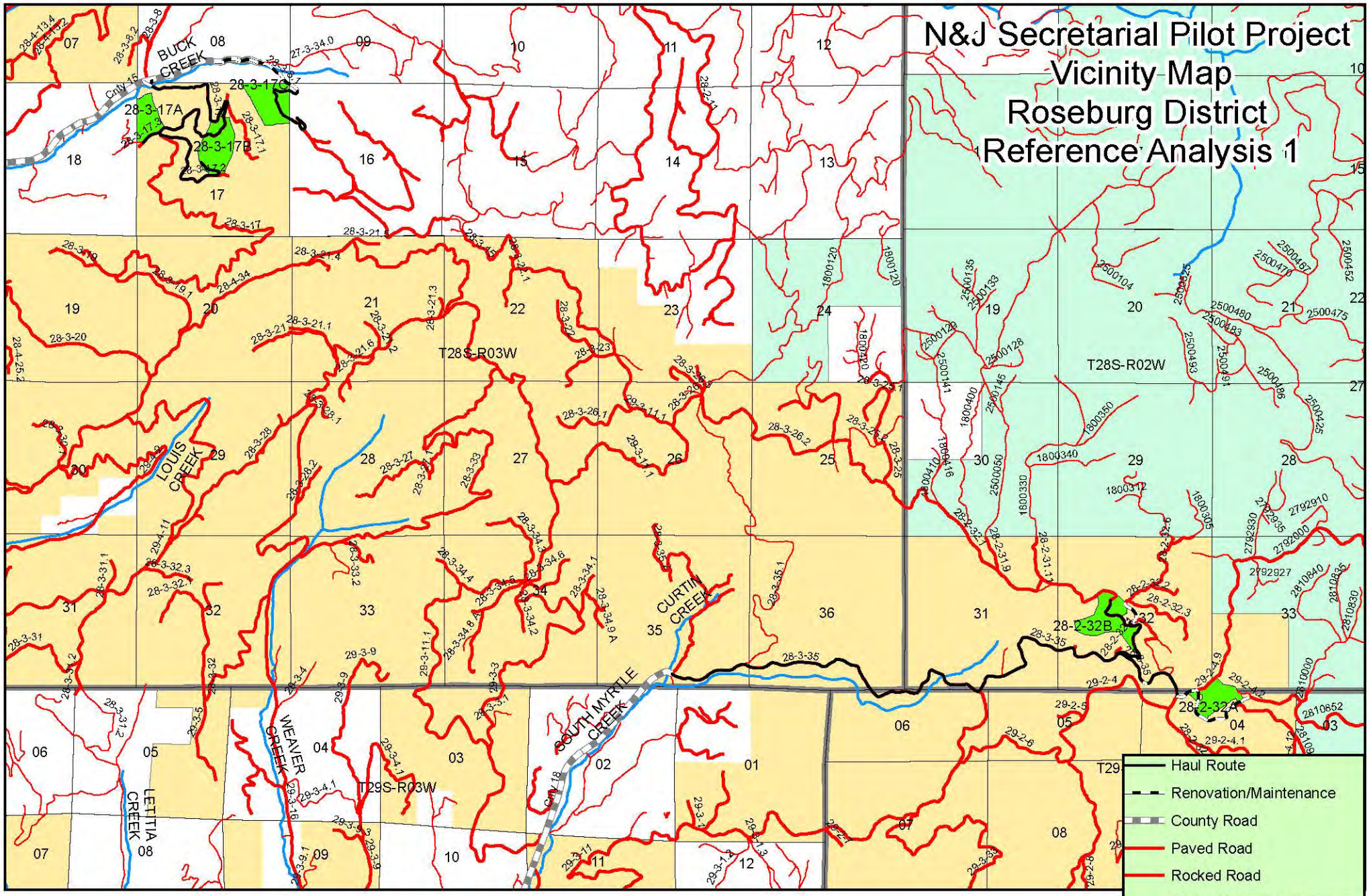
- Renovate/Maintain Rock or Paved Surface
- Additional Road Drainage
- Paved Road
- Rocked Road
- Native Material or Unknown

Streams
- Intermittent
- Perennial
- No Harvest Area
- Density Management in Riparian Reserve
- Potential Treatment Units

Ownership
- US Forest Service
- Private
- Bureau of Land Management

N&J Secretarial Pilot Project
Vicinity Map
Roseburg District
Reference Analysis 1



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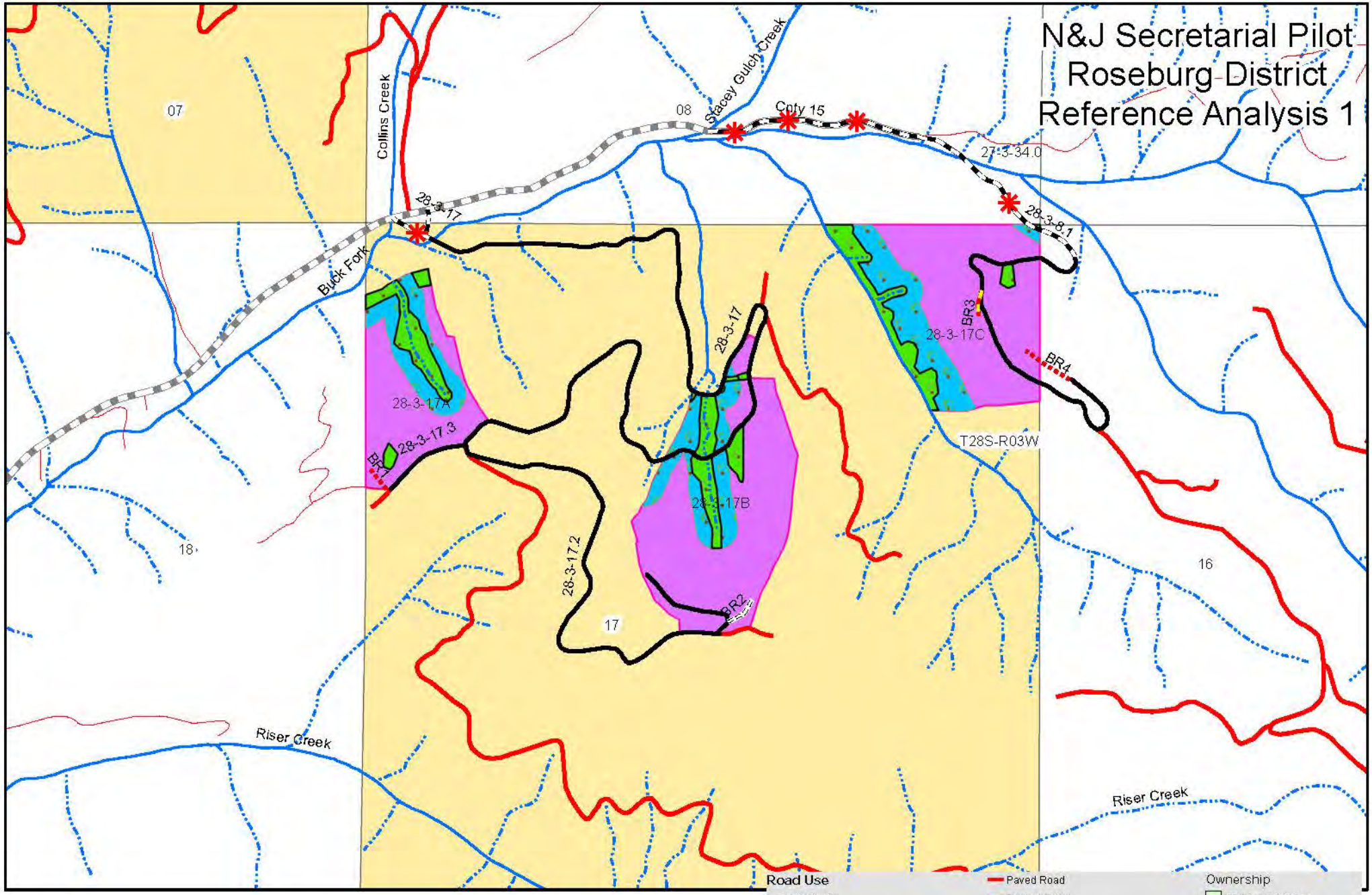
N&J Secretarial Pilot
Roseburg District
Reference Analysis 1



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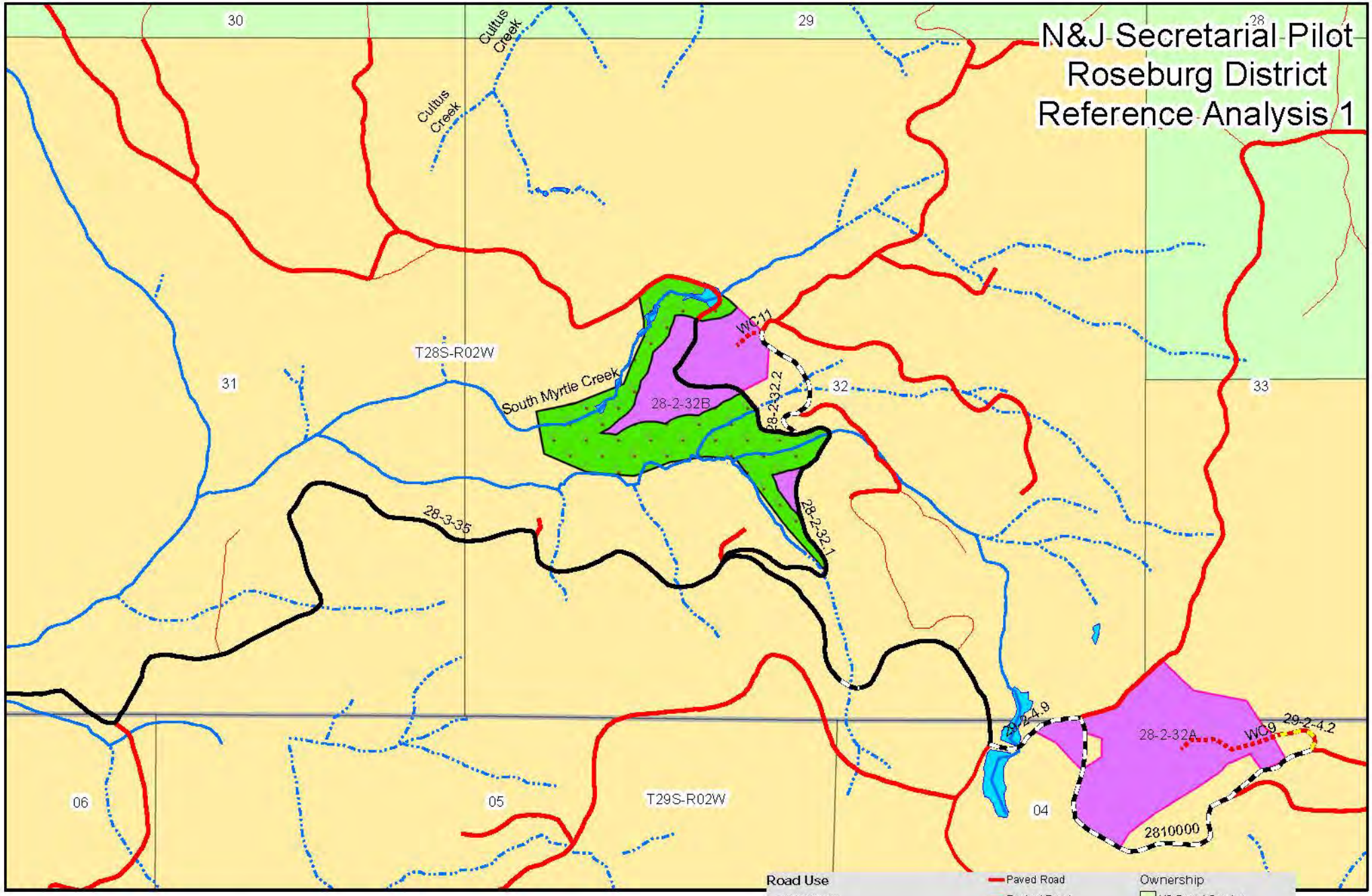
- Rocked Road
- Native Material or Unknown

Streams
- Intermittent
- Perennial
- No Harvest Area
- Density Management in Riparian Reserve
- Commercial Thinning Area

Ownership
- US Forest Service
- Private
- Bureau of Land Management

N&J Secretarial Pilot
Roseburg District
Reference Analysis 1



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- Commercial Thinning Area

Ownership
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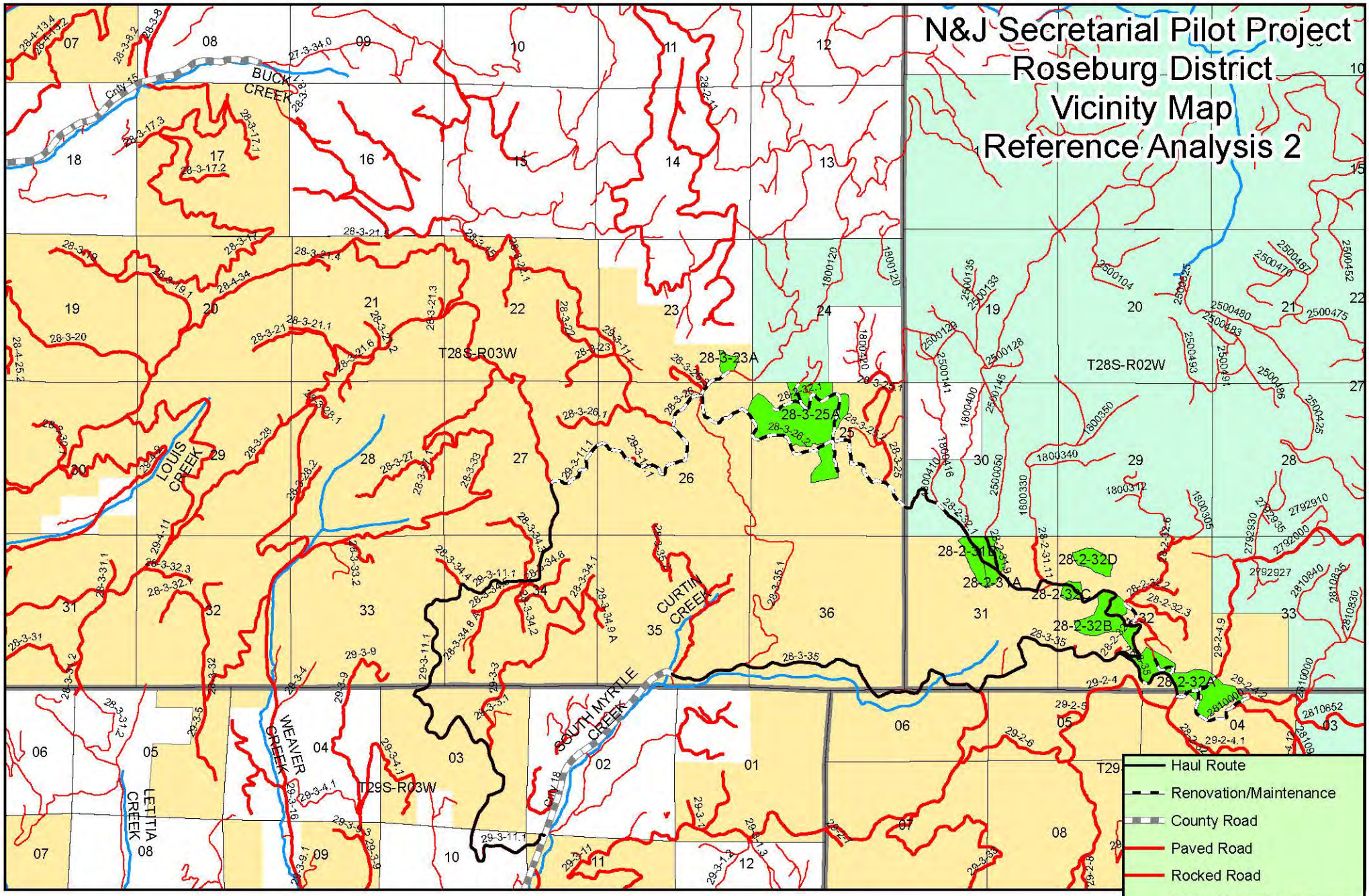
- Private
- Bureau of Land Management

N&J Secretarial Pilot Project
Roseburg District
Vicinity Map
Reference Analysis 2



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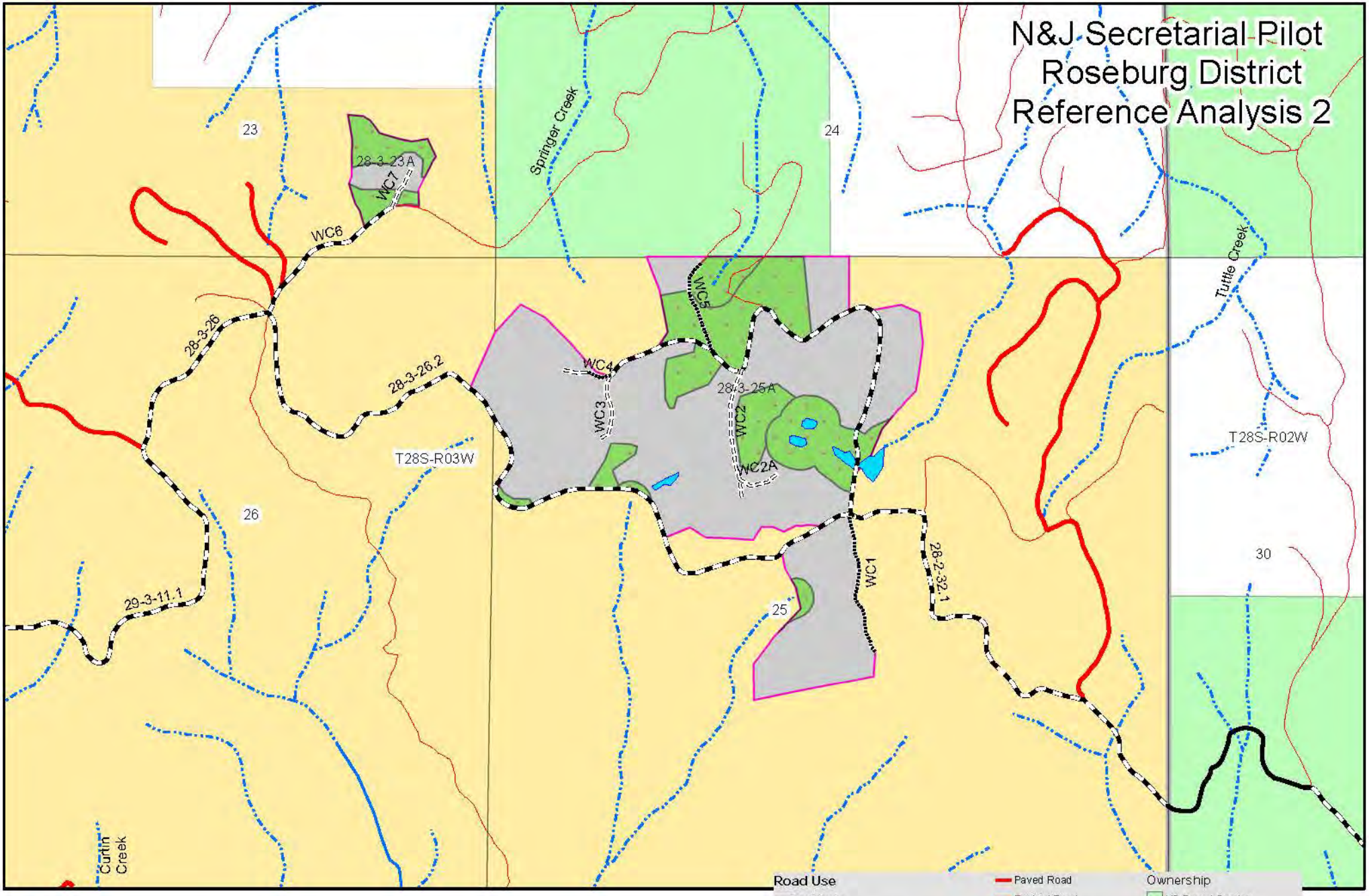
Roseburg District
Reference Analysis 2



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- Perennial
- Wet Area
- No Harvest Area
- Potential Treatment Units

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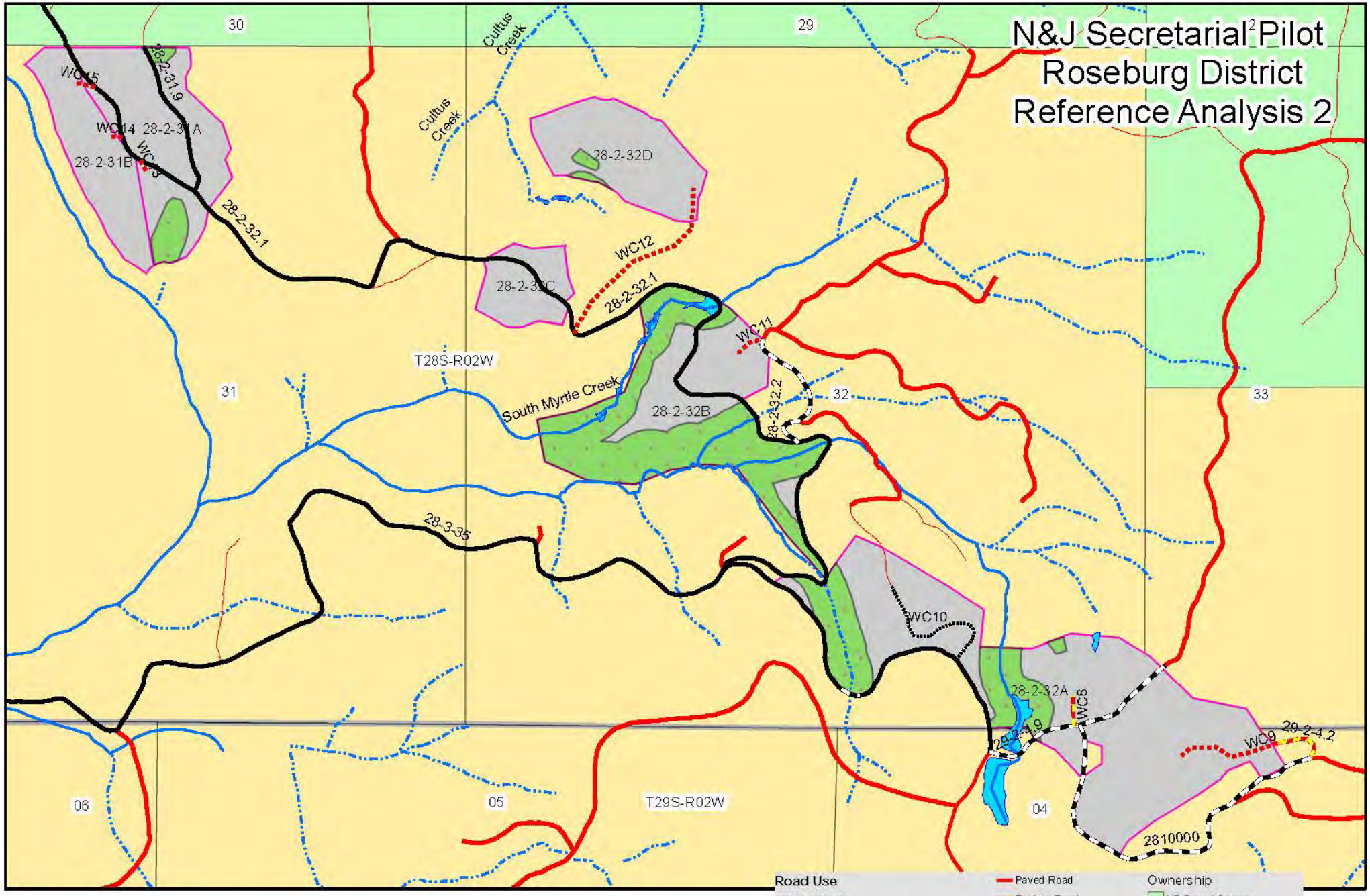
N&J Secretarial Pilot
Roseburg District
Reference Analysis 2



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Appendix B - Silvicultural Terminology

Variable-Retention Regeneration Harvest (VRRH) – a timber harvest that retains structures, organisms, and conditions from the pre-harvest forest stand for incorporation into the post-harvest ecosystem, with the goal of establishing complex early-seral forest conditions through the regeneration a new cohort of trees and other vegetation. Retention can include individual structures (dispersed retention) such as live trees (green-trees), down logs and snags, and/or untreated areas (aggregated retention areas or aggregates).

Aggregate Retention (Aggregates) – areas designated as reserved from harvest, i.e. "no treatment" areas. Depending on the alternative these areas may include entire stands or relatively small portions of stands. Aggregates include various designated stream and wildlife habitat buffers. Depending on the alternative and harvest operability, yarding corridors may be established through designated aggregates with cut trees retained in place. The minimum aggregate size for this project is one-quarter (¼) acre.

Dispersed Retention – individual live (green-trees) trees or small groups (< ¼ acre) of live trees designated for long-term post-harvest retention to provide for living and dead structures.

Relative Density (RD) – a means of describing the level of competition among trees or the site occupancy in a stand relative to some theoretical maximum based on tree size and species composition. For this project "RD" refers to Curtis relative density (Curtis, 1982). RD is defined on a scale of 0 to 100. Competition (suppression) related mortality begins at about RD equal to 55.

Light Thinning – tree density is reduced to a residual RD of 30–40. For the Roseburg Pilot project this equates to an average residual tree density of about 120 trees per acre, basal area of 110 feet^2/acre and canopy cover of 70%.

Moderate Thinning – tree density is reduced to a residual relative density of 25-30. For the Roseburg Pilot project this equates to an average residual tree density of about 80 trees per acre, basal area of 90 feet^2/acre and canopy cover of 55%.

Minor conifer – any conifer tree species other than Douglas-fir.

Passive Recruitment – the reliance on natural mortality processes to produce snags and down wood.

Active Recruitment – reliance on natural mortality processes to produce snags and down wood, plus the artificial creation of snags and down wood via girdling and falling of live trees at or soon after the time of harvest.

Seral Stage – as defined in the Roseburg District 1995 ROD/RMP.

Stand Structural Classification – conifer forests within the project area are classified in this analysis by a four-stage structural classification that incorporates stand age, potential natural vegetation, and structural attributes of live trees (see Table B-1).

Table B-1

Structural Stage Classification		
Structural Stages	**Subdivisions**	**Descriptions**
Stand Establishment	without Structural Legacies (SE)	Majority of stand is very young forest with most trees < 50 feet tall and without larger predominant trees
	with Structural Legacies (SEL)	Majority of stand is very young forest majority of trees < 50 feet tall with some larger predominant overstory trees
Young – High Density [RD ≥ 25]	without Structural Legacies (YH)	Majority of trees > 50' tall, but dominant trees still generally small (< 20 inches dbh) and without larger predominant overstory trees and RD ≥ 25
	with Structural Legacies (YHL)	Majority of trees > 50' tall, but trees generally still small (< 20 inches dbh) and with some larger predominant overstory trees and RD ≥ 25
Young – Low Density [RD ≤ 25]	without Structural Legacies (YL)	Majority of trees > 50' tall, but dominant trees still generally small (< 20 inches dbh) and without larger predominant overstory trees and RD ≤ 25
	with Structural Legacies (YLL)	Majority of trees > 50' tall, but trees generally still small (< 20 inches dbh) and with some larger predominant overstory trees and RD ≤ 25
Mature	with Single-Layered Canopy (MSC)	Larger dominant trees (> 20 inches dbh) with low variation in tree size
	with Multi-layered Canopy (MMC)	Larger dominant trees (> 20 inches dbh) with more than one canopy layer

Appendix C – Wildlife

Table C-1 Special Status Wildlife Species Eliminated from Detailed Discussion

Status	Common Name	Scientific Name	Key Habitat Features	Reason Eliminated
Bureau Sensitive	Columbian White-tailed deer	*Odocoileus virginianus leucurus*	Oak woodland habitats near and north of Roseburg, OR (USFWS 1983)	Out of species' range
Bureau Sensitive	Fisher	*Martes pennati*	Mature and older forest with: large trees or snags with cavities for natal and maternal dens; tree platforms, especially mistletoe brooms, for resting; and coarse wood and structural complexity to support a prey base of small to medium mammals and birds	No known or suspected populations on the Roseburg District or in western Oregon outside of the Southern Cascades and Northern Siskiyou mountains.
Bureau Sensitive	Foothill yellow-legged frog	*Rana boylii*	Low-gradient streams with bedrock or gravel substrate (Corkran and Thoms 1996)	Habitat protected through riparian buffers
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)	Out of species' range
Bureau Sensitive	Harlequin duck	*Histrionicus histrionicus*	Larger fast-flowing streams and riparian areas (Thompson et al. 1993, Robertson and Goudie 1999)	Habitat protected through riparian buffers
Bureau Sensitive	Lewis' woodpecker	*Melanerpes lewis*	Open woodland with ground cover and snags (Tobalske 1997)	Habitat not present
Bureau Sensitive	Northwestern pond turtle	*Actinemys marmorata marmorata*	Marshes, ponds, lakes, streams, and rivers with emergent structure (Csuti et al. 1997).	Habitat protected through riparian buffers
Bureau Sensitive	Oregon Vesper sparrow	*Pooecetes gramineus affinis*	Grassland, farmland, sage. Dry, open habitat with moderate herb and shrub cover (Jones and Cornely 2002)	Habitat not present
Bureau Sensitive	Round Lanx snail	*Lanx subrotunda*	Umpqua River and major tributaries (USDA/USDI 1994)	Habitat protected through riparian buffers
Bureau Sensitive	Scott's Apatanian caddisfly	*Allomyia scotti*	Low-gradient streams with gravel and cobble substrates (Wiggins 1977)	Habitat protected through riparian buffers
Bureau Sensitive	Spotted tail-dropper (Slug)	*Prophysaon vanattae pardalis*	Moist mature forest (Frest and Johannes 2000)	Out of species' range
Bureau Sensitive	Western ridged mussel	*Gonidea angulata*	Low to mid-elevation streams with cobble, gravel, or mud substrates (Nedeau et al 2005)	Habitat protected through riparian buffers
Bureau Sensitive	White-tailed kite	*Elanus leucurus*	Low-elevation grassland, farmland or savannah and nearby riparian areas (Dunk 1995)	Habitat not present
Bureau Sensitive/ Bald and Golden Eagle Protection Act	Bald Eagle	(*Haliaeetus leucocephalus)*	Nests in large trees within 2 miles of large bodies of water (Buehler 2000, Anthony and Isaacs 1989).	Suitable Habitat not present
Threatened and Endangered Species	Marbled Murrelet	*Brachyramphus marmoratus*	Large Diameter Trees with nesting platforms within 50 miles of coast (Evans Mack et al. 2003)	Out of species' range

Non-High Priority Site Designation
Secretary's Pilot Project
Roseburg District
Unit 28-3-25A

"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" provides several situations where specific projects may be exempted from the Standards and Guidelines. These provisions are varied, and are intended for very specific sets of conditions. The identification of non-high priority sites (Standards and Guidelines, Page 10) is one such example." (BLM IM No. OR-2006-047).

Red tree voles (*Arborimus longicaudus*) (hereafter referred to as RTV) were identified in the 2001 Survey and Manage ROD/S&Gs as a Category C species (Uncommon Species, Pre-Disturbance Surveys Practical) (Table 1-1, (USFS and BLM, 2001)). Survey and Manage protections were reinstated following the December 2009 court ruling in *Conservation Northwest et al. v. Sherman et al.*, Case No. 08-1067-JCC with current species management categories provided by the 2011 Settlement Agreement in that case (BLM IM No. OR-2011-063).

Introduction

Unit 28-3-25A is one of several timber sale units being developed in response to direction from the Secretary of the Interior "…to develop Demonstration Pilot Projects intended to demonstrate the application of principles of restoration forestry developed by Drs. Jerry F. Franklin and K. Norman Johnson. The intent of these projects, in part, is to help inform long-term planning on BLM O&C lands" (BLM, Scoping Letter, DOI-BLM-OR-R050-2011-0006-EA, 2011). One of the objectives of the proposed timber sale is to restore early-seral habitat to the landscape. In terms of silvicultural prescription and subsequent forest management this project would most closely align itself with a regeneration harvest.

This project will be consistent with the Northwest Forest Plan, and as such must include the Survey and Manage provisions (BLM, USFS, USFWS, & NPS, 1994). To fulfill the requirement for red tree voles, the forest habitat in the planned timber sale units has been evaluated against the requirements of the 2011 Settlement Agreement in Conservation Northwest et al v. Sherman et al. (BLM IM-OR-2011-063). Regeneration harvests do not meet any of the exemptions from Survey and Manage as outlined. In consideration of RTV, the planned timber sale units were evaluated against the "Criteria for determining the need for pre-disturbance surveys" (p. 2 in Biswell, Blow, Breckel, Finley, & Lint, (2002)) (survey protocol). Unit 28-3-25A is the only unit that meets the pre-disturbance survey requirement.

The criteria for determining the need to conduct pre-disturbance surveys are:

1) The proposed activity (project) is within the known or suspected geographic range of the species. --*The Roseburg District occurs within the Mesic Forest Distribution Zone (Table 1 in survey protocol* (Biswell, Blow, Breckel, Finley, & Lint, 2002)*).*
2) Suitable habitat that may potentially contribute to a reasonable assurance of persistence occurs within the proposed project areas (ROD S&G, p 23) -- *Of the 10 timber sale units, only Unit 28-3-25A meets the habitat definitions of a QMD (quadratic mean diameter) greater than 18 inches at breast height and canopy closure greater than 60 percent, with two or more predominant trees per acre. QMD in this unit was estimated at 18.1 inches survey protocol* (Biswell, Blow, Breckel, Finley, & Lint, 2002)); and,

3) The proposed activity has the potential to "cause significant negative effect on the species habitat or the persistence of the species at the site" (ROD S&G, p. 22). -- *Planned activities would result in the loss and modification of suitable RTV habitat, through the removal of overstory trees survey protocol* (Biswell, Blow, Breckel, Finley, & Lint, 2002)*).*

Timber sale Unit 28-3-25A is 138 acres (approx.) in size; as designed it has 13.5 acres of Riparian Reserves and 31.5 acres of other "aggregated retention areas", where blocks of existing habitat will be retained. RTV clearance surveys began July 14, 2011 and were completed November 2, 2011.Ground surveys and tree climbing efforts were completed in 23 field days , using 25 BLM employees and 3 coordinators. All portions of the unit were surveyed including areas that were designated as "aggregate retention" or "Riparian Reserve". Unit 28-3-25A is approximately 138 acres, and the total transect length surveyed was approximately 36140ft (11016m), which is 261ft/ac. (80m/ac). Any potential RTV nests found on the transects were to be climbed and their status determined by one of the biologists. Then, surveys of 100m circles around any confirmed RTV trees, were conducted by completely searching for other potential nest trees. All nests located in the 100m circles were to be climbed and status determined, or not climbed and assumed to be active RTV nests. Then, additional 100m nest searches around all confirmed RTV and assumed active nest trees were conducted. This process continued until we had almost completely covered the unit with overlapping 100m nest circle searches, at which time it was decided to search the remaining area of the unit. The result of our ground survey efforts exceeded 100% coverage of the 138ac. unit. After transects, climbing, and additional ground surveys were completed the BLM identified 42 RTV nest trees, and 24 potential nest trees (Table 1). Trees that were not climbed to determine whether they were active or inactive, or whether they were RTV or not, will be assumed to be active RTV nest trees; this totals 37 of the 66 nests found.

Table 1. Results of BLM Red Tree Vole Surveys.

Red Tree Vole Nest Tree Status	Number
Active RTV Nest Tree[1]	18
Inactive RTV Nest Tree[2]	11
RTV Nest Tree-status undetermined[3]	13
Unknown[4]	24
Total	**66**

[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.] An arboreal nest that is confirmed to be used by a red tree vole and the activity status is undetermined.
[4.] 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.

According to the Survey and Manage management recommendations for the RTV, by grouping all possible nest trees within 100 meters of each other and buffering nest trees by at least one-site potential tree height (a 180 feet tree height was selected; this is the greater of the two defined site-potential tree heights for the Myrtle Creek and Little River watersheds) (p. 13 in USFS and BLM, 2000), nine RTV sites are created; seven active sites and two inactive sites. RTV sites range from a single tree to 55 trees (approximately 44 acres) (**Figure 1**). The two inactive sites do not require protection under the RTV Management Recommendations. RTV management areas were designated for the seven active sites. Individually these management areas range from 2.8 to 50.9 acres, for a total of 97 acres (75 acres within the unit). Five of the management areas adjoin each other and when considered as a whole these management areas are all in excess of 10 acres (**Figure 2**).

Implementation of these RTV management areas would prohibit implementation of the regeneration harvest prescription on 39 acres (outside of aggregate retention) and restrict all new road construction; thereby restricting potential timber harvest on an additional, 21 acres. Consequently, 33 acres of the original 138 would be available for a regeneration harvest (**Table 2**).

Table 2. Progression of Unit 28-3-25A harvest area.

Gross Unit Area (acres)		**138**
Withdrawals (acres)	Riparian Reserves	13.5
	Aggregate Retention	31.5
	RTV Management Area (outside of other withdrawn areas)	39
Available Harvest Area (acres)		**54**
Area inaccessible without temporary road construction		21
Final Harvest Area (acres)		**33**

An interested citizen group, the Northwest Ecosystem Survey Team (N.E.S.T.) climbed trees within Unit 28-2-25A to look for evidence of RTV occupancy. It is not known what criteria they used to select trees for climbing, and their reported sites have not been climbed by agency personnel for verification. Additionally, their training, credentials, and chain of custody of samples are self-reported and have not been verified. For these reasons, their reported site locations are included here for informational purposes, but are not considered to be protocol survey data. They reported 14 active nest trees and 8 inactive nest trees, in addition to those identified by the BLM.

In addition, potential RTV nest trees (trees not climbed by BLM) were located by the BLM in the Aggregate Retention portion of Unit 28-3-23A and N.E.S.T. reported finding RTV nest trees in Unit 28-2-31A. RTV habitat containing nest trees in Unit 28-2-23A will not be impacted by timber sale activities. Reported, potential RTV nest trees (trees not climbed by BLM) in Unit 28-2-31A do not occur in RTV habitat identified in the RTV Survey Protocol version 2.1 as "Suitable habitat that may potentially contribute to a reasonable assurance of persistence occurs within the proposed project area" (Biswell, Blow, Breckel, Finley, & Lint, 2002).

Figure 1. RTV survey results in Unit 28-3-25A.

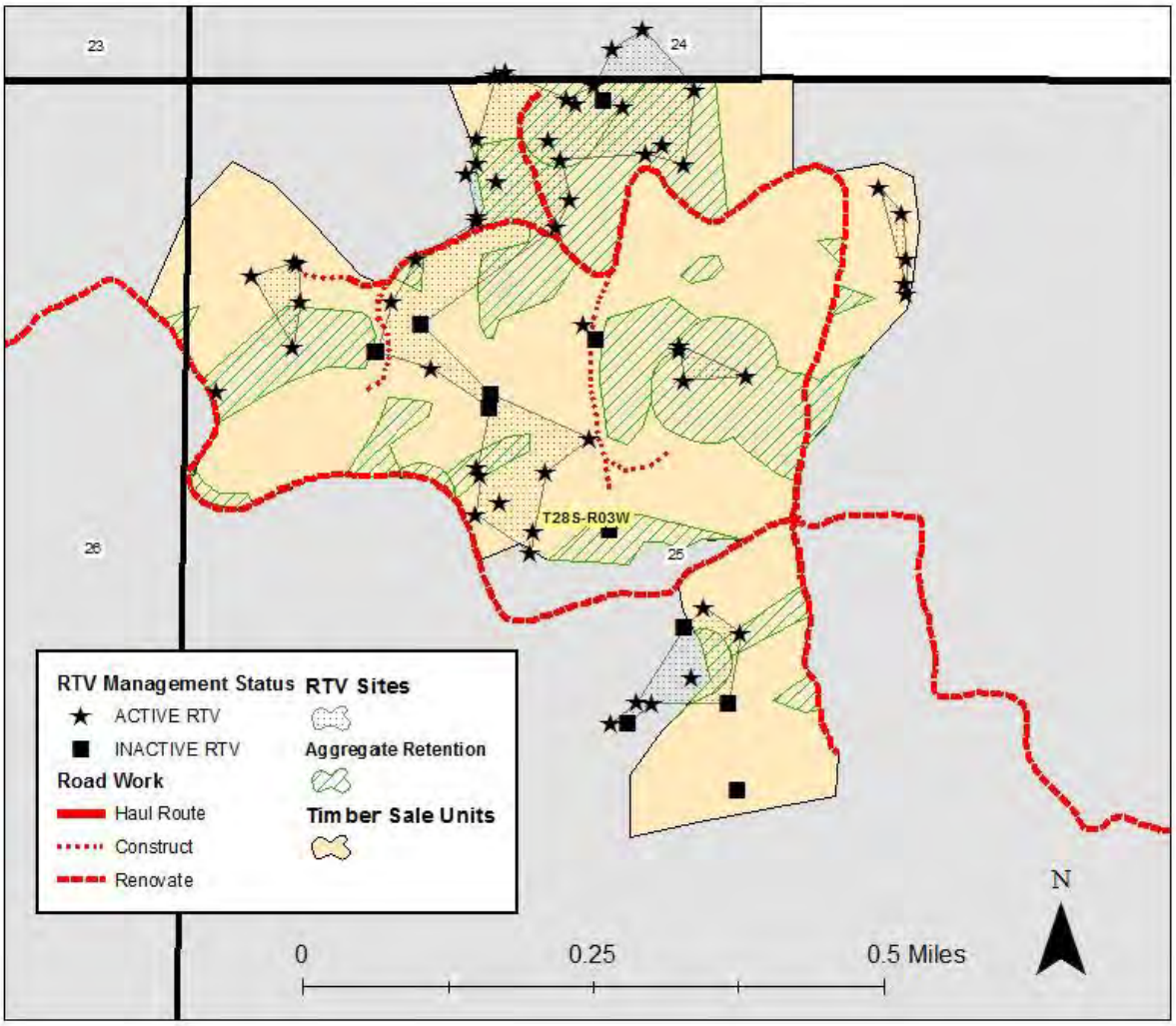
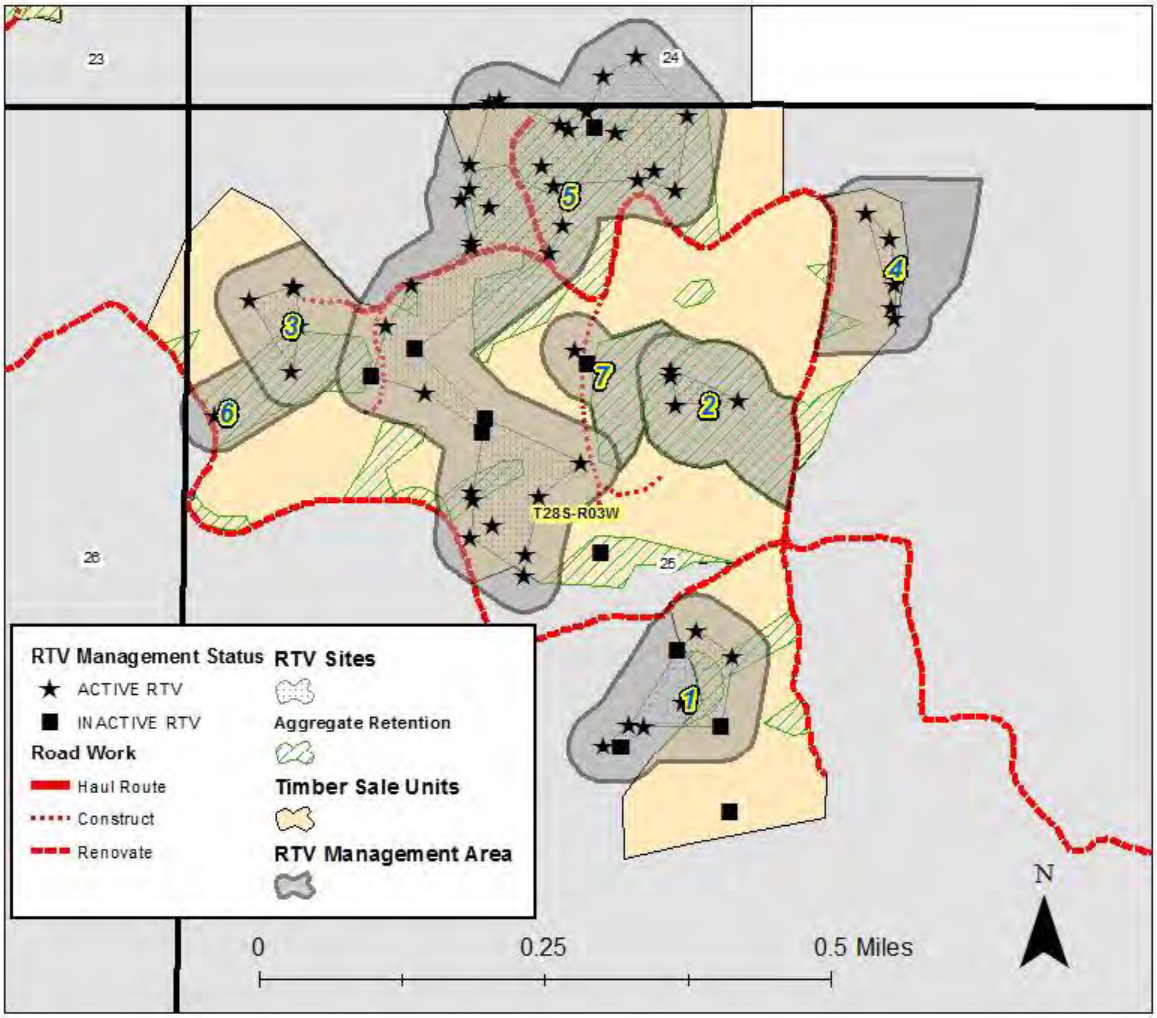


Figure 2. RTV habitat management areas in Unit 28-3-25A.



Analysis

RTVs 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):

- 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).

Red Tree Vole Status in the Mesic zone and within the project watersheds
The data summarized below was obtained from the queries conducted on 1) the BLM's GeoBOB database on 11 November 2011; 2) a static snapshot of the USFS's NRIS database contained on BLM servers, dated 27 October 2011; 3) data received from the Umpqua National Forest on 31 October 2011 (presumably from their NRIS database) (Christensen, pers. comm. 31 Oct 2011); and 4) a static snapshot of the BLM's GeoBOB database (queried on 10 March 2012).

A query of the BLM and USFS's special status species databases identified over 13,800 observations of RTV nesting structures (active, inactive, or unknown status) range-wide; over 5900 within the Mesic zone (**Table 3**). These observations represent over 2,800 RTV sites range-wide with over 600 in the Mesic Zone (**Table 3**).

The data summarized here does not include survey results for the Unit 28-3-25A. Within the Little River and Myrtle Creek fifth-field watersheds over 180 RTV observations (active, inactive, or unknown status), 131 active observations (72%), have been located on BLM and USFS lands representing 50 sites, 42 active (84%)(Table 3). Over 2,400 acres of RTV surveys have been completed within the Myrtle Creek and Little River watersheds (**Table 3**). This equates to a RTV observation every 14 acres, an active RTV every 19 acres, within the 2 watersheds. The majority of this data was collected prior to 2006, when the ruling in the lawsuit of Northwest Ecosystem Alliance, et al. v Rey, et al. exempted the need to conduct Survey and Manage species surveys prior to commercial thinning and density management in stands less than 80 years of age.

Within the Mesic zone, the BLM's GeoBOB records 846 RTV surveys, 377 (45 %) of those identified at least one RTV nest tree (status-active, inactive, or unknown). Within the Roseburg District, 337 surveys of 11,053 acres discovered 962 known and potential RTV nest trees equating to 92 active RTV sites. Thirty percent of RTV surveys on the Roseburg District located active RTV sites.

Table 3. Summary of red tree vole data on BLM and USFS lands, within western Oregon.

	Range-Wide			Mesic Zone				Watersheds[a]			Unit 28-3-25A
	BLM	USFS	Total	BLM	USFS	Total		BLM	USFS	Total	
Observations (#)	7169	6707	13,876	2011	3903	5914	Total	50	131	181	66
							Active[c]	42	89	131	55
Sites (#)	2044	818	2862	234	389	623	Total	21	29	50	9
							Active[c]	17	25	42	7
Sites (ac)	2061	32,667	34.728	1054	17,743	18,797	Total	5	1547[b]	1549	26
							Active[c]	4.8	1382	1387	25.9
Surveys (ac)	116,998	unavail.	unavail.	20,824	unavail.	unavail	Total	767	1717	2484	138

a. Watersheds: Little River and Myrtle Creek fifth-fields
b. Sites on USFS are measured as survey area with RTV presence, an overestimate of the actual extent of the site.
c. Sites with RTV activity status of Active or Unknown.

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 (p13,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)*

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 Federal 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).

The Analytical Watershed

Unit 28-3-25A straddles the divide between the Myrtle Creek and Little River fifth field watersheds; therefore both watersheds will comprise the analytical area (hereafter referred to as the "watershed") (Error! Reference source not found.). There are approximately 208,000 acres within the watershed; almost 97,000 acres of it is privately owned (46.6%) (**Table 4**). RTV habitat currently comprises over 50 percent of forest capable lands on Federal lands and 33 percent when private lands are considered (**Table 4**) [RTV habitat was analyzed in GIS as conifer forest over 100 years on BLM and Private lands and over 80 years of age on Forest Service lands. These stands are assumed to have the minimum QMD or 18 inches and canopy cover of 60+ percent as defined in RTV survey protocols (Biswell, Blow, Breckel, Finley, & Lint, 2002).].

Figure 3. Land use allocation of federal lands within the analytical watersheds associated with the RTV non-high priority site designation for unit 28-3-25A, of the Secretary's Pilot Project.

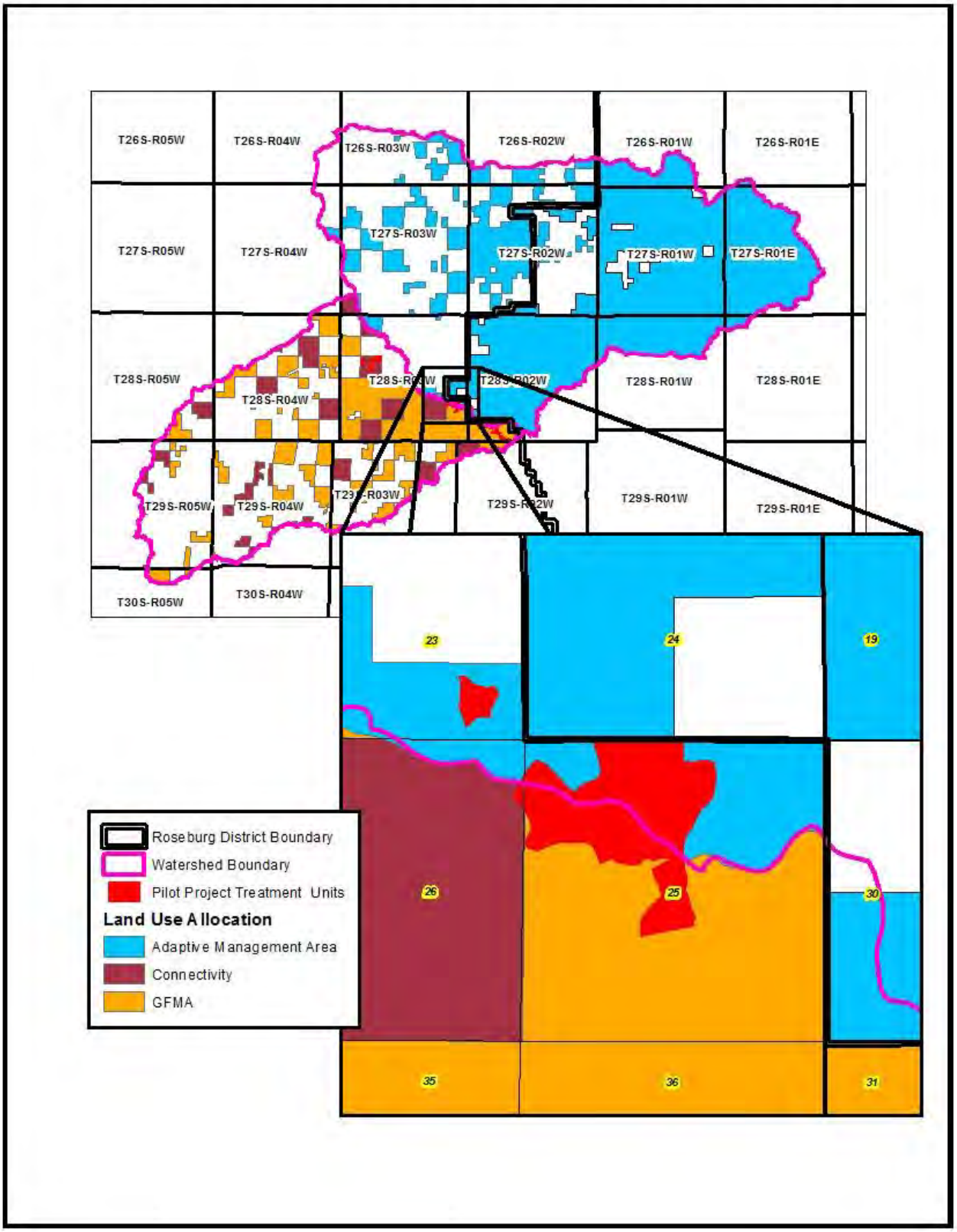


Table 4. Red tree vole habitat conditions within the Myrtle Creek and Little River fifth field watersheds.

	Area	Non-forest	Forest capable	RTV Habitat[a]	% Habitat[b]
Private	93,955	16,226	77,729	2,990	4
BLM	50,392	955	49,437	25,293	51
USFS	63,704	1,025	62,679	34,830	56
Total	**208,051**	**18,206**	**189,845**	**63,113**	**33**

a. Defined as unmanaged stands over 100 years of age on BLM and Private lands and stands over 80 years of age on Forest Service lands; difference is based upon difference in databases utilized.
b. Measured as percent of Forest Capable. (col. 5/col. 4 x 100)

The land use allocation of federal lands within the watershed (BLM and USFS) consists of a combination of Matrix (both General Forest Management Area and Connectivity) and Adaptive Management Area land use allocations (Error! Reference source not found.) (Under the Western Oregon Plan Revision these BLM lands are predominantly Timber Management Area and Deferred Timber Management Area[1.]). Riparian Reserves comprise 39 percent of the BLM and 33 percent Forest Service managed lands; under the Western Oregon Plan Revision BLM's Riparian Management Area (similar objectives), conservatively would be approximately 20 percent of BLM managed lands .

Management Recommendations and Non-High Priority Site Proposal

To maintain the persistence of red tree voles within and adjacent to Unit 28-3-25A, the Roseburg District proposes to designate RTV Management Areas (RTV MA) 1, 3, 6, 7 and portions of 5 as non-high priority sites, but to maintain RTV MA 2 and 4 in their entirety and a portion of 5 (**Figure 4**). In addition, to maintain north-south connectivity for RTV, the District is proposing additional land withdrawals. The goal is to maintain a well-connected corridor of RTV habitat from north to south within and around the timber sale unit. One large RTV MA would be designated encompassing the entire stand of suitable RTV habitat north and east of the 28-2-32.1 road (where it occurs within Unit 28-3-25A) (**Figure 4**). The RTV MA would protect 41 of the 88 potential RTV nest trees identified by BLM (31 Active, 1 Inactive) and RTV nest trees reported by N.E.S.T. (8 active, 1 inactive). Aggregate retention blocks within the unit will contain an additional 11 BLM (6 active, 1 inactive) and N.E.S.T. RTV trees (4 inactive). An additional seven of the 88 potential RTV nest trees are located outside of the timber sale unit (5 active, 2 inactive). In total 52 of 88 potential RTV nest trees (59%) will be protected with some sort of habitat retention strategy. Twenty potential RTV nest trees identified by BLM will be impacted by harvest activities (13 active, 7 inactive) and 9 N.E.S.T. RTV trees (6 active, 3 inactive). Based upon the survey results within the timber sale area it is highly likely that the area within the RTV MA outside of the sale unit supports additional potential RTV nest trees. In conclusion, 20 acres within Unit 28-3-25A would be identified as non-high priority sites, while 41 acres of occupied RTV Habitat Areas would be retained within the unit. An additional 34 acre outside of the unit would be managed longer term as part of the RTV Habitat Area, and would not be subject to timber harvest.

Table 5. Summary of red tree vole nest tree status after non-high priority site designation.

		Protected in Management Area	Protected in Aggregate Retention Blocks	Protected Outside Sale Unit Boundary	Non-High Priority Site: Not protected	Total
BLM	Active	31	6	5	13	55
	Inactive	1	1	2	7	11
N.E.S.T.	Active	8	0	0	6	14
	Inactive	1	4	0	3	8
Total Active		**39**	**6**	**5**	**19**	**69**
Total Inactive		**2**	**5**	**2**	**10**	**19**
Grand Total		**41**	**11**	**7**	**29**	**88**

The NHPS designation is justified for RTV MAs 1, 3, 6, 7, and the southern portion of 5 (identified as 5b in **Figure 3**) for the following reasons:

1. The BLM is proposing a management area 75 acres, as compared to the 97 acres preliminarily identified, for the purpose of maintaining active, viable RTV sites in and adjacent to Unit 28-3-25A.
2. North to south connectivity through the section will be maintained by the Management Areas (**Figure 5. Aerial photo of the habitat surrounding the Secretary's Pilot** Project Unit 28-3-25A..
3. Forty-one of the 88 known and potential RTV nest trees (47 percent) will be protected from harvest effects within RTV management areas; an additional 11 potential nest trees (12 percent) will be contained with aggregate retention blocks and will be impacted less than those in the harvest area but more than those in the management areas due to shorter buffer distances. In total 35 known or potential RTV nest trees (47 percent of the trees within the harvest unit) will receive total or partial protection from the effects of the harvest activities.
4. Although a small portion of the watersheds have been surveyed, 50 (42 active) sites have been identified. Detections rates (percentage of survey areas where at least one RTV is detected) in the Mesic Zone are high (26%) and managers and technical specialists have determined that there are a moderate to high number of likely extant sites and that RTV sites are well distributed within the Mesic Zone (USFS and BLM, 2003a). A current summary of GeoBOB data indicates that 45 percent of surveys identified at least one potential RTV tree (active, inactive, or status unknown).
5. Over 50 percent of forest capable Federal lands within the Myrtle Creek and Little River fifth field watersheds provide RTV habitat. When northern spotted owl Recovery Action 32 (USFWS, 2011a) is considered, up to 43 percent of Federal lands within the watersheds may be restricted from harvest. Additionally, Riparian Reserve strategies (over 30 % of federal lands under the NWFP) would result in the protection of additional 3% of the RTV habitat within the watersheds.
6. Managers and technical specialists determined in 2003, 2004, and 2007 that persistence was not a significant issue for the RTV in the Mesic zone (USFS and BLM, 2003; USFS and BLM, 2004; USFS and BLM, 2007).

Implementing full RTV management recommendations in Unit 28-3-25A would render 65percent of the proposed timber harvest within it inoperable (**Figure 2**, **Table 2**). Due to the importance of this unit in the overall implementation of the Roseburg Pilot Project, given the prevalence of RTV habitat in the watersheds and large number of RTV observations in the Mesic Zone, the opportunity to preserve representative sites within and adjacent to the unit, and maintain North-South connectivity to existing habitat, the BLM has determined that the unit is appropriate for application of the Non-High Priority Site determination process.

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).

_____ _____
Steve Lydick, Field Manager Date
South River Field Office, BLM

_____ _____
Carol Cushing, District Ranger Date
North Umpqua Ranger District, USFS

_____ _____
Jim Thrailkill, Supervisor Date
Roseburg Field Office, USFWS

Figure 4. Red tree vole non-high priority site designation for Unit 25A,

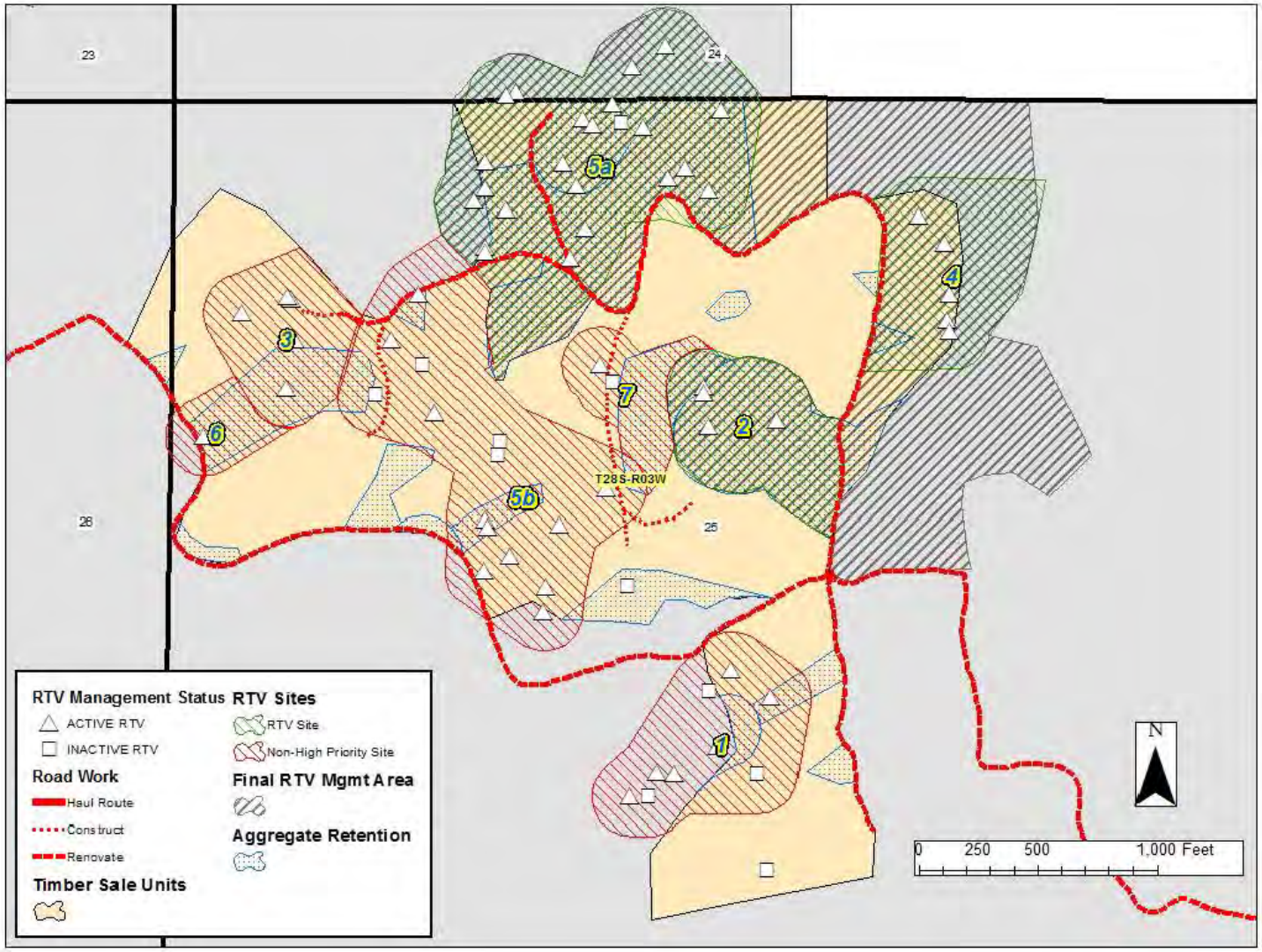
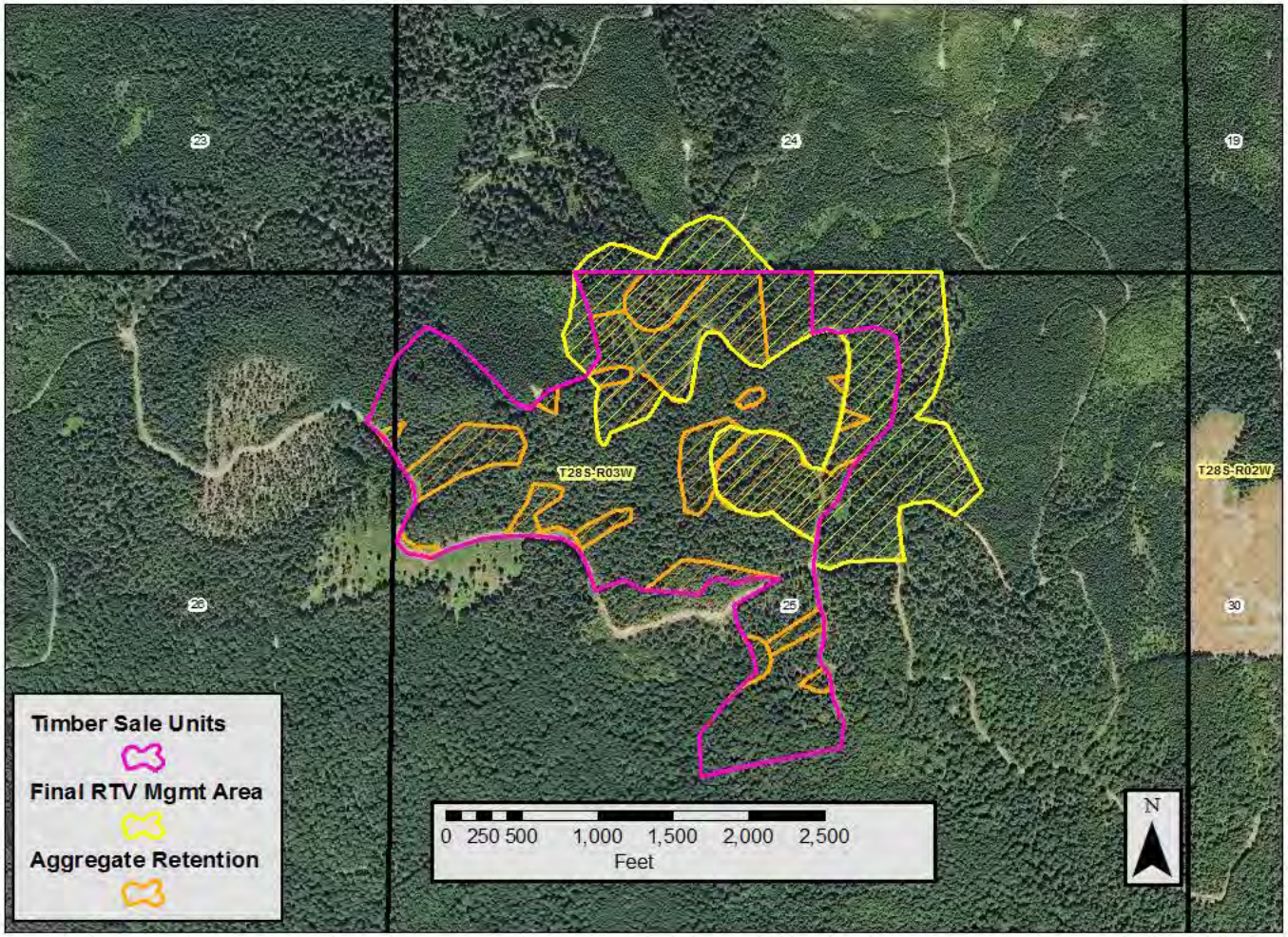


Figure 5. Aerial photo of the habitat surrounding the Secretary's Pilot Project Unit 28-3-25A.



Appendix D - Botany

Table D-1 Botanical Species

Scientific Name	Taxon or Common Name	Habitat	Surveys Required	Survey Results
Brideopourus nobilissiujs	Fungi (B)	Western hemlock and Pacific silver fir plant associations	No, habitat not present	N/A
Chiloscyphus gemmiparus	Liverwort (B)	Rocks in the bed of cold water streams	No, habitat not present	N/A
Diplophyllum plicatum	Liverwort (B)	Bark of hardwoods and conifers.(Cool moist sites)	No, habitat not present	N/A
Entosthodon fascicularis	Moss (B)	Seasonally wet, exposed soil in seeps or along intermittent streams	No, habitat not present	N/A
Gymnomitrion concinnatum	Liverwort (B)	Peaty soil of cliffs and rock outcrops	No, habitat not present	N/A
Helodium blandowii	Moss (B)	Edges of fens or along streamlets in fens	No, habitat not present	N/A
Meesia uliginosa	Moss (B)	Fens on saturated ground, usually in full sunlight	No, habitat not present	N/A
Schistostega pennata(*)	Moss (B)	On damp rocks, soil and decaying wood in dark places	No, habitat not present	N/A
Tayloria serrata	Moss (B)	Old dung, rotten wood, or on soil enriched by dung on roadsides	Habitat	Negative
Tetraphis geniculata(*)	Moss (B)	Large legacy logs in cool moist areas	Habitat	Negative
Tetraplodon mnioides	Moss (B)	Soil and rotten wood enriched by old dung	Habitat	Negative
Tomentypnum nitens	Moss (B)	Montane fens slightly elevated sites such as logs and stumps	No, habitat not present	N/A
Tortula mucronifolia	Moss (B)	Rock or occasionally on dry soil in exposed locations	Habitat	Negative
Trematodon boasii	Moss (B)	Soil along edges of trails; streams and ponds in the subalpine zone	No, habitat not present	N/A
Bryoria subcana	Lichen (B)	Bark of conifers in streams and on high precipitation ridges within 30 miles of ocean	No, habitat not present	N/A
Calicium adspersum(*)	Lichen (B)	Bark on conifers	Habitat	Negative
Chaenotheca subrosicida (*)	Lichen (B)	Bark on conifers	Habitat	Negative
Dermatocarpon (*)meiophyllizum- D. luridum dropped from the state	Lichen (B)	Rocks on stream channels	No, habitat not present	N/A
Hypogymnia duplicata (*)	Lichen (B)	Old-growth conifers	No, habitat not present	N/A

Scientific Name	Taxon or Common Name	Habitat	Surveys Required	Survey Results
Lobaria linita	Lichen (B)	Mature forests in the western hemlock zone	No, habitat not present	N/A
Pannaria rubiginosa (*)	Lichen (B)	Mature Douglas-fir/western hemlock forest	No, habitat not present	N/A
Pilophorus nigricaulis	Lichen (B)	Non-forest communities on talus slopes and rock outcrops	No, habitat not present	N/A
Stereocaulon spathuliferum	Lichen (B)	Rock	Habitat	Negative
Adiantum jordanii	California Maiden-hair (C)	Outcrops, riparian areas	Habitat	Negative
Arabis koehleri var. koehleri	Koehler's rockcress (D)	Dry rocky serpentine slopes and ridges	No, habitat not present	N/A
Arctostaphylos hispidula	Hairy Manzanita (C)	Dry rocky ridges and gravelly soils	Habitat	Negative
Asplenium septentrionale	Grass fern (D)	Rock outcrops	Habitat	Negative
Bensoniella oregana	Bensonia (C)	Margins of bogs and meadows	Habitat	Negative
Bothrychium minganense (*)	Gray moonwort (B)	Riparian and old-growth redcedar	Habitat	Negative
Calochortus coxii	Crinite mariposa lily (C)	Serpentine soils	No, habitat not present	N/A
Calochortus umpquaensis	Umpqua mariposa lily (C)	Serpentine soils	No, habitat not present	N/A
Camassia howellii	Howell's camas (C)	Serpentine soils	No, habitat not present	N/A
Carex comosa	Bristly sedge (C)	Wet areas	Habitat	Negative
Carex gynodynama	Hairy sedge (C)	Moist meadows , open forests	Habitat	Negative
Carex serratodens	Saw-tooth sedge (C)	Moist meadows	Habitat	Negative
Cicendia quadrangularis	Timwort (C)	Meadows	Habitat	Negative
Cimicifuga elata	Tall bugbane (C)	Doulas-fir forests	Habitat	Negative
Cypripedium fasciculatum (*)	Clustered lady's slipper (C)	Dry to moist conifer and mixed conifer forests	Habitat	Negative
Delphinium nudicaule	Red larkspur (C)	Talus and gravelly soils on rocky slopes	Habitat	Negative
Epilobium oreganum	Oregon willow herb (C)	Wet serpentine soils at lower elevations	No, habitat not present	N/A
Eschscholzia caespitosa	Gold poppy (C)	Foothills and valleys	Habitat	Negative
Eucephus vialis	Wayside aster (C)	Douglas-fir forests	Habitat	Negative
Horkelia congesta ssp. congesta	Shaggy horkelia (D)	Meadows and open woods	Habitat	Negative

Scientific Name	Taxon or Common Name	Habitat	Surveys Required	Survey Results
Horkelia tridentate ssp. tridentata	Three-toothed Horkellia (C)	Open dry coniferous forest	Habitat	Negative
Iliamna latibracteata	California globe mallow (C)	Streambanks and moist ground in the shade or open	Habitat	Negative
Kalmiopsis fragrans	Fragrant kalmiopsis (D)	Dry stony mountain slopes	Habitat	Negative
Lathryrus holochlorus	Thin-leaved peavine (A)	Fence rows and partially cleared land in the Umpqua Valley	Habitat	Negative
Lewisia leana	Lee's lewisia (C)	Rocky or gravelly ridges often on serpentine soils	Habitat	Negative
Limnanthes gracilis ssp. gracilis	Slender meadow-foam (D)	Vernally moist to wet slopes including serpentine	Habitat	Negative
Lotus stipularis	Stipuled trefoil (C)	Open forests and stream beds	Habitat	Negative
Lupinus oreganus ssp. *kincaidii*	Kincaid's lupine (D)	Open woods and forests	Habitat	Negative
Meconella oregana	White fairy poppy (C)	Open ground and serpentine soils	Habitat	Negative
Pellaea andromedifolia	Coffee fern (D)	Dry rock outcrops	Habitat	Negative
Perideridia erythrorhiza	Red-rooted yampah (D)	Vernally moist in heavy, poorly drained soils	No, habitat not present	N/A
Plagiobothrys hirtus	Rough popcorn flower (D)	Vernally wet meadows	No, habitat not present	N/A
Polystichum californicum	California sword fern (D)	Rocky open slopes	Habitat	Negative
Romanzoffia thompsonii	Thompson's mistmaiden (D)	Seasonally wet rock outcrops on open slopes	Habitat	Negative
Schoenoplectus subterminalis - formerly *Scirpus subterminalis*	Water clubrush (D)	Relatively shallow water	No, habitat not present	N/A
Scirpus pendulus	Drooping bullrush (C)	Wet meadows	Habitat	Negative
Sisyrinchium hitchcockii	Hithcock's blue-eyed grass (D)	Valley grasslands and oak savannahs	Habitat	Negative
Utricularia gibba	Humped bladderwort (D)	Shallow standing water	No, habitat not present	N/A
Utricularian minor	Lesser bladderwort (D)	Shallow standing water	No, habitat not present	N/A
Wolffia borealis	Dotted water-meal (C)	Lakes and ponds	No, habitat not present	N/A
Wolffia columbiana	Columbia water-meal (D)	Lakes and ponds	No, habitat not present	N/A

(*) = Survey and Manage species that will remain Sensitive in OR and/or WA even though the criteria would place them in the Strategic category or off the list.

(A) Hitchcock, C.L., A. Cronquist, M. Ownbey, J.W. Thompson. 1961. *Vascular Plants of the Pacific Northwest* Part 3: *Saxifragaceae to Ericaceae.* University of Washington Press, Seattle, WA.

(B) Interagency Special Status/Sensitive Species Program. Interagency-Oregon/Washington State. USDI DOI Bureau of Land Management and USDA Forest Service. http://www.fs.fed.us/r6/sfpnw/isss

(C) Mullens, Linda and Showalter, Rachel, 2007. Rare Plants of Southwest Oregon

(D) USDI, Bureau of Land Management. 1991. Special Status Plants of Roseburg District

Survey & Manage Tracking Form:
Botany Species Survey and Site Management Summary

BLM Roseburg District – South River Field Office

Project Name: South River Pilot Project **Prepared By:** Gary Basham
Project Type: Variable Retention Harvest **Date:** August 25, 2011
Location: T28S, R3W, Sections 17, 23 and 25; T28S, R2W, Sections 25, 31 and 32; and T29S, R2W, Section 4

S&M List Date: 2011 Settlement Agreement

Table A. Survey & Manage Botany Species. The BLM Roseburg District compiled the species listed below from the 2011 Settlement Agreement, Attachment 1. This includes those vascular and non-vascular plant species with pre-disturbance survey requirements (Category A or C species) whose known or suspected range includes the Roseburg District according to:

- Interagency Special Status / Sensitive Species Program (ISSSSP) Species Fact Sheets located at http://www.fs.fed.us/r6/sfpnw/issssp/planning-documents/species-guides.shtml
- Survey and Manage Program Survey Protocols located at http://www.blm.gov/or/plans/surveyandmanage/sp.htm
- The Oregon Flora Project Atlas located at http://www.oregonflora.org/atlas.php

This list also includes any Category B, D, E, or F species with known sites located within the project area.

Species	S&M Category	Survey Triggers			Survey Results			Site Management
		Within Range of the Species?	Project Contains Suitable habitat?	Project will affect species/habitat?	Surveys Required?	Survey Date (month/year)	Sites Known or Found?	
Fungi								
Bridgeoporus nobililssimus	A	Yes	No [1]	N/A	No	N/A	0	No
Lichens								
Bryoria pseudocapillaris	A	No [2]	N/A	N/A	No	N/A	0	No
Chaenotheca subroscida	E	Yes	Yes	No	No	8/11	1	Yes
Hypogymnia duplicata	C	Yes	No[3]	N/A	No	N/A	0	
Leptogium cyanescens	A	No [2]	N/A	N/A	No	N/A	0	

Species	S&M Category	Survey Triggers			Survey Results			Site Management
		Within Range of the Species?	Project Contains Suitable habitat?	Project will affect species/habitat?	Surveys Required?	Survey Date (month/year)	Sites Known or Found?	
Lichens								No
Lobaria linita	A	Yes	No [4]	N/A	No	N/A	0	No
Nephroma occultum	A	Yes	No [5]	N/A	No	N/A	0	No
Niebla cephalota	A	No [2]	No	N/A	No	N/A	0	No
Pseudocyphellaria perpetua	A	No [2]	No	N/A	No	N/A	0	No
Pseudocyphellaria rainierensis	A	Yes	No[5]	N/A	No	N/A	0	No
Teloschistes flavicans	A	No [2]	No	N/A	No	N/A	0	No
Bryophytes								
Schistostega pennata	A	No [4]	No	N/A	No	N/A	0	No
Tetraphis geniculata	A	Yes	Yes	N/A	No	N/A	0	No
Vascular Plants								
Botrychium minganense	A	Yes	Yes	N/A	No	8/11	0	No
Botrychium montanum	A	No [6]	No	N/A	No	N/A	0	No
Coptis asplenifolia	A	No [6]	No	N/A	No	N/A	0	No
Coptis trifolia	A	No [6]	No	N/A	No	N/A	0	No
Corydalis aquae-gelidae	A	No [6]	No	N/A	No	N/A	0	No
Cypripedium fasciculatum	C	Yes	Yes	Yes	Yes	8/11	0	No
Cypripediium montanum	C	Yes	Yes	Yes	Yes	8/11	0	No
Eucephalis vialis	A	Yes	Yes	Yes	Yes	8/11	0	No
Galium kamtschaticum	A	No [6]	No	N/A	No	N/A	0	No
Plantanthera orbiculata var. orbiculata	C	No [6]	No	N/A	No	N/A	0	No

[1] Surveys are not required since suitable habitat is not available on this project. This species is found on a host species which is absent from this project.
[2] Surveys are not required since there is no suitable habitat within the project area. This species only inhabits the immediate coast.
[3] Surveys are not required since there is no suitable habitat within the project area. This species is found in the Oregon Coast Range and near Mt. Hood.
[4] Surveys are not required since there is no suitable habitat within the project area. This species is only found in high elevation areas.
[5] Surveys are not required since there is no suitable habitat within the project area. Species habitat depends on old growth forests.
[6] Douglas County is outside of the known range for this species.

Statement of Compliance. The BLM Roseburg District applied the 2011 Settlement Agreement Species List to the South River Pilot project, completing pre-disturbance surveys, and management of known sites (Table A) required by Survey Protocols and Management Recommendations to comply with the *2001 Record of Decision and Statndard and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measure Standards and Guidelines.*

SUMMARY OF SURVEY RESULTS] Project surveys discovered sites for two Survey and Manage species

Unit 28-2-31A
Chaenotheca chrysocephala **(Survey and Manage B)** 2011 Pre-disturbance surveys identified two sites. In accordance with the Conservation Planning Species Fact Sheet, which specifies protection with a 100-feet no disturbance buffer to maintain microclimate conditions, these sites were incorporated into aggregate retention blocks.

Chaenotheca subrocida **(Bureau Sensitive; Survey and Manage E)** 2011 Pre-disturbance surveys identified one site. In accordance with the Conservation Planning Species Fact Sheet, which specifies protection with a 100-feet no disturbance buffer to maintain microclimate conditions, the site was incorporated into an aggregate retention block.

Unit 28-2-32C
Chaenotheca chrysocephala **(Survey and Manage B)** 2011 Pre-disturbance surveys identified two sites. In accordance with the Conservation Planning Species Fact Sheet, which specifies protection with a 100-feet no disturbance buffer to maintain microclimate conditions, these sites were incorporated into Riparian Reserves.

/ S / Gary Basham
_____
Gary Basham, Botanist
South River Field Office

August 25, 2011
_____
Date

Appendix E
Consistency of the Proposed Action with 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, page B-9).

ACS Components:

1. Riparian Reserves (ACS Component #1)

   Riparian Reserves would be established in the Matrix land use allocations and Little River Adaptive Management Area. The ROD/RMP (p. 24) specifies Riparian Reserve widths equal to the height of two site potential trees, slope distance, on each side of fish-bearing streams and one site-potential tree, slope distance, on each side of perennial or intermittent non-fish bearing streams, wetlands greater than an acre, and constructed ponds and reservoirs. Identical management direction has been adopted in the Little River Adaptive Management Area. Site potential tree heights (SPTH) are listed below by watershed:

Watershed	**SPTH (ft)**
Little River	180
Myrtle Creek	160
Middle South Umpqua River – Dumont Creek	180

   A maximum of 21 acres of Riparian Reserves would be treated with a variable density thinning prescription. Post-harvest, prescribed fire would be allowed to enter select Riparian Reserves. All other treatment is proposed outside of 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)." Middle South Umpqua River – Dumont Creek is designated as a Tier 1 Key Watershed (ROD/RMP, p. 20).

3 Watershed Analysis (ACS Component #3):

   In developing the proposed project, Watershed Analyses for each of the affected 5th field watersheds were used to evaluate existing conditions, establish desired future conditions, and assist in the formulation of appropriate alternatives. The Watershed Analyses are available for public review at the Roseburg District office or can be viewed under "Plans & Projects" on the Roseburg District website at www.blm.gov/or/districts/roseburg/index.htm.

Existing watershed conditions are described in the **Aquatic Habitat, Oregon Coast Coho Critical Habitat, and Essential Fish Habitat** (pp.104-107) and **Water Resources** (pp. 107-109) sections of the Roseburg Pilot Environmental Assessment (EA) and in the pertinent 5th field Watershed Analyses. The short and long term effects of the alternatives on aquatic resources are also described in the **Aquatic Habitat, Oregon Coast Coho Critical Habitat, and Essential Fish Habitat** (pp. 113-177 and 121-123) and **Water Resources** (pp. 118-121 and 123-124) sections of the EA.

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 watershed restoration project and are therefore consistent with the Watershed Restoration component of the ACS.

Stream enhancement projects have been implemented on both BLM administered lands and adjacent private land throughout the Myrtle Creek watershed for the purpose of enhancing spawning and rearing habitat for Oregon Coast coho salmon, steelhead trout and Coastal cutthroat trout. Projects that have been implemented on BLM lands include about 3.5 miles of log placement and replacing over 10 culverts identified as barriers to fish passage to open up access to historically available habitat.

This work has been done in collaboration with timber companies, private land owners, the Partnership for Umpqua Rivers, Douglas Soil and Water Conservation District, Oregon Department of Fish and Wildlife, and the BLM. Future opportunities for restoration are discussed in the Myrtle Creek Watershed Analysis and Water Quality Restoration Plan (pp. 180-194). Restoration planning is underway on two reaches of South Myrtle Creek above the mouth of Weaver Creek and in Deadman Creek in the Middle South Umpqua – Dumont Creek watershed.

Fish continue to have access to historic salmon and steelhead habitat in large, mainstem rivers however an unknown number of culverts on small tributary streams may still block access during some times of the year.

Range of Natural Variability:

Based on the dynamic, disturbance-based 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. Therefore, a more meaningful measure of natural variability is assessed at scales equal to or greater than the 5th-field watershed scale. At this scale, spatial and temporal trends in aquatic habitat condition can be observed and evaluated over larger areas, and important cause/effect relationships can be more accurately determined.

Middle South Umpqua - Dumont Creek

Proposed project acres (approximately 7 acres) and road construction in the Middle South Umpqua – Dumont Creek watershed are located on ridges with no Riparian Reserves proposed for treatment and consequently no mechanism to affect ACS objectives. Therefore a discussion of the Range of Natural Variability for the Middle South Umpqua – Dumont Creek watershed will not be included in this analysis.

Little River

Natural disturbance events to aquatic systems in the Pacific Northwest include wildfires, floods, and landslides. Average fire return intervals at the drainage scale for the Little River watershed were calculated between 20 and 100 years (prior to the advent of fire suppression).

Most of the Little River watershed is dominated by the Little Butte Volcanic formation and the Colestin formation. The granitic terrain found in the Little Butte Volcanic Formation has historically had a landslide density of approximately twelve landslides per square mile while the Colestin formation has had a history of approximately eight landslides per square mile (Little River Watershed Analysis)

Timber harvesting and road construction over the past 50 years have substantially increased the frequency and distribution of landslides above natural levels in the Little River watershed. However, there is a downward trend in landslide incidence over the last 50 years that is associated with improved management practices. On BLM land, future landslides, mostly during large storm events, are expected to deliver large wood and rock fragments to lower-gradient streams because of BLM Riparian Reserves. These events would more closely resemble landslides within relatively unmanaged forests. These disturbance events are the major natural sources of sediment and wood to a stream system and are very episodic in nature.

Due to the dynamic nature of these disturbance events, stream channel conditions vary based on the time since the last disturbance event. This results in a wide range of aquatic habitat conditions at the site level. Site level habitat conditions can be summarized by Oregon Department of Fish and Wildlife (ODFW) habitat surveys. Surveys have been conducted throughout the Little River watershed, mostly in the third through sixth-order streams.

Approximately 21 reference reaches in the Little River Sub-Basin of the Umpqua Basin were compared against all surveyed streams. These relatively unmanaged reaches represent the variability of conditions within natural stream systems as well as habitat characteristics desirable for a variety of fish species, including salmonids. When compared to these “reference streams”, aquatic habitat survey data from the Little River watershed indicates that most tributaries are lacking large woody debris. While this condition is considered typical at any given site scale, it is atypical for most streams to be devoid of wood at the larger 5th-field scale. Therefore, at this larger scale, aquatic habitat conditions are considered to be outside the range of natural variability.

Because of its dynamic nature, sediment effects to streams can only be described in general terms. It is important to remember that ODFW instream habitat data is a snapshot in time. When compared to reference reaches, sediment conditions in most of the tributaries of Little River watershed appear to be similar to the reference reaches in that they fall in the low to low-moderate erosion risk class (Little River Watershed Analysis).

Stream temperatures vary naturally in this watershed as a result of variation in geographic location, elevation, climate, precipitation, and distance from the source water. Stream temperatures also naturally vary as a response to the natural disturbance events mentioned in the previous paragraphs, as well as current practices on private forest, agricultural, and residential properties. Due to the large amount of riparian clearing over the last 150 years (converting forest into farmland), coupled with management-induced channel widening, irrigation withdrawals, and loss of gravels, it is likely that stream temperature increases have been greater over larger spatial and temporal scales than observed naturally. One of BLM's objectives for managing Riparian Reserves is to maintain and enhance vegetation providing shade along streams.

Changes in stream flow can result from consumptive withdrawals and effects of land use activities on storm water runoff, infiltration, storage and delivery. Agricultural and domestic withdrawals are common along Little River and its tributaries. Many tributaries within the Little River watershed have also been cleaned of large wood, or salvage logged. BLM forest management in the Little River watershed is designed to reduce or prevent watershed impacts.

Myrtle Creek

Natural disturbance events to aquatic systems in the Pacific Northwest include, but are not limited to wildfires, floods and landslides. Myrtle Creek is classified as having a mixed severity fire regime. Prior to the advent of fire suppression, average fire return intervals at the drainage scale were between 20 and 150 years with individual fires showing a range of effects. Fires covered large areas, varied in intensities, and burned often. The overall effect is one of patchiness at the landscape level.

Forest and land management practices in the watershed have altered the frequency and distribution of landslides through the construction of forest roads and commercial harvest of timber. Approximately 7.2 percent of the Myrtle Creek watershed has a high potential risk for landslides, but there are no areas at extreme risk (Geyer, 2003). On BLM-administered lands, future landslides, mostly occurring during large storm events, are expected to deliver large wood and rock to lower gradient streams from sources within BLM Riparian Reserves. These episodic deliveries of large wood and rock closely mimic natural conditions.

Given the dynamic nature of these disturbance events, stream channel conditions vary based on the time since the last event. This results in a wide range of aquatic habitat conditions at the site level. Site level habitat conditions can be summarized by Oregon Department of Fish and Wildlife (ODFW) habitat surveys, conducted throughout the Myrtle Creek watershed, primarily on third-order and larger streams.

Aquatic habitat survey data from the Myrtle Creek watershed indicate that most tributaries lack large woody debris and adequate pool-riffle geomorphology (Geyer, 2003). While local disturbances can create conditions where large wood and associated habitat features are lacking at the 7th field scale, it is considered atypical for most streams to be devoid of wood at the larger 5th field scale. One of BLM's objectives for managing Riparian Reserves is to maintain and enhance sources of large wood along streams.
Because of its dynamic nature, sediment influence on streams can only be described in general terms. Increased sediment delivery stemming from roads, timber harvest and landslides has contributed to relatively high levels of fine sediment entering the stream network within the Myrtle Creek watershed (Geyer, 2003). In fact, in the Myrtle Creek watershed there are 59 miles (11 percent of total road mileage) of unsurfaced roads within 200 feet of a stream (Geyer, 2003) which could act as a mechanism for sediment entering the stream network. While much of this sediment is a result of natural processes and geology, landslide frequencies increased within the basin when land management activities began in earnest in the 1950s. Flood events in the 1960s likely triggered the largest number of these landslides and debris flows.

Stream temperatures vary naturally in these watersheds as a result of variation in elevation, climate, precipitation, aspect, and distance from headwaters. Stream temperatures also vary naturally in response to the natural disturbance events previously described, as well as current land management practices on private forest, agricultural, and residential properties.

Changes in stream flow can result from consumptive withdrawals and effects of land use activities on storm water runoff, infiltration, storage and delivery. Water withdrawals for domestic use, irrigation, agriculture, and livestock watering are common in most of the larger tributaries of the Myrtle Creek watershed.

Within the portions of the Myrtle Creek watershed there are approximately 179 miles of perennial streams and 693 miles of intermittent streams. Primary BLM objectives for managing Riparian Reserves on stream reaches located on BLM-administered lands are to provide for riparian and aquatic conditions that supply stream channels with effective shade, sediment filtering, nutrient supply, functional wood recruitment, and streambank stability

Table E-1 Individual ACS Objectives Assessment

	Myrtle Creek 5th field watershed		**Little River 5th field watershed**		**Middle South Umpqua River – Dumont Creek 5th field watershed**	
	Site/Project Scale Assessment	**5th Field Watershed Scale Assessment**	**Site/Project Scale Assessment**	**5th Field Watershed Scale Assessment**	**Site/Project Scale Assessment**	**5th Field Watershed Scale Assessment**
ACS Objective	Scale Description: This project is located in seven 7th field drainages in the Myrtle Creek 5th field watershed. The drainages vary in size from 894 to 3,969 acres. The BLM manages approximately 12,384 acres throughout these drainages (68 percent). The 319 acres proposed for treatment ranges from less than one percent to 4.2 percent of the individual drainage areas, and totals 2.6 percent of the BLM-managed lands in the drainages.	Scale Description: This project is located in the Myrtle Creek 5th field watershed. This watershed is approximately 76,247 acres in size of which 31,029 acres (41 percent) are managed by the BLM. The acreage proposed for treatment represents 0.4 percent of the watershed area, and one percent of the BLM-managed lands in the watershed.	Scale Description: This project is located in two 7th field drainages in the Little River 5th field watershed. The drainages are 7,753 and 8,330 acres respectively. The BLM manages approximately 767 acres in the drainages (5 percent). The 113 acres proposed for treatment represents 0.4 and 0.9 percent of the respective drainage areas, and totals 14.7 percent of the BLM-managed lands in the drainages.	Scale Description: This project is located in the Little River 5th field watershed. The watershed totals roughly 131,850 acres in size of which 19,304 acres (15 percent) are managed by the BLM. The acreage proposed for treatment represents 0.1 percent of the watersheds, and 0.6 percent of the BLM-managed lands in the watershed.	Scale Description: This project is located in one 7th field drainage in the Middle South Umpqua River – Dumont Creek 5th field watershed. The drainage is 3,342 acres in size. In total the BLM manages approximately 3,222 acres in the drainage (96 percent). The six acres proposed for treatment represents 0.2 percent of the drainage area, and 0.2 percent of the BLM-managed lands in the drainage.	Scale Description: This project is located in the Middle South Umpqua River – Dumont Creek 5th field watershed. The watershed totals roughly 98,772 acres in size of which 10,559 acres (11 percent) are managed by the BLM. The acreage proposed for treatment represents 0.01 percent of the watershed, and 0.1percent of the BLM-managed lands in the watershed.
1. *Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations, and communities are uniquely adapted.*	Within all drainages, the proposed action would treat about 21.2 acres of Riparian Reserves. Remaining trees within these treated stands would attain larger heights and diameters in a shorter amount of time than if left untreated. Enhanced ecological structure and diversity would be the result of a variable density thinning treatment which would target deciduous trees and other unique riparian features for release. This treatment would speed attainment of this objective.	The proposed action would also speed attainment of this objective at the watershed scale.	There are no treatments proposed within Riparian Reserves. Treatment was not deemed necessary following field surveys by BLM aquatics staff. The ACS objective would be maintained.	Riparian Reserves in the watershed would remain unchanged from the current condition. The ACS objective would be maintained.	There are no treatments proposed within Riparian Reserves. Proposed timber harvest units are located on a ridgeline and are not in close proximity to any Riparian Reserves. Riparian Reserves of the drainage would remain unchanged from the current condition. The ACS objective would be maintained.	Riparian Reserves of the watershed would remain unchanged from the current condition. The ACS objective would be maintained.
2. *Maintain and restore spatial and temporal connectivity within and between watersheds*	Riparian Reserves would only be treated in Units 28-3-17A, B and C as deemed necessary by BLM aquatics staff and would and only apply under Alternative 2, Sub-Alternative B. It would not inhibit spatial and temporal connectivity. Absent additional stream crossings, there would be no influence on spatial and temporal connectivity at the site scale.	The existing condition of aquatic connectivity at the watershed scale would be maintained for the same reasons that it would be maintained at the site scale.	Absent any additional stream crossings and treatments within Riparian Reserves, the proposed project would have no influence on spatial and temporal connectivity at the site scale.	The proposed project would have no influence on spatial and temporal at the site scale and would, hence, maintain the existing temporal and spatial connectivity at the watershed scale.	Absent any additional stream crossings and treatments within Riparian Reserves, the proposed project would have no influence on spatial and temporal connectivity at the site scale.	The proposed project would have no influence on spatial and temporal at the site scale and would, hence, maintain the existing temporal and spatial connectivity at the watershed scale.

3. *Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations*	As discussed on p. 120 of the EA, variable retention harvest and variable density thinning would not increase ECA to an extent that could potentially influence peak flows. Cross-channel yarding would rely on at least one end suspension of timber. No logging equipment would cross streams. Roaded area would not increase beyond threshold levels and would subsequently not pose a risk to peak flow enhancement. Consequently, this project would maintain the physical integrity of the aquatic system at the site scale.	The physical integrity of aquatic systems at the watershed scale would be maintained for the same reasons they would be maintained at the site scale.	As discussed on p. 120 of the EA, variable retention harvest and variable density thinning management would not increase ECA to an extent that could potentially influence peak flows. There are no treatments proposed within Riparian Reserves, and no need for cross-channel yarding of timber. No logging equipment would cross streams. The physical integrity of the groundwater sources that feed the fens in and adjacent to Unit 28-3-25A would be protected by a 180-foot "no treatment" area meant to eliminate soil disturbance and compaction. There would be no new permanent road crossings established on streams. Roaded area would not increase above threshold levels or pose a risk to peak flow enhancement. Consequently, this project would maintain the physical integrity of the aquatic system at the site scale.	The physical integrity of aquatic systems at the watershed scale would be maintained for the same reasons they would be maintained at the site scale.	As discussed on p. 120 of the EA, variable retention harvest and variable density thinning would not increase ECA to an extent that could potentially influence peak flows There are no treatments proposed within Riparian Reserves, and no need for cross-channel yarding of timber. No logging equipment would cross streams. There would be no new permanent road crossings established on streams. Roaded area would not increase above threshold levels or pose a risk to peak flow enhancement. Consequently, this project would maintain the physical integrity of the aquatic system at the site scale.	The physical integrity of aquatic systems at the watershed scale would be maintained for the same reasons they would be maintained at the site 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 in Units 28-3-17A, B and C as deemed necessary by BLM aquatics staff and would and only apply under Alternative 2, Sub-Alternative B. "No-treatment" areas astride streams would protect stream banks from erosion that could contribute sediment to streams and would serve to capture any sediment laden overland flow from harvested upland stands. At least 50 perfect canopy cover would be retained outside of "no treatment" areas within the Riparian Reserves to provide shade, and prevent	Based on the information discussed at the site scale, this project would also restore water quality at the watershed scale.	All aquatic resources would have a full site potential tree height "no-treatment" buffer which would protect stream banks from erosion that could contribute sediment to adjacent streams and would serve to capture any sediment laden overland flow from harvested upland stands. Sufficient canopy would be retained to provide shade, preventing an increase in stream temperatures. Implementation of additional Project Design Features (PDF) as listed on pp. 114 and 118 the EA would ensure water quality not be degraded by proposed road work. Road and ditch renovation, installation of	Based on the information discussed at the site scale, this project would also maintain water quality at the watershed scale.	There are no aquatic resources in or adjacent to the proposed project. Road renovation, improvement, construction, and variable retention harvest would all be located on a ridgeline or stable side slopes immediately below a ridge where they would be effectively disconnected from the stream network. There would be no impact to water quality which would be maintained.	Based on the information discussed at the site scale, this project would also maintain water quality at the watershed scale.

	increases in stream temperatures. Implementation of additional Project Design Features (PDFs) as listed on pp. 114 and 118 of the EA would ensure water quality 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 live streams would remove the mechanism for sediment transport to streams. Cross-channel yarding would rely on at least one end suspension of timber to minimize sediment potential. No logging equipment would cross streams. There would be no new road construction in or adjacent to Riparian Reserves. Water quality would improve as a result of the installation of additional road drainage structures. Therefore water quality is being restored.		additional road drainage structures, seasonal restrictions on haul over unsurfaced roads, and sediment traps in ditches close to live streams remove the mechanism for sediment transport to streams. No logging equipment would cross streams. There would be no new road construction in or adjacent to Riparian Reserves. Cross-channel yarding of timber would not occur. Water quality would be maintained at the site scale.			
5. *Maintain and restore the sediment regime under which aquatic ecosystems evolved.*	As mentioned above, "no-treatment" areas established on streams in or adjacent to proposed units and PDFs for road work would prevent disturbance to stream channels and stream banks and intercept surface run-off allowing sediment transported by overland flow to settle out before reaching active waterways. Due to the installation of additional road drainage structures, the natural sediment regime would trend towards restoration.	Based on the information discussed at the site scale, this project would also trend towards restoring the historic sediment regime at the watershed scale.	As mentioned above, "no-treatment" areas established on streams in or adjacent to proposed units and PDFs for road work would prevent disturbance to stream channels and stream banks and intercept surface run-off allowing sediment transported by overland flow to settle out before reaching active waterways. Therefore, the natural sediment regime would be maintained at the site scale.	Based on the information discussed at the site scale, this project would also maintain the historic sediment regime at the watershed scale.	Based on the information described in Objective 4, this project would maintain the historic sediment regime at the site scale.	Based on the information discussed at the site scale, this project would also maintain 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,*	As discussed on p. 120 of the EA, variable retention harvest and variable density thinning would not increase ECA to an extent that could potentially influence peak flows.	In-stream and peak flows would be maintained at the watershed scale for the same reasons they would be maintained at the site scale.	As discussed on p. 120 of the EA, variable retention harvest and variable density thinning would not increase ECA to an extent that could potentially influence peak flows.	In-stream and peak flows would be maintained at the watershed scale for the same reasons they would be maintained at the site scale.	As discussed on p. 120 of the EA, variable retention harvest and variable density thinning would not increase ECA to an extent that could potentially influence peak flows.	In-stream and peak flows would be maintained at the watershed scale for the same reasons they would be maintained at the site scale.

nutrient, and wood routing.	As discussed on p. 120 of the EA, the project would not increase roaded area to an extent where peak flows could potentially be enhanced. This project would maintain stream flows within the range of natural variability at the site scale.		As discussed on p. 120 of the EA, the project would not increase roaded area to an extent where peak flows could potentially be enhanced. This project would maintain stream flows within the range of natural variability at the site scale.		As discussed on p. 120 of the EA, the project would not increase roaded area to an extent where peak flows could potentially be enhanced. This project would maintain stream flows within the range of natural variability at the site 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. Therefore, it would also maintain stream interactions with the floodplain and respective water tables 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.	As discussed in Objective 6, this project would maintain stream flows within the range of natural variability at the site scale. Additionally, the fens of Unit 28-3-25A would receive a "no-treatment" area of 180 feet which would adequately protect water table elevations. Given these conditions, stream interactions with the floodplain and respective water tables at the site scale would be maintained.	At the watershed scale, this project would also maintain stream interactions with the floodplain and respective water tables within the range of natural variability.	As discussed in Objective 6 above, this project would maintain stream flows within the range of natural variability at the site scale. Consequently, it would also maintain stream interactions with the floodplain and respective water tables 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.*	The proposed project is designed to return riparian stands in Units 28-3-17A, B and C to a more natural density, species diversity, and growth trajectory. This could include enhancing deciduous tree development and increasing light in riparian stands. These actions would aid in restoring plant species composition and structural diversity at the site scale.	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.	There are no treatments proposed within Riparian Reserves. Treatment was not deemed necessary following field surveys by BLM aquatics staff. The ACS objective would be maintained.	Riparian Reserves in the watershed would remain unchanged from the current condition. The ACS objective would be maintained.	Due to lack of proximity, Riparian Reserves at the site scale would remain unchanged from the current condition. The ACS objective would be maintained.	Riparian Reserves of the watershed would remain unchanged from the current condition. The ACS objective would be maintained.
9. *Maintain and restore habitat to support well-distributed populations of native plant, invertebrate and vertebrate riparian-dependent species.*	As described in Objective 8, the intent of this project is to set riparian stands on a trajectory that would trend toward historical conditions. It is expected that as a result of working to restore riparian stands, riparian dependent species would positively respond, thus restoring the objective.	The intent of this project is to restore riparian stand conditions. Improving riparian stand conditions would help restore adequate habitat to support riparian-dependent species at watershed scales.	There are no treatments proposed within Riparian Reserves. Treatment was not deemed necessary following field surveys by BLM aquatics staff. The ACS objective would be maintained.	Riparian Reserves in the watershed would remain unchanged from the current condition. The ACS objective would be maintained.	Due to lack of proximity, Riparian Reserves at the site scale would remain unchanged from the current condition. The ACS objective would be maintained.	Riparian Reserves of the watershed would remain unchanged from the current condition. The ACS objective would be maintained.

Summary:

Based upon the information listed above, the proposed action would meet Aquatic Conservation Strategy objectives at the site and watershed scale. 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 watershed, this project would not retard or prevent attainment of ACS objectives but would actually speed attainment of these objectives. Therefore, this action is consistent with the Aquatic Conservation Strategy, and its objectives at the site and watershed scales.

Appendix F
Carbon Storage/Release Analytical Methodology

Project: Roseburg Pilot Project – Alternative Two, Sub-Alternative B
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This appendix lays out the analytical methodology for calculating carbon storage and release for Alternative Two, Sub-Alternative B. It is intended to show the reader the assumptions used and the calculations from which the figures were derived. The same assumptions and methodology shown below were applied to Alternative One; Alterative Two, Sub-Alternative A; Reference Analysis One; and Reference Analysis Two. The results are contained in Table 3-25.

Analysis of Carbon Storage

It is recognized that there is a variety of scientific literature available regarding the quantitative measures (e.g. decay rates of slash, fire consumption of slash, fuel use and efficiency, haul distances, etc.) and additional factors that may be used in calculating carbon storage that can influence the outcome of this analysis. However, the methodology described here provides a consistent means to compare the relative effects of the alternatives considered in Pilot Project and not necessarily the absolute amount of carbon that would be stored or released under the alternatives.

The analysis of carbon storage modeled the amount of carbon stored in the forest and harvested wood products, and the amount of carbon released into the atmosphere to harvest those wood products. The analysis divided carbon storage/release into six pools:

- Standing, Live Trees
- Other Than Live Trees
- Wood Products
- Slash Burning
- Logging Slash
- Fossil Fuels

The carbon in these six pools was summed at each time step to calculate the Net Carbon Balance by alternative.

Carbon Storage in Standing, Live Trees

The carbon pool of "Standing, Live Trees" represents the live trees that are developing currently and would develop in the future within the proposed units.

1. Standing, live tree carbon was derived in this analysis using the outputs from the ORGANON model (Hann et al., 2005) for standing tree volume in the proposed units over time for each alternative.

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. The cubic foot tree volumes per acre were converted to pounds of biomass using a conversion factor of 35 pounds of biomass/cubic foot (2008 FEIS, Appendices-28, Table C-1). Biomass was assumed to be Douglas-fir in this analysis.

4. The pounds of biomass per acre derived from tree volumes were expanded to a total biomass for entire trees (including branches, bark, and roots) per acre by multiplying by 1.85 (2008 FEIS, Appendices-28).

5. The expanded biomass for entire trees per acre was converted to pounds of carbon per acre by multiplying by 0.50 (2008 FEIS, Appendices-28).

6. Pounds of carbon in whole trees per acre were converted to tonnes of carbon in whole trees per acre by dividing by 2200 (2008 FEIS, Appendices-28).

7. The tonnes of carbon in whole trees per acre were converted to tonnes of carbon in whole trees within each proposed unit by multiplying by the size of the unit in acres.

8. The tonnes of carbon in whole trees within the project were derived by summing the tonnes of carbon in whole trees within each unit. It is this summation that is shown in Table 3-25 as "Standing, Live Trees".

Carbon Storage in Forests Other than Live Trees

The carbon pool of "Other than Live Trees" represents shrubs, brush, snags, woody debris, and organic carbon in the soil within the proposed units.

1. Carbon in other than live trees for each unit was derived by multiplying the unit acreage by the tonnes of carbon per acre shown in Table F-1 (which was adapted from Table C-2 in the 2008 FEIS, Appendices-29). The stands in the Pilot Project were aged based on the time steps used in the analysis (i.e. 10, 20, and 50 years after the current condition) and the corresponding tonnes of carbon per acre was used in the calculations of other than live tree carbon. A weighted average was used to determine the average age of the stands in the project area.

2. The tonnes of carbon within the project were derived by summing the tonnes of carbon within each unit. It is this summation that is presented in Table 3-25 as "Other Than Live Trees".

Table F-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
≥ 125 years	Developed Structurally Complex	94.8

* adapted from 2008 FEIS, Appendices-29.

Carbon Storage in Wood Products

The carbon pool of "Wood Products" represents the amount of carbon that would be converted from standing, live trees into either saw logs or pulpwood, collectively referred to as wood products under the proposed action. There would be no carbon pool of wood products under the No Action Alternative since wood products would not be generated.

1. The tonnes of carbon in whole trees were derived previously in Steps 1-7 under "Standing, Live Trees" for the time steps used in this analysis. The difference between the tonnes of carbon in whole trees at "current condition" and at "harvest time" would be the tonnes of carbon in whole trees that would be harvested.

2. The tonnes of carbon in whole trees that would be harvested per unit were summed to provide the total for the project.

3. The tonnes of carbon in whole trees that would be 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 (derived in Step 4 of "Standing, Live Trees").

4. At harvest time, 13.5 percent of the saw log's carbon would immediately be released Smith et al. (2006); but afterwards the carbon in saw logs would be gradually released over time. The tonnes of carbon held in saw logs were then decayed over time by multiplying the tonnes of carbon in saw logs harvested by the values shown in Table F-2 which were adapted from the 2008 FEIS, Appendices-30 and Smith et al. (2006).

5. Additional tonnes of carbon held in pulpwood (e.g. chips) were derived by multiplying the 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 time, 14.8 percent of the pulpwood's carbon would immediately be released Smith et al. (2006); but afterwards the carbon in pulpwood would be gradually released over time. The tonnes of carbon held in pulpwood were then decayed over time by multiplying the tonnes of carbon in pulpwood by the values shown in Table F-2 which were adapted from the 2008 FEIS, Appendices-30 and Smith et al. (2006).

7. The sum total of the tonnes of carbon immediately released from saw logs (derived in Step 4 above) and from pulpwood (derived in Step 6 above) represent the total amount of carbon released by "Wood Products" at harvest time. The sum total of the tonnes of carbon held in saw logs (derived in Step 4 above) and held in pulpwood (derived in Step 6 above) at each time step represent the amount of carbon stored in "Wood Products" as shown in Table 3-25.

Table F-2. Fraction of Carbon Remaining or Captured as an Alternative Energy Source*.

Timestep	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 2008 FEIS, Appendices-30 and Smith et al. 2006)

Carbon Release in Slash Burning

The carbon pool of "Slash Burning" represents the amount of slash generated by the proposed timber harvest that is consumed through prescribed burning. There would be no carbon pool of slash burning under the No Action alternative since logging slash would not be generated and therefore not burned.

1. The amount of slash burned in landing piles for areas commercially thinned was calculated by averaging slash burned in recently implemented sales under similar conditions and was found to be 2.0 tonnes of biomass per acre. Tonnes of slash to be burned were calculated by multiplying 2.0 tonnes by the total number of acres in the project area (A. Wheeler, pers. comm., 2009).

2. It was assumed that 90 percent of the slash scheduled for pile burning would be consumed (K.Kosel, pers. comm., 2009); thereby releasing carbon. The tonnes of slash biomass per acre consumed were derived by multiplying the tonnes of slash biomass per acre by 0.90.

3. The tonnes of slash biomass consumed per acre were converted to tonnes of carbon released per acre by using a conversion factor of 0.50 tonnes of biomass/tonne of carbon. It was calculated that an average of 0.9 tonnes of carbon would be released per acre of commercial thinning and/or variable density thinning unit scheduled for piling and burning using prescribed fire.

4. The release of carbon from pile burning in areas treated by regeneration harvest was calculated the same as areas treated by thinning except 4.0 tonnes of slash was used. The total amount of 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). An average of 15.2 tonnes of slash was used. 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

The carbon pool of "Logging Slash" represents the limbs, fine branches, leaves/needles, stumps, and roots of harvested trees that are left on-site in the proposed units after harvest operations that are not consumed during slash burning. There would be no carbon pool of logging slash under the No Action Alternative since logging slash would not be generated.

1. The tonnes of logging slash remaining on-site was calculated by subtracting the following three amounts of carbon from the total tonnes of carbon in whole trees that would be harvested from the project (derived in Step 2 under "Wood Products"):
    - the tonnes of carbon immediately released from wood products (derived in Step 7 of "Wood Products"),
    - the tonnes of carbon stored in wood products at harvest time (derived in Step 7 of "Wood Products"), and
    - the tonnes of carbon released from slash burning.

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 F-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 3-25.

Table F-3. Decay Rates of Carbon from Douglas-fir Slash*.

Timestep	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 through the consumption of gasoline and diesel fuel by various harvest-related activities under the proposed action such as: timber falling, timber yarding, log hauling, and road construction and renovation. There would be no carbon pool of fossil fuels under the No Action Alternative since no harvest-related activities would occur.

1. The gallons of fuel that would be consumed during harvest operations (i.e. timber felling and yarding) were estimated based on the production rates and fuel efficiencies shown in Table F-4. It was assumed that equipment was in operation for 8.5 hours.

Table F-4. Fossil Fuel Consumption during Harvest Operations.

Equipment	Production Rate[a] (acres/day)	Fuel Efficiency[b] (gallons/hour)
Chainsaw (gasoline)	0.4	-
Motorized Carriage (gasoline)	1	-
Cable/Skyline Yarder (diesel)	1	6.1
Loader (diesel)	1	4.5
rubber tire skidder (diesel)	2	4.8
tracked tire skidder (diesel)	2	3.6
Harvester (diesel)	3	4.7
Forwarder (diesel)	3	4.3

[a] based on experience of BLM Contract Administrators and Crusier/Appraisers.
[b] based on World Forestry Institute (1997).

2. For the hauling of logs, this analysis assumed an average log-truck load of 4,500 BF (based on experience of BLM Contract Administrators and Cruiser/Appraisers) and a fuel efficiency of 6.0 miles per gallon. The length of haul was assumed to be 60 miles (round trip).

3. For road construction it was assumed that 588 gallons of diesel would be consumed per mile (5,280 feet) of road constructed and 73 gallons per mile of road renovated (Loeffler et al., 2009).

4. For road rocking it was assumed that for every station (100 ft.) 57.5 yards of rock would be used based on (BLM, 1970). It was also assumed that a truck would hold 10 yards and the average miles per load would be 60. The fuel mileage was assumed to be 6 mile per gallon.

5. The gallons of fuel that would be 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. The total gallons of fuel that would be consumed were converted to tonnes of carbon that would be 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 the proposed action is shown in as "Fossil Fuels" in Table 3-25.

Appendix G

Scoping Summary

Written scoping comments were received from the following organizations and individuals:

A. Brian Tenbusch, American Forestry Resource Council
B. Rocky McVay, Association of O&C Counties
C. Rex Storm, Associated Oregon Loggers 1
D. Francis Eatherington, Cascadia Wildlands, and George Sexton, Klamath Siskiyou Wildlands Center
E. Jay Walters, Cow Creek Tribe of Indians
F. Dennis Morgan, general public
G. Melvin Thornton, Douglas Forest Protective Association
H. Cindy Haws, Myrtle Creek Rural Community Partnership for Sustainability
I. Doug Heiken, Oregon Wild
J. Mike Cloughesy, Oregon Society of American Foresters
K. Kelly Crispen and Mary Scurlock, Pacific Rivers Council
L. Bill Richardson, Rocky Mountain Elk Foundation

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Subject of Concern	Comment Number	Author Reference	Comment	How Comment is Answered or Incorporated into an Alternative
Riparian and Stream Tr4eatments	1	K, D, H, I	Only treat riparian areas where it is needed to meet the objectives of the Aquatic Conservation Strategy.	Appendix E, Consistency of the Proposed Action with Objectives of the Aquatic Conservation Strategy, specifically addresses the proposed treatments in Riparian Reserves in Section 17, T. 28 S., R. 3 W. The EA (p. 123) further discusses the desirability of such treatments to enhance vegetative diversity.
	2	K	Wants to see a scientific justification for active silvicultural treatments in the riparian areas.	Riparian Reserves proposed for treatment were selected by Fisheries, Hydrology, Wildlife, and Forestry staff during pre-consultation with a National Marine Fisheries Service (NMFS) Fisheries Biologist. Treatment objectives were based on the lack of structural diversity and ecological integrity such as small and large functional wood and riparian understory vegetation. The effects to stream temperature and turbidity in addition to aquatic and terrestrial habitat were taken into account during the selection of the Riparian Reserves to be treated, and are addressed in the EA (pp. 122 and 123).
	3	D	Include an alternative that has no riparian thinning.	Alternative One, Alternative Two, Sub-Alternative A and Reference Analysis Two do not contain riparian thinning options.
	4	L	Watershed Analyses for the Myrtle Creek Watershed show a need for increased large wood in streams. The BLM must determine where active restoration is needed.	The Roseburg District has been cooperating for years with other organization such as the Partnership for the Umpqua Rivers to plan and implement restoration projects in Myrtle Creek, based on the recommendations of watershed analyses. Where restoration opportunities, such as riparian density management, exist within areas proposed for treatments, they are considered. However, many restoration opportunities are outside the scope of the Purpose and Need of this project.
	5	A, E, J	Supports including riparian thinning in the project area (while ensuring it conforms to the Aquatic Conservation Strategy).	Alternative Two, Sub-Alternative B (EA, p. 22) includes variable density thinning in select Riparian Reserves to meet objectives of the Aquatic Conservation Strategy, specifically maintenance and restoration of the species composition and structural diversity of plant communities in riparian zones and wetlands
	6	C	Supports including riparian thinning that harvests more trees than the default level of the Northwest Forest Plan.	The degree of riparian thinning that can be undertaken is constrained by management direction from the 1995 Roseburg District Record of Decision and Resource Management Plan for the Roseburg District.

Aquatic Species Protection	7	K	Concern that the Coho salmon, a Federally listed species under the Endangered Species Act could be harmed by the project. If so, formal consultation would be needed.	The BLM prepared and submitted to the National Marine Fisheries Service (NMFS) a Biological Assessment with a determination of May Affect, Not Likely to Adversely Affect for the Oregon Coast coho salmon and its Critical Habitat. NMFS has verbally concurred with this determination but have not yet responded with its Letter of Concurrence.
Water Quality and Quantity	8	H	Project should restore connectivity of mature forests to increase summer water flow and storage	None of the subwatersheds in the project area are at risk of peak flow enhancement (EA, p. 109). Similarly, the current state of vegetation cover is such that water storage in the summer would not be impacted. Riparian Reserves are only being treated in Section 17, T. 28 S., R. 3 W., where current vegetative conditions do not maximize water retention. By treating these stands, a more diverse riparian community would be encouraged which in turn would be better suited for summer water retention. Following treatment, Riparian Reserves would not be re-planted as objectives would be met by reducing stocking densities and enhancing existing hardwoods.
	9	H	Project will make summer low flows lower. The findings of Grant et. al, 2008, are being misapplied by the BLM.	The findings of Grant et al., 2008, cited in the EA (p. 120), apply to peak flow enhancement in a winter storm setting and do not apply to summer low flow reductions or water storage.
Landscape Level Planning	10	G, I, J	Use landscape level planning to determine where best to do these treatments and how well the goals are met.	The Roseburg District Secretarial Demonstration Pilot Project did not lend itself to landscape-level analyses. The Secretary of Interior asked Drs. Franklin and Johnson to demonstrate their principles by implementing a specific project. Drs. Franklin and Johnson, in collaboration with the BLM, identified the proposed project area as suitable for their demonstration. The process used does not represent an exhaustive search for all suitable treatment areas in the Roseburg District or the Myrtle Creek watershed. These questions are best addressed in broader land-management planning. On March 9th the BLM published a Notice of Intent to initiate such a planning effort for lands in western Oregon, which will provide the opportunity to address landscape-level issues.
	11	J	Must analyze effects of fuel treatments on a landscape context.	

Early Seral Habitat	12	D, H	The Purpose and Need must be better defined and should identify what diversity is needed that is not already present in adjoining private-land clearcuts.	Drs. Johnson and Franklin have explained the differences in diversity between their variable-retention regeneration harvest prescription and the prescription commonly implemented on private lands at public meetings and field trips (EA, p. 4). This issue is also discussed in their paper: Johnson, K. Norman, and Jerry Franklin. 2009. *Restoration of Federal Forests in the Pacific Northwest: Strategies and Management Implications*. Institute of Applied Ecology. Corvallis, OR.
	13	J	Specific need for early seral habitat has not been documented. Should just set aside limited areas within the project area and let natural regeneration take its course.	See response to Comment # 12.
	14	I	The EA should demonstrate that the existing amount of early-seral habitat is inadequate.	The EA (Tables 3-2 and 3-3, p. 35) describes the current age class distribution of the project area watersheds.
	15	D, H, I	Consider creating early seral habitat by treating young plantations.	One objective of the Purpose and Need is to offer timber sales that support large and small commercial operations (EA, p. 2). Treating young plantations, alone, would not accomplish this (EA, p. 52) and is therefore outside of the Purpose and Need of this project.
	16	I	Rely on natural processes to create early seral habitat.	See response Comment # 15.
	17	D	Compare amount of early seral habitat that would be created by thinning with the amount that would be created by the proposed project.	Effects of various harvest types on early-seral vegetation are discussed in the Chapter Three of the EA (pp. 45 and 46).
	18	I	Create early seral habitat by including gaps in thinning projects	This is done on projects, when and where appropriate, such as variable-density thinning within the Late-Successional Reserve and Riparian Reserve land use allocation.
	19	I	Protect existing shrub component	The process of harvesting and site preparation would impact the amount and distribution of the existing shrub component. The very nature of the proposed action prohibits protection in the strict sense of the word. Shrubs are likely to be present within undisturbed areas in the harvested area and are expected to recolonize harvested areas by sprouting and from seed (EA, pp. 45 and 46).

	20	L	Strongly supports forest management that develops, restores, or enhances early seral type vegetation used by deer and elk.	The proposed regeneration harvest described under Alternative 2 Two expected to produce early-seral forest conditions for a period of up to 30 years before conifer dominance and canopy closure is expected (EA, p. 46).
	21	L	Where thinning is prescribed, thin canopy to or below 40% crown closure to ensure light reached ground and promotes establishment of early seral vegetation.	Limited thinning is proposed in Alternative Two, Sub-Alternative B, and thinning effects are also described in Reference Analysis One. In order to conform with management direction in the Roseburg District Record of Decision and Resource Management Plan, and meet Aquatic Conservation Strategy objectives, the project design maintains canopy cover post-harvest at over 50 percent (EA, p. 23).
	22	L	Retain meadows and any other natural openings	No meadows exist within the proposed harvest units. In this area natural openings are commonly wet areas which would be encompassed within untreated Riparian Reserves. In upland areas, openings are commonly associated with rock outcrops or shallow soils and would remain so.
	23	L, F	In thinned stands, create gaps of 1 to 5 acres oriented east, south, or west on slopes of 30 percent or less.	Variable-retention harvesting, not thinning is the primary treatment proposed by Alternative Two. Variable density thinning is confined to Riparian Reserves under Alternative Two, Sub-Alternative B and Reference Analysis Two. The need to maintain average canopy cover at a minimum average of 50 percent and the relatively small area to be thinned under Alternative Two, Sub-Alternative B does not provide the opportunity to create gaps of one to five acres.
	24	L	In open areas plant shrubs that provide quality browse for wildlife.	The EA (pp. 21 and 22) describes artificial revegetation with grasses, forbs, shrubs and hardwood trees.
	25	L	Seed all disturbed areas with a native grass and forb seed mix that provides high value forage.	Seeding for forage purposes is addressed in the EA, as described above. Seeding disturbed areas is also addressed in the EA (p. 22) as a measure that would be taken to discourage establishment of noxious weeds and invasive non-native plants.
Snags, logs, and Retention Trees	26	D	The EA should describe how the snag component will be restored and retained and how the target level of snags compares to natural snag-producing events.	Provisions for snags and large down wood are addressed in the descriptions of the alternatives and reference analyses, in Chapter Two. The discussion particular to Alternative Two is on pages 13 and 14.

	27	D	Consider creating patches of snags using fire rather than regeneration harvest.	One objective of the Purpose and Need is to offer timber sales that provide jobs and contribute timber for manufacturing. Creating snags and not harvesting is therefore outside of the Purpose and Need of this project. It is anticipated that harvesting and prescribed burning would create additional snags to supplement those reserved in aggregates and dispersed retention (EA, p. 13).
	28	D	Compare the amount of trees retained in a Northwest Forest Plan regeneration harvest with the amount of trees retained in this project.	The predicted number of trees that would be retained under Alternative Two and Reference Analysis Two are presented in the EA Table 3-8, p. 41 and Table 3-16, p. 53). Reference Analysis Two is a Northwest Forest Plan regeneration harvest that would conform to the 1995 Roseburg District Record of Decision and Resource Management Plan (EA, p.28).
	29	I	Retain all old and large trees and legacy structures	"Old and large trees and legacy structures" would be retained in aggregate retention areas and as dispersed retention within the variable retention harvest areas (EA, pp. 12 and 13).
	30	I	Protect under represented species such as yew, cedar, hemlock, pine, and hardwoods.	Retention would reflect the existing conifer species composition of the snags (EA, p. 13) in both the aggregate and dispersed retention.
	31	I	Northwest Forest Plan standards for down wood and snags are outdated and underestimate quantities needed	The Roseburg District Record of Decision and Resource Management Plan provides management direction for down wood and snag levels (EA, p 13). Changing the specified levels would require a revision of the current plan, or adoption of a new land use management plan. That process is outside the scope of the proposed project.
	32	I	Regeneration harvest will worsen the current deficit of coarse wood in our forests.	Post-harvest, levels of coarse [down dead] wood are expected to meet or exceed the levels required by the Record of Decision and Resource Management Plan for the Roseburg District (EA, pp. 13 and 14).
	33	J	Retention blocks should be bigger than the proposed one-third to three acre size in order to maximize their effectiveness as habitat and to minimize harvest cost and stand damage	Aggregate retention blocks vary in size based on the total retention goals and resource issues. Considering all land use allocations the maximum aggregate size is about 29 acres. Considering only areas outside the Riparian Reserves the maximum aggregate size is about 15 acres (EA, Table 2-1, p. 11).

Spotted Owl Habitat	34	I	Do not log suitable spotted owl nesting, roosting, foraging habitat.	Existing levels of suitable northern spotted owl nesting, roosting, and foraging habitat were taken into account during unit pool refinement and development of proposed prescriptions (EA, p. 10). While it is not possible to completely avoid harvest in these areas while maintaining consistency with project purpose and need, effects to these habitats have been minimized to the degree practicable.
	35	I	The landscape is already too fragmented. In order to better locate areas for treatment, the BLM should create a spotted own risk map that considers a variety of habitat characteristics.	In order to minimize potential effects to the northern spotted owl, existing home ranges, reproductive status and habitat conditions were taken into account during unit pool refinement and development of proposed prescriptions. The U.S. Fish and Wildlife Service provided technical assistance in these processes, as well as in field identification of high quality habitat for retention under the proposed action.
	36	D	The no action alternative should consider how much spotted owl habitat exists within the watershed	Amount and distribution of northern spotted owl habitat in the Myrtle Creek watershed was taken into account during unit pool refinement (EA, p. 10). Effects to northern spotted owl habitat under the proposed action have been minimized to the degree practicable consistent with project purpose and need.
Late Seral Habitat	37	D	The no action alternative should consider the benefits of doing nothing in older stands.	Alternative One analyzes the effects of taking no action.
	38	D	The no action alternative should consider the cumulative effects of potential treatments under the Western Oregon Plan Revision.	The relevant planning document for this project is the 1995 Roseburg District Record of Decision and Resource Management Plan for the Roseburg District, not the 2008 Record of Decision for the Western Oregon Plan Revision.

	39	D	What thinning will not occur because the BLM is busy doing the Pilot Project?	No work on thinning projects would be, or has been, deferred as a consequence of conducting the analysis of the Roseburg District Secretarial Pilot Project EA. The average annual ratio of planned regeneration harvest to thinning anticipated in the 1995 Roseburg District Record of Decision and Resource Management Plan is 8 to 1. In fiscal year 2012 the projected ratio is 0.2 to 1, a substantial difference from planned. Current proposed thinning projects substantially exceed current land use plan levels and current proposed regeneration harvest projects are substantially below projected levels. The Roseburg District Secretarial Demonstration Pilot Project proposes regeneration harvest in the form of a variable retention prescription (EA, Alternative Two). It is the only regeneration harvest planned in 2012. Approximately 25 percent of the Roseburg BLM's fiscal year 2012 timber volume allocation would be met by regeneration harvest as described in the proposed action (EA, Alternative Two). The remainder would come principally from thinning projects. See also the response to Comment # 59.
	40	H, I	Restore mature and late successional forest for Threatened and Endangered and other terrestrial species.	The BLM regularly conducts density management projects designed to speed the rate of development of late successional forest stands. However, that would be outside the Purpose and Need of this project which calls, in part, for the creation of early seral habitat for an extended period (EA, pp. 1 and 2).
	41	I	Thin forests rather than conducting regeneration harvests	The BLM regularly conducts thinning projects. However, replacing regeneration harvest with thinning would be outside the Purpose and Need of this project which calls for variable retention harvest, a modified version of regeneration harvest. to create early seral habitat (EA, pp. 1 and 2) See also response to comments # 39 and #59.
	42	I	Conserve mature forests. They provide habitat and are the closest to becoming later-seral forests.	A large percentage of mature forests are designated as Late Successional Reserves and Riparian Reserves by the Roseburg District Record of Decision and Resource Management Plan for that express purpose. However, the project area does not fall in one of these areas. Instead, the project area falls within the General Forest Management Area, Connectivity/Diversity Blocks and Adaptive Management Area in which timber production is an emphasis.

Reforestation	43	D	Create an alternative in which all regeneration is by natural means and no trees are planted.	An alternative with no tree planting is not likely meet management direction for reforestation in the Roseburg District Record of Decision and Resource Management Plan. Management direction (ROD/RMP, p. 63) requires that reforestation generally occur within one year of the completion of harvest and site preparation. Adequate natural regeneration within that time frame is not considered a reliable option for meeting BLM reforestation stocking standards (EA; p. 46). Discussions between BLM inter-disciplinary team members and Franklin and Johnson occurred on August 9, 2011. Franklin and Johnson stated that the planting of approximately 200 to 250 trees per acre would meet their objective of an extended early-successional stage of forest development. Subsequent BLM analysis supports that conclusion. Franklin's and Johnson's marking guide dated 4/24/2011 states: *"Tree planting will be conducted at low levels (e.g., 200 +/- trees/acre to assure basic levels of restocking; natural regeneration will be expected to significantly augment the planting over time."*
	44	D, I	Drs. Johnson and Franklin write that regeneration should be primarily natural. Justify why the BLM proposes to plant trees.	See response to comment # 43 above.
	45	F	Be sure that desired plants will grow back before harvesting an area.	The expected sequence of vegetation development following harvesting is described (EA, pp. 45 and 46): Planted seedlings would be comprised of native species appropriate to the specific sites (EA, Table 2-3, p. 21).
	46	C, E	Use herbicides for site preparation and seedling release in order to ensure the establishment of new conifer stands.	Herbicides are currently not available for use in site preparation and seedling release by BLM in western Oregon, with the exception of control of noxious and invasive weed species. Site preparation, post-harvest, would be achieved through the application of prescribed fire. Seedling maintenance and release would be accomplished by manual methods, e.g. mulching, tree leader protectors, shrub cutting or pulling with hand tools, chainsaws etc. Treatments would be centered on individual trees, not applied in a blanket manner. Treatments prescribed are based on pre and post-harvest site specific assessments (EA, p. 21)

Monitoring	47	D	Monitoring is an important component of this project. Include a plan for monitoring the results.	Implementation monitoring is required by the ROD/RMP, and will be focused on appropriate resources (EA, p. 154). Long term monitoring on the effectiveness of the proposed action on the creation of complex early seral habitat will be conducted over a period of years and will be used to actively manage conifer density (EA, p. 21).
Forest Carbon	48	D	Analyze the carbon budget for this project	The Carbon Storage and Release Section Chapter Three of the EA (pp. 146-153 and Appendix F) analyzed the carbon budget for the alternatives and reference analyses.
	49	J	Optimize carbon storage by maintaining and enhancing mature forests	Carbon Storage and Release in Section IV of Chapter Three (EA, p. 148 and Table 3-27, p. 153) analyzed Alternative One (No Action), which produced the largest amount of stored carbon. The No Action Alternative is outside of the Purpose and Need for the project and is not a selectable alternative.
Social and Economic	50	H	Project is driven by corporate timber interests versus the social and economic needs of local community.	As described in Chapter One (EA, pp. 1-3), the project is driven by a variety of factors, including but not limited to: the Roseburg District Record of Decision and Resource Management Plan, the direction of the Secretary of Interior, the interest of the Oregon Congressional delegation, and the principles of Drs. Johnson and Franklin. The project objectives and design were further refined by public input gathered at meeting and field tours and in writing.
	51	I	Create jobs by implementing restoration projects, such as thinning, watershed restoration, and road stabilization removal.	The BLM actively implements thinning, watershed restoration, and road improvement projects. However, these projects do not replace the Purpose and Need for this project (EA, pp. 1-3).
	52	I	Logging mature forests is not needed to provide jobs. Only a small fraction of forest jobs are related to mature forest logging on Federal lands.	The proposed project area lies within the General Forest Management Area, Connectivity/Diversity Block and Adaptive Management Area land use allocations as designated by the Roseburg District Record of Decision and Resource Management Plan. Timber production is an important component. The need to provide timber to contribute to job creation is analyzed at a broad scale in land management plans, not at the individual project level. Part of the Purpose and Need of this project is to produce timber (EA, pp. 1-3).
	53	A, B	Include an economic analysis that displays the difference in jobs and economic growth between alternatives.	An analysis of this sort is beyond the scale of this project and would need to be addressed in a broader land management planning effort. On March 9th the BLM published a Notice of Intent to initiate such a planning effort for lands in western Oregon. This effort would provide an opportunity to conduct an analysis that addresses economic growth and job creation.

	54	A	Design the project to use locally available and appropriate harvesting systems.	The project was designed to be harvested with commonly used cable yarding and ground-based equipment (EA, pp. 14 and 47).
	55	C	Include a person on the ID team assigned to operational and economic issues.	A timber appraiser was added to the ID team. An analysis of the economic efficiency of the different alternatives and reference analyses has been provided (EA, pp. 47, 50, 52, and 57).
Timber Production	56	A, C	Include an alternative that maximizes timber production, minimizes logging costs, has a minimum number of operating restrictions, and includes the harvesting of large trees and construction of new roads.	These issues have been considered in the design of the proposed project. However, an alternative that maximized timber production and minimized costs would have been outside of the Purpose and Need. The third objective under the Purpose (EA, p. 2) "is to design and offer timber sales that would provide jobs and contribute timber for manufacturing," It does not call for maximizing harvest and minimizing cost. Instead, the alternatives balance timber production and resource protection in each alternative and reference analysis. A comparison of logging costs, specific to yarding, is provided as discussed above at #55.
	57	C	Harvest more large and mature stands and leave fewer leave trees than the default Northwest Forest Plan level.	While some harvest of mature trees is proposed under Alternative Two, Sub-Alternatives A and B, the project must conform to the Roseburg District Record of Decision and Resource Management Plan which is tiered to and must conform with the Northwest Forest Plan.
	58	J	Less intensive reforestation will lead to decreased future stand growth and should be analyzed.	The estimated reduction of tree regeneration growth rate was analyzed based on the amount and distribution of green-tree retention in individual units (EA, pp. 40, 41, and 44).
	59	I	Produce wood via thinning projects	The BLM regularly conducts thinning projects. This project proposes variable-retention harvest in addition to on-going and planned thinning projects. Replacing the regeneration harvest proposed in this project with thinning would be outside the Purpose and Need of this project which calls for the application of variable retention harvest in order to create early seral habitat (EA, pp. 1-3). In fiscal year 2012 the thinning component of the Roseburg District's initial timber harvest plan comprised an estimated 75 percent by volume measure and 83 by acreage. Thinning exceeds the assumed average annual acreage in the Roseburg District Record of Decision and Resource Management Plan by approximately 1,200 percent,

	60	H, I	The early seral vegetation resulting from regeneration harvest will create a more severe fire risk.	Early seral systems can be more fire prone however the size of the treatments within the larger landscape of the area would not increase the overall fire risk. Since would be lightly planted, depending largely on natural regeneration, and stand densities would be actively managed over the first 15 years post-harvest to maintain early-seral conditions, the areas would not become a monoculture of small trees that could pose a more severe fire risk.
	61	F	Incorporate fuel breaks into harvest areas.	This option was considered but it was not incorporated into this project as it was already complex with short planning and survey windows.
	62	I	The expanded road system will increase motorized access and with that the chance of fire ignition.	There would be no increase in roads available to the public. All new roads, as well as select existing roads, would be blocked to traffic upon project completion (EA, Table 2-2, p. 17). Additional roadside treatment of activity fuels would also be conducted to reduce the risk of human-caused roadside ignition (EA, p. 20)
Roads	63	I	Avoid all road construction	The roads proposed in this project are intended to access landing sites necessary for effective and efficient unit harvest, or to move landings off of main roads to avoid traffic congestion and provide for emergency response (EA, p. 6).
	64	C	Build more roads than the default level of the Northwest Forest Plan	The roads proposed for construction are sufficient for the needs of conventional yarding systems. Building additional roads would not provide any further benefit, while incurring additional costs that would make the sales less economical and reduce revenues to the O&C Counties.
	65	G	After harvest, keep open and maintain all roads to allow access for fire fighters.	Almost all of the 1.2 miles of new road construction associated with the proposed action is located within unit boundaries. None would be needed for management purposes in the long term (EA, p. 6).
	66	F	Place harvest areas by existing roads so it will be a better fuel break and will be easier to access.	A large pool of candidate units was eliminated from further consideration because major access issues existed (EA, p. 10). All but one of the proposed harvest units has some measure of existing access. Five of the proposed units, comprising slightly more than 70 percent of the proposed harvest acreage, are located along roads 29-2-32.1 and 28-3-26.2, which are principally in ridge-top locations and serve as natural fuel breaks.

Weeds	67	I	Prevent weeds by avoiding soil disturbance and canopy removal	Proactive measures to control and prevent weed establishment and spread are undertaken as a part of the Roseburg District integrated weed management program (EA, p. 32). As described in Chapter Two (EA, p. 22), preventative measures would also be implemented in association with the proposed action.
	68	E	Use herbicides to prevent the spread of weeds into treatment areas	See the response to comment # 46.
Scope of Project	69	I	Public not given opportunity to influence the scope of the project. Regeneration harvest was pre-determined. However, plenty of opportunities for thinning remain.	The Secretary of Interior defined the broad scope of the project when he asked Drs. Norm Johnson and Jerry Franklin to demonstrate their concepts via pilot projects on the Roseburg, Medford, and Coos Bay Districts. Drs. Johnson and Franklin chose to demonstrate their ideas for variable retention harvest in a moist forest type on the Roseburg District, therefore thinning would not appropriate to the Purpose and Need. However, in order to illustrate the differences between a thinning and variable retention harvest, as defined by Johnson and Franklin, Reference Analysis One (EA, pp. 24—28) has been included. Although the broad scope of the project was set by the Secretary of Interior's direction, a series of public meetings and field tours (EA, p. 4) were held to give members of the public an opportunity to submit comments, many of which have been incorporated into the analysis.
	70	A	Describe the process used to select 250 to 350 acres for treatment out of the 31,000 acres of BLM-managed lands in the watershed.	This process is described in the EA (p. 10).
	71	A	Explain what the BLM intends to do with Matrix stands that are older than 110 and 160 years and project these criteria across the Roseburg District.	These stands remain in the Matrix land use allocations, and would be managed in accordance with this allocation as modified by new information, such as the Recovery Plan for the Northern Spotted Owl and its Critical Habitat Designation.
	72	J	Purpose and Need fails to state why there is a need for the Pilot Project. Should incorporate the goals of habitat improvement, wildfire hazard reduction, and sustainable timber supply.	Chapter One (EA, pp. 1-3) expands the purpose and need statement beyond that stated in the Scoping Notice. The goals of habitat improvement and sustainable timber supply are specifically included. Wildfire hazard reduction is not specific goal of this project but is incorporated into the design of the alternatives and analyzed in the effects (EA, pp.19-20 and 142-143)

O & C Act	73	A	Principles of the pilot project are not compatible with the sustained yield clause of the O & C Act.	This project conforms to the 1995 ROD/RMP, which incorporates the sustained yield requirement of the O & C Act.
	74	B	Add the sustained yield requirement of the O & C Act to the objectives of the pilot project.	See the response to comment # 74.
	75	J	Regeneration approaches to extending early seral habitat should be evaluated for consistency with the O & C Act.	The BLM would replant the variable retention harvest areas. Planting densities would be sufficient to restock the sites to at least the minimum stocking levels required by the Roseburg District Record of Decision and Resource Management Plan (EA, p. 20), which conforms to the O & C Act.