

***Myrtle Creek Commercial  
Thinning and Density  
Management  
Environmental Assessment***

Bureau of Land Management  
Roseburg District Office  
South River Field Office  
EA # OR-105-05-09

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# Chapter One

## PURPOSE AND NEED FOR ACTION

This chapter provides a brief description of the purpose and need for the proposed action being analyzed in this environmental assessment (EA).

### I. Background

The Roseburg District *Record of Decision and Resource Management Plan* ((ROD/RMP) USDI, BLM 1995) directs that commercial thinning be practiced in the Matrix where practical and where research indicates increased gains in timber production are likely (p. 62).

- In the General Forest Management Area commercial thinning would be programmed in stands under 80 years of age and would be designed to assure high levels of timber volume productivity (p. 151).
- In Connectivity/Diversity Blocks commercial thinning would be undertaken in stands up to 120 years of age and usually designed to assure high levels of timber volume productivity (p. 153).
- In Riparian Reserves density management is to be applied to control stocking levels, establish and manage non-conifer vegetation, and acquire vegetation characteristics consistent with Aquatic Conservation Strategy objectives (pp. 153-154).

A summary of recommendations for density management, stand selection criteria, and treatment recommendations in Riparian Reserves is contained in the Myrtle Creek Watershed Analysis and Water Quality Restoration Plan ((MCWA) USDI, BLM 2002a pp. 183-4). These include:

- Consideration of a first entry when stands are generally between 30 and 40 years old, crown ratios of dominant trees are 40 to 50 percent, and height growth rates are high;
- Consideration of stand structure and expected stand development, rather than stand age, as the principal criteria for treatment. Stands greater than 80 years of age that display a single layered canopy and little stand diversity should be considered for density management;
- Use of wide variable spacing to obtain rapid tree growth, a vigorous understory of trees or shrubs, large-limbed trees with very deep crowns, coarse tree form, and rough textured canopies. Where high tree growth rates are desired, stands should be managed to maintain a relative density index <sup>1</sup> below 0.55;

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<sup>1</sup> Relative density index compares the current density of a stand with the theoretical maximum density. In general terms it means that for a given average diameter, a stand can support a maximum number of trees per acre. Conversely, for a given number of trees per acre, there is a maximum average diameter possible. Relative density indicates whether the stand is growing well, is in need of thinning, can support an understory, or is experiencing suppression mortality.

- If deemed appropriate, use closer spacing or untreated areas to provide snags and coarse down wood through the natural process of suppression mortality;
- Use wider spacing where necessary to retain hardwoods as stand components in a hardwood/conifer mix appropriate for the vegetative zone;
- Consider removing young trees adjacent to large remnant trees in order to maintain vigorous growth of the larger trees; and
- Use canopy gaps to encourage the development of understory vegetation. Gap size should reflect local conditions and should be at least three-quarters of an acre in size if the retention of shade intolerant species is desired.

## II. Proposed Action

The proposed action is commercial thinning and density management in forest stands on BLM-managed lands within the Matrix in the Myrtle Creek fifth-field watershed. Approximately 1300 acres were evaluated. Field verification and stand examinations reduced the acreage deemed suited for thinning and density management to approximately 663 acres. Stands may be native in origin or the result of reforestation following a previous harvest or a stand replacing event such as fire or windstorm.

It is anticipated that the proposed action would yield between seven and eight million board feet (MMBF) of timber in support of local and regional manufacturers and economies. Volume derived from treatments in the General Forest Management Area and Connectivity/Diversity Block land use allocations would contribute toward the annual allowable sale quantity (ASQ) of 45 MMBF for the Roseburg District. Timber volume derived from density management in Riparian Reserves would not be chargeable towards this objective.

This EA will consider the environmental consequences of the proposed action and no action alternatives in order to provide sufficient evidence for determining whether there would be impacts exceeding those considered in the Roseburg District *Proposed Resource Management Plan/Environmental Impact Statement* (PRMP/EIS) which would require preparation of a Supplemental Environmental Impact Statement (SEIS). In addition to the PRMP/EIS, this analysis is tiered to and incorporates by reference the assumptions and analysis of consequences provided by:

- 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, 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, USDI 2001);

- The FSEIS *to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* (USDA, USDI 2004a); and
- The FSEIS *to Clarify Provisions Relating to the Aquatic Conservation Strategy* (USDA, USDI 2004b).

Implementation of the proposed action would conform to the requirements of the ROD/RMP. The ROD/RMP incorporates as management direction the standards and guidelines of the *Record of Decision for Amendments (ROD) to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* (USDA, USDI 1994b), as amended by 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, USDI 2001) and the 2004 *Record of Decision to Clarify Provisions Relating to the Aquatic Conservation Strategy* (USDA, USDI 2004).

### III. Objectives

The objective of the proposed treatments is reduction of the relative density of stands in order to maintain individual tree and stand vigor, consistent with stand and landscape objectives described in Appendix E of the Roseburg District ROD/RMP (pp. 150 and 152).

Commercial thinning in the Matrix would also:

- Provide a high level of quality wood and sustainable timber production from the General Forest Management Area; and moderately high levels of timber production from the Connectivity/Diversity Blocks (pp. 150-151); and
- Recover the commodity value of trees that would be lost to suppression mortality.

Similar treatments would be applied in Riparian Reserves to retain hardwoods as stand components, diversify the species and structural composition, and accelerate the growth of the retained trees. These proposed treatments are based on recommendations of watershed analysis, silvicultural staff, and management direction to develop vegetation characteristics needed to attain objectives of the Aquatic Conservation Strategy (pp. 153-154).

The timber volume derived from treatments in the General Forest Management Area and Connectivity/Diversity Block land use allocations would contribute to the Roseburg District annual ASQ, supporting socio-economic benefits envisioned in the PRMP/EIS (Vol. 1, p. xii). The PRMP/EIS estimated that BLM management programs (including timber sales) would support 544 jobs and provide \$9.333 million in personal income annually.

#### **IV. Decision Factors**

Factors to be considered when selecting among alternatives will include:

- The degree to which the objectives previously described would be achieved, including: the manner in which timber harvest would be conducted with respect to the type(s) of equipment and method of yarding; season(s) of operations; and the manner in which access would be provided, including road renovation, and the types and locations of road construction;
- The nature and intensity of environmental impacts that would result from implementing the alternative and the nature and effectiveness of measures to mitigate impacts to resources including, but not limited to wildlife and wildlife habitat, soil productivity, and water quality;
- Compliance with management direction from the ROD/RMP; and
- Compliance with applicable laws including, but not limited to, the Clean Water Act and the Endangered Species Act.

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## Chapter Two

# DISCUSSION OF THE ALTERNATIVES

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

### I. Alternative One – The Proposed Action

#### *General Unit Design and Marking Prescriptions*

Commercial thinning and density management would be used to reduce the relative density index<sup>2</sup> in generally even-aged forest stands dominated by Douglas-fir. These treatments would be developed consistent with management objectives for the individual land use allocations. Trees would primarily be removed from the suppressed and intermediate canopy classes, although some co-dominant and dominant trees could be removed where necessary to meet specific density objectives. Generally, trees selected for retention would have at least a 30 percent live crown ratio so that live crown expansion and accelerated diameter growth would be more likely following thinning (Daniel, et. al. 1979).

Stand ages are established by one of two methods. Where previous harvest and reforestation have occurred, operational inventory data may be used. In native stands, stand exams are the primary means for determining age and are derived based on the measured age of the dominant and co-dominant trees comprising the numerically predominant component of the stands that is the focus of thinning and density management.

Older remnant trees may be present, but are not the numerically predominant stand components or the focus of thinning and density management treatments. Large remnant trees would be retained to the greatest degree practicable. Circumstances under which these trees could be cut would be limited to: road rights-of-way; clearing landing areas; and operational safety concerns subject to Oregon State laws and regulations. Conversely, since treatments would focus on removal of intermediate and suppressed canopy layers, it is possible that suppressed trees designated for cutting may include trees older than the prevailing stand age.

Hard conifer and hardwood snags 16 inches or larger in diameter breast height and at least 20 feet in height would be marked for retention where they are considered likely to survive thinning operations. In some instances snags could be protected in the General Forest Management Area by buffering with rub trees or enclosed in untreated areas in the Riparian Reserve and Connectivity/Diversity Block allocations, where consistent with silvicultural objectives.

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<sup>2</sup> As discussed on page 1, relative density index compares current stand density to a theoretical maximum. The ration may be used as a guide to determine if stand conditions will support understory establishment and growth, and whether or not a stand is entering or already experiencing suppression mortality.

Snags would be retained to the greatest degree practical. Circumstances where snags could be felled would include: operational safety concerns subject to Oregon State laws and regulations; location in a road right-of-way; or where retention in untreated areas would preclude achieving the silvicultural objectives of the thinning and density management treatments. In Riparian Reserves felled snags would be retained as down wood. In the General Forest Management Area and Connectivity/Diversity Block allocations Matrix there is no large woody debris retention requirement for an intermediate entry, but down wood in Decay Classes 3, 4 and 5 would be reserved under contract provisions.

Stands in the General Forest Management Area would be thinned to a relative density index of 0.30 to 0.35 to maximize volume growth of the remaining trees. One-third to one-half of stand basal area would be removed and canopy closure reduced to between 45 and 60 percent. Minor conifer species would be retained to reflect the approximate percentages present in the stands.

Density management in Connectivity/Diversity Blocks would be designed to reduce the relative density index to approximately 0.25 by removing 40 to 50 percent of the basal area, resulting in post-treatment canopy closure of 40 to 50 percent. A second entry into stands presently less than 80 years old would be anticipated in 15 to 20 years, subject to an accompanying analysis, when the relative density index reaches approximately 0.45.

A variable marking prescription would be used in Connectivity/Diversity Block stands based on a combination of basal area and number of trees per acre. This would encourage development of structural diversity that would include understory vegetation and retention of the healthiest, best-formed trees. Minor conifer species would be retained to reflect approximate percentages present in the stands, and large hardwoods retained toward meeting the future objective of providing two per acre for retention at the time of regeneration harvest. Stands would be evaluated for conifer under-planting in conjunction with density management to help create a secondary canopy layer as well as non-conifer understory vegetation.

Within Riparian Reserves, variable-width “no-harvest” buffers would be established to protect stream bank integrity, maintain streamside shade and provide a filtering strip for overland runoff. These buffers would be a minimum slope distance of 20 feet in width, measured from the top of the stream bank. Actual widths would vary subject to an on-the-ground evaluation and consideration of factors such as unique habitat features, streamside topography and vegetation. The nature of streams, such as intermittent vs. perennial, fish-bearing, susceptibility to solar heating, and proximity to Essential Fish Habitat would also be considered in determining specific buffer widths.

No equipment operations would be allowed within the “no-harvest” buffers. If necessary to fell trees within the “no harvest” buffers for operational purposes the felled trees would be left in place to provide instream wood and protection for stream banks. The need for any yarding corridors across streams would be clearly demonstrated by the purchaser. Corridors would be a maximum of 20 feet in width and laid out perpendicular to stream channels at pre-approved locations.

A variable marking prescription would be applied in Riparian Reserves outside of “no-harvest” buffers with a relative density objective of 0.25 and canopy closure of 40 to 50 percent. To maintain structural and habitat diversity, tree selection would not be solely based on the best formed trees, and would include trees with broken or deformed tops. Hardwoods and minor conifer species, reflecting the species distribution in the riparian forest, would be retained. Because there is not a concern for regeneration of shade intolerant species, canopy gaps would generally be no larger than ¼-acre.

Timber cruising would employ methods that could include the felling of sample trees in upland stands to formulate local volume tables. The environmental effects of sample tree felling would be consistent with those described in the Roseburg District 3P Fall, Buck and Scale EA (USDI, BLM 2000). Felled sample trees would become part of the offered sale volume.

Table 2-1 describes proposed units by legal location, acreage, land use allocation, and anticipated yarding method. Maps of the units are contained in Appendix A.

**Table 2-1 General Unit Information**

<b>Unit Designation</b>	<b>Unit Acres</b>	<b>Land Use Allocation</b>	<b>Yarding Method</b>
28-3-17A	27	Connectivity/Diversity Block	Cable
28-3-17B	41	Connectivity/Diversity Block	Cable
28-3-17C	45	Connectivity/Diversity Block	Cable
28-3-17D	28	Connectivity/Diversity Block	Cable
28-3-21A	63	General Forest Management Area	Cable/Ground-Based
28-3-26A	45	Connectivity/Diversity Block	Cable/Ground-Based
28-3-33B	31	General Forest Management Area	Cable
28-3-35A	43	General Forest Management Area	Cable/Ground-Based
29-3-9D	24	General Forest Management Area	Cable
29-3-9E	5	General Forest Management Area	Cable
29-3-11A	41	Connectivity/Diversity Block	Cable
29-3-11B	24	Connectivity/Diversity Block	Cable
29-3-11C	18	Connectivity/Diversity Block	Cable
29-3-11D	9	Connectivity/Diversity Block	Cable/Ground-Based
29-3-21C	9	General Forest Management Area	Cable/Ground-Based
29-4-01A	31	General Forest Management Area	Cable/Ground-Based
29-4-01B	33	General Forest Management Area	Cable/Ground-Based
29-4-01C	29	General Forest Management Area	Cable/Ground-Based
29-4-01D	39	General Forest Management Area	Cable
29-4-01E	15	General Forest Management Area	Cable/Ground-Based
29-4-03C	19	General Forest Management Area	Cable
29-4-03F	44	General Forest Management Area	Cable

### *Yarding Operations*

Because the project areas are in predominantly steep terrain, yarding would be primarily accomplished using skyline yarding systems capable of maintaining a minimum of one-end log suspension to minimize soil disturbance and compaction. Yarding corridors would be pre-designated by the purchaser and approved by the contract administrator. A minimum of 100 feet of lateral yarding capacity would be required so that yarding corridors would be spaced at intervals of 200 feet, whenever practicable, thereby reducing the number of yarding corridors and landings required.

Ground-based yarding would be limited to areas around landings and within a few hundred feet of roads on broad ridge-top locations. Ground-based yarding operations would be restricted to the dry season, typically mid-May to mid-October. Skid trails would be pre-designated and limited to slopes of less than 35 percent, using existing skid trails to the greatest degree practical. Primary skid trails, including those already existing, and landings would collectively affect no more than 10 percent of the ground-based harvest area. Primary skid trails are defined as those on which mineral soil is exposed on more than 50 percent of the trail. Landings would be tilled upon completion of operations to restore them to the forest land base.

### *Access*

Existing permanent roads would provide primary access for thinning operations. Access to suitable landing areas would be provided by construction of new roads, reconstruction of older roads, reconstruction of decommissioned spur roads and non-system roads (i.e. jeep roads and other unauthorized roads). Road renovation would primarily be limited to widening, blading and brushing, and would not involve the replacement of any stream crossing structures. New roads would be located on ridge tops or stable side slopes and outside of Riparian Reserves to the extent practicable, as indicated on the project proposal maps in Appendix A.

Where management entries are anticipated within 15 to 20 years or where under-planting in units in the Connectivity/Diversity Block land use allocation is planned, retention of new roads as a part of the permanent transportation system would be considered. Otherwise, new roads would be of a temporary nature.

Temporary roads would be constructed, used and decommissioned in the same operating season. If not utilized in that time frame because of events such as extended fire closure, the BLM at its discretion would winterize the roads for use the following year. In either event, temporary roads would be decommissioned after use. Decommissioning would generally consist of construction of water bars or drainage dips, sub-soiling of the road bed, and blocking to vehicular use. Roads that are renovated or reconstructed, but not surfaced, would be decommissioned unless prohibited under third-party access rights, in which case the roads would be weatherized and blocked to prevent vehicular use, and reopened in the future if needed.

Table 2-2 provides, by unit, estimates of the type and miles of road construction and reconstruction subject to refinement during field layout.

**Table 2-2 Proposed Road Construction and Renovation**

<b>Unit</b>	<b>Action Proposed</b>	<b>Road Length</b>	<b>Disposition Following Completion of Thinning</b>
28-3-17A	Surface existing ridge top road	0.15 miles	Retain for future management access
28-3-17B	Construct permanent rock road	0.25 miles	Retain for future management access
28-3-17C	Reconstruct portion of Road 28-3-17.1	0.41 miles	Decommission after thinning
	Construct and surface permanent ridge top road	0.57 miles	Retain for future management access
28-3-21A	Re-align and surface portion of Road 28-3-21.6	0.07 miles	Retain new segment road for future management, decommission original segment after thinning
	Construct temporary spur	0.04 miles	Decommission after thinning
28-3-33B	Construct temporary spur	0.15 miles	Decommission after thinning
28-3-35A	Construct temporary spur	0.46 miles	Decommission after thinning
29-3-9D	Construct temporary spur	0.34 miles	Decommission after thinning
29-3-9E	Construct temporary spur	0.09 miles	Decommission after thinning
29-3-11B	Construct temporary spur	0.28 miles	Decommission after thinning
29-3-21C	Construct temporary spur	0.06 miles	Decommission after thinning
29-4-01A	Construct temporary spur	0.25 miles	Decommission after thinning
29-4-01B	Construct temporary spur	0.35 miles	Decommission after thinning
29-4-01C	Reconstruct segment of Road 29-4-1.0	0.13 miles	Decommission after thinning
	Reconstruct segment of Road 29-4-1.1	0.09 miles	Decommission after thinning
	Construct temporary spur	0.31 miles	Decommission after thinning
29-4-01D	Reconstruct temporary spur	0.16 miles	Decommission after thinning
29-4-01E	Reconstruct temporary spur	0.29 miles	Decommission after thinning

*Seasonal Restrictions*

Felling and yarding of timber, other than clearing rights-of-way, would generally be prohibited during the bark-slip period, from April 15<sup>th</sup> to July 15<sup>th</sup>, when young trees are more susceptible to mechanical damage. Circumstances may exist, however, where it would be practical to waive this restriction, such as in the use of harvesters and forwarders that are capable of severing trees and setting them aside without damaging adjoining trees.

Yarding and hauling of timber from areas accessed by temporary unsurfaced roads would be restricted to the period between May 15<sup>th</sup> and the onset of autumn rains, usually around mid-October, subject to bark-slip restrictions described above. If weather and road conditions warrant, operations could be extended beyond mid-October subject to a provisional waiver.

A nesting pair of northern goshawk (*Accipiter gentilis*) has been documented in the Riser Creek drainage. The last known nest site is within a quarter-mile of Units 28-3-17 B, C and D. To avoid disturbance during nesting and fledging season, thinning operations would be prohibited on Units B and D, and the upper half of Unit C from March 1<sup>st</sup> through August 30<sup>th</sup>.

A northern spotted owl (*Strix occidentalis caurina*) nest site is located in the Curtin Creek drainage within a quarter-mile of Unit 28-3-26 A, which contains habitat components suitable for foraging. To avoid effects to owls from habitat modification during the nesting and fledging period, operations on this unit would be prohibited from March 1<sup>st</sup> to September 30<sup>th</sup> unless surveys determine that the owl pair has not nested or that the nesting attempt was unsuccessful.

A pair of peregrine falcons (*Falco peregrinus*) nests within a mile of proposed unit 28-3-35A. To prevent disruption during the nesting and fledging season, operations would be prohibited between January 1<sup>st</sup> and August 15<sup>th</sup>, but could be waived earlier if no young are present, or once the young have fledged.

### *Hazardous Fuels Reduction*

To reduce the risk of fire and damage to the thinned forest stands, slash piles at landings would be burned to reduce roadside fuel concentrations. Within the Wildland Urban Interface, thinning slash would be piled and burned within 50 feet of main roads bordering units to reduce the risk of ignition and to create fuel breaks. It is estimated that hand piling and burning would treat 15 acres.

## **II. Alternative Two – No Action**

No commercial thinning or density management would be conducted in the proposed units. Stand development would continue along present trajectories leading to increasing stand densities, increased suppression mortality and potential stand stagnation.

Other stands in the General Forest Management Area and Connectivity/Diversity Block land use allocations would be selected for analysis commercial thinning, density management or regeneration harvest to meet the ROD/RMP objective of an ASQ of 45 MMBF.

## **III. Considered But Not Analyzed In Detail**

### **A. Units Dropped or Deferred**

As noted on page 2, approximately 1300 acres were initially identified for consideration in this analysis, but approximately 637 acres were eliminated from consideration upon further review.

- A 27 acre unit was dropped because of access and operational difficulties that would render thinning impractical and uneconomical.
- Three units, totaling 42 acres, in the Connectivity/Diversity Block land use allocation are approaching the upper age limit (120 years) for intermediate entry. Given the current condition of the stands it was determined that density management would not benefit stand development.

- Approximately 269 acres in the General Forest Management Area were not considered suitable for commercial thinning based on average tree diameters. It was recommended that treatment of these stands be deferred and re-evaluated in another ten years.
- Approximately 299 acres were deemed unsuitable for thinning because stand density, substantial numbers of large trees, or general stand conditions suggest that regeneration harvest would be more appropriate management.

## **B. Helicopter Yarding vs. Building or Reconstructing Roads**

Prior to development of the proposed alternative, comments were received suggesting that the BLM should consider helicopter yarding as an alternative to construction of new roads or renovation of decommissioned roads.

Helicopter yarding would not be considered a reasonable alternative for the following reasons.

- Primary road access already exists to 21 of the 22 units proposed for treatment in this analysis. New construction would minimal and simply provide access to advantageous yarding locations or allow landings to be moved off of main road systems in order to avoid impeding the regular flow of traffic.
- In order to be economical, service and log landings must be located near units. In the Myrtle Creek watershed there are no sites presently available that would accommodate helicopter operations. Construction of sufficiently large landing areas would be costly and require timber clearing, grubbing and leveling.
- Using representative appraisal criteria for a comparison of costs indicates that helicopter yarding would be more than two and a half times more expensive than traditional cable yarding methods.

To helicopter yard the proposed thinning units would require a medium-size ship such as a Sikorsky 61 or Boeing Vertol 107. Based on a distance of a half mile from unit to landing and a production rate of 12 truck loads per day, logging costs would be slightly more than \$427 per thousand board feet loaded on a truck. By comparison, using a 40-foot tower, an average yarding distance of 400 feet, and a production rate of four truck loads per day yields a production cost of only \$162 per thousand board feet loaded on a truck.

For the estimated eight million board feet of timber the proposed action would yield, helicopter yarding costs would be approximately \$3,416,000 (8,000 M x \$427/M). In comparison, cable yarding costs would be approximately \$1,296,000 (8,000 M x \$162/M). The difference of more than \$2,000,000.00 is not economically reasonable.

- Savings on road construction and renovation would not offset the difference in yarding costs.

For construction of temporary roads on gentle terrain with no culvert installation required, a cost of \$200 per station (100 feet) would be reasonable and customary, with comparable costs for decommissioning. Average construction costs per station of permanent all-weather road would be on the order of \$1,500.00. The cost of renovating decommissioned road beds would be comparable to temporary road construction.

Using the average costs noted, construction and subsequent decommissioning of an estimated 130 stations (2.46 miles) of temporary spur roads would cost approximately \$52,000.00. Cost for construction of approximately 49 stations (0.93 miles) of permanent road and surfacing of 8 stations (0.15 miles) of dirt road would be on the order of \$85,500.00. Reconstruction of 57 stations (1.08 miles) of previously decommissioned roads would be approximately \$22,800.00. Taken together this represents \$160,300.00 in potential savings if helicopter yarding were employed. Little of this potential savings would likely be realized, however, considering that additional cost would be incurred for the construction of helicopter logging and service landings.

The comments also suggested that temporary roads gouge out mountainsides, leave clearcut strips, can spread disease if they are tilled, and that the soil compaction has a lasting effect. To the last point, reference was made to a study<sup>3</sup> showing that “sub-soiling, ripping or otherwise de-compacting the road after use” does not restore the soil to pre-road condition.

The effects of temporary road construction have been considered and are not of a magnitude comparable to those portrayed in the comments submitted.

- As noted on page 8, new roads would be mostly located on ridge tops or stable side slopes, greatly reducing the need for excavation and modification to the existing slopes and contours, and to natural drainage patterns.
- The running surface of temporary roads is typically 10 to 12 feet wide within a narrow right-of-way. These would not leave clearcut strips as the narrow corridors would be largely indistinguishable from yarding corridors and the 25 to 30 foot spacing between trees that would be typical following thinning.
- Root diseases are endemic in forest soils and spread by root grafts between live trees. Sub-soiling road surfaces would not affect this process in either an adverse or beneficial manner.

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<sup>3</sup> Effectiveness of Road Ripping in Restoring Infiltration Capacity of Forest Roads. Charles H. Luce, USDA Forest Service Intermountain Research Station, 1221 S. Main, Moscow, ID 83843. September 1996. Restoration Ecology, Vol. 5, No. 3. page 268.

- The BLM is aware of the research cited regarding the effectiveness of ripping in restoring the infiltration capacity of road surfaces. The study acknowledged limits to the degree of restoration achievable, but concluded (p. 269) concluded: “Ecological restoration of forest roads and watersheds requires improved vegetation cover and improved infiltration for forest road surfaces. These findings suggest that ripping can be a reasonably effective step in the restoration process.”

**C. Reservation of the Biggest and Best Trees in Riparian Reserves and Connectivity/Diversity Blocks to Provide Down Wood**

Comments received indicated that the BLM should identify the “biggest and best” of the trees to be thinned and reserve them for “dead wood” before they are sold.

This was not considered to be a necessary alternative for the following reasons.

- As described on page 5, the largest trees would already be reserved in the marking prescription which is targeted primarily at the removal of trees in the intermediate and suppressed canopy classes.
- It is anticipated that coarse woody debris will be adequately provided for because: contract provisions will stipulate reservation of all existing coarse woody debris in Decay Classes 3, 4 and 5; snags felled in Riparian Reserves for safety or operational reasons will be retained on site to supplement existing coarse woody debris; and tops of trees broken out during thinning operations, as well as natural events such as windthrow, snow break and suppression mortality would provide additional coarse woody debris in the near term.

It has also been suggested that an upper diameter limit should be established for trees designated for cutting. There is no silvicultural basis for limiting the size of trees cut. To do so would be arbitrary and could preclude achievement of stand density objectives identified (pp. 6 and 7) and anticipated (pp. 33-36).

**IV. Resources That Would Remain Unaffected By Either Alternative**

The following resources or critical elements of the human environment would not be affected under either alternative because they are not present in the project areas: Areas of Critical Environmental Concern (ACEC); prime or unique farmlands; floodplains; wilderness; waste, solid or hazardous; and Wild and Scenic Rivers.

The proposed action is consistent with Executive Order 12898 which addresses Environmental Justice in minority and low-income populations. The BLM has not identified any potential impacts to low-income or minority populations, either internally or through the public involvement process. No Native American religious concerns were identified by the team or through correspondence with local tribal governments.

As discussed in Chapter Three (pp. 30-31), cultural resources would not be affected and no measurable increase or decrease in the introduction or rate of spread of noxious weeds is anticipated.

The only energy transmission, transport facility, and/or right-of-way in proximity to any of the project areas is a high-voltage transmission line that is outside of any stands proposed for treatment. No commercially usable energy sources are known to exist. As a consequence, no adverse effect on energy resources would be anticipated.

# Chapter Three

## THE AFFECTED ENVIRONMENT

This chapter summarizes the specific resources that are present or potentially present and could be affected by the proposed action. The description of the current conditions inherently includes and represents the cumulative effects of past and current land management activities undertaken by the BLM and private entities.

### I. Timber/Vegetation

The stands proposed for commercial thinning and density management range in age from approximately 40 to 85 years of age. Roughly 65 percent of these stands have been actively managed with pre-commercially thinning and fertilization treatments.

Unit 28-3-17A was selected for visual representation of present stand conditions. Stand exam data was modeled using Organon v. 6.0, for Southwest Oregon and depicted (Figure 3-1) using Stand Visualization System version 3.31 (SVS).

**Figure 3-1 Representative Stand Conditions**



Douglas-fir is the dominant conifer species, with incense-cedar, grand fir, western hemlock, and sugar pine also represented. The project watershed is located entirely outside the acknowledged range of Port-Orford-cedar. Crown ratios are above 30 percent, a level important for maintaining or increasing stand health and vigor. Hardwoods are few and primarily consist of Pacific madrone, golden chinquapin, and big leaf maple.

Common understory shrubs are ocean spray, hazel, vine maple, red huckleberry, rhododendron and various species of manzanita. Herbaceous vegetation is generally sparse and primarily composed of salal, Oregon-grape, sword fern and bear grass.

Individual stand conditions tend to be homogenous across upland areas and Riparian Reserves, particularly in those stands that have been actively managed in the past. Tables 3-1, 3-2 and 3-3 summarize the approximate stand conditions derived from modeled stand exam data.

**Table 3-1 Current Conditions of Proposed Units in Township 28 S, Range 3 W.**

Unit	Stand Age	Trees per Acre	Basal Area in sq. ft.	Quadratic Mean Diameter in inches	Relative Density Index	Percent Canopy Closure	Average Crown Ratio
28-3-17A	44	247	204	12.3	0.65	97	0.51
28-3-17B	38	198	158	12.1	0.51	95	0.48
28-3-17C	37	224	167	11.7	0.54	99	0.46
28-3-17D	41	250	205	12.3	0.65	85	0.39
28-3-21A	44	188	198	13.9	0.60	92	0.54
28-3-26A	85	211	273	15.4	0.80	100	0.27
28-3-33B	39	282	153	10.0	0.53	73	0.50
28-3-35A	59	167	163	13.4	0.50	70	0.38

**Table 3-2 Current Conditions of Proposed Units in Township 29 S, Range 3 W.**

Unit	Stand Age	Trees per Acre	Basal Area in sq. ft.	Quadratic Mean Diameter in inches	Relative Density Index	Percent Canopy Closure	Average Crown Ratio
29-3-9D	63	180	167	13.0	0.52	72	0.33
29-3-9E	76	164	192	14.7	0.57	77	0.32
29-3-11A	45	199	173	12.6	0.55	90	0.56
29-3-11B	42	295	192	10.9	0.64	100	0.44
29-3-11C	48	167	138	12.3	0.44	64	0.37
29-3-11D	48	167	138	12.3	0.44	64	0.37
29-3-21C	55	180	153	12.5	0.49	69	0.38

**Table 3-3 Current Conditions of Proposed Units in Township 29 S, Range 4 W.**

Unit	Stand Age	Trees per Acre	Basal Area in sq. ft.	Quadratic Mean Diameter in inches	Relative Density Index	Percent Canopy Closure	Average Crown Ratio
29-4-1A	41	300	207	11.2	0.68	88	0.40
29-4-1B	41	187	193	13.7	0.59	79	0.41
29-4-1C	44	169	171	13.6	0.53	73	0.39
29-4-1D	40	167	151	12.9	0.47	67	0.50
29-4-1E	43	227	200	12.7	0.63	83	0.39
29-4-3C	43	166	160	13.3	0.50	69	0.35
29-4-3F	52	193	169	12.7	0.53	73	0.34

## II. Wildlife

Over 335 vertebrate species are known or suspected to occur on the Roseburg District, along with hundreds of invertebrate species. Twenty-four of these species are listed under the Endangered Species Act or designated as Bureau Sensitive or Bureau Assessment species. Two species, one also covered by the Special Status Species Program, are also subject to protection under the Survey & Manage program. The proposed action would have no effect on 15 of these species because the project area is outside their accepted range or suitable habitat for individual species is not present (Appendix B). Consequently, these species were eliminated from further discussion. The nine remaining species that may be affected are addressed below.

### A. Threatened and Endangered Species

#### Northern Spotted Owl

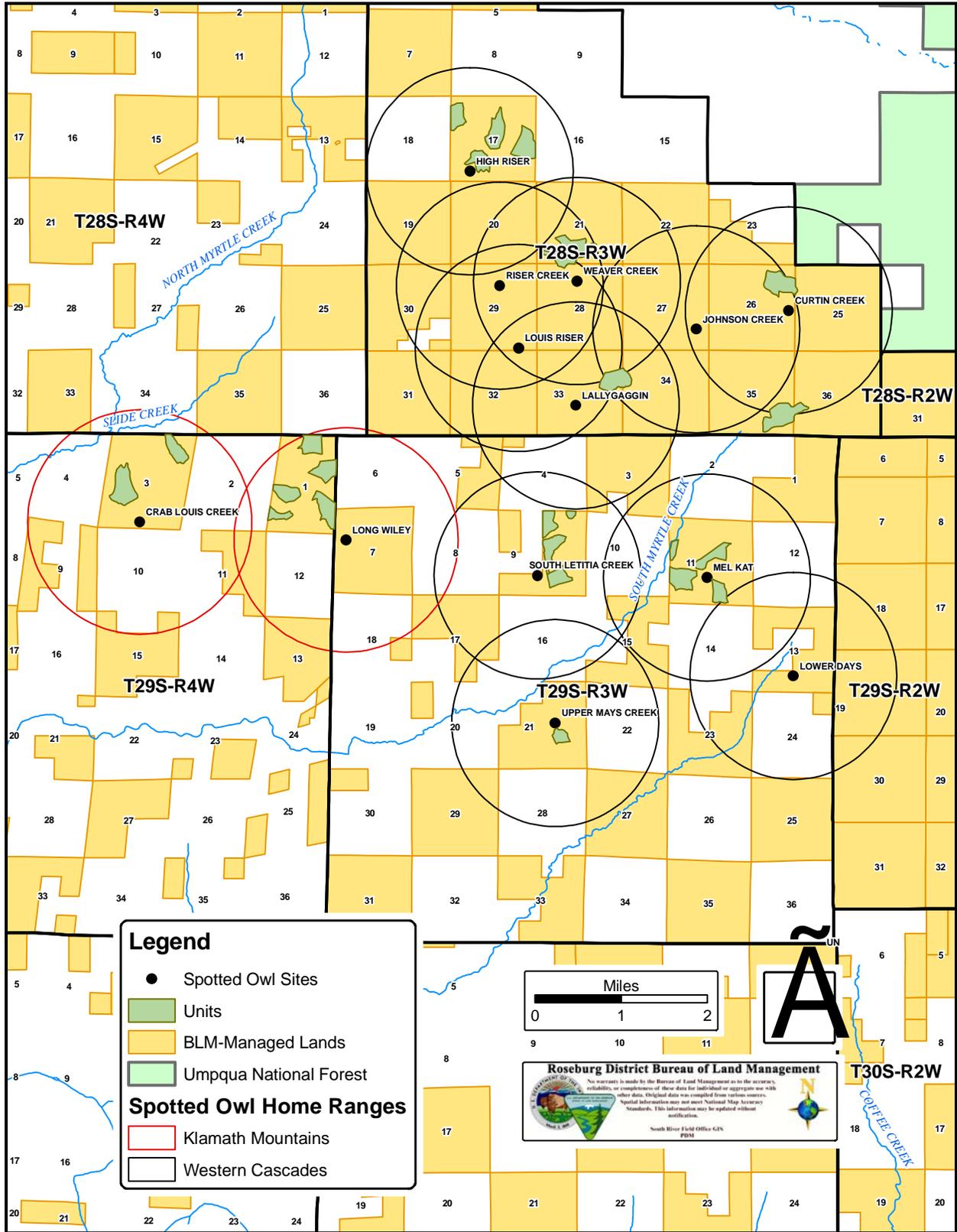
For nesting, the northern spotted owl (*Strix occidentalis caurina*) generally uses forest stands with multiple shrub and canopy layers, large overstory trees, large snags, accumulations of coarse woody debris, and nesting structures like large broken-topped trees, cavities in trees and snags, or platforms in tree canopies (Forsman et al 1984, Hershey et al. 1997).

On the Roseburg District these habitat features are generally found in stands 80 years old or greater, which are referred to as suitable or NRF (nesting/roosting/foraging) habitat. Stands that, at a minimum, provide for spotted owl movement are referred to as dispersal habitat; NRF habitat is a subset of dispersal habitat. Areas that provide no function for spotted owls are called unsuitable habitat. Unit 28-3-26 A provides marginal suitable habitat, while the remainder of the project area is dispersal habitat.

The effects of habitat modification to specific spotted owl sites are assessed by assigning a generalized home range with a radius of 1.3 miles in the Klamath physiographic province and 1.2 miles in the Western Cascades physiographic province (USDI, BLM 1991). Surveys have identified 13 spotted owl sites with home ranges that overlap portions of the project area (Figure 3-2) and unsurveyed suitable spotted owl habitat is present adjacent to unit 28-3-35 A.

None of the proposed units are located within critical habitat units designated by the U.S. Fish and Wildlife Service for the survival and recovery of the northern spotted owl. Consequently, critical habitat will not be discussed further in this analysis.

Figure 3-2 Spotted owl sites and provincial home ranges, Myrtle Creek



## **B. BLM Special Status Species**

Bureau Special Status Species are those eligible for federal or state listing or candidate status under the Endangered Species Act. They are managed in accordance with BLM Manual Section 6840 (USDI, BLM 2001a), which states that Bureau actions must not contribute to the need to list Bureau Sensitive and Assessment species under the Endangered Species Act.

### **Bureau Sensitive Species**

#### Chace Sideband and Oregon Shoulderband Snails

The Chace sideband snail (*Monadenia chaceana*) and Oregon shoulderband snail (*Helminthoglypta hertlieni*) are endemic to northwest California and southwest Oregon. When active, they may be found on herbaceous vegetation, ferns, leaf litter, or moss mats in shaded areas near refugia. Food sources appear to include leaf litter, fungus, and/or detritus. Refugia include interstices in rock-on-rock habitat, soil fissures, or the interior of large woody debris (Weasma 1998a and 1998b). Suitable habitat for both species is present throughout the project area.

#### Northern Goshawk

The northern goshawk (*Accipiter gentilis*) is a large forest-dwelling hawk found throughout temperate forested regions of the northern hemisphere. Goshawks forage below the forest canopy preying on a variety of birds and small mammals.

In the northwest, stands used for foraging and nesting are generally mature with large trees, a closed canopy, and a relatively open understory; however goshawks are known to use younger stands as well (Reynolds et al. 1982, Daw et al. 1998, Daw and DeStefano 2001). A known goshawk nest site is located Section 17, T. 28 S., R. 3 W., and goshawks may use utilize the stand comprising Unit 28-3-17D due to its proximity.

More than a dozen other goshawk observations have been made at various locations throughout the South River Resource Area indicating that they may also be nesting in other areas. Units 28-3-26A and 28-3-21A would provide suitable habitat because of the presence of large trees with nesting structure, a high degree of canopy cover, and a sufficiently open understory allowing for sub-canopy flight. The remaining units are marginal habitat due to relatively small tree size and high tree density.

#### American Peregrine Falcon

The peregrine falcon (*Falco peregrinus anatum*) is a raptor found across North America, and was once designated as a Federally-threatened species under the Endangered Species Act. The species builds nests (or aeries) on cliffs or other sheer vertical structures, and preys on other birds, which they catch on the wing. There is a known aerie on Jolly Rock within a mile of proposed Unit 28-3-35A.

### Purple Martin

The purple martin (*Progne subis*) is the largest North American swallow and has a breeding distribution throughout the eastern U.S., coastal areas of the Pacific Northwest, and the southern Rocky Mountains. Although martin populations nest in birdhouses or other artificial structures, they also nest in tree cavities. Snags with cavities excavated by woodpeckers are thought to be the most important habitat features (Brown 1997). Nests are typically found near open areas and water (Brown 1997, Horvath 2003). The project area could provide foraging and roosting opportunities for purple martins in units where large snags or trees are present.

### Townsend's Big-Eared Bat

The Townsend's big-eared bat (*Corynorhinus townsendii*) is an insectivorous species found throughout the western U.S. and the Ozark and Appalachian Mountains. It is associated with a variety of habitats, including desert scrub, pinyon-juniper, and coniferous 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). The project area could provide foraging and roosting opportunities for this species where large, hollow snags or trees are present.

## **Bureau Assessment Species**

### Pacific Pallid Bat

The Pacific pallid bat (*Antrozous pallidus pacificus*) is an insectivorous species found throughout the Southwest, southern Rocky Mountains, and Pacific Northwest. It generally uses arid or semi-arid environments with rock, brush, or forest edge habitat (reviewed in Verts and Carraway 1998). Hibernacula and roost sites are known to include caves, mines, rock crevices, bridges, buildings, and hollow trees or snags (Lewis 1994). The project area could provide foraging and roosting opportunities in units where large, hollow snags or trees are present.

### Fringed Myotis Bat

The fringed myotis bat (*Myotis thysanodes*) is an insectivorous species found throughout the western U.S., utilizing a range of habitats, from sagebrush to Douglas-fir forest (reviewed in Verts and Carraway 1998). Known hibernacula and roost sites include caves, mines, buildings, and large snags (Weller and Zabel 2001). Although definitive evidence is lacking, it is thought that fringed myotis populations in Oregon migrate in winter. The project area could provide foraging and roosting opportunities in units where large, hollow snags or trees are present.

### C. Special Attention (Survey & Manage) Species

There were three vertebrate species and seven mollusk species managed under the Survey and Manage standards and guidelines documented or suspected to occur on the Roseburg District at the time of the implementation of the 2001 *Record of Decision* (S&M ROD) 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*.

Two vertebrate species, the Del Norte salamander (*Plethodon elongatus*) and Oregon red tree vole (*Arborimus longicaudus*), were removed from protection and management by the 2001 and 2003 Annual Species Reviews (ASR), a process provided for in the 2001 S&M ROD.

The blue-grey tailed dropper (*Prophyaon coeruleum*) was removed by the 2001 S&M ROD, with removal of the Oregon shoulderband snail (*Helminthoglypta hertleini*) coming in the 2002 ASR, and the Oregon megomphix snail (*Megomphix hemphilli*) in the 2003 ASR. In the 2003 *Survey Protocol for S&M Terrestrial Mollusk Species v3.0* (USDA, USDI 2003), it was determined that the evening field slug (*Deroceras hesperium*) was not likely to occupy forest lands on the Roseburg District.

The three wildlife species remaining on the Roseburg District Survey and Manage list as of December 29, 2003, were the Siskiyou or Chace sideband snail (*Monadenia chaceana*), the Crater Lake tightcoil snail (*Pristiloma arcticum crateris*), and the great gray owl (*Strix nebulosa*).

The habitat requirements for the Chace sideband snail are described in the previous discussion of Bureau Sensitive species. As documented in Appendix B, habitat for the tightcoil snail is absent in the project area.

Suitable habitat for great gray owls is characterized by: (1) large diameter nest trees, (2) forest canopy providing roosting cover, and (3) proximity [within 200m] to openings ten acres or larger in size that could be used as foraging areas (USDA, USDI 2004d). The current survey protocol (p. 14) states that pre-disturbance surveys are not suggested in suitable nesting habitat adjacent to man-made openings at this time. An evaluation of the proposed thinning units indicates no natural meadows or openings  $\geq 10$  acres within 200m. Consequently, the great gray owl will not be discussed further in this analysis.

## III. Botany

### A. Vascular Plants

Kincaid's lupine (*Lupinus sulfureus* ssp. *Kincaidii*) is listed under the Endangered Species Act as a Federally-threatened species. It is an herbaceous perennial that is native to the prairies of the Willamette Valley and southwestern Washington. It has been

located at several sites in Douglas County, Oregon along roads and forest edges. Species vigor appears to be correlated with canopy openness (Menke, C.A. and T. Kaye 2003).

Based on the availability of suitable habitat, surveys would be conducted for Kincaid's lupine, BLM Special Status vascular plants, and Special Attention (Survey & Manage) Species described in Appendix C that might be expected in the project watershed.

## **B. Fungi**

Bureau Sensitive fungi species documented in the South River Resource Area include *Dermocybe humboldtensis*, *Phaeocollybia californica*, *P. olivacea*, and *Ramaria spinulasa* var. *diminutiva*. Four other species (*Arcangeliella camphorata*, *P. gregaria*, *P. oregonensis*, and *Rhizopogon chamaleontinus*) are suspected based on the habitat and host species present.

There are two known occurrences of *Dermocybe humboldtensis* on the Roseburg District. One is in the Irwin Rocks Research Natural Area/Area of Critical Environmental Concern, more than 20 miles west of the Myrtle Creek project area. The second site is located in the Myrtle Creek watershed more than three miles from any proposed thinning unit.

Five occurrences of *Phaeocollybia olivacea* are documented on the Roseburg District. One site is documented in the South River Resource Area, in the Middle Fork Coquille fifth-field watershed more than 20 miles west of the Myrtle Creek project area. A second is documented approximately 6.7 miles to the northeast in the Little River fifth-field watershed.

One occurrence of *Phaeocollybia californica* is documented in the Upper North Myrtle Creek subwatershed, slightly more than one mile from any proposed thinning units.

There is an occurrence of *Ramaria spinulasa* var. *diminutiva* in the North Myrtle Area of Critical Environmental Concern/ Research Natural Area. It is approximately one mile northwest of the nearest proposed thinning units and would not be affected.

These species are primarily associated with members of the *Pinaceae* family, principally Douglas-fir and western hemlock. Important habitat components include: dead, down wood; standing dead trees; live, mature trees; many shrub species; a broad range of microhabitats; and for many, a well-distributed network of late-successional forest with moist and shaded conditions (USDA, USDI 2004c p. 148).

Most Special Status fungi species are highly isolated in their occurrence. They produce short-lived, ephemeral sporocarps or fruiting structures that are seasonal and annually variable in occurrence (USDA, USDI 2004c p. 148). Richardson (1970) estimated that sampling every two weeks would fail to detect about 50 percent of macrofungus species fruiting in any given season. In another study by O'Dell (1999), less than ten percent of species were detected in each of two consecutive years at any one of eight sites.

#### **IV. Fish and Aquatic Resources**

The proposed commercial thinning and density management units are predominantly located in upland areas with only a few intermittent stream channels nearby. There are several larger perennial and fish-bearing streams below the proposed units. The haul routes consist of existing ridge top roads which would be supplemented by the construction of new permanent and temporary roads, and reconstruction of two previously decommissioned roads and two overgrown road segments. There are segments of existing access roads that cross or parallel streams. Aquatic habitat conditions and fish presence or absence were noted during site visits.

Aquatic Habitat Inventory surveys were conducted by the Oregon Department of Fish and Wildlife in the late 1990s on 48 stream reaches in the watershed, totaling approximately 72 miles. The results of these surveys are summarized in watershed analysis (MCWA, pp. 144-154) and are included in the description of aquatic conditions where applicable. The Oregon Department of Fish and Wildlife developed “desired” and “undesirable” benchmarks for specific habitat components (Foster et al 2001), based on survey reference reaches throughout Oregon. Habitat components often considered most important for fish are spawning substrate/sediment, large woody debris, pool habitat and habitat access.

##### **A. Aquatic Habitat Conditions**

###### *Substrate/Sediment*

Availability of quality spawning habitat is important for resident and anadromous fish productivity and can vary based on the amount and size of spawning substrates. Gravel and small cobbles that are 1.3 to 10.2 cm in diameter in size and relatively free from embedded fine sediment provide ideal spawning substrate (Bell 1986).

During egg incubation and alevin emergence, fine sediment deposition in excess of 15 percent can reduce survival (Bjornn and Reiser 1991). In streams along access roads surveys showed that most riffles had moderate amounts of gravel but high levels of fine sediment. The “desirable” benchmark for gravel is greater than 35 percent of all substrate. The “desirable” level for fine sediment is less than 8 percent of all substrate. Six reaches had a “desirable” rating for fines and 26 reaches had gravel amounts exceeding the “desirable” benchmark.

###### *Large Woody Debris*

Large woody debris is important to formation of deep scour pools and retention of gravel substrate (Bilby and Ward 1989). Pools and off-channel habitat provide refuge for salmonids during high flow events and reservoirs of cool water during low flow months (Swanston 1991).

Streams throughout the watershed had both few pieces of and low volumes of large woody debris. Of the 48 stream reaches surveyed by the Oregon Department of Fish and Wildlife, only one reach had desirable ratings for number of pieces, volume of pieces and

number of key pieces. Key pieces are defined as greater than 24 inches in diameter and greater than 33 feet in length (Foster 2001).

Only three stream reaches had “desirable” ratings for two of the three components. Ten other stream reaches had a “desirable rating for a single component, six reaches a “desirable” volume of large woody debris, and four reaches with a “desirable” number of pieces of large woody debris per 100 m. of stream.

High gradient headwater streams, both intermittent and perennial, located adjacent to proposed thinning units generally had a high volume and number of pieces of large woody debris. Riparian forest in steep and confined headwater valleys, such as those in the project area, directly contribute more wood (May and Gresswell 2003), and absent redistribution by large flood events, these larger pieces are retained for longer periods of time.

#### *Pool quality*

Pools are important habitat features for juvenile rearing during low flow months when high stream temperatures add to stress, and during high flow events when off-channel pools provide refuge habitat. Salmonids typically are found in greater numbers and larger sizes in deep pool habitats (Rosenfeld et al. 2000).

Streams are considered to be in “desirable” condition when pool habitat area exceeds 35 percent of total stream habitat. Of the stream reaches surveyed, 19 had pool habitat area in excess of 35 percent, while 13 reaches had pool habitat areas of less than 10 percent.

Complex pools contain more than three pieces of large woody debris. No stream reaches met the “desirable” benchmark of greater than 2.5 complex pools per kilometer of stream.

Overall, streams in the watershed lack sufficient pool habitat for salmonid rearing, due in part to past management practices that removed large woody debris during stream cleaning and reduced recruitment of large wood by harvesting trees from riparian areas.

#### *Habitat access*

Access to the streams by migrating fish can be restricted by culverts with outlet jumps exceeding two feet and in-pipe gradients exceeding five percent. While adult fish may be capable of jumping in excess of two feet, juvenile fish are often prevented from upstream migration by jumps greater than six inches.

In 2001, the Myrtle Creek Watershed Analysis and Water Quality Restoration Plan identified 41 culverts on anadromous or resident fish-bearing streams that prevented or hindered passage.

## **B. Special Status Species**

Salmonid species found in watersheds in the South River Resource Area 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*).

The National Marine Fisheries Service designated Oregon Coast coho salmon as a threatened species in 1998 (Federal Register 1998). In February 2004, the 9<sup>th</sup> Circuit Court of Appeals upheld a 2001 district court ruling removing the threatened status of Oregon Coast coho. The species was proposed for re-listing as a threatened species (Federal Register 2004), but on January 19, 2006, a decision was issued that the species did not warrant listing under the Endangered Species Act (Federal Register 2006).

Coho salmon are presently considered a Bureau Sensitive species, and are found in both North and South Myrtle Creek. The nearest distribution limit is within 320 feet, a two site-potential tree, considered as adjacent, of two proposed units (Table 3-3). Access roads cross coho bearing streams and perennial and intermittent tributaries of coho bearing streams.

The Oregon Coast steelhead trout Evolutionary Significant Unit was proposed as a candidate for threatened species designation in 1998, but has since been downgraded by the National Marine Fisheries Service to a “species of concern” (Federal Register 2005a). Distribution of steelhead trout closely resembles that of coho salmon.

The Umpqua chub (*Oregonichthys kalawatseti*) is a Bureau Sensitive Species restricted to the main stem of the Umpqua River and some of its larger tributaries. It has been documented below the confluence of Myrtle Creek and the South Umpqua River (Markle et al. 1991) but surveys near the mouth of Myrtle Creek have failed to find this fish (Simond 1998).

The Pacific lamprey (*Lampetra tridentate*) is a Bureau Assessment Species that may be found in 3<sup>rd</sup> order or larger tributaries of the Umpqua River and may be present in many accessible 3<sup>rd</sup> order or greater streams in the Myrtle Creek watershed.

**Table 3-3 Fish Distribution Limits in Relationship to Proposed Thinning Units**

Unit	Distance to Fish Bearing Streams (mi.)	Distance to Steelhead (mi.)	Distance to Coho Salmon/EFH (mi.)
28-3-17 A	Adjacent	Adjacent	Adjacent
28-3-17 B	0.2	0.3	0.5
28-3-17 C	Adjacent	0.6	0.8
28-3-17 D	0.2	0.2	0.2
28-3-21 A	0.1	0.1	0.4
28-3-26 A	1.7	1.7	1.9
28-3-33 B	0.4	0.5	0.8
28-3-35 A	< 0.1	< 0.1	< 0.1
29-3-9 D	< 0.1	< 0.1	< 0.1
29-3-9 E	0.5	0.5	0.5
29-3-11 A	Adjacent	< 0.1	< 0.1
29-3-11 B	Adjacent	0.6	0.6
29-3-11 C	Adjacent	0.4	0.4
29-3-11 D	Adjacent	Adjacent	Adjacent
29-3-21 C	0.5	0.5	0.5
29-4-1 A	0.3	0.3	0.3
29-4-1B	0.7	0.7	0.7
29-4-1 C	0.4	0.4	0.4
29-4-1 D	0.3	0.3	1.2
29-4-1 E	0.6	0.6	0.6
29-4-3 C	0.2	0.2	0.2
29-4-3 F	0.1	0.5	0.5

**C. Essential Fish Habitat**

Streams and aquatic habitat presently or historically accessible to chinook and coho salmon are considered Essential Fish Habitat, designated for fish species of commercial importance by the Magnuson-Stevens Fishery Conservation and Management Act of 1996 (Federal Register 2002 Vol. 67/No. 12). Two proposed thinning units are adjacent to streams designated as Essential Fish Habitat.

**V. Water Resources****A. Stream Flow**

The climate in the project watershed is a Mediterranean type characterized by cool, wet winters and warm, dry summers. Most precipitation is in the form of rain, concentrated between November and March. Stream flow volumes closely parallel the precipitation pattern. Peak stream flows occur from November to March, and low stream flows occur from July to October. Small 1<sup>st</sup> and 2<sup>nd</sup> order headwater streams are intermittent and have no surface flow during the dry season.

*Peak Flows and Transient Snow Zone*

Higher than normal peak flows can occur as a result of timber harvest in the Transient Snow Zone (TSZ) (Harr and Coffin 1992). The TSZ is that area between 2,000 and 5,000 feet elevation that may alternately receive snow or rain. Harvest in the TSZ can provide openings where snow accumulates. Warm rain-on-snow events can melt this increased snow pack quickly and create higher than normal flows.

Approximately 260 acres proposed for thinning are located in the TSZ. The remainder of the acreage proposed for thinning is located below the TSZ in the rain dominated zone. The Myrtle Creek fifth-field watershed is comprised of four sixth-field subwatersheds. Areas within each hydrologic unit and the percent of each that is located in the TSZ are presented in Table 3-4.

**Table 3-4 Transient Snow Zone Area**

<b>Watershed/ Subwatershed Name (Field)</b>	<b>Total Forested Area in Acres</b>	<b>Percent Area in TSZ (%)</b>
Upper North Myrtle (6 <sup>th</sup> )	13,232	36%
Upper South Myrtle (6 <sup>th</sup> )	24,816	41%
Lower North Myrtle (6 <sup>th</sup> )	17,681	13%
Lower South Myrtle (6 <sup>th</sup> )	9,043	1%
Myrtle Creek (5 <sup>th</sup> )	64,772	27%

The present risk of peak flow enhancement resulting from past timber harvest was evaluated using a model recommended in the Oregon Watershed Assessment Manual (Watershed Professionals Network 1999 IV-11). The model predicts peak flow enhancement in proportion to the percent of land in a drainage located in the TSZ and the percent of this area with less than 30 percent canopy closure. Aerial photo interpretation and Geographic Information System (GIS) analysis of vegetative conditions in the project drainages indicate that, although past timber harvest has created some openings, the larger proportion of forest lands in the TSZ have good canopy closure and enhanced peak flows are not likely to result from TSZ effects.

*Peak Flows and Roads*

Roads may affect the hydrologic function of a watershed in many ways. Roads can increase the drainage density of a watershed, acting as a preferential pathway for surface water run-off, resulting in a decrease in the volume of overland flow that infiltrates into the ground water or soil water storage. Run-off traveling down non-vegetated road beds can be highly erosive. Increased drainage density due to roads increases the rate at which run-off leaves a basin, resulting in higher peak flows in times of snow melt or rainfall and reduced stream flows in the later summer months. Segments of some roads that access proposed thinning units drain directly into stream channels at crossings and likely contribute to increased peak flows.

## **B. Water Quality**

Water quality standards are determined for each waterbody by the Oregon Department of Environmental Quality (ODEQ). Water bodies that do not meet water quality standards are placed on the state's 303(d) list as Water Quality Limited (ODEQ 2003).

South Myrtle Creek, Riser Creek, Weaver Creek, and Slide Creek are listed as water quality limited for exceeding temperature standards. While these streams are present within the analysis area, they are not located adjacent to any of the proposed thinning units, and will not be discussed further in this analysis.

### *Sediment*

No sediment data exists for streams in the project area. Studies by Reid (1981), and Reid and Dunne (1984) have shown, however, that forest roads can be major contributors of fine sediment to streams. This additional sediment can reduce water quality for domestic use and cause detrimental change to streams and their inhabitants (Castro and Reckendorf 1995).

Roads may directly alter streams by increasing erosion and sedimentation, which in turn can alter stream channel morphology. Roads may also alter the natural drainage characteristics of channels and change the run-off characteristics of watersheds (Furniss, et al. 1991) by reducing the period of time water is stored in the watershed. Roads can act as a link between sediment sources and streams, and often account for most of the sediment problems in a watershed. Run-off from roads can enter the natural stream channel network when roads are hydrologically connected to stream channels. Ways in which roads may be hydrologically connected and contribute sediment include: road-stream crossings; where discharge is sufficient to create a gully in the inboard ditch line; and road fillslopes encroach on streams.

### *Stream Temperature*

Water temperature is a key factor affecting growth and survival of aquatic organisms. The effect of stream temperature on fish, amphibians, macro-invertebrates, etc. varies by species and within the life cycle of individual species (Lantz 1971; ODEQ 1995). Factors influencing water temperature include elevation, slope aspect, local topography, distance from stream headwaters, solar potential, stream flow patterns, channel geometry, vegetation, and stream shading.

The most common cause of elevated stream temperatures associated with timber harvest is a reduction in streamside shading that can cause streams to be more susceptible heating by solar radiation reaching the stream surface (Moore and Miner 1997).

### C. Water Rights

Surface water rights for domestic use exist within one mile downstream of proposed unit 29-4-3C. As no effects on water yields are anticipated and no increase in sedimentation would result from thinning operations, no effect to downstream users is expected. As a consequence, water rights will not be discussed further in this analysis.

**Table 3-5 Domestic Surface Water Rights Within One Mile  
Downstream of Proposed Units\***

Unit	Location of Water Right	Permit #	Address
29-4-3 C	28-4-34 SESW	S 44489	Earl Osborn P.O. Box 1416 Myrtle Creek, OR 97457

\*Information for Oregon Water Resources Department GIS data.

### VI. Soils

Soils in the Myrtle Creek watershed primarily developed from granitic and sedimentary parent material. The two dominant soil types are Lettia-Beal and Illahee-Mellowmoon-Scaredman.

Soils of the Lettia-Beal series are underlain by granitic rock and found on footslopes, side slopes, and ridges with gradients primarily ranging from 3 to 60 percent at elevations between 700 to 3500 feet. Lettia soils are formed on gently sloping to steep side slopes and are deep and well-drained. The surface layer is typically gravelly loam with a loam and clay loam subsoil. Beal soils are formed on moderately to steep slopes and are deep and well drained. The surface layer is typically loam with clay loam and clay subsoil. (USDA 2004 p. 41)

Soils of the Illahee-Mellowmoon-Scaredman series are loamy, and found on slopes with gradients from 3 to 90 percent at elevations from 2800 to 4600 feet. Illahee soils are formed on gently sloping to very steep sided slopes, are very deep and well drained. Both the surface layer and subsoil are gravelly loam. Mellowmoon soils are similar to Illahee soils but the subsoil is a clay loam and gravelly clay loam. Scaredman soils are moderately deep, well drained and located on steep and very steep side slopes. The surface layer is extremely gravelly loam and the subsoil is very gravelly loam. (USDA 2004 p. 47)

Timber Production Capability Classification (TPCC) is an intensive inventory providing site specific information concerning land managed by BLM. This information identifies fragile sites where timber growing may be easily reduced due to inherent soil properties and landform characteristics. (PRMP/EIS, Chapter 3-11)

Fragile sites fall within one of two classifications. Fragile Nonsuitable Woodlands are sites judged to be biologically and/or environmentally incapable of supporting a sustainable yield of forest products. None of the areas proposed for thinning fall in this category. Fragile Suitable Woodlands are those where unacceptable soil productivity losses may result from forest management activities unless mitigated by the application of appropriate Best Management Practices.

Three categories of Fragile Suitable Woodland are present in areas proposed for thinning. These are:

- Slope gradient (FGR) is a potential concern on approximately 449 acres. Unacceptable losses of soil and organic matter may result from forest management activities unless best management practices are used to protect the soil/growing site (MCWA, p. 83);
- Mass movement (FPR) is a potential concern on approximately 181 acres. Sites consist of deep seated, slumps or earth flows on undulating topography with slope gradients general less than 60 percent. On forested sites, some conifers may be curved at the butt and/or along the stem. Forest management is feasible because of the slow and gradual rate of movement (MCWA, 84); and
- Surface Erosion (FMR) is a potential concern on approximately 29 acres. Soils have surface horizons that are highly erodible and susceptible to dry ravel. Forest management activities are not expected to adversely increase soil erosion, and any site productivity loss, if it did occur, would be expected to be within acceptable limits (MCWA, p. 85).

## **VII. Cultural/Historical Resources**

Previous surveys of portions of the project areas have identified five sites with archaeological resources. Four sites are in proximity to proposed Unit 28-3-26 A. The fifth is located on the east side of proposed Unit 28-3-35 A.

Two sites in proximity to Unit 28-3-26 A are in a Riparian Reserve that would be excluded from thinning, and should not be affected by thinning in the upland areas. A third site was evaluated and consulted with the State Historic Preservation Office (SHPO) in 1998. It was determined not to be significant<sup>4</sup> and would not be adversely affected by the proposed thinning. The fourth site has not been evaluated for its significance but would likely be affected by the proposed thinning.

The fifth site on the east side of Unit 28-3-35 A was determined to be significant through consultation with the Oregon State Historic Preservation Office in 1994, and would likely be adversely affected by the proposed thinning.

Clearance inventories would be conducted for all remaining units. Any new sites would be avoided or evaluated, whichever would be practical. If new sites are evaluated and deemed significant, the BLM would consult on effects to these new sites as well as others previously identified as significant. Proposed units and roads would be modified as necessary to avoid adverse effects. If modification is not practical, mitigation would be applied, as provided by SHPO, in the form of extraction of a portion of the information contained within the resource. Consequently, cultural/historical resources will not be addressed further in this analysis.

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<sup>4</sup> Significance refers to the value of the resource as defined in the National Historic Preservation Act and its implementing regulations, rather than effects as described in the National Environmental Policy Act and regulations of the Council on Environmental Quality.

## VIII. Noxious Weeds

There are scattered infestations of noxious weeds within the project area, particularly Himalayan blackberry and Scotch broom. These infestations also occur along the access roads.

Implementation of the *Roseburg District Integrated Weed Control Plan and Environmental Assessment* (USDI, BLM 1995b) is an ongoing effort to prevent or reduce spread of weed populations, and control or contain existing infestations. Activities include inventory of weed infestations, assessing risk for spread, and weed control in areas in which management activities are planned. Controls may include release of biological agents, mowing, hand-pulling, and use of approved herbicides. Noxious weed treatments will be undertaken regardless of whether or not the proposed action is implemented.

Additional management practices that may be implemented to reduce potential weed spread or the establishment of favorable weed germination conditions could include: steam cleaning or pressure washing of heavy equipment used in logging and road construction to remove soils and other materials that could transport weed seed or root fragments; scheduling work in uninfested areas prior to work in infested areas; seeding and mulching soil with native seed; or revegetating with native plant species where natural regeneration is unlikely to prevent weed establishment. As a consequence there would be negligible changes in noxious weed populations under either alternative, and no further discussion is necessary in this analysis.

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## **Chapter Four**

# **ENVIRONMENTAL CONSEQUENCES**

This chapter discusses specific resource values that may be affected, the nature of the short-term and long-term effects, including those that are direct, indirect and cumulative, that may result from implementation of the alternatives. The discussion is organized by individual resources. It addresses the interaction between the effects of the proposed thinning and density management with the current environment, describing effects that might be expected, how they might occur, and the incremental effects that could result. It does not address effects of a negligible or discountable nature, focusing instead on direct and indirect effects including those with a realistic potential for cumulative effects.

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 in western Oregon have been described and analyzed in the PRMP/EIS and FSEIS, incorporated herein by reference.

### **I. Timber/Vegetation**

#### **A. Alternative One – The Proposed Action**

This alternative would meet the objectives of the proposed action described on page 2 of this document because it would:

- Reduce present stand densities and maintain stand vigor;
- Recover the commodity value of trees that would be lost to suppression mortality;
- Provide for a high level of sustainable timber production from lands allocated to the General Forest Management Area;
- Help meet future landscape objectives for the Connectivity/Diversity Block land use allocation described in Appendix E of the ROD/RMP (p. 152);

- Aid in development of vegetative and structural diversity in Riparian Reserves; and
- Contribute to the Roseburg District ASQ objective of 45 MMBF annually, in support of the socio-economic benefits envisioned in the PRMP/EIS.

As illustrated in Tables 3-1 through 3-3 on page 15, most stands proposed for thinning have a relative density that exceeds 0.55, a point at which competition between individual trees results in increased mortality and a reduction in tree vigor. Most of the stands that do not presently exceed a relative density of 0.55 are approaching or will exceed this condition in less than 10 years. Two exceptions are Units 29-4-11 C and D in the Connectivity/Diversity Block land use allocation with a current relative density of 0.44.

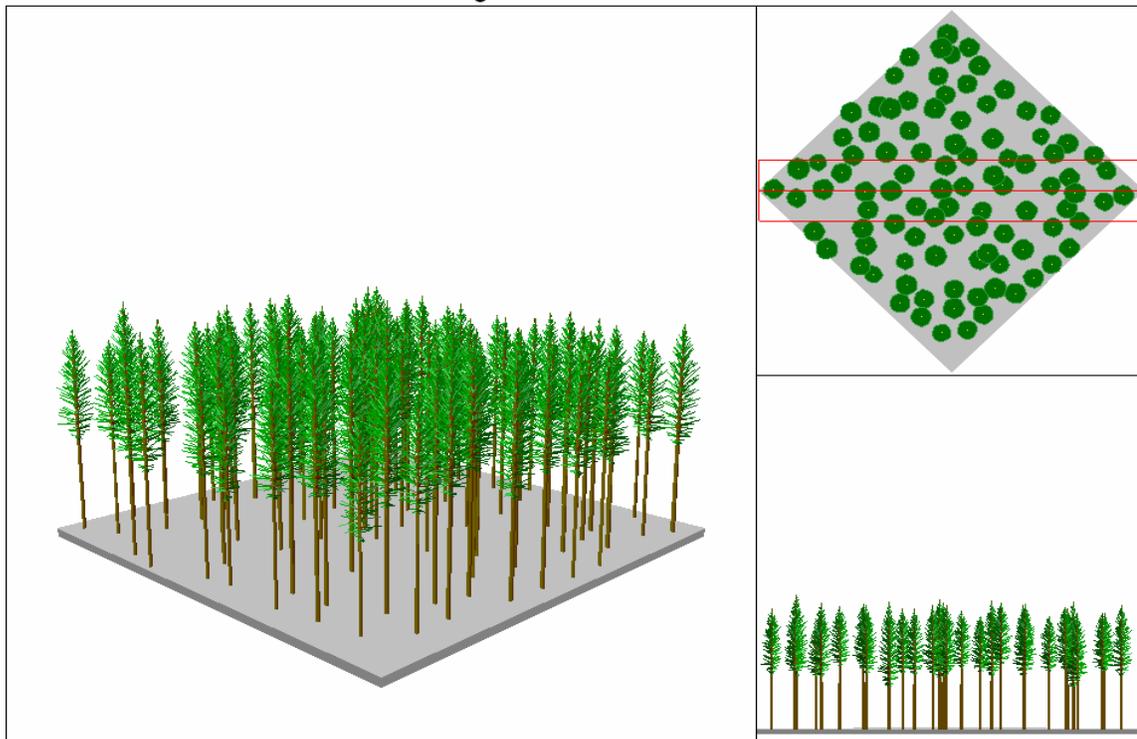
Stands in the General Forest Management Area would be thinned to a relative density of between 0.30 to 0.35 by removing up to half of the present basal area, in order to maximize timber quality and yield, consistent with management direction to “Manage developing stands on available lands to promote tree survival and growth and to achieve a balance between wood volume production, quality of wood, and timber value at harvest.” (ROD/RMP, p. 60)

Figure 4-1 illustrates anticipated post-treatment conditions for a representative stand thinned to approximately 95 trees per acre and 58 percent crown closure.

**Figure 4-1 General Forest Management Area Stand Treatment.**

A:28-3-17A ALL SPECIES Age: 44 CUT

28-3-17athin.002



Density management in the Connectivity/Diversity Block and Riparian Reserve allocations would reduce relative densities to 0.25-0.30, respectively. This would reduce canopy closure to between 40 and 50 percent, allowing sufficient sunlight to reach the forest floor to encourage establishment of an understory and vertical stratification of canopy layers (Hayes, et. al. 1997).

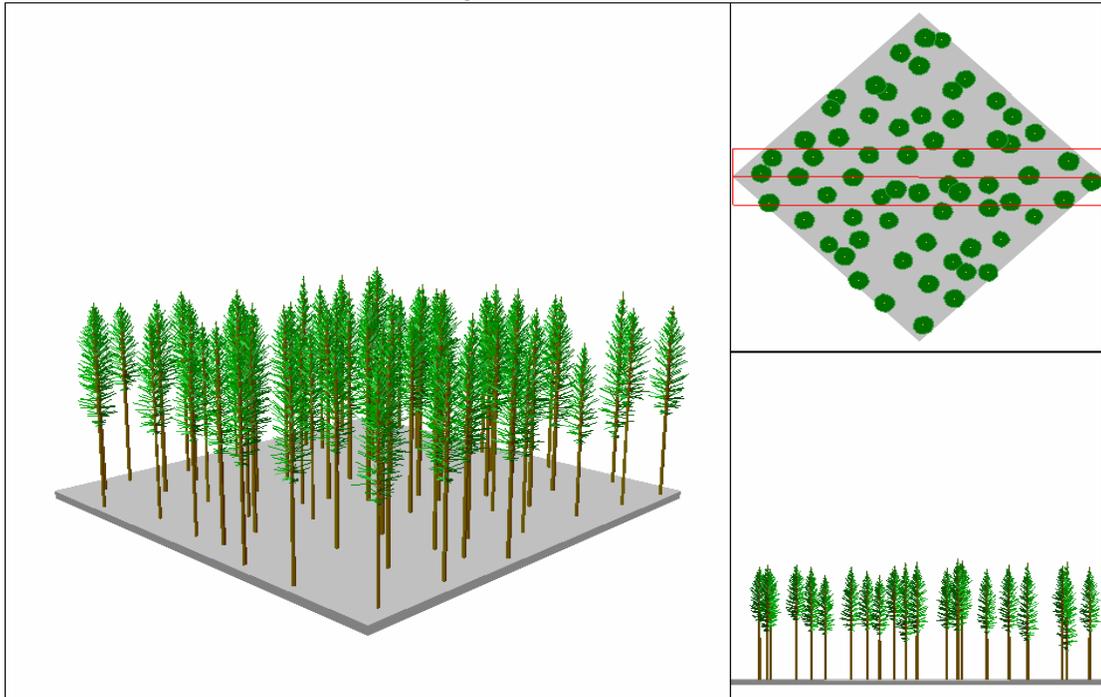
An exception would be Unit 28-3-26 A which would be thinned to a relative density of 0.37, a value slightly higher than would be typical in the General Forest Management Area. This is because the unit is situated near a ridge top and there is a concern for wind firmness following thinning. Post treatment, approximately 50 trees per acre would remain with a Quadratic Mean Diameter of approximately 23 inches.

Figure 4-2 represents the anticipated typical post-treatment condition of Connectivity/Diversity Block units and treated areas in Riparian Reserves.

**Figure 4-2 Connectivity/Diversity Block Stand Treatment**

A:28-3-17A ALL SPECIES Age: 44 CUT

28-3-17athin.svs



Tables 4-1 through 4-3 summarize the anticipated post-treatment conditions for the General Forest Management Area and Connectivity/Diversity Block units. As the marking prescriptions in Riparian Reserves would be similar to those employed in Connectivity/Diversity Blocks, post-treatment stand conditions would be generally comparable, but not necessarily identical.

**Table 4-1 Post-treatment Conditions, Township 28 S, Range 3 W.**

Unit	Trees per Acre	Basal Area in sq. ft.	Quadratic Mean Diameter in inches	Relative Density Index	Percent Canopy Closure	Average Crown Ratio
28-3-17 A	65	90	16.0	0.26	44	0.58
28-3-17 B	78	90	14.5	0.27	50	0.49
28-3-17 C	69	80	14.6	0.24	46	0.51
28-3-17 D	75	90	14.8	0.27	38	0.45
28-3-21 A	66	120	18.2	0.33	52	0.58
28-3-26 A	51	150	23.1	0.37	52	0.33
28-3-33 B	125	100	12.1	0.32	47	0.52
28-3-35 A	76	120	17.1	0.34	48	0.42

**Table 4-2 Post-Treatment Conditions, Township 29 S, Range 3 W.**

Unit	Trees per Acre	Basal Area in sq. ft.	Quadratic Mean Diameter in inches	Relative Density Index	Percent Canopy Closure	Average Crown Ratio
29-3-9 D	85	110	15.6	0.33	47	0.35
29-3-9 E	74	130	17.9	0.36	50	0.35
29-3-11 A	70	90	15.3	0.26	46	0.61
29-3-11 B	71	80	14.4	0.24	41	0.51
29-3-11 C	71	90	15.2	0.26	40	0.42
29-3-11 D	71	90	15.2	0.26	40	0.42
29-3-21 C	90	110	15.0	0.32	43	0.41

**Table 4-3 Post-Treatment Conditions, Township 29 S, Range 4 W.**

Unit	Trees per Acre	Basal Area in sq. ft.	Quadratic Mean Diameter in inches	Relative Density Index	Percent Canopy Closure	Average Crown Ratio
29-4-1 A	103	110	14.0	0.33	49	0.47
29-4-1 B	83	110	15.6	0.32	46	0.47
29-4-1 C	80	110	15.9	0.32	46	0.45
29-4-1 D	93	110	14.7	0.33	48	0.56
29-4-1 E	94	110	14.7	0.33	46	0.44
29-4-3 C	90	110	15.0	0.32	49	0.37
29-4-3 F	100	120	14.8	0.36	50	0.37

Tables 4-4, 4-5 and 4-6 summarize anticipated stand conditions in the General Forest Management Area at culmination of mean annual increment<sup>5</sup> (CMAI), and at area control rotation of 150 years in Connectivity/Diversity Blocks, in response to thinning. Given that Riparian Reserve treatments would closely mimic Connectivity/Diversity Block treatments, the long-term condition of Riparian Reserves would be generally comparable, though not entirely identical, to conditions in the Connectivity/Diversity Blocks.

<sup>5</sup> Culmination of mean annual increment, or CMAI, is defined as the age in the growth cycle of a tree or stand at which the mean annual increment for height, diameter, basal area, or volume is at a maximum. (The Dictionary of Forestry, The Society of American Foresters 1998).

**Table 4-4 CMAI/Area Control Rotation Conditions, Township 28 S, Range 3 W.**

Unit	Trees per Acre	Basal Area in sq. ft.	Quadratic Mean Diameter in inches	Relative Density Index	Percent Canopy Closure
28-3-17 A	60	376	33.8	0.80	96
28-3-17 B	66	408	33.7	0.87	100
28-3-17 C	61	415	35.2	0.87	100
28-3-17 D	62	346	31.9	0.76	100
28-3-21 A	62	329	31.3	0.72	100
28-3-26 A	50	292	32.8	0.63	100
28-3-33 B	96	355	26.1	0.84	91
28-3-35 A	67	279	27.7	0.65	100

**Table 4-5 CMAI/Area Control Rotation Conditions, Township 29 S, Range 3 W.**

Unit	Trees per Acre	Basal Area in sq. ft.	Quadratic Mean Diameter in inches	Relative Density Index	Percent Canopy Closure
29-3-9 D	71	268	26.3	0.63	100
29-3-9 E	66	284	28.1	0.65	100
29-3-11 A	65	384	33.0	0.83	100
29-3-11 B	62	342	32.0	0.75	100
29-3-11 C	62	292	29.5	0.66	100
29-3-11 D	62	292	29.5	0.66	100
29-3-21 C	73	325	28.7	0.74	100

**Table 4-6 CMAI/Area Control Rotation Conditions, Township 29 S, Range 4 W.**

Unit	Trees per Acre	Basal Area in sq. ft.	Quadratic Mean Diameter in inches	Relative Density Index	Percent Canopy Closure
29-4-1 A	89	289	24.4	0.70	100
29-4-1 B	75	324	28.1	0.75	100
29-4-1 C	72	325	28.8	0.74	100
29-4-1 D	81	239	28.5	0.82	91
29-4-1 E	83	328	26.9	0.77	100
29-4-3 C	67	359	31.2	0.79	93
29-4-3 F	75	294	26.9	0.70	100

**B. Alternative Two – No Action**

This alternative would not meet the resource management objectives described above and in Chapter One of this EA.

In the absence of thinning, relative stand densities would continue to increase with a corresponding increase in mortality among trees in the suppressed and intermediate crown classes. These stands would continue developing along an even aged, single-storied trajectory until some future disturbance alters the stand structure.

Canopies would remain closed and live crowns of individual trees would continue to recede. As live crown ratios fall below 30 percent a corresponding decline in the vigor of individual trees and stagnation in growth would occur. Closely spaced trees with small crowns have a reduced photosynthetic capacity resulting in decreased diameter growth and diminished resistance to attacks from disease and insects. As trees increase in height with little increase in diameter, they become unstable and more susceptible to wind damage (Oliver and Larson 1996). The likelihood of a favorable response to any future thinning treatments would also decrease.

In Connectivity/Diversity Blocks and the General Forest Management Area, managing stands in this manner would not be consistent the objective of moderately high to high levels of sustainable timber production.

In Connectivity/Diversity Blocks this type of development would not meet future stand condition objectives. Many habitat characteristics associated with late-successional and old-growth forests would be largely unattainable barring a natural disturbance that alters current developmental trajectories. Canopy stratification and gap creation would generally not occur. Overtopping and suppression of hardwoods would gradually eliminate them as stand components.

The primary objective of Riparian Reserves management is development of late-successional forest characteristics. Old-growth stands developed at lower relative densities and greater growth rates compared to managed second-growth stands. Old-growth stands appear to have developed under conditions with large trees numbering fewer than 50 per acre. Over time, stands regenerated with little competition between trees as disturbances, such as wildfire, of a magnitude sufficient to promote natural regeneration of conifers occurred (Tappeiner et. al. 1997).

It is not expected that single-storied riparian stands would develop into multi-storied stands without altering present growth trajectories. In the absence of disturbance, shade-tolerant species such as grand fir and western redcedar would remain suppressed in the understory and there would be insufficient sunlight to allow conifer and hardwood regeneration. Numbers of snags would decline as they fall and deteriorate. As large down wood decays, its availability would decline as suppression mortality would primarily occur in small trees and not provide a continuum of larger material.

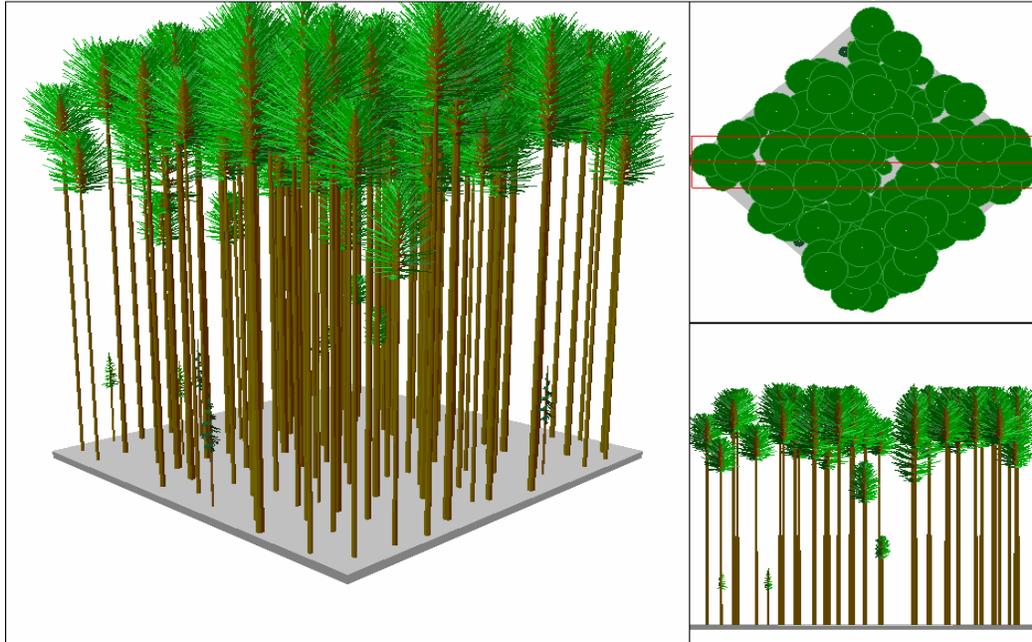
Failure to treat Riparian Reserves would result in reduced potential for recruitment of large wood into streams as large trees would be at a distance from streams where little potential for in-stream recruitment would exist. Suppression and elimination of hardwoods from the Riparian Reserves would further simplify the vegetative composition of the stands, inconsistent with ACS objectives

SW Organon version 6.0 was used to project stand growth in the General Forest Management Area at culmination of mean annual increment, and area control rotation of 150 years in Connectivity/Diversity Blocks, absent any silvicultural treatments. Figure 4-3 is a visual representation of the anticipated conditions.

**Figure 4-3 – Future Stand Conditions if Left Untreated**

A:28-3-17A ALL SPECIES Age: 149

28-3-17agrow.svs



Tables 4-7, 8 and 9 summarize projected stand conditions at 150 years in Connectivity/Diversity Blocks or CMAI in the General Forest Management Area absent any thinning treatments.

**Table 4-7 Future Untreated Conditions, Township 28 S, Range 3 W.**

Unit	Trees per Acre	Basal Area in sq. ft.	Quadratic Mean Diameter in inches	Relative Density Index	Percent Canopy Closure
28-3-17 A	105	391	26.1	0.93	86
28-3-17 B	91	415	28.9	0.95	94
28-3-17 C	90	403	28.7	0.92	88
28-3-17 D	89	335	26.2	0.79	86
28-3-21 A	135	347	21.7	0.88	93
28-3-26 A	110	353	24.2	0.86	99
28-3-33 B	164	330	19.2	0.88	94
28-3-35 A	111	280	21.5	0.72	100

**Table 4-8 Future Untreated Conditions, Township 29 S, Range 3 W.**

Unit	Trees per Acre	Basal Area in sq. ft.	Quadratic Mean Diameter in inches	Relative Density Index	Percent Canopy Closure
29-3-9 D	121	261	19.9	0.69	97
29-3-9 E	109	281	21.7	0.71	96
29-3-11 A	108	400	26.1	0.95	87
29-3-11 B	96	333	25.3	0.80	86
29-3-11 C	93	315	25.0	0.76	100
29-3-11 D	93	315	25.0	0.76	100
29-3-21 C	102	312	23.7	0.77	100

**Table 4-9 Future Untreated Conditions, Township 29 S, Range 4 W.**

Unit	Trees per Acre	Basal Area in sq. ft.	Quadratic Mean Diameter in inches	Relative Density Index	Percent Canopy Closure
29-4-1 A	181	272	16.6	0.77	97
29-4-1 B	131	329	21.4	0.84	94
29-4-1 C	111	312	22.7	0.78	92
29-4-1 D	125	347	22.6	0.87	93
29-4-1 E	141	318	20.4	0.83	93
29-4-3 C	105	272	21.7	0.71	92
29-4-3 F	118	282	20.9	0.73	94

**C. Cumulative Effects**

Based on a study by Andrews and Cowlin (1940), vegetative conditions in the Myrtle Creek fifth-field watershed in 1936 were characterized by: 12,828 acres of non-forest land; 1,129 acres of hardwood forest and savanna; 1,118 acres of early-seral conifer forest less than 30 years of age; 13,239 acres of mid-seral conifer forest, 50 to 80 years old; and 47,952 acres of mature conifer forest at least 80 years of age (MCWA, p. 22).

Beginning in the 1950s, timber harvest became a major force in shaping the current vegetative conditions in the watershed (MCWA, p. 13). By 2001, non-forested land had declined by slightly more than ten percent to 11,466 acres. Hardwood dominated forest increased by roughly 43 percent to 1,618 acres. Conifer forest declined by approximately 845 acres or one and a half percent of 1936 levels (MCWA, p. 41), the decline largely attributable to conversion of the land to residential properties and public infrastructure.

Age class distribution of conifer forests also changed dramatically. Early-seral forest comprised 13,365 acres, an increase of almost 1,200 percent. Over the same period, mid-seral forests increased by increased by 232 percent t to 30,771 acres. Correspondingly, mature forest declined by roughly 60 percent to 19,018 acres.

The BLM manages 30,984 acres in the Myrtle Creek fifth-field watershed, representing 40.6 percent of all ownership. Conifer forest accounts for 30,374 acres or 98 percent of BLM lands. In 2001, the age class distribution of these forest lands was: 7,449 acres of early-seral forest, less than 30 years of age, representing 56 percent of all early seral forest in the Myrtle Creek fifth-field watershed; 2,223 acres of mid-seral stands, 30 to 80 years of age, representing 7.2 percent of all mid-seral forest in the Myrtle Creek fifth-field watershed; and 17,592 acres of mature forest, greater than 80 years of age, representing 58 percent of forest land managed by the BLM, and 92.5 percent of all mature forest in the Myrtle Creek fifth-field watershed. (MCWA, pp 45-46)

Other than limited roadside salvage of blown down timber and removal of timber associated with reciprocal rights-of-way agreements, over the past five years timber management by the BLM in the Myrtle Creek fifth-field watershed over the past five years has been limited to the authorization of 171 acres of commercial thinning and density management under the Tater Tot Commercial Thinning decision.

The proposed action would treat 618 acres of mid-seral and 45 acres of mature forest. Taken together with the Tater Tot acreage, this would amount to 36 percent of the mid-seral stands and one-quarter of one percent of mature forest stands managed by the BLM in the Myrtle Creek fifth-field watershed. While thinning does modify stand conditions, it largely retains those trees that are the dominant and co-dominant stand components and as such does not alter stand age and age class distributions.

In addition to these thinning projects, the BLM will re-analyze four sold but unawarded timber sales in the Myrtle Creek fifth-field watershed originally authorized in 1997 and 1998. These sales would harvest approximately 585 acres of mature forest, creating early-seral forest with remnant large trees and snags. This harvest, upon implementation, would reduce the amount of mature forest managed by the BLM in this watershed by 3.3 percent.

In 2001, the age-class distribution of privately managed forest land in the Myrtle Creek fifth-field watershed was approximately 5,900 acres less than 30 years of age, 25,440 acres between 30 to 80 years of age, and 1,423 acres greater than 80 years of age.

In 2005, an interpretation of aerial photographs and digitized satellite imagery was used to evaluate the vegetative condition of private forest lands in the Myrtle Creek fifth-field watershed. It suggests that there are approximately 7,668 acres of early seral forest, representing an increase of 30 percent in the last four years. Over the same period, acres of mid-seral forest declined by slightly more than nine percent to 23,981 acres. Mature forest declined to 1,298 acres, also slightly more than nine percent. This indicates a harvest of approximately 365 acres of mid-seral forest and 32 acres of mature forest from private lands annually over the past four years. Some small measure of error in these figures can be expected, however, as the precise level of in-growth and maturation of forest stands cannot be determined by the aforementioned methods.

Assuming a continued rate of private harvest comparable to that addressed above, approximately 3,650 acres of mid-seral forest would be harvested on private lands in the Myrtle Creek fifth-field watershed over the next decade. The effect would be to reduce acres of mid-seral forest on private lands by slightly more than 15 percent, and slightly less than 14 percent in all ownerships. Much of this acreage will be replaced, however, as stands upwards of 20 years of age further develop, including approximately 2,200 acres of BLM-managed forest identified as 20 to 30 years of age in 2001 (MCWA, p. 46).

It is anticipated that approximately 320 acres of mature forest would be harvested on private lands in the Myrtle Creek fifth-field watershed over the next decade. This would reduce the acreage of mature forests on privately managed lands by almost 25 percent. When combined with the 585 acres of regeneration harvest proposed on BLM-managed lands, this would reduce the amount of mature forest in the Myrtle Creek fifth-field watershed by approximately 4.8 percent over the next decade. This would be partially offset over the same period of time as approximately 2,200 acres of 50 to 80 year old stands on BLM-managed lands further develop and mature.

## II. Wildlife

### A. Alternative One - The Proposed Action

#### 1. Threatened and Endangered Species

##### Northern Spotted Owl

The proposed action would modify approximately 663 acres of forested habitat in 13 spotted owl home ranges.

Unit 28-3-26A is overlapped by the Curtin Creek and Johnson Creek home ranges. Density management would downgrade the function of the stand from suitable habitat to dispersal-only habitat by reducing horizontal and vertical cover, removing potential hunting perches, and disturbing coarse woody debris that provides habitat for prey species.

It is expected that both affected home ranges would continue to support spotted owl use because habitat modification would be limited to approximately 2 percent of the suitable habitat within each range. Suitable habitat would still be maintained at 75 percent or 2,086 acres on BLM-managed lands in the Curtin Creek home range, and 71 percent or 2,045 acres on BLM-managed land in the Johnson Creek home range. These levels of suitable habitat are well within the reported amounts considered necessary to support spotted owl nesting and reproduction (Ripple et al. 1991, Johnson 1992, Meyer et al. 1998).

No effect to spotted owls from noise disruption would be expected, as thinning operations would either occur outside of the disruption threshold (USDI, FWS 2005) for known spotted owl sites or activity centers, or be seasonally restricted from March 1<sup>st</sup> to June 30<sup>th</sup> if within the disruption threshold of unsurveyed suitable spotted owl habitat. Seasonal restrictions could be waived until March 1<sup>st</sup> of the following year if surveys indicate that spotted owls are not present, not nesting, or failed in nesting. These factors would ensure that noise disruption would not cause spotted owls to abandon nests or fledge prematurely.

Thinning operations on Unit 28-3-26A would be seasonally restricted from March 1 to September 30 to avoid affecting spotted owl fledglings from the Curtin Creek site through modification of habitat. The restriction would be subject to waiver until March 1 of the following year if surveys have determined that the site is unoccupied, or that no nesting was attempted or that attempts were unsuccessful.

Thinning of the remaining units would modify dispersal-only habitat by reducing vertical and horizontal cover, but owls would be expected to continue to use the stands because canopy cover would exceed 40 percent with mean tree diameters greater than 11 inches, figures widely accepted as a threshold for dispersal function (Thomas et al. 1990).

Table 4-10 displays the effects of the proposed thinning on levels of dispersal and suitable habitat in each affected spotted owl home range.

**Table 4-10 Modification to Spotted Owl Habitat on BLM Lands**

Site	Federal Acres in Home Range	Dispersal-Only Habitat			Suitable Habitat		
		Pre-Action	Post-Action	Change	Pre-Action	Post-Action	Change
Crab Louis	1169	242 (21%)	242 (21%)	0 (0%)	406 (35%)	406 (35%)	0 (0%)
Curtin Creek	2764	29 (1%)	29 (1%)	0 (0%)	2131 (77%)	2086 (75%)	45 (2%)
High Riser	1965	217 (11%)	217 (11%)	0 (0%)	969 (49%)	969 (49%)	0 (0%)
Johnson Creek	2891	110 (4%)	110 (4%)	0 (0%)	2084 (72%)	2045 (71%)	39 (1%)
Lallygaggin	2424	609 (25%)	609 (25%)	0 (0%)	1111 (46%)	1111 (46%)	0 (0%)
Long Wiley	1441	429 (30%)	429 (30%)	0 (0%)	721 (50%)	721 (50%)	0 (0%)
Louis Riser	2775	566 (20%)	566 (20%)	0 (0%)	1404 (51%)	1404 (51%)	0 (0%)
Lower Days	1478	264 (18%)	264 (18%)	0 (0%)	829 (56%)	829 (56%)	0 (0%)
Mel Kat	1123	279 (25%)	279 (25%)	0 (0%)	533 (47%)	533 (47%)	0 (0%)
Riser Creek	2820	224 (8%)	224 (8%)	0 (0%)	1607 (57%)	1607 (57%)	0 (0%)
South Letitia Creek	905	382 (42%)	382 (42%)	0 (0%)	326 (36%)	326 (36%)	0 (0%)
Upper Mays Creek	951	222 (23%)	222 (23%)	0 (0%)	510 (54%)	510 (54%)	0 (0%)
Weaver Creek	2875	276 (10%)	276 (10%)	0 (0%)	1714 (60%)	1714 (60%)	0 (0%)

The proposed thinning and density management would stimulate understory growth in the project area by reducing canopy cover, which may indirectly benefit northern spotted owls by improving habitat conditions for prey species such as woodrats (*Neotoma* spp.), that favor brushy habitats (Sakai and Noon 1993).

Additionally, the proposed action could indirectly benefit spotted owls in Riparian Reserves that are not subject to future harvest and in Connectivity/Diversity Blocks scheduled for longer harvest rotations by accelerating the development of late-successional forest conditions providing suitable habitat.

## 2. BLM Special Status Species

### American Peregrine falcon

As discussed in Chapter Two, thinning operations on proposed Unit 28-3-35A would be subject to seasonal operating restrictions unless it is determined that the falcons have not nested or have fledged young early. Consequently, noise disruption to the nearby aerie is not expected and falcons would not be affected.

### Chace Sideband and Oregon Shoulderband snails

Surveys would be conducted for these two snail species where suitable habitat exists. If found, snail sites would be protected by altering unit configurations, designating buffers, or implementing other measures to provide suitable microclimate, undisturbed substrate, and vegetation or down wood. These measures would ensure that, if present, viable populations of these species would remain in the project area. The proposed action could also indirectly benefit these species by creating additional coarse woody debris and conditions favorable for establishment and growth of herbaceous vegetation. Consequently, it is not expected that the proposed action would contribute to a need to list either species as threatened or endangered.

### Northern Goshawk

Seasonal restrictions on project activities in units 28-3-17 B, C, and D would be implemented to mitigate possible noise disruption to the nearby known nest site, ensuring that thinning operations would not cause nest abandonment or premature fledging of young.

Goshawks could be using proposed Units 28-3-26 A and 28-3-21 A for nesting due to the presence of large remnant trees, or unit 28-3-17 D due to its proximity to a known nest stand. The proposed thinning would reduce suitability of these stands for goshawk nesting by reducing canopy cover and potential nesting structure in the near term. While individual goshawks could be affected, as the Northwest Forest Plan continues to be implemented populations as a whole are expected to stabilize in a well-distributed pattern across federal land (FSEIS 3&4-179), consistent with BLM Special Status Species Program objectives.

As with the northern spotted owl, this project could indirectly benefit goshawks, as thinning and density management would accelerate the development of late-successional forest conditions in Riparian Reserves that are not subject to future harvest and in Connectivity/Diversity Blocks scheduled for longer harvest rotations.

Consequently, the proposed action would not be expected to contribute to the need to list the goshawk as a threatened or endangered species.

### Purple Martin

Although purple martins typically nest in more open habitat than the project area (Brown 1997, Horvath 2003), suitable nest trees and/or snags may exist on the periphery of units, in openings within units, or in large remnant trees that extend above the primary canopy. These habitat features would be reserved, however, except where necessary to meet density objectives, mitigate safety hazards, or clear road rights-of-way.

While some limited removal of nesting habitat could occur, it would not be expected to result in the extirpation of purple martins, if present, from the project area. Consequently, it is not expected that the proposed action would contribute to a need to list the purple martin as a threatened or endangered species.

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

Proposed Units 28-3-21A and 28-3-26A contain large remnant trees and snags that could provide roost sites for these bat species. The proposed action would reserve these habitat features except where necessary to mitigate safety hazards, or clear road rights-of-way. Roosting opportunities for these bat species could be reduced under such circumstances, but such limited removal would not be expected to result in the extirpation of these bat species, if present, from the project area.

The proposed action could indirectly benefit these bat species in Riparian Reserves that are not subject to future harvest and in Connectivity/Diversity Blocks scheduled for longer harvest rotations by accelerating the development of late-successional forest conditions providing suitable habitat.

Consequently, the proposed action would not be expected to contribute to a need to list these bat species as threatened or endangered species.

### **B. Alternative Two - -No Action**

There would be no direct effects to wildlife in the project area associated with habitat modification or noise disturbance. The potential for such effects would exist elsewhere as other stands within the Matrix would be selected for timber harvest.

Existing habitat conditions in the project area would be maintained and the forest stands would continue to develop along their current trajectories. Because of the overstocked stand conditions and slowing growth rates, habitat features typical of mature and late-successional forest would develop more slowly than under Alternative One.

Present levels of spotted owl habitat and owl use of the stands would remain generally unchanged. Dispersal-only habitat in the project area would develop into suitable spotted owl habitat more slowly than under Alternative One due to delayed development of features like large diameter trees with broken tops or cavities, large down wood and snags, and a well-developed shrub layer.

Similarly, northern goshawks could continue to use the project area at current levels. The project area would grow into suitable goshawk habitat more slowly than under Alternative One due to continued high tree density and slower development of large diameter nest trees.

### C. Cumulative Effects

Availability of late-seral forest habitat is the primary wildlife concern in the Myrtle Creek fifth-field watershed. Stands in this area begin functioning as late-successional habitat at approximately 80 years of age when characteristics like large diameter trees, a secondary canopy layer, snags, and cavities have developed. Early and mid-seral habitat is expected to be abundant on private lands as a result of past and future timber harvest.

While thinning and density management would reduce tree densities in the treated stands, it would not affect overall stand ages, the ability of the stands to grow and develop into late seral habitat, or the current availability of late-seral forest habitat in the Myrtle Creek fifth-field watershed. Thinning treatments may temporarily reduce the utility of some of the units for certain wildlife species by removing canopy cover and horizontal structure, but canopy cover would return to pre-treatment levels within 10 to 15 years.

At present, of the 34,400 acres of forested land in private ownership within the Myrtle Creek fifth-field watershed there are approximately 1,300 acres of late-seral forest. The PRMP/EIS assumed (Vol. I, p. 4-4) that “. . . most private forest lands would be intensively managed with final harvest on commercial economic rotations averaging 50 years.” If timber harvest on private forest lands continues at a rate comparable to that noted above (p. 40), late-seral forest habitat will be unavailable on private lands within the next 40 years.

Other reasonably foreseeable timber management actions by the BLM in the Myrtle Creek fifth-field watershed include four regeneration harvest timber sales that were previously sold but have not been awarded. The four sales: Buck Fever, Class of 98, Dream Weaver and Sweet Pea, would harvest 585 acres in the Upper South Myrtle and Lower South Myrtle six-field subwatersheds.

The BLM manages 30,372 acres of conifer forest lands in the Myrtle Creek fifth-field watershed. Of this total, there are 17,592 acres of late-seral stands representing 57 percent of forest lands managed by the BLM. The proposed regeneration harvest would represent a reduction of approximately 1.9 percent in the amount of late-seral forest habitat provided by the Federal lands, and 1.8 percent of all late-seral forest in the watershed.

At present, in the Myrtle Creek fifth-field watershed there are approximately 2,200 acres of mid-seral forest stands managed by the BLM that will develop into late-seral forest stands over the next 20 to 30 years. Reductions in late-seral habitat, representative of suitable northern spotted owl habitat, were envisioned in the first decade following implementation of the ROD/RMP. Watershed analysis (MCWA, p. 68) projects that with implementation of management direction from the ROD/RMP, the amount of late-seral forest present in the Myrtle Creek fifth-field watershed in the year 2025 will be the same as presently exists even following regeneration harvest authorized by the ROD/RMP. This indicates that there would be no cumulative effects to the continued availability and functionality of late seral habitat in the Myrtle Creek watershed.

Because BLM-administered Matrix lands are managed on harvest rotations longer than those employed on private forest lands (i.e. regeneration harvest at 80 to 110 years of age in the GFMA and regeneration harvest on a 150-year area control rotation for stands in Connectivity/Diversity Blocks) and because Late-Successional Reserves and Riparian Reserves are not scheduled for regeneration harvest, overall age-class distribution of forest lands managed by the Roseburg District BLM will tend toward older seral stages, as illustrated in the PRMP/EIS (Chapter 4 – 27 & 28).

Over a period of 100 years, implementation of management direction from the ROD/RMP is projected to result in a 51 percent increase in the amount of old-growth forest managed on the Roseburg District (PRMP/EIS, Chapter 4 – 29). This is projected to provide an additional 131,000 acres of nesting, roosting and foraging habitat for the northern spotted owl, and habitat for those other species dependent on late-successional forest habitat (PRMP/EIS, Chapter 4 – 57).

### **III. Botany**

#### **A. Alternative One – The Proposed Action**

##### **1. Vascular Plants**

No direct effects to Special Status species would be anticipated as a result of the proposed action. In the event species identified in Appendix C are located by surveys, sites would be protected in accordance with management recommendations designed to maintain habitat conditions favorable for their persistence.

##### **2. Fungi**

The proposed action would not affect any known sites for Bureau Sensitive fungi species described on page 20, because they are all outside of any of the proposed thinning units.

The presence of these species in the project area is unknown as surveys are not considered practical for reasons described on page 21. If any of these species are present in the proposed thinning units, a loss of sites would likely result as a consequence of the removal of substrate and modification of microclimate, as described in the *Final Supplemental Environmental Impact Statement to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines* (pp. 150-154).

Opening up the forest canopy would alter the forest microclimate by reducing shade, resulting in greater solar exposure and drier conditions. This would likely result in a reduction in moisture retention by forest litter, soil organic components and large woody debris. Yarding would also result in the displacement and degradation of forest litter, organic matter and large woody debris.

Studies have demonstrated that overstory removal reduces ectomycorrhizal sporocarp (fruiting bodies) production. (Luoma et al 2004). The degree of reduction depends on many factors described above. Thinning would retain a large number of potential hosts trees, so loss of all sites would be unlikely. The remaining host trees can serve as refugia allowing fungi to persist until stand conditions such as canopy closure, soil moisture and relative humidity return to pre-thinning levels. Even though a temporary reduction in fruiting would be expected, as stand conditions return to pre-thinning levels over the next 10 to 15 years, mycorrhizal fungi communities will also recover.

## **B. Alternative Two – No Action**

### **1. Vascular Plants**

No direct effects would result from this alternative, however, in the absence of management to create forest gaps or control competing vegetation, some special status species, such as Kincaid's lupine and *Horkelia* sp., that require open growing conditions and abundant sunlight may decline because a declining availability of light necessary to these species.

### **2. Fungi**

Under this alternative, the project stands would continue to function as fungi habitat and no loss of sites would be expected because microclimatic conditions of temperature and humidity would be maintained by retention of present forest canopy, and soil organic matter, forest litter and large woody debris would remain intact and undisturbed.

## **C. Cumulative Effects**

As any populations of Special Status or Special Attention species found in association with the proposed thinning and density management units would likely be small and isolated, and measures implemented to maintain habitat integrity and microclimate would render any effects benign in nature, no cumulative effects would be anticipated.

Anticipated effects to fungi would be short-term at the site level. Luoma found that harvested units would not be expected to function as habitat for the first 20 years following harvest (Luoma D.L. et. al. 1996). Pilz and Molina (1994) found that surviving mycelium or spores from elsewhere may quickly colonize the roots of new trees, but several decades may pass before ectomycorrhizal species fruit again. In most instances, ectomycorrhizal diversity increases with stand age with higher diversity of species observed in mature stands (Bradbury, S.M. et. al. 1998). Molina (1993) found reestablishment of fungi occurs 20 to 30 years after a stand is established and canopy closure occurs. As thinning and density management would not remove all host trees and canopy, and canopy closure would return to pre-treatment levels in 10 to 15 years, fungal communities would be expected to recover within 20 years.

Within the Myrtle Creek fifth-field watershed, forest lands managed by the BLM presently provide nearly 23,000 acres of suitable fungi habitat. Approximately 40 percent of the suitable habitat is on lands allocated to Riparian Reserves. When combined with unmapped Late-Successional Reserves (spotted owl core areas) and other withdrawn lands, nearly 45 percent of BLM-managed lands in the watershed are not subject to regeneration harvest and may be expected to provide well-distributed habitat for long-term population stability for fungi.

When considering all ownership, there are approximately 49,800 acres of suitable fungi habitat in the Myrtle Creek fifth-field watershed. Based on an assumed average annual harvest from private timber lands of 400 acres annually, modification of 663 acres in association with the proposed thinning and density management, and the proposed regeneration harvest of 585 acres associated with four sold but unawarded timber sales, a reduction of 10 to 11 percent in available suitable habitat could be expected over the next decade. While difficult to precisely estimate, this loss would be partially offset by in-growth and maturation of younger forest stands, including 2,173 acres of forest managed by the BLM that is presently between 20 and 30 years old, such that suitable fungi habitat is expected to remain abundant and well-distributed. Consequently, it is not anticipated that the proposed commercial thinning and density management project or the four sold but unawarded regeneration harvest timber sales timber sale would contribute to a future need to list any of these fungi species as threatened or endangered.

#### **IV. Fish and Aquatic Resources**

##### **A. Alternative One – The Proposed Action**

###### **1. Aquatic Habitat Conditions**

Activities that could affect aquatic habitat conditions include thinning operations, timber hauling, and activities associated with road construction, renovation and decommissioning.

###### *Spawning substrate/sediment*

Effects to stream substrates from thinning and density management activities would not be expected. “No harvest” buffers at least 20 feet in width would be established on all streams. Equipment operations would be prohibited within these buffers so that soils would not be displaced or compacted. Non-compacted forest soils in the Pacific Northwest have very high infiltration capacities and are not effective in transporting sediment by rain splash or sheet erosion (Dietrich et. al. 1982). Any potential sediment resulting from thinning operations would be intercepted by the vegetated “no-harvest” buffers and precipitate out rather than reach stream channels. These buffers would also provide root strength sufficient to protect bank stability and prevent abnormal bank erosion that would contribute additional sediment to streams where it could accumulate and become embedded in streambed gravels (FEMAT 1993).

The greatest potential for effects is from road related activities that can contribute sediment to streams and affect substrate quality (Furniss et al. 1991). These activities include construction, renovation, and decommissioning of roads associated with timber sales, as well as timber hauling over the roads.

New permanent roads would be sited entirely on stable ridge top or side slope locations outside of Riparian Reserves. These road segments would be surfaced for all-weather use. The roads would be out-sloped with no ditch lines or culverts that could concentrate run-off during wet weather and provide a means for sediment-laden water to reach streams.

A total of 2.46 miles of temporary roads would be constructed, primarily in ridge top locations where there would be no connection to the stream network and no mechanism for transport of sediment. One exception exists where a temporary spur road accessing Unit 29-3-9 D would require construction of a crossing over an intermittent stream. Hauling would be restricted to the dry season when the stream has no surface flow. The road would be decommissioned prior to the onset of autumn rains, including removal of the temporary culvert and fill material, and blocking the road to vehicular use. This would effectively eliminate any concerns for sediment associated with the road.

Reconstruction of segments of three roads, two previously decommissioned, would total 1.08 miles. The two previously decommissioned roads are in ridge top locations, outside of Riparian Reserves, and will have no effect to water quality as they are not connected to the drainage network by any stream crossings or ditch lines. The portion of Road No. 28-3-17.1 accessing the lower half of proposed Unit 28-3-17 C has two failing stream crossings that contribute sediment to two intermittent stream channels in the wet season. Reconstruction of this road segment would include installation of temporary crossings that would be removed following thinning and eliminate any future sediment concerns associated with the road.

Any minor amounts of sediment that may be generated by construction and use of the two roads described above would be localized in effect. Intermittent stream channels adjacent to proposed thinning units are steep gradient with high storage capacity. Intermittent mountain streams typically have sufficient storage capacity to retain any small amount of sediment generated in the local area (Montgomery and Buffington 1997).

Timber hauling could occur in both the dry and wet seasons. Haul during the dry season would not generate nor deliver road-derived sediment to live stream channels, because absent precipitation there would be no mechanism for sediment transport.

Hauling during the wet season, which normally occurs from November to May, can mobilize fine sediment for transport to streams, especially at stream crossings (Waters 1995). Haul route renovation would include road blading and reshaping, cleaning of cross-drain culverts, and installation of additional cross-drain culverts above stream crossings to divert run-off and ditch drainage onto the forest floor and away from streams, thereby reducing or eliminating sediment sources. The following practices would also be applied, where warranted, as further mitigation against sedimentation.

- Ditch lines would be left vegetated where possible to help filter sediment from road run-off, and
- Water bars would be installed as directed to further route water off of the road surface and onto the forest floor.

#### *Large woody debris*

The removal of trees within a half site-potential tree height (80 feet) of streams could result a short-term reduction in available wood, but smaller diameter wood does not persist for the long term due to higher decay rates (Naiman et al. 2002) and is more easily flushed from the system than large pieces (Keim et al. 2000). Current down wood would be reserved to provide for the short term, while density management would accelerate the growth of large diameter trees that would provide long-term sources of large wood for in-stream habitat.

Road construction would have little effect on the availability of large woody debris for in-stream recruitment. Excepting the spur road accessing Unit 29-3-9 D and reconstruction of a portion of Road No. 28-3-17.1, all road construction and reconstruction would be located outside of Riparian Reserves. In the two instances requiring placement of temporary culverts, any trees removed would be sapling and pole-sized. Given the small size of these trees and the limited scope of activity in the Riparian Reserves, the long-term availability of large wood for in-stream recruitment would not be compromised.

#### *Pool habitat*

The availability of pool habitat would be unaffected by either thinning and density management, or road construction and reconstruction as no existing large wood would be removed from streams.

Density management in Riparian Reserves would primarily remove suppressed and intermediate trees while retaining most dominant and co-dominant trees, so availability of large trees for in-stream recruitment would be largely unchanged. In 20 to 30 years the accelerated growth and development of the remaining trees would provide an abundance of larger diameter trees that, upon recruitment into streams, would enhance pool complexity and create additional pool habitat.

### *Habitat access*

Access to spawning and rearing habitat would be unaffected by either timber harvest or road related activities. Road construction and renovation, whether permanent or temporary, would not involve construction or replacement of stream crossings on any fish-bearing streams. Stream crossings installed on intermittent streams would be removed at the end of the summer operating season. As a consequence, access to aquatic habitat would by fish and other aquatic fauna would be unaffected.

## **2. Special Status Species**

Direct effects to fish species from the harvest and hauling of timber could result from deposition of additional fine sediment and a temporary increase in turbidity, which can hinder survival of eggs and alevin buried in gravel. Turbidity can reduce foraging ability, impair breathing by clogging gill membranes, and increase overall stress levels in fish (Waters 1995).

None of these direct effects would be expected, however. As discussed above, thinning in upland stands and density management in Riparian Reserves would not result in fine sediment reaching streams as uncompacted soils and vegetation in “no-harvest” buffers would filter out sediment from run-off.

Indirect effects of sediment generated by road related activities could include reduced spawning success, and a reduction in the survival of egg and alevins where sediments accumulate and become embedded in stream gravels. For reasons discussed above (pp. 49-50) the anticipated magnitude of such effects are expected to be so small as to not be measurable at the project scale.

## **3. Essential Fish Habitat**

It is not anticipated that thinning and density management would have any adverse effect on Essential Fish Habitat in the Myrtle Creek fifth-field watershed.

As previously discussed (p. 48), non-compacted forest soils in the Pacific Northwest have very high infiltration capacities and are not effective in transporting sediment by rain splash or sheet erosion. Any potential sediment resulting from thinning operations would be intercepted by the vegetated “no-harvest” buffers and precipitate out rather than reach stream channels.

As addressed above, existing large down wood would be reserved to provide for short-term needs for instream wood, while density management in Riparian Reserves would accelerate the growth of large diameter trees that would provide long-term sources of large wood for in-stream habitat. Consequently, there should be no short-term effect on the availability and quality of pool and off-channel habitat, with increases in abundance and quality of these habitats and accumulation of spawning substrates expected in the long term.

Effects of sediment generated by road related activities, particularly timber hauling in wet weather, would be limited to the immediate vicinity of stream crossings. The application of the project design features described above would prevent adverse effects from road related activities.

## **B. Alternative Two – No Action**

Under this alternative there would be no thinning or density management of overstocked upland and riparian stands to promote the growth of large diameter conifer trees. This would contribute to a declining trend in the availability of large wood for recruitment into streams. As existing large wood deteriorates there would be a reduction in pool habitat and the ability of streams to retain and store spawning gravels. This trend would continue for several decades barring some other form of disturbance that reduces stand densities and allows for the growth and development of larger trees.

Absent road-related work including renovation, construction or decommissioning, aquatic habitat would continue to be affected by road run-off and sediment generated from roads that have poor drainage, blocked cross drains and inadequate rock surface. Over time these road segments would contribute additional sediment to stream channels impairing spawning substrate and rearing habitat.

The continued use of natural surface roads or rock roads in poor condition in the watershed, particularly during periods of wet weather, would generate sediments that could reach streams during rain events. These sediments are concentrated by improperly functioning road drainage systems and routed into streams rather than being dispersed across forest slopes where sediments would precipitate before reaching active waterways.

The overall effect would be stable or deteriorating water quality and spawning substrate, degradation of feeding and rearing conditions for fish and other aquatic wildlife, and degradation of Essential Fish Habitat.

In addition, fish and aquatic habitat downstream of the project area would continue to be cumulatively affected by actions on privately-managed forest and agricultural lands which may include harvest of riparian forest, run-off from fields and pastures, and run-off from natural surface roads and tractor skid trails that would continue to reduce the availability of large wood for in-stream recruitment, lead to increases in stream temperatures and contribute additional sediment.

## **C. Cumulative Effects**

In the past four years, the BLM has implemented numerous aquatic restoration projects in the Myrtle Creek fifth-field watershed, including replacement of stream crossing culverts, in-stream habitat enhancement, riparian vegetation treatment, and stream bank stabilization. In the short and long terms these projects: restore access to historical habitat; improve in-stream habitat quality and complexity that increases spawning success, juvenile survival, and smolt productivity; restores riparian vegetative communities; and reduces sediment.

Ten stream crossing culverts have been replaced by the BLM with structures such as bottomless arches and pre-cast bridges that have re-established or improved access to more than 20 miles of spawning and rearing habitat. Post-construction restoration of the sites has included planting of native hardwoods and conifers to provide streamside shade and bank stability.

Approximately one mile of in-stream habitat restoration, consisting of the placement of large logs, was completed on Slide Creek in 2003. A similar treatment is planned for one mile of Weaver Creek in 2006. These structures help trap and retain spawning substrate and create over-wintering pool habitat for juvenile salmon.

Patches of blackberries have been cleared along the one-mile reach of Slide Creek where in-stream restoration was implemented. The cleared areas, totaling approximately five acres, were then planted with native hardwoods and conifers in order to establish a diverse riparian community and provide future sources of large woody debris.

Similar restoration activities have also been completed by private landowners. Several culverts on privately-controlled roads have been removed, or replaced with crossings that allow passage of fish. A private timber company placed boulder structures in a reach of Slide Creek approximately 2000 feet in length. A private property owner placed logs in a reach of Weaver Creek with the assistance from the Umpqua Basin Watershed Council and Oregon Department of Fish and Wildlife.

Other timber management under consideration in the Myrtle Creek fifth-field watershed includes the award of four regeneration harvest sales originally authorized in the late 1990s. These sales would not cumulatively affect aquatic conditions because: full-width intact Riparian Reserves will provide long-term sources of large wood for in-stream recruitment; shading provided by Riparian Reserves will maintain water temperatures; and uncompacted soils and ground vegetation in Riparian Reserves will prevent overland transport of sediment from reaching streams and possibly degrading spawning substrates.

Access for timber harvest hauling will be provided by existing roads wherever practical, utilizing temporary or semi-permanent roads where there is no long-term need for management access. Road construction and renovation will incorporate measures to reduce the potential for roads to transmit sediment to the stream network, resulting in long-term sediment reductions in local drainages and the Myrtle Creek fifth-field watershed. While localized improvements in aquatic conditions might be expected at the local project level, overall results at the Myrtle Creek fifth-field watershed level would be negligible.

## V. Water Resources

### A. Alternative One – The Proposed Action

#### 1. Stream Flow

No measurable effect to stream flow would be anticipated as a result of commercial thinning and density management because the project would involve only partial removal of vegetation on areas constituting two percent or less of each affected drainage. In an overview of several studies, Satterlund and Adams (1992, p. 253) found that “Lesser or nonsignificant responses occur [to water yield] . . . where partial cutting systems remove only a small portion of the cover at any one time.” Where individual trees or small groups of trees are harvested, the remaining trees will generally use any increased soil moisture that becomes available following timber harvest.

##### *Peak Flows and Transient Snow Zone*

Increases in peak flow can occur in forested basins in conjunction with timber harvest in the TSZ due to creation of openings that allow for abnormally high snow accumulation. Warm rain-on-snow events can melt this increased snow pack quickly and create higher than normal flows. These effects, however, primarily occur in areas within the TSZ with less than 30 percent crown closure (Watershed Professionals Network 1999, IV-11). Thinning is proposed on 252 acres in the TSZ within the Myrtle Creek fifth-field watershed. The resulting crown closure would average approximately 45 percent. The Oregon Watershed Assessment Manual (Watershed Professionals Network 1999, IV-11) risk assessment model indicates that there would be a low risk of peak flow enhancement resulting from the proposed thinning.

##### *Peak Flows and Roads*

As described in the preceding section on *Fisheries and Aquatic Resources* (p. 49), new road construction and reconstruction of older roads, whether intended to be permanent or temporary, would be primarily located on ridge tops and outside Riparian Reserves. These roads would be out-sloped in lieu of the construction of ditch lines and installation of cross drains. Consequently, the roads would be entirely disconnected from the drainage network and would have no potential for affecting stream flow levels.

In the two instances involving installation of temporary stream crossings, the roads would be decommissioned in the same dry season in which they are built and used. Decommissioning would include removal of the culverts and construction of water bars on the decommissioned road beds so that run-off is diverted to the forest floor rather than concentrated into the stream crossings. For these reasons, these roads would also not contribute to enhanced stream flows.

## 2. Water Quality

### *Sediment*

Density Management in Riparian Reserves can cause localized soil disturbance and the short-term potential for erosion, primarily associated with yarding operations. However, as described in the preceding section addressing *Fisheries and Aquatic Resources* (p. 48), “no-harvest” buffers would be established for all streams within or adjacent to proposed units. These “no harvest” buffers would prevent disturbance to stream channels and stream banks and would intercept surface run-off allowing for deposition of any sediment transported by overland flow before it reached active waterways.

Cable yarding across stream channels could disturb stream banks and increase sediment delivery to streams. However, the yarding corridors would be designed and constructed to minimize any disturbance to stream banks and channels, and prevent sediment delivery. The location of yarding corridors would be approved by the contract administrator. Corridors would be a maximum of 20 feet in width and laid out perpendicular to stream channels. Full suspension of logs would be required wherever practicable. Additionally, if it is necessary to fell trees within the “no-harvest” buffers to provide tail holds or clear skylines, the trees would be felled perpendicular to the corridors and left in place to provide in-stream wood and armoring for stream banks. Consequently, there would be a negligible increase in sediment as a result of these yarding corridors.

According to Reid (1981) and Reid and Dunne (1984), forest roads can be a major contributor of fine sediment to streams, through down cutting of ditch lines and erosion of unprotected road surfaces by overland flow.

As described in the preceding section on *Fisheries and Aquatic Resources* (p. 49), most road construction, whether permanent or temporary, would be sited outside of Riparian Reserves in stable locations. These new roads would not be connected to the drainage network. Since road segments must be connected directly to stream channels in order to deliver sediment-laden water, these roads would have no effect on stream sediment.

In the instances where road construction or reconstruction would involve the placement of temporary culverts in intermittent streams, removal of the temporary culvert and fill material in conjunction with decommissioning and blocking the road to vehicular use would effectively eliminate any concerns for sediment creation.

Decommissioning of all temporary roads would be designed to restore “natural hydrologic flow” (USDI, BLM 2001). Any increases in sediment delivery to streams following road decommissioning would be of short duration and would remain localized for reasons previously discussed.

Timber hauling could occur in both the dry and wet seasons of operation. Haul during dry season would not generate nor deliver road-derived sediment to live stream channels, because absent precipitation there would be no mechanism for the transport of fine sediment into adjacent or nearby streams.

Effects of sediment generated by road related activities, particularly timber hauling in wet weather, would be short term and limited to the immediate vicinity of stream crossings. Also, prior to log hauling, sediment-control devices such as silt fences and hay bales may be placed in ditch lines and at cross drain outlets to trap sediment locally and prevent migration into streams.

### *Stream Temperature*

Density management in Riparian Reserves would have the potential to increase stream temperature by temporarily creating openings in the canopy and reducing streamside shade. Shade from trees near the stream channel is important for reducing direct solar radiation and preventing elevation of stream temperatures.

Variable width “no-harvest” buffers would be established along streams to retain direct shading as necessary for maintenance of water temperatures. The final width of the “no-harvest” buffers would be based on consideration of factors such as unique habitat features, streamside topography and vegetation, the nature of the stream, (intermittent or perennial), fish presence, and susceptibility to solar heating. Vegetation that provides primary shading for stream channels would be protected by the “no harvest” buffers. Consequently, stream shading would not likely be affected by thinning and density management and it is not expected that stream temperatures would be affected.

## **B. Alternative Two – No Action**

### **1. Stream Flow**

There would be no effect to annual water yield or low flows because absent any commercial thinning and density management there would be no reduction in existing vegetative cover and no modification to the present rates of water uptake and evapotranspiration by trees and lesser plants.

### *Peak Flows and Transient Snow Zone*

There would be no effect to peak flows because absent any commercial thinning and density management there would be no change in the canopy closure within the TSZ. Consequently, there would be no modification of snow capture or snow melt rates that could enhance peak flows.

### *Peak Flows and Roads*

Some midslope forest roads in the Myrtle Creek fifth-field watershed would continue to marginally increase the magnitude of peak flows due to their capacity to extend the drainage network. Jones (2000) found that roads created a 13 to 36 percent increase to peak flows (> 1-year return period) in seven of eight small basins studied, and the “magnitude of increase was related to the density of midslope roads.”

The magnitude of flow enhancement is also dependent on road drainage. Roads not connected to stream channels, or those with drainage that efficiently directs surface flow to the forest floor where it can infiltrate, would have a negligible effect on flow magnitude and timing. Though not likely measurable, roads not renovated or decommissioned would pose a continued risk for increasing peak flow if connected to stream.

## **2. Water Quality**

### *Sediment*

Absent any soil disturbance from felling and yarding operations, there would be little, if any, potential for erosion and sediment delivery to streams.

Absent the need for timber hauling, renovation and reconstruction of access roads would not be undertaken. Roads with failing or improperly functioning drainage systems would continue to deliver fine sediment to streams.

### *Stream Temperature*

There would be no effect on stream temperatures, as there would be no change in present levels of streamside shading.

## **C. Cumulative Effects**

### **1. Stream Flow**

#### *Peak Flow Enhancement in Association with Timber Harvest*

The estimated 663 acres of thinning proposed represents slightly more than one percent of the 64,772 forested acres within the Myrtle Creek fifth-field watershed. As discussed on page 27, the risk of peak flow enhancement associated with past timber harvest on all lands in the TSZ, both private and Federal, is considered low. The risk associated with proposed thinning within the TSZ, when considered with recent harvest on private lands was also determined to be low.

Other timber management under consideration in the Myrtle Creek fifth-field watershed includes the award of four regeneration harvest sales originally authorized in the late 1990s. Of the 585 acres comprising the Dream Weaver, Buck Fever, Class of 98 and Sweet Pea timber sales, fewer than 200 acres are located within the TSZ. When combined with recent private harvest and the 663 acres proposed for thinning in this analysis, the risk for enhancement of peak flows still remains low.

If harvest is undertaken on private lands in the same drainages in the near future, short-term increases in peak flows for small storms with less than a two-year return interval could occur. Oregon Forest Practices Act regulations on size of harvest units, the spatial scattering of harvest on private lands and road drainage improvements in the Myrtle Creek fifth-field watershed would effectively mitigate any effects at the watershed level, however.

#### *Peak Flow Enhancement associated with roads*

There are approximately 520 miles of roads in the Myrtle Creek fifth-field watershed, which is slightly more than 119 square miles in area. Average road density is 4.36 miles per square mile (MCWA, p. 107). Combined, the proposed Myrtle Creek Commercial Thinning and Density Management Project and South Myrtle Creek Regeneration Harvest Plan would construct an estimated 1.30 miles of permanent roads, 3.37 miles of temporary roads, 0.37 miles of semi-permanent roads, and reconstruct 1.08 miles of existing roads. Since only 1.30 miles of new road would be retained post-harvest, the net effect would be to increase road density in the watershed by 0.02 miles (~ 100 feet) per square mile.

These roads would be primarily located on ridge top locations without any connection to the stream network. Out-sloping the roads in lieu of constructing ditches and installing cross drains would further reduce any potential for routing run-off directly into streams by dispersing the flow across forest slopes where it will infiltrate the soil and sub-soil.

Given the practically immeasurable increase in road density and disconnection of these new roads from the stream drainage network, no enhancement of peak flows would be expected in individual streams or at the scale of the Myrtle Creek fifth-field watershed.

## **2. Water Quality**

#### *Sediment associated with timber harvest*

Full Riparian Reserves would be established on all streams in or adjacent to the units proposed for harvest in the South Myrtle Creek Regeneration Harvest Plan, and “no-harvest” buffers would be established on all streams adjacent to units proposed for thinning and density management units. These would serve to

precipitate any sediment in overland run-off and prevent sedimentation of streams, such that there would be no cumulative degradation of water quality in the Myrtle Creek fifth-field watershed.

*Sediment associated with timber hauling*

As previously discussed, new permanent and temporary roads would be primarily located on ridge top locations without any connection to the stream network. Out-sloping the roads in lieu of constructing ditches and installing cross drains would further reduce any potential for routing run-off to locations where sediment-laden water could be diverted into streams. Consequently, it is not anticipated that there would be any measurable increases in sediment in individual streams or cumulatively at the scale of the Myrtle Creek fifth-field watershed.

In conjunction with the two proposed timber management actions, extensive renovation to existing roads would be undertaken. In association with the South Myrtle Creek Regeneration Harvest Plan, approximately 22 miles of roads would be renovated and upgraded to present day construction standards, including additional cross drains and supplemental surfacing. In association with the Myrtle Creek Commercial Thinning and Density Management Project, an estimated 2 to 3 miles of roads would be renovated. The cumulative effects of the renovation would be long-term reductions in stream sedimentation arising from road erosion and long-term improvements to water quality in the Myrtle Creek fifth-field watershed.

*Stream Temperature*

Full Riparian Reserves would be established on all streams in or adjacent to the units proposed for harvest in the South Myrtle Creek Regeneration Harvest Plan, and “no-harvest” buffers would be established on all streams adjacent to units proposed for thinning and density management, with widths determined in part by susceptibility of individual streams to solar heating. Consequently, stream primary streamside shading would be maintained and no measurable change in heating potential or cumulative change in stream temperatures would be expected in the Myrtle Creek fifth-field watershed.

**VI. Soils**

**A. Alternative One – The Proposed Action**

Limited and localized soil displacement, erosion and compaction could be expected as a consequence of both cable and ground-based yarding. Partial cut harvest and skyline yarding would not increase the risk of slope failure because the area subject to soil displacement and alteration of surface water flow would be reduced by implementation of the following practices:

- Equipment used in cable yarding would have the capacity for maintaining a minimum of one-end log suspension, and a minimum of 100 feet of lateral yarding capacity to reduce the number of yarding corridors and landings needed, thereby reducing the potential area subject to soil disturbance and compaction;
- Downhill or side-hill yarding would be minimized, and intermediate supports would be used to gain deflection for yarding in order to minimize soil displacement and erosion on concave and convex slopes; and
- Yarding roads would be water barred where necessary to reduce the potential for water channeling and erosion.

In order to minimize soil compaction and displacement, and reduce the potential for soil erosion associated with ground-based yarding:

- Yarding operations would be prohibited on slopes in excess of 35 percent, with operations limited to the dry season, typically mid-May to mid-October when soils have dried out and are less susceptible to compaction;
- Skid trails would be pre-designated, using existing trails to the greatest degree practicable. Cumulatively, landings and primary skid trails would affect less than ten percent of the entire ground-based harvest area; and
- Landings and skid trails would be sub-soiled, reducing anticipated increases in soil bulk density by 80 percent (Andrus and Froehlich 1983). After sub-soiling, primary skid trails would be water-barred. Trails would be mulched or otherwise treated to reduce the potential for erosion.

Retention of forest canopy at approximately 50 percent of pre-thinning levels would also reduce the risk of splash erosion.

As a result, the effects to soils would be consistent with those identified and considered in the PRMP/EIS (p.4-13 to 4-17)

## **B. Alternative Two – No Action**

In the absence of commercial thinning or density management there would be no potential effects to soils within the proposed units such as compaction, displacement, erosion, and loss of organic matter. These effects would potentially occur elsewhere in the Matrix as other areas are selected for timber harvest.

## **C. Cumulative Effects**

No cumulative effects to soils would be anticipated as any effects would be confined to the proposed thinning units and regeneration harvest units and would not exceed the level and scope of effects considered and addressed in the PRMP/EIS (Chapter 4, pp. 12-16).

## **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, 190, 193, & 195-199), and would focus on the following resources: Riparian Reserves; Matrix; Water and Soils; Wildlife Habitat; Fish Habitat; and Special Status Special Attention Species Habitat.

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## Chapter 5

# LIST OF, AGENCIES AND INDIVIDUALS CONTACTED, PREPARERS AND LITERATURE CITED

This project was originally identified in the Roseburg BLM Fall 2005 Quarterly Planning Update. A Notice of Availability of the EA for public review and comment, and any subsequent decisions will be published in *The News-Review*, Roseburg, Oregon.

### I. Agencies & Persons Contacted:

Adjacent Landowners & Down-stream Water Users  
Cow Creek Band of Umpqua Tribe of Indians  
National Marine Fisheries Service  
U.S. Fish and Wildlife Service

### II. The following agencies, organizations, and individuals will be notified of the completion of the EA:

Cascadia Wildlands Project  
Douglas Timber Operators, Robert Ragon - Executive Director  
National Marine Fisheries Service  
Oregon Department of Environmental Quality  
Oregon Department of Fish and Wildlife  
Oregon Natural Resources Council  
U.S. Fish and Wildlife Service  
Umpqua Valley Audubon Society  
Umpqua Watersheds, Inc.  
Ronald S. Yockim, Attorney-at-Law

### III. List of Preparers:

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## LIERATURE AND REFERENCES CITED

- Andrews, H.J. and R.W. Collins. 1940. Forest Resources of the Douglas-fir Region. USDA Forest service. Pacific Northwest Region. USDA Misc. Pub. 389. 169 pp.
- Andrus, C.W. & Froehlich, H.A. 1983. Research Bulletin 45 - An evaluation of four implements used to till compacted forest soils in the Pacific Northwest. Forest Research Laboratory, Oregon State University, Corvallis, Or.
- Bell, M. C. 1986. Fisheries handbook of engineering requirements and biological criteria. U. S. Army Corps of Engineers, Office of the Chief of Engineers, Fish Passage Development and Evaluation Program, Portland, Oregon.
- Bilby, R. E., and J. W. Ward. 1989. Changes in Characteristics and Function of Woody Debris with Increasing Size of Streams in Western Washington. Transactions of the American Fisheries Society 118:368-378.
- Bjornn, T. C. and D. W. Reiser. 1991. Habitat requirements of salmonids in streams. American Fisheries Society Special Publication 19:83-138.
- Brown, C. R. 1997. Purple Martin. In The Birds of North America No. 287, A. Poole and F. Gill, eds. The Birds of North America, Inc., Philadelphia, Pennsylvania, USA. 31pp.
- Buehler, D. A. 2000. Bald eagle (*Haliaeetus leucocephalus*). In A. Poole and F. Gill (eds.), The Birds of North America. No. 506. Philadelphia, PA: the Academy of Natural Sciences and Washington, DC: the American Ornithologists' Union.
- Castro, J. and F. Reckendorf. 1995. Effects of Sediment on the Aquatic Environment: Potential NRCS Actions to Improve Aquatic Habitat. Natural Resources Conservation Service. Oregon State University, Department of Geosciences, Corvallis, Oregon.
- Corkran, C. C. and C. Thoms. 1996. Amphibians of Oregon, Washington and British Columbia. A field identification guide. Lone Pine Publishing, Vancouver, BC. 175 pp.
- Daniel, T.W., J. Helms, and F. Baker. 1979. Principles of Silviculture. McGraw Hill Book Company, 2<sup>nd</sup> edition.
- Daw, S. K., S. DeStefano, and R. J. Steidl. 1998. Does survey method bias the description of Northern goshawk nest-site structure? Journal of Wildlife Management 62: 1379-1384.
- Daw, S. K. and S. Destefano. 2001. Forest characteristics of Northern Goshawk nest stands and post-fledging areas in Oregon. Journal of Wildlife Management 65: 59-65.
- Dietrich, W. E., T. Dunne, N. F. Humphrey, and L. M. Reid. 1982. *Construction of Sediment Budgets for Drainage Basins* in Sediment Budgets and Routing in Forested Drainage Basins. USFS General Technical Report PNW-141.

Duncan, N., T. Burke, S. Dowlan, and P. Hohenlohe. 2003. Survey Protocol for Survey and Manage Terrestrial Mollusk Species From the Northwest Forest Plan. Bureau of Land Management, U.S. Forest Service, and U.S. Fish and Wildlife Service. Portland, Oregon, USA. 70pp.

Dunk, J. R. 1995. White-tailed kite (*Elanus leucurus*): In A. Poole and F. Gill, Eds. The birds of North America, No. 178. The Academy of Natural Sciences, Philadelphia, PA and The American Ornithologists' Union, Washington, D.C.

Federal Register. 1998. Endangered and Threatened Species; Endangered Status for Oregon Coast Evolutionarily Significant Unit of Coho Salmon. Federal Register 63(153):42587-42591.

Federal Register. 2002. Magnuson-Stevens Act Provisions; Essential Fish Habitat. Federal Register, 67(12):2343-2383.

Federal Register. 2004. Endangered and Threatened Species: Proposed Listing Determinations for 27 ESUs of West Coast Salmonids. Federal Register 69(113):33102-33179.

Federal Register. 2005a. Endangered and Threatened Species; Designation of Critical Habitat for 13 Evolutionarily Significant Units of Pacific Salmon (*Oncorhynchus* spp.) and Steelhead (*O. mykiss*) in Washington, Oregon, and Idaho. Federal Register 69(239)

Federal Register. 2005b. Endangered and Threatened Species; Establishment of Species of Concern List, Addition of Species to Species of Concern List, Description of Factors for Identifying Species of Concern, and Revision of Candidate Species List Under the Endangered Species Act Federal Register 69(73):19975-19979.

Federal Register. 2006. Endangered and Threatened Species: Withdrawal of Proposals to List and Designate Critical Habitat for the Oregon Coast Evolutionarily Significant Unit (ESU) of Coho Salmon. 71(12):3033-3048.

Forsman, E. D., E. C. Meslow, and H. M. Wight. 1984. Distribution and Biology of the Spotted Owl in Oregon. Wildlife Monographs 87. 64 pp.

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

Furniss, M. J., T. D. Roelofs, and C. S. Yee. 1991. Road construction and maintenance. American Fisheries Society Special Publication 19:297-323.

Harr, R. D., and B. A. Coffin. 1992. Influence of Timber Harvest on Rain-On-Snow Runoff: A Mechanism for Cumulative Watershed Effects. American Institute of Hydrology. Pp. 455-469.

- Hayes, J.P., S.S. Chan, W.H. Emmingham, J.C. Tappenier, L.D. Kellogg, and J.D. Bailey. Wildlife Response to Thinning Young Forests in the Pacific Northwest. *Journal of Forestry*. August, 1997. pp. 28-33.
- Healey, S., W. Cohen, and M. Lefsky. 2003. Stand-replacing harvests and fires in Oregon, 1972-2002. PNW Research Station, Corvallis, Oregon.
- Hershey, K. T., E. C. Meslow, and F. L. Ramsey. 1997. Characteristics of forests at spotted owl nest sites in the Pacific Northwest. *Journal of Wildlife Management* 62:1398-1410.
- Horvath, E. 2003. Purple Martin. Pages 428-430 in D. B. Marshall, M. G. Hunter, and A L. Contreras, eds. *Birds of Oregon: A General Reference*. Oregon State University Press. Corvallis, Oregon, USA. 768 pp.
- Johnson, D.H. 1992. Spotted owls, great horned owls, and forest fragmentation in the Central Oregon Cascades. M.S. thesis, Oregon State University, Corvallis, OR
- Jones, J. A., 2000. Hydrologic processes and peak discharge response to forest removal, regrowth, and roads in 10 small experimental basins, western Cascades, Oregon. *Water Resources Research*, Vol. 36, No. 9, pp 2621-2642, September 2000.
- Jones, S. L., and J. E. Cornely. 2002, Vesper Sparrow (*Pooecetes gramineus*): In A. Poole and F. Gill, Eds. *The birds of North America*, No. 624. The Birds of North America, Inc., Philadelphia, PA.
- Keim, R. F., A. E. Skaugset, and D. S. Bateman. 2000. Dynamics of coarse woody debris placed in three Oregon streams. *Forest Science* 46(1):13-21.
- Lantz, R. L. 1971. Influence of water temperature on fish survival, growth, and behavior, pp 182-193 in Krygier, J.T., and J.D. Hall (EDS.), *Forest land uses on stream environment*, OSU Extension: Corvallis, Oregon.
- Lewis, S. E. 1994. Night roosting ecology of pallid bats (*Antrozous pallidus*) in Oregon. *American Midland Naturalist* 132:219-226.
- Lint, J. B., B. Noon, R. Anthony, E. Forsman, M. Raphael, M. Collopy, and E. Starkey. 1999. Northern Spotted Owl Effectiveness Monitoring Plan for the Northwest Forest Plan. General Technical Report PNW-GTR-440. USDA Forest Service, Pacific Northwest Research Station, Portland, Oregon, USA. 43pp.
- Luoma, D.L., et al. Response of ectomycorrhizal fungus sporocarp production to varying levels and patterns of green-tree retention. *Forest Ecology and Management* 202 (2004) 337-354.
- Markle, D. F., T. N. Pearsons, and D. T. Bills. 1991. Natural history of Oregonichthys (Pisces: Cyprinidae) with a description of a new species from the Umpqua River of Oregon. *Copeia* 2:227-293.

May, C. L., and R. E. Gresswell. 2003. Large wood recruitment and redistribution in headwater streams in the southern Oregon Coast Range, U.S.A. *Canadian Journal of Forestry Resources* 33:1352-1362

Menke, C.A. and T. Kaye 2003. Population Monitoring and Survey for *Lupinus sulphureus* ssp. *kincaidii* on the BLM Roseburg District. pp. 29

Meyer, J.S., L.L. Irwin, and M.S. Boyce. 1998. Influence of habitat abundance and fragmentation on northern spotted owls in western Oregon. *Wildlife Monographs* No. 139. Buteo Books: Shipman, VA.

Mongomery, D. L and J. M. Buffington. 1997. Channel-reach morphology in mountain drainage basins. *Geological Society of America Bulletin* 109:596-611.

Moore, J.A., and J.R. Miner. 1997. Stream temperatures, Some Basic Considerations. Oregon State University Extension Service. Corvallis, Oregon.

Naiman, R. J., E. V. Balian, K. K. Bartz, R. E. Bilby and J. J. Latterell. 2002. Dead Wood Dynamics in Stream Ecosystems. Pages 23-48, *in* W. F. Laudenslayer, Jr., Shea, P. J., Valentive, B. E., Weatherspoon, C. P., Lisle, T. E., editors. Proceedings of the symposium on the ecology and management of dead wood in western forests, General Technical Report PSW-GTR-181. USDA Forest Service, Pacific Southwest Research Station, Albany, CA.

Nelson, S. K. 1997. Marbled Murrelet (*Brachyramphus marmoratus*). In A. Poole, F. Gill. Eds. *The Birds of North America*, No. 276. The Academy of Natural Sciences, Philadelphia, and the American Ornithologists' Union. Washington, DC

O'Dell, T.E., J.F. Ammirati, and E.G. Schreiner. 1999. Ectomycorrhizal Basidiomycete Diversity and Abundance on a Moisture Gradient in the *Tsuga heterophylla* Zone. *Canadian Journal of Botany*.

Oliver, C.D. and B. Larson. 1996. *Forest Stand Dynamics*, Update Edition. John Wiley & Sons, Inc.

Oregon Department of Environmental Quality. 1995. Temperature: 1992-1994 water quality standards review, report of the State of Oregon Technical Advisory Committee, Temperature Subcommittee. Portland, Oregon.

Oregon Department of Environmental Quality, 2003. Oregon's final 2002 303(d) list, Portland Oregon [<http://www.deq.state.or.us/wq/303dlist/303dpage.htm>].

Reid, L.M. 1981. Sediment production from Gravel-Surfaced Forest Roads, Clearwater Basin, Washington. Fisheries Research Institute. College of Fisheries, University of Washington. Seattle Washington. FRI-UW-8108.

- Reid, L.M., and T. Dunne. 1984. Sediment Production from Forest Road Surfaces. *Water Resources Research* 20-11: pp 1753-1761.
- Reynolds, R. T., E. C. Meslow, and H. M. Wight. 1982. Nesting habitat of coexisting *Accipiter* in Oregon. *Journal of Wildlife Management* 46: 124-138.
- Richardson, M.J. 1970. Studies on *Russula emetica* and other agarics in a scots pine plantation. *British Mycological Society* 55:217-219.
- Ripple, W.J., D.H. Johnson, K.T. Hershey, and E.C. Meslow. 1991. Old-growth and mature forests near spotted owl nests in western Oregon. *J. Wildlife Management* 55(2):316-318.
- Robertson, G. J., and R. I. Goudie. 1999. Harlequin Duck (*Histrionicus histrionicus*): In A. Poole and F. Gill, Eds. *The birds of North America*, No. 446. The Birds of North America, Inc., Philadelphia, PA.
- Rosenfeld, J. M. Porter, and E. Parkinson. 2000. Habitat factors affecting the abundance and distribution of juvenile cutthroat trout (*Oncorhynchus clarki*) and coho salmon (*Oncorhynchus kisutch*). *Canadian Journal of fisheries and Aquatic Sciences* 57:766-774.
- Sakai, H. F. and B. R. Noon. 1993. Dusky-footed woodrat abundance in different-aged forests in northwestern California. *Journal of Wildlife Management* 57: 373-382.
- Satterlund, Donald R., and Paul W. Adams. 1992. *Wildland Watershed Management*, second edition. John Wiley & Sons, Inc. New York.
- Simond, D. C. 1998. Distributional surveys of Umpqua chub *Oregonichthys kalawatseti*, 1987 and 1998. Final Report, order no. 1448-13420-97-M216. U.S. Fish and Wildlife Service. Portland, OR.
- Storm, R. M., and W. P. Leonard, eds. 1995. *The reptiles of Washington and Oregon*. Seattle Audubon Society, Seattle, WA. 176 pp.
- Swanston, D. N. 1991. *Natural Processes*. American Fisheries Society Special Publication 19:139-179.
- Tappeiner, J.C., D. Huffman, D. Marshall, T. Spies, and J. Bailey. 1997. Density, ages, and growth rates in old-growth and young-growth forests in coastal Oregon. *Canadian Journal of Forest Research*. 27(5):638-648.
- Thomas, J. W., E. D. Forsman, J. B. Lint, E. C. Meslow, B. R. Noon, and J. Verner. 1990. A conservation strategy for the northern spotted owl: a report of the Interagency Scientific Committee to address the conservation of the northern spotted owl. Portland, Oregon. U.S. Department of Agriculture, Forest Service; U.S. Department of Interior, Bureau of Land Management, U.S. Fish and Wildlife Service, National Park Service. 427 pp.

Thompson, J., R. Goggans, P. Greenlee, and S. Dowlan. 1993. Abundance, distribution and habitat associations of the harlequin duck (*Histrionicus histrionicus*) in the Cascade Mountains, Oregon. Unpublished report prepared for cooperative agreement between the Oregon Department of Fish and Wildlife, Willamette National Forest, Mt. Hood National Forest, and the Bureau of Land Management, Salem District. 37 pp.

Tobalske, B. W. 1997, Lewis' Woodpecker (*Melanerpes lewis*): In A. Poole and F. Gill Eds., The birds of North America, No. 284. The Academy of Natural Sciences, Philadelphia, and The American Ornithologists' Union, Washington DC.

USDA. 2004. Soil Survey of Douglas County Area, Oregon. GPO.

USDA. USDI. U.S. Forest Service and BLM. 1994b. Record of Decision and Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl.

USDA, USDI. U.S. Forest Service and BLM. 2001a. Final Supplemental Environmental Impact Statement for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl.

USDA. USDI. U.S. Forest Service and BLM. 2001b. Record of Decision for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl.

USDA, USDI. U.S. Forest Service and BLM. 2003. *Survey Protocol for S&M Terrestrial Mollusk Species v3.0*.

USDA, USDI. U.S. Forest Service and BLM. 2004a. Final Supplemental Environmental Impact Statement to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl.

USDA, USDI. U.S. Forest Service and BLM. 2004b. Final Supplemental Environmental Impact Statement to Clarify Provisions Relating to the Aquatic Conservation Strategy.

USDA, USDI. U.S. Forest Service and BLM. 2004c. Record of Decision to Clarify Provisions Relating to the Aquatic Conservation Strategy.

USDA, USDI. U.S. Forest Service and BLM. 2004d. Survey Protocol for the Great Grey Owl within the range of the Northwest Forest Plan v3.0.

USDI, BLM. 1991. Special Status Plants of the Roseburg District.

- USDI, BLM. October 1994. Roseburg District Proposed Resource Management Plan and Environmental Impact Statement.
- USDI, BLM Roseburg District. June 1995a. Record of Decision and Resource Management Plan.
- USDI, BLM. Roseburg District. 1995b. Roseburg District Integrated Weed Control Plan and Environmental Assessment.
- USDI, BLM. 1997. Instruction Memorandum OR-98-012 “Northern Goshawk Management Guidelines.” Bureau of Land Management, Oregon State Office, Portland, Oregon.
- USDI, BLM. 2001a. Bureau of Land Management Manual Section 6840. 50pp.
- USDI, BLM. Roseburg District. 2000. 3P Fall, Buck and Scale Sampling Environmental Assessment.
- USDI, BLM. 2001b. Western Oregon Districts Transportation Management Plan. Roseburg District Office, Roseburg, OR.
- USDI, BLM. 2002. Myrtle Creek Watershed Analysis and Water Quality Restoration Plan, Second Iteration. Bureau of Land Management, Roseburg District, South River Resource Area. Roseburg, Oregon, USA. 425 pp.
- USDI, FWS. 2005. Biological Opinion: Roseburg District Bureau of Land Management FY 2003-2008 Management Activities (Ref. # 1-15-05-F-0512). U.S. Fish and Wildlife Service, Roseburg, Oregon, USA. 127 pp.
- Verts, B. J. and L. N. Carraway. 1998. Land Mammals of Oregon. University of California Press. Berkeley, California, USA.
- Waters, T, F. 1995. Sediment in streams: sources, biological effects, and control. American Fisheries Society Monograph 7.
- Watershed Professionals Network. 1999. Oregon Watershed Assessment Manual. June 1999. Prepared for the Governor’s Watershed Enhancement Board, Salem, Oregon.
- Weller, T. J. and C. J. Zabel. 2001. Characteristics of fringed myotis day roosts in northern California. *Journal of Wildlife Management* 66:489-497.
- White, C.M., N. J. Clum, T. J. Cade, and W. G. Hunt. 2002. Peregrine Falcon (*Falco peregrinus*). In A. Poole and F. Gill (eds.), *The birds of North America*. No. 660. Philadelphia, PA: the Academy of Natural Sciences and Washington, DC: the American Ornithologists’ Union.

Wiggins, G. B. 1977. Larvae of the North American caddisfly genera (*Trichoptera*). University of Toronto Press. Toronto, Ontario, Canada. 401pp.

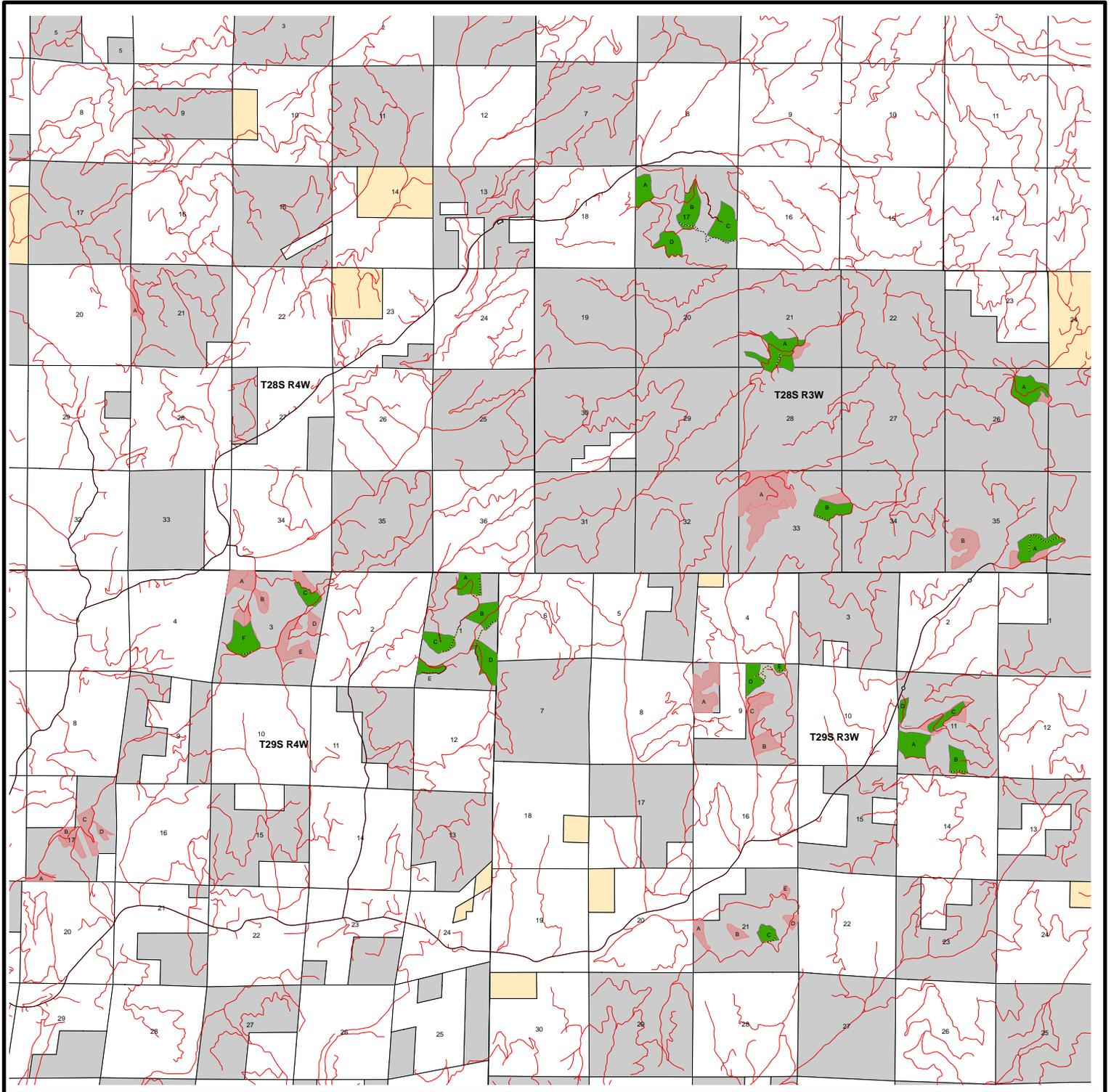
Woodbridge, B., G. Silovsky, and K. Austin. 1993. Survey Protocol for Northern Goshawk on National Forest Lands in the Pacific Northwest Region. USDA Forest Service, Oregon Department of Fish and Wildlife, and Washington Department of Fish and Wildlife.

## **Appendix A**

### **Maps of the Proposed Project Area and Units**

# MYRTLE CREEK PROJECT

Commercial Thinning & Density Management



0 0.5 1 2 3 4 Miles



Willamette Meridian, Douglas Co., OR.

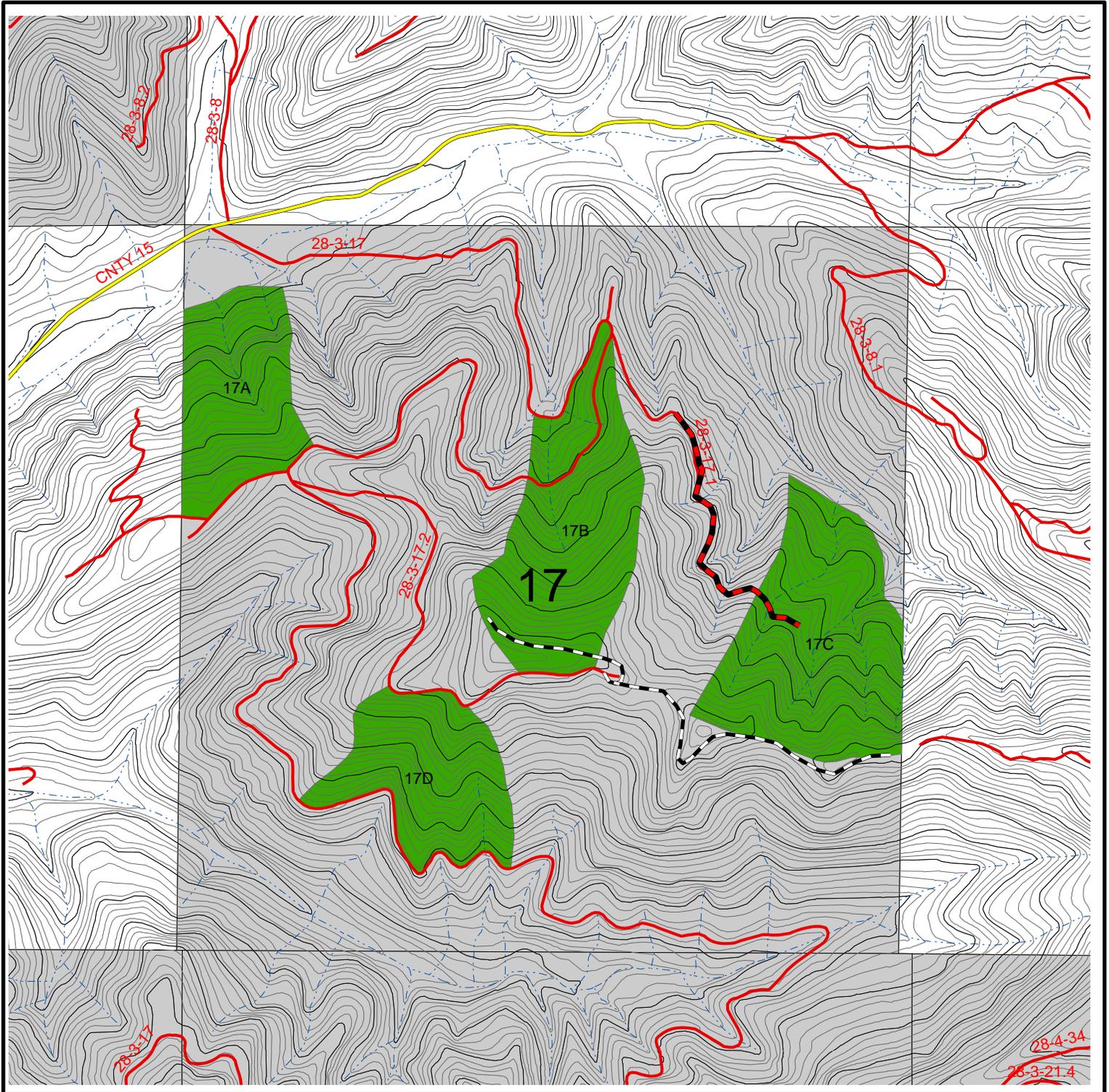
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- |  |                           |  |                              |
|--|---------------------------|--|------------------------------|
|  | Paved County Road         |  | Areas considered but dropped |
|  | Existing Road             |  | Thinning/Density Mngmt. Area |
|  | Construct, Permanent Rock |  | BLM (O&C) Land               |
|  | Reconstruct, Decommission |  | BLM (PD) Land                |
|  | Construct, Decommission   |  | Non-BLM Land                 |

# MYRTLE CREEK PROJECT

Commercial Thinning & Density Management



0 2,000 Feet



T28S, R3W

Willamette Meridian, Douglas Co., OR.

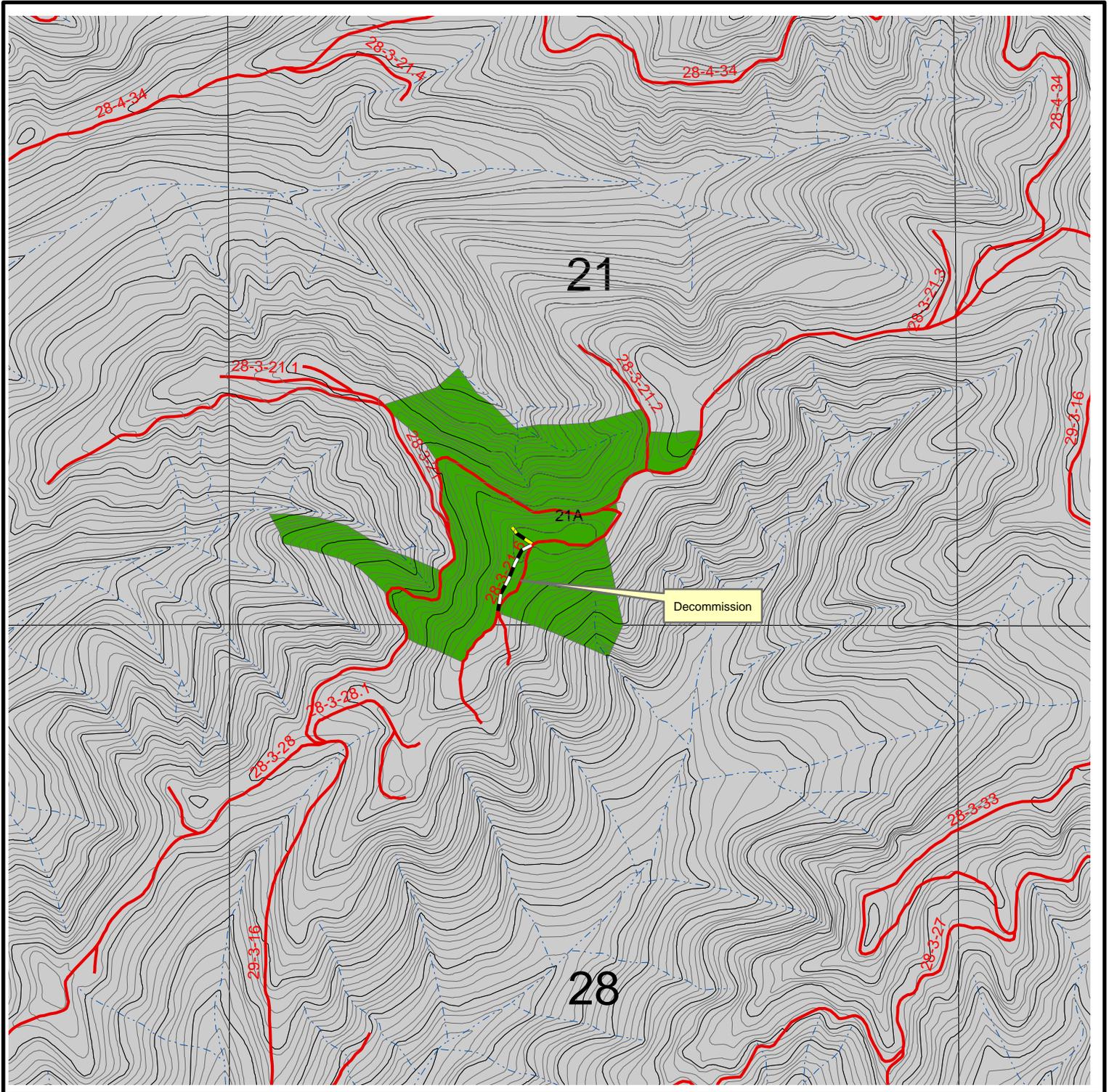
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- Paved County Road
- Existing Road
- Construct, Permanent Rock
- Reconstruct, Decommission
- Construct, Decommission
- Stream
- 100' Contour
- 20' Contour
- Thinning/Density Mngmt. Area
- BLM (O&C) Land
- BLM (PD) Land
- Non-BLM Land

# MYRTLE CREEK PROJECT

Commercial Thinning & Density Management



0 2,000 Feet



T28S, R3W

Willamette Meridian, Douglas Co., OR.

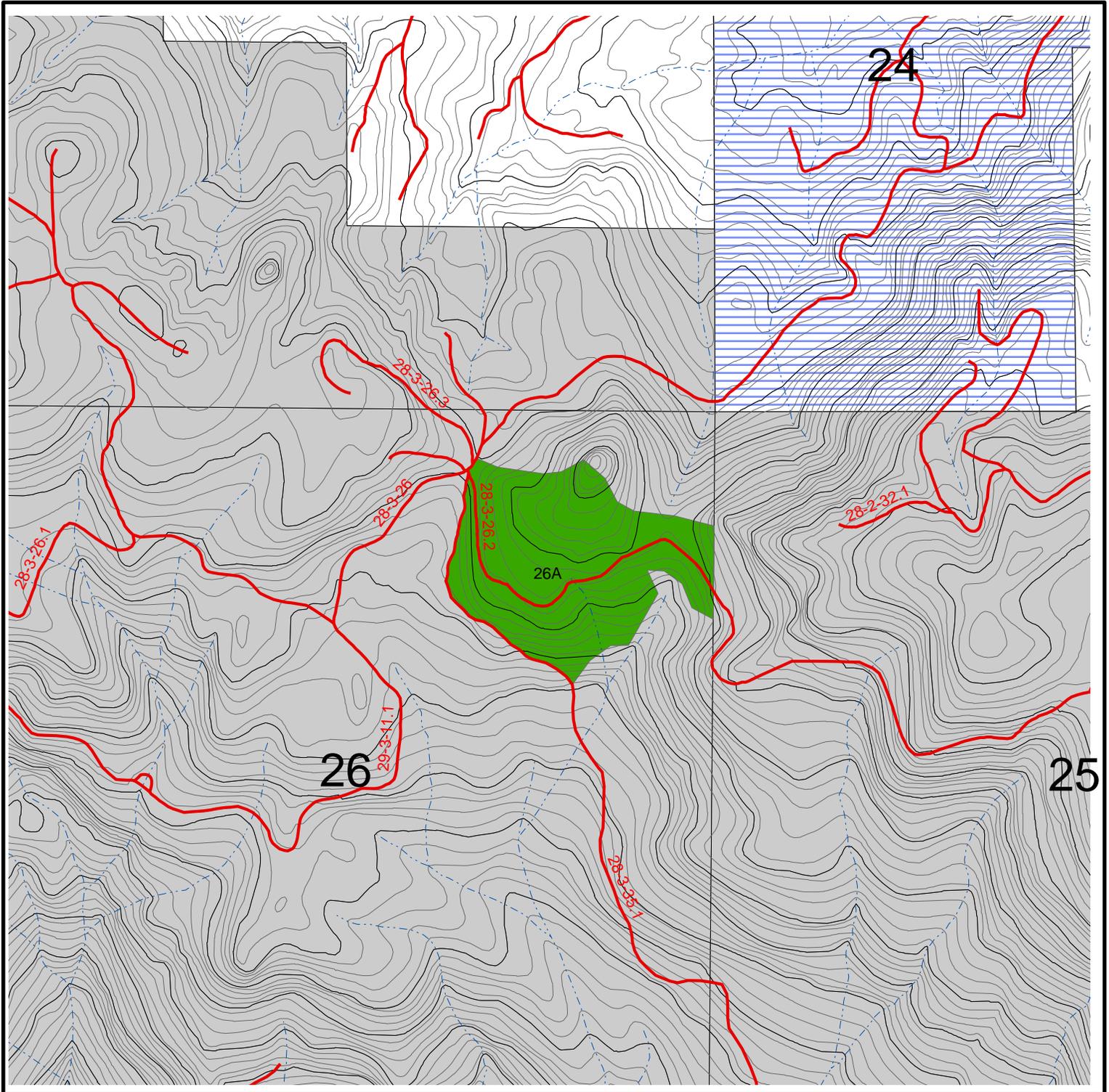
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Commercial Thinning & Density Management



0 2,000 Feet



T28S, R3W

Willamette Meridian, Douglas Co., OR.

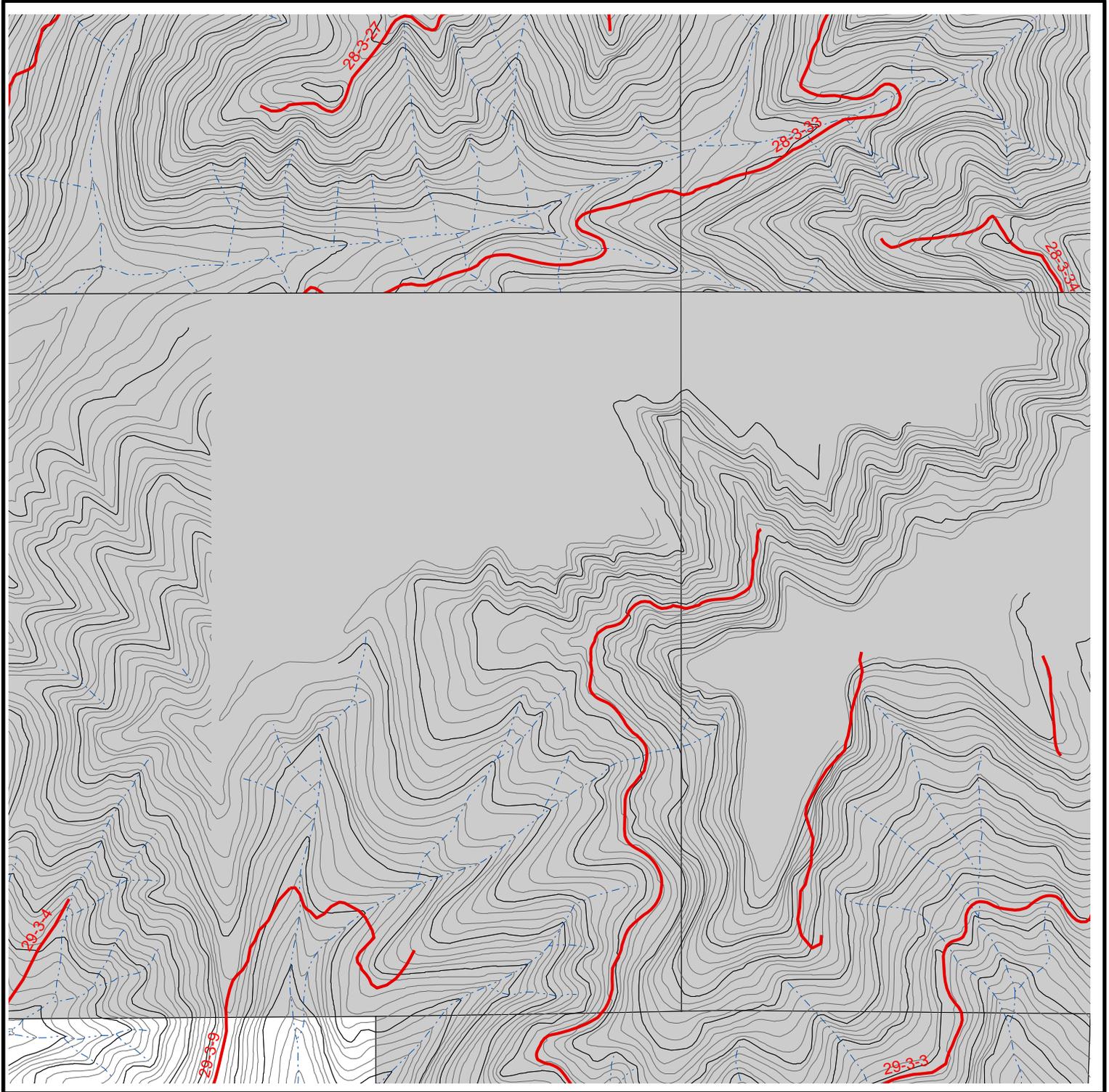
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Commercial Thinning & Density Management



0 2,000 Feet



T28S, R3W

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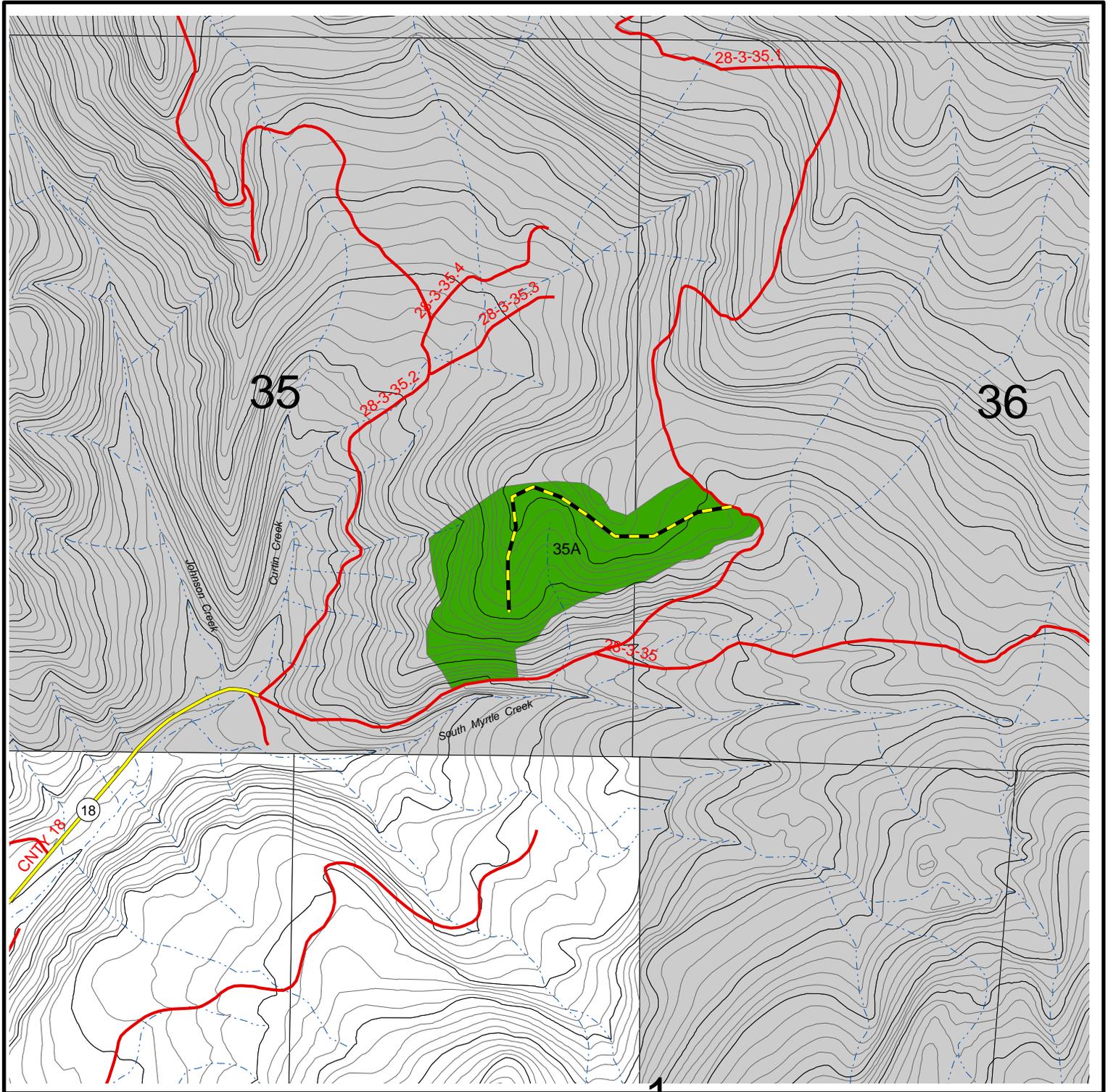
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Commercial Thinning & Density Management



0 2,000 Feet



T28S, R3W

Willamette Meridian, Douglas Co., OR.

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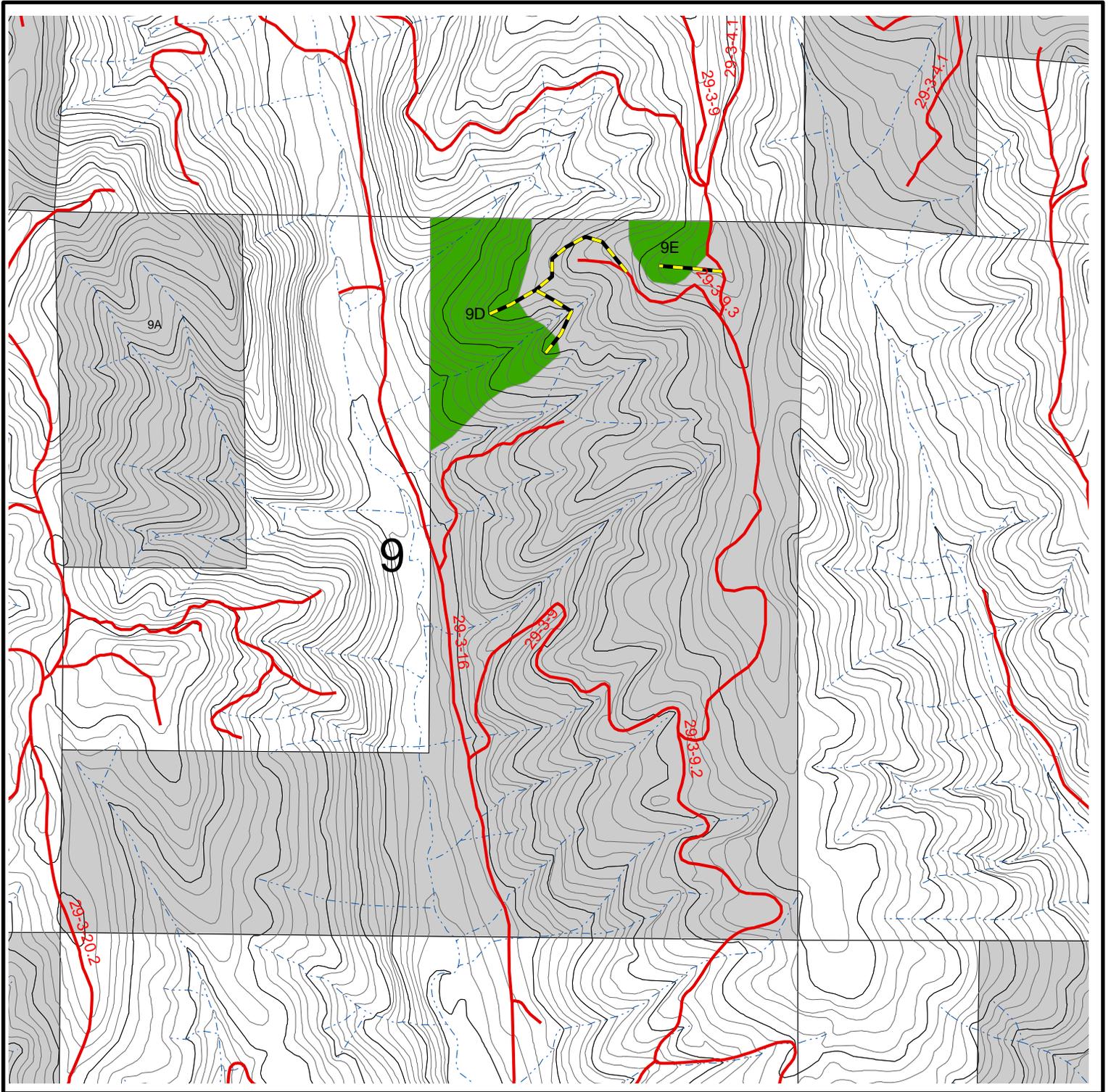


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# MYRTLE CREEK PROJECT

Commercial Thinning & Density Management



0 2,000 Feet



T29S, R3W

Willamette Meridian, Douglas Co., OR.

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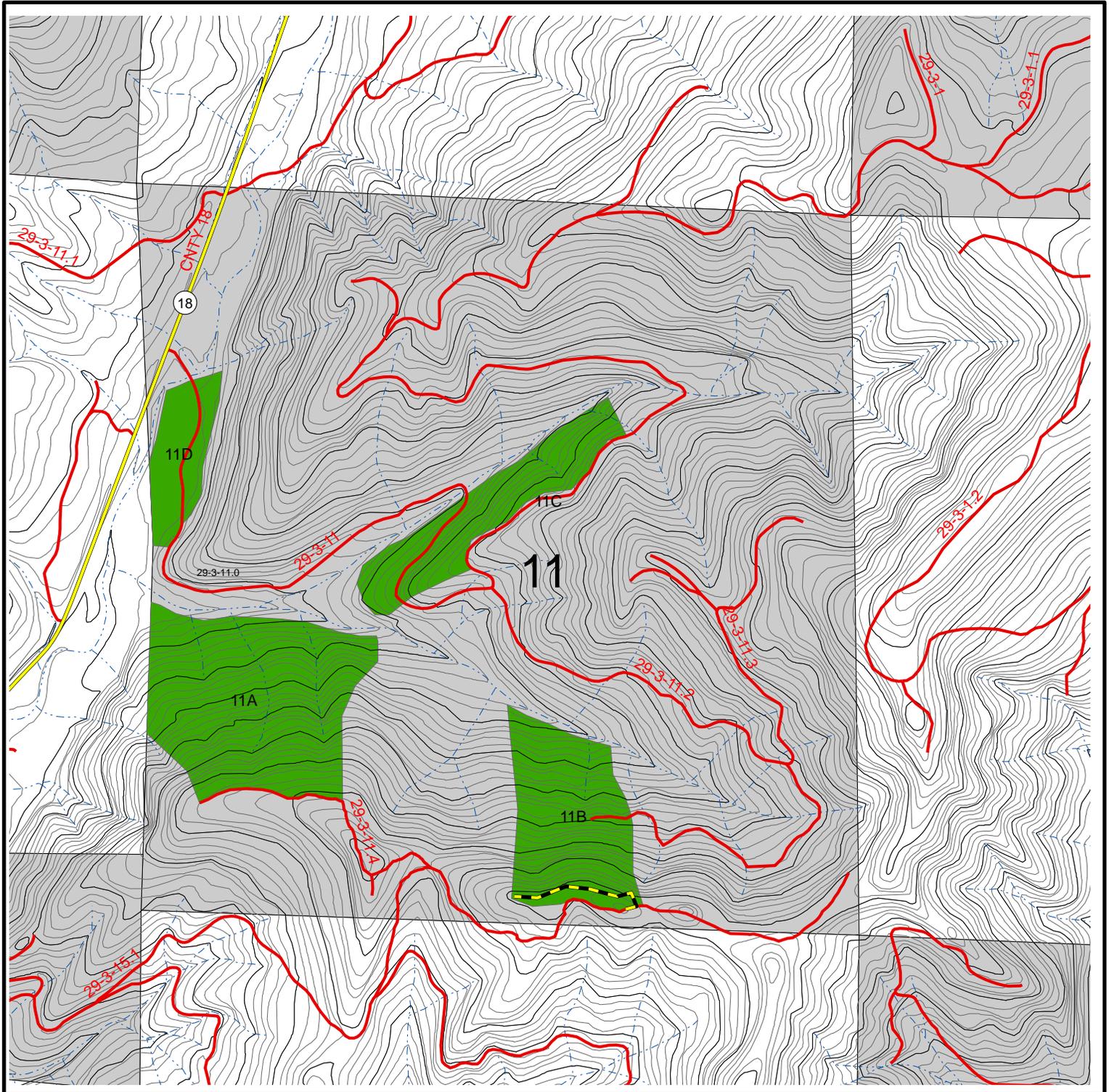


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Commercial Thinning & Density Management



0 2,000 Feet



T29S, R3W

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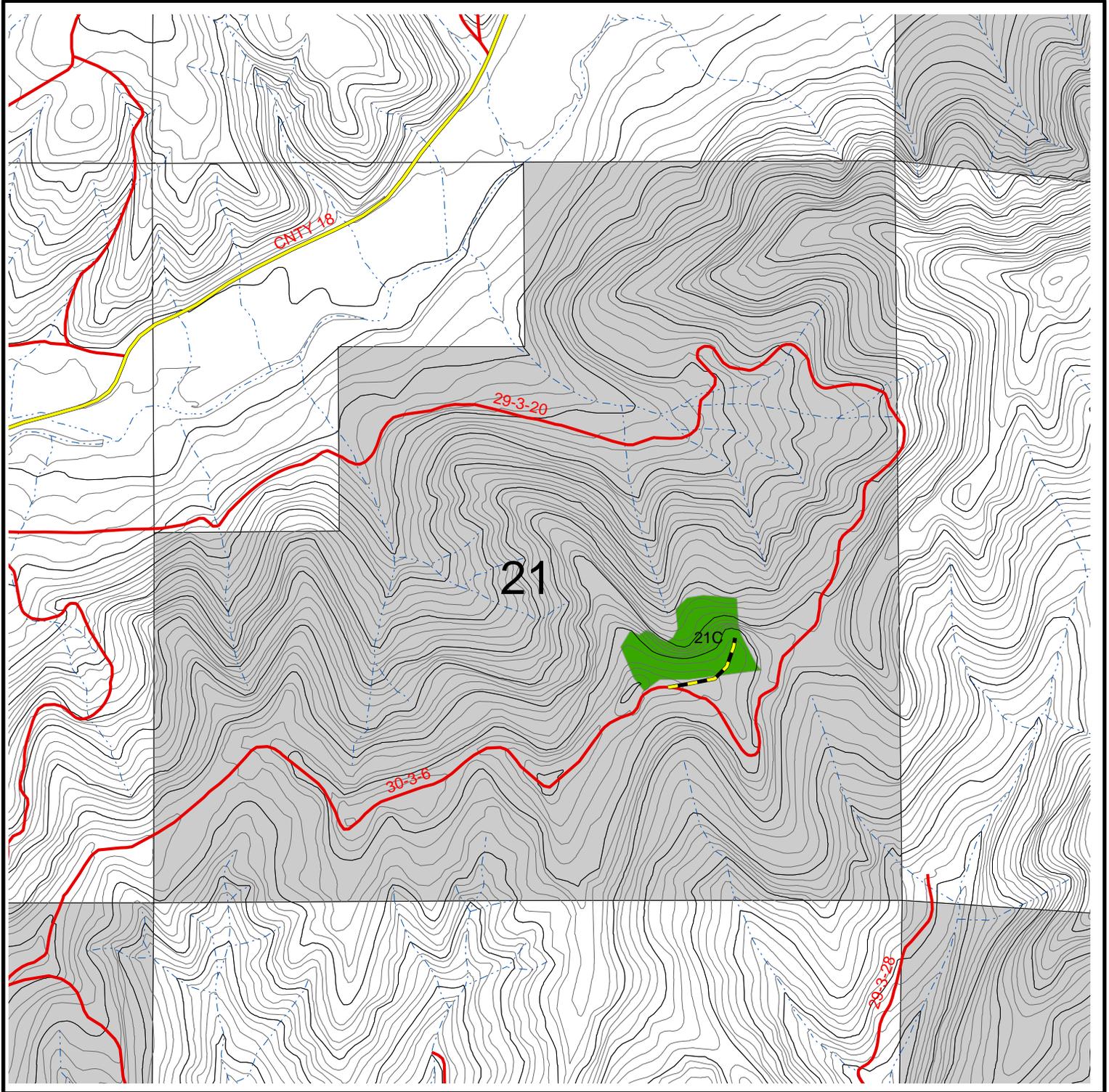


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# MYRTLE CREEK PROJECT

Commercial Thinning & Density Management



0 2,000 Feet



T29S, R3W

Willamette Meridian, Douglas Co., OR.

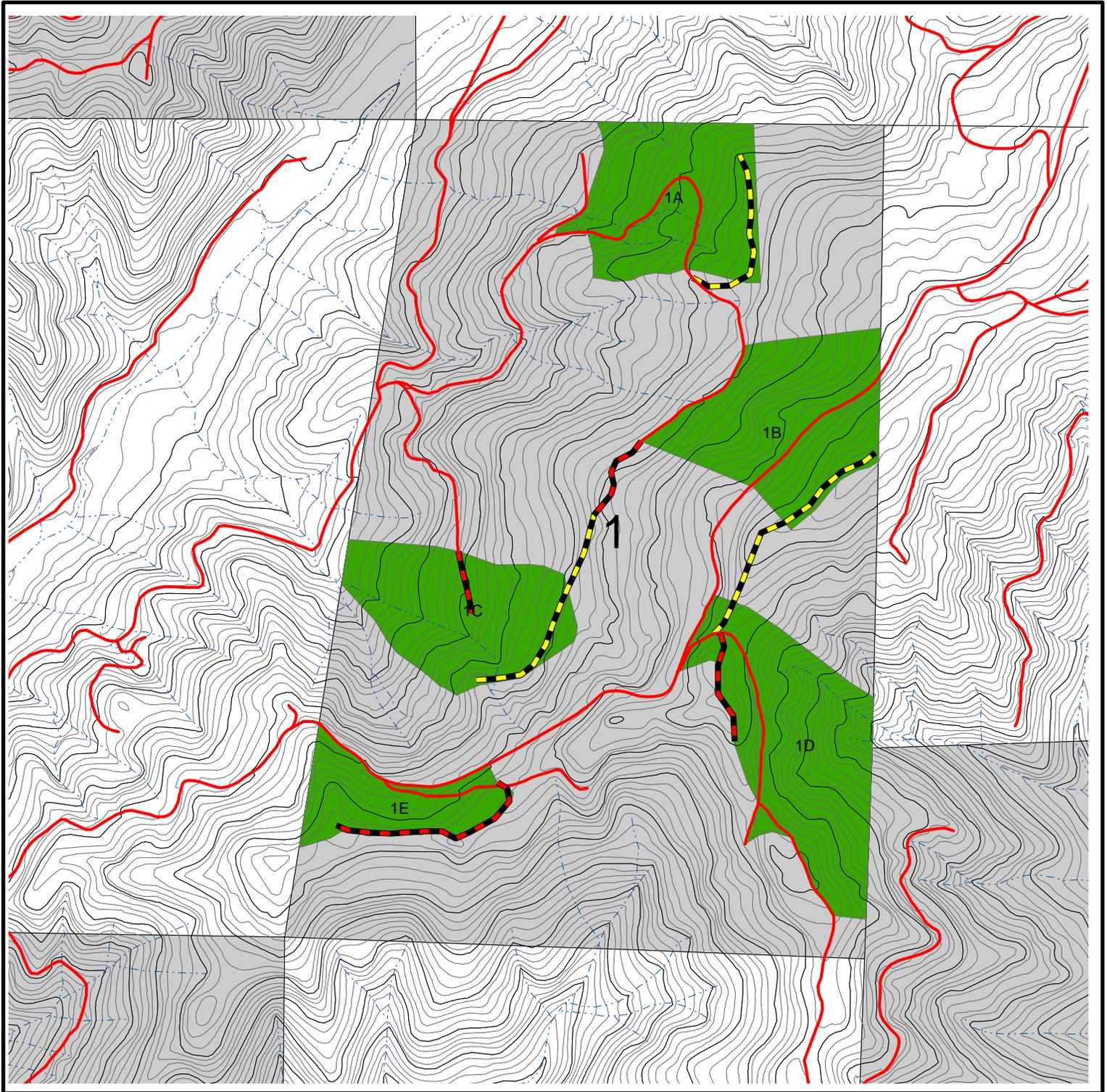
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-  BLM (O&C) Land
-  BLM (PD) Land
-  Non-BLM Land

# MYRTLE CREEK PROJECT

Commercial Thinning & Density Management



T29S, R4W

Willamette Meridian, Douglas Co., OR.

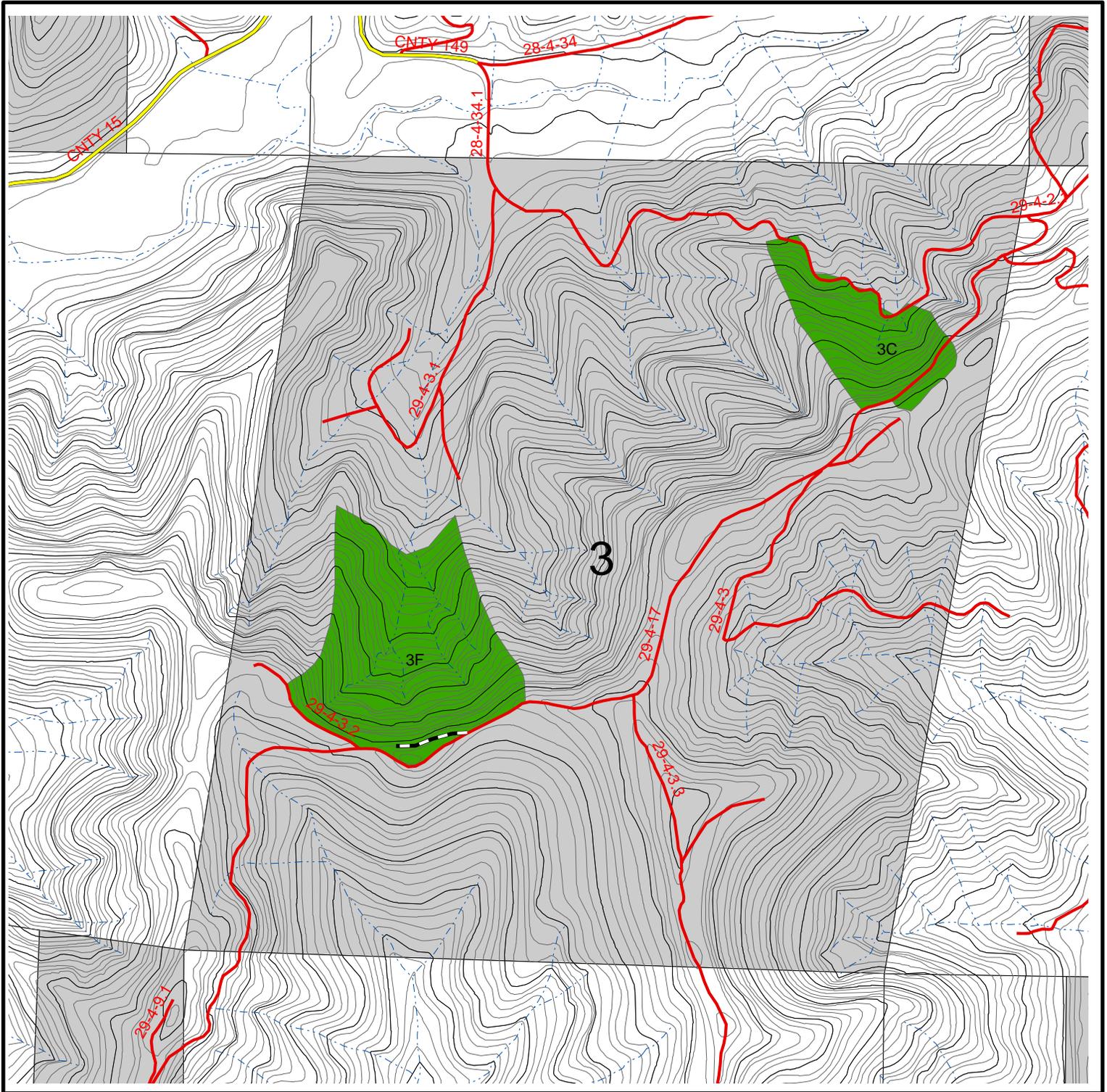
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-  Construct, Decommission
-  Stream
-  100' Contour
-  20' Contour
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-  BLM (O&C) Land
-  BLM (PD) Land
-  Non-BLM Land

# MYRTLE CREEK PROJECT

Commercial Thinning & Density Management



0 2,000 Feet



T29S, R4W

Willamette Meridian, Douglas Co., OR.

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-  Reconstruct, Decommission
-  Construct, Decommission
-  Stream
-  100' Contour
-  20' Contour

-  Thinning/Density Mngmt. Area
-  BLM (O&C) Land
-  BLM (PD) Land
-  Non-BLM Land

## Appendix B

### Special Status Wildlife Species Eliminated from further Discussion

Status	Common Name	Scientific Name	Habitat Features Used	Reason Eliminated
Federal Threatened	Bald Eagle	<i>Haliaeetus leucocephalus</i>	Large trees near large bodies of water (Buehler 2000, Isaacs and Anthony 2003)	No habitat
Federal Threatened	Marbled Murrelet	<i>Brachyramphus marmoratus</i>	Mature trees with large branches or platforms (Nelson 1997)	Out of species' range
Status	Common Name	Scientific Name	Habitat Features Used	Reason Eliminated
Bureau Sensitive	Columbian White-Tailed Deer	<i>Odocoileus virginianus leucurus</i>	Oak woodland	No habitat
Bureau Sensitive	Crater Lake Tightcoil	<i>Pristiloma arcticum crateris</i>	Herbs, woody debris, or rocky cover in or near perennially wet areas of mature forest (Duncan et al. 2003)	No habitat
Bureau Sensitive	Green Sideband	<i>Monadenia fidelis beryllica</i>	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	Klamath Tail-Dropper	<i>Prophyaon sp. nov.</i>	Moist mature forest (Frest and Johannes 2000)	Out of species' known range
Bureau Sensitive	Lewis' Woodpecker	<i>Melanerpes lewis</i>	Open woodlands with ground cover and snags (Tobalske 1997)	No habitat
Bureau Sensitive	Oregon Vesper Sparrow	<i>Pooecetes gramineus affinis</i>	Grassland, farmland, sage; dry, open habitat with moderate herb and shrub cover (Jones and Cornely 2002)	No habitat
Bureau Sensitive	Rotund Lanx	<i>Lanx subrotunda</i>	Aquatic habitat in Umpqua River and major tributaries (USDA/USDI 1994)	No habitat
Bureau Sensitive	Scott's Apatanian Caddisfly	<i>Allomyia scotti</i>	Low-gradient streams with gravel and cobble substrates (Wiggins 1977)	No habitat
Bureau Sensitive	Spotted Tail-Dropper	<i>Prophyaon vanatta pardalis</i>	Moist mature forest (Frest and Johannes 2000)	Out of species' range
Bureau Sensitive	Western Pond Turtle	<i>Clemmys marmorata</i>	Marshes, ponds, lakes, rivers with emergent structure; and adjacent forest (Storm and Leonard 1995)	No habitat

Status	Common Name	Scientific Name	Habitat Features Used	Reason Eliminated
Bureau Assessment	Foothill Yellow-Legged Frog	<i>Rana boylei</i>	Low-gradient streams with bedrock or gravel substrate (Corkran and Thoms 1996)	No habitat
Bureau Assessment	Harlequin Duck	<i>Histrionicus histrionicus</i>	Larger fast-flowing streams and riparian areas (Thompson et al. 1993, Robertson and Goudie 1999)	No habitat
Bureau Assessment	White-Tailed Kite	<i>Elanus leucurus</i>	Low-elevation grassland, farmland or savannah and nearby riparian areas (Dunk 1995)	No habitat

# Appendix C

## Special Status Plant Species Summary

Scientific Name	Taxon	Status	Habitat	Survey Requirement
<i>Lupinus kincaidii</i> ssp. <i>kincaidii</i>	Vascular Plant	Federal Threatened	Open woods and meadows	Habitat Present Survey Needed
<i>Arabis koehleri</i> var. <i>koehleri</i>	Vascular Plant	Bureau Sensitive	Dry, rocky serpentine slopes, ridges	No Habitat
<i>Bensoniella oregana</i>	Vascular Plant	Bureau Sensitive	Along the margins of bogs, meadows, and springs in mixed coniferous forests in partial and full sun	Habitat Present Survey Needed
<i>Calochortus coxii</i>	Vascular Plant	Bureau Sensitive	Dry open slopes or under open canopies on serpentine soils	No Habitat
<i>Calochortus umpquaensis</i>	Vascular Plant	Bureau Sensitive	Grassland and forests on serpentine soils	No Habitat
<i>Cimicifuga elata</i>	Vascular Plant	Bureau Sensitive	Woods and thickets at low elevations	Habitat Present Survey Needed
* <i>Corydalis aquae-gelidae</i>	Vascular Plant	Bureau Sensitive	Perennial streams seeps and springs	No Habitat
* <i>Cypripedium fasciculatum</i>	Vascular Plant	Bureau Sensitive	Dry to moist conifer and mixed evergreen forest)	Habitat Present Survey Needed
* <i>Eucephalis vialis</i>	Vascular Plant	Bureau Sensitive	Mixed evergreen/hardwood forests typically with open	Habitat Present Survey Needed
<i>Frasera umpquaensis</i>	Vascular Plant	Bureau Sensitive	Moist meadows and moist coniferous forest. Mostly grows in shaded conditions but can also occur in full sun	Habitat Present Survey Needed
<i>Horkelia congesta</i> ssp. <i>congesta</i>	Vascular Plant	Bureau Sensitive	Meadows and open woods	Habitat Present Survey Needed
<i>Kalmiopsis fragans</i>	Vascular Plant	Bureau Sensitive	Dry, stony mountain slopes	Habitat Present Survey Needed
<i>Lathyrus holochlorus</i>	Vascular Plant	Bureau Sensitive	Fence rows and partially cleared land, from the Willamette Valley to the Umpqua Valley	No Habitat
<i>Limnanthes gracilis</i> var. <i>gracilis</i>	Vascular Plant	Bureau Sensitive	Vernally moist to wet rocky slopes and meadows on various substrate including serpentine	No Habitat
<i>Romanzoffia thompsonii</i>	Vascular Plant	Bureau Sensitive	Seasonally wet rock outcrops on open slopes	Habitat Present Survey Needed
<i>Sisyrinchium hitchcockii</i>	Vascular Plant	Bureau Sensitive	Valley grasslands and oak savannahs	No Habitat
<i>Adiantum jordanii</i>	Vascular Plant	Bureau Assessment	Outcrops, Riparian	Habitat Present Survey Needed
<i>Asplenium septentrionale</i>	Vascular Plant	Bureau Assessment	Volcanic or granite rock crevices and ledges under a forest canopy	Habitat Present Survey Needed

Scientific Name	Taxon	Status	Habitat	Survey Requirement
<i>*Botrychium minganense</i>	Vascular Plant	Bureau Tracking	Riparian and old growth redcedar	Habitat Present Survey Needed
<i>*Botrychium montanum</i>	Vascular Plant	Bureau Assessment	Riparian and conifer forest	Habitat Present Survey Needed
<i>Carex brevicaulis</i>	Vascular Plant	Bureau Assessment	Rocky or Sandy soils	Habitat Present Survey Needed
<i>Carex comosa</i>	Vascular Plant	Bureau Assessment	Wet areas	Habitat Present Survey Needed
<i>Carex gynodynamis</i>	Vascular Plant	Bureau Assessment	Moist meadows, open forests	Habitat Present Survey Needed
<i>Carex serratodens</i>	Vascular Plant	Bureau Assessment	Wet Meadows	Habitat Present Survey Needed
<i>Cicendia quadrangularis</i>	Vascular Plant	Bureau Assessment	Meadows	Habitat Present Survey Needed
<i>*Coptis trifolia</i>	Vascular Plant	Bureau Assessment	Riparian and wetland conifer forest	Habitat Present Survey Needed
<i>*Cypripedium montanum</i>	Vascular Plant	Bureau Tracking	Mixed conifers	Habitat Present Survey Needed
<i>Eschscholzia caespitosa</i>	Vascular Plant	Bureau Assessment	Fields and brushy slopes of the foothills and valleys	Habitat Present Survey Needed
<i>Festuca elmeri</i>	Vascular Plant	Bureau Assessment	Woods	Habitat Present Survey Needed
<i>Horkelia tridentata</i> <i>Ssp. tridentata</i>	Vascular Plant	Bureau Assessment	Open, dry coniferous forests	Habitat Present Survey Needed
<i>Iliamna latibracteata</i>	Vascular Plant	Bureau Assessment	Streambanks and moist ground in the shade or open	Habitat Present Survey Needed
<i>Pellaea andromedaefolia</i>	Vascular Plant	Bureau Assessment	Dry rock outcrops mostly in the open sun but at times along shaded stream banks	Habitat Present Survey Needed
<i>Polystichum californicum</i>	Vascular Plant	Bureau Assessment	Rock outcrops beneath forest canopies or on open slopes. Often inside rock overhangs or on shear bluffs and cliffs	Habitat Present Survey Needed
<i>Utricularia gibba</i>	Vascular Plant	Bureau Assessment	Shallow water in the valleys and mountains	No Habitat
<i>Utricularia minor</i>	Vascular Plant	Bureau Assessment	Shallow standing or slow moving water	No Habitat
<i>Wolffia borealis</i>	Vascular Plant	Bureau Assessment	Lakes, ponds, and pools of standing water	No Habitat
<i>Wolffia columbiana</i>	Vascular Plant	Bureau Assessment	Lakes, ponds, and pools of standing water	No Habitat

Scientific Name	Taxon	Status	Habitat	Survey Requirement
<i>Chiloscyphus gemmiparus</i>	Bryophyte	Bureau Sensitive	Rocks in the bed of cold water streams	No Habitat
<i>Crumia latifolia</i>	Bryophyte	Bureau Assessment	Wet calcareous cliffs near the coast	No Habitat
<i>Diplophyllum plicatum</i>	Liverwort	Bureau Assessment	Bark of hardwoods and conifers, on thin soil over rock, and on decaying wood, primarily in cool, moist sites	Habitat Present Survey Needed
<i>Funaria Muhlenbergii</i>	Bryophyte	Bureau Assessment	Shaded forests on fine textured soil.	Habitat Present Survey Needed
<i>Pseudoleskeella serpentinensis</i>	Bryophyte	Bureau Assessment	Serpentine endemic	No Habitat
* <i>Schistostega pennata</i>	Bryophyte	Bureau Assessment	On damp rocks, soil and decaying wood in dark places.	No Habitat
<i>Tayloria serrata</i>	Bryophyte	Bureau Assessment	Soil and rotten wood enriched by old dung	Habitat Present Survey Needed
* <i>Tetraphis geniculata</i>	Bryophyte	Bureau Assessment	Decomposing stumps and logs of coniferous trees	Habitat Present Survey Needed
<i>Tetraplodon mnioides</i>	Bryophytes	Bureau Assessment	Soil and rotten wood enriched by old dung.	Habitat Present Survey Needed
<i>Tripterocladium leucocladulum</i>	Bryophyte	Bureau Assessment	Shaded to exposed rocks, cliffs and bark of hardwoods.	Habitat Present Survey Needed
* <i>Bryoria pseudocapillaris</i>	Lichen	Bureau Sensitive	Coastal Sites.	No Habitat
* <i>Bryoria spiralifera</i>	Lichen	Bureau Sensitive	Coastal Sites.	No Habitat
<i>Bryoria subcana</i>	Lichen	Bureau Assessment	Bark and wood of conifers in forest in stream and high precipitation ridges within 30 mile of the ocean.	Habitat Present Survey Needed
<i>Calicium adpersum</i>	Lichen	Bureau Assessment	Habitat unknown	Habitat Present Survey Needed
* <i>Hypogymnia duplicata</i>	Lichen	Bureau Tracking	Old-growth conifers.	Habitat Present Survey Needed
* <i>Leptogium cyanescens</i>	Lichens	Bureau tracking	Mixed Conifers	Habitat Present Survey Needed
* <i>Lobaria linita</i>	Lichen	Bureau Assessment	Mature forests in the Western Hemlock Zone.	Habitat Present Survey Needed
* <i>Niebla cephalota</i>	Lichens	Bureau Assessment	Coastal Sites.	Habitat Present Survey Needed
* <i>Nephroma occultum</i>	Lichen-	Bureau Tracking	Old-growth conifers.	Habitat Present Survey Needed
<i>Pannaria rubiginosa</i>	Lichen	Bureau Assessment	Mature Douglas-fir/western hemlock forest.	Habitat Present Survey Needed
<i>Pilophorus nigricaulis</i>	Lichen	Bureau Assessment	Non-forest communities on talus slopes, cliffs, and rock outcrops.	Habitat Present Survey Needed
* <i>Pseudocyphellaria perpetua</i>	Lichen	Bureau Tracking	Coastal Site.	No Habitat

Scientific Name	Taxon	Status	Habitat	Survey Requirement
<i>*Pseudocyphellaria rainierensis</i>	Lichen	Bureau Tracking	Old-growth conifers.	Habitat Present Survey Needed
<i>Sulcaria badia</i>	Lichen	Bureau Assessment	Bark and wood mainly from oak and maple.	Habitat Present Survey Needed
<i>Stereocaulon spathuliferum</i>	Lichen	Bureau Assessment	Rock	Habitat Present Survey Needed
<i>*Teloschistes flavicans</i>	Lichen	Bureau Assessment	Coastal Sites.	No Habitat
<i>Arcangiella camphorata</i>	Fungi	Bureau Sensitive	Forms sporocarps beneath the soil surface associates with Douglas-fir and Western Hemlock. Fruits in Spring and Fall	Surveys not practical
<i>Bridgeporus nobilissimus</i>	Fungi	Bureau Sensitive	Range of Pacific Silver Fir and Noble Fir.	No Habitat
<i>Dermocybe humboldtensis</i>	Fungi	Bureau Sensitive	Sporocarps usually occur in association with the roots of various Pinaceae ssp. Fruits in Fall.	Surveys not practical
<i>Phaeocollybia californica</i>	Fungi	Bureau Sensitive	Associated with the roots of Douglas-fir and Western Hemlock. Fruits in Spring and Fall.	Surveys not practical
<i>Phaeocollbia gregaria</i>	Fungi	Bureau Sensitive	Associated with the roots of Douglas-fir. Fruits in the Fall.	Surveys not practical
<i>Phaeocollbia olivacea</i>	Fungi	Bureau Sensitive	Scattered or in arcs in mixed forests containing Fagaceae or Pinaceae in coastal lowlands. Fruits in the Fall	Surveys not practical
<i>Phaeocollbia oregonensis</i>	Fungi	Bureau Sensitive	Associated with the roots of Douglas-fir and Western Hemlock. Fruits in the fall.	Surveys not practical
<i>Ramaria spinulosa var. diminutive</i>	Fungi	Bureau Sensitive	Fruits in humus or soil and matures above the ground, associated with Pinaceae ssp. Fruits in the Fall.	Surveys not practical
<i>Rhizopogon chamaleontinus</i>	Fungi	Bureau Sensitive	Found underground in association with the roots of Douglas-fir and Sugar Pine.	Surveys not practical
* Survey and Manage Species 2003				

## APPENDIX D CRITICAL ELEMENTS OF THE HUMAN ENVIRONMENT

The following elements of the human environment are subject to requirements specified in statute, regulation, or executive order.

These resources or values either **not present** or **would not be affected by the proposed actions or alternative**, unless otherwise described in this EA. This negative declaration is documented below by individuals who assisted in the preparation of this analysis.

ELEMENT	NOT PRESENT	NOT AFFECTED	IN TEXT
Air Quality		X	X
Areas of Critical Environmental Concern	X		
Cultural Resources			X
Environmental Justice	X		
Farm Lands (prime or unique)	X		
Floodplains	X		
Native American Religious Concerns	X		
Non-Native and Invasive Species		X	X
Threatened or Endangered Wildlife Species			X
Threatened or Endangered Plant Species			X
Wastes, Hazardous or Solid	X		
Water Quality Drinking/Ground		X	
Wetlands/Riparian Zones		X	X
Wild & Scenic Rivers	X		
Wilderness	X		
Visual Resource Management		X	