Olalla-Lookingglass LSR Density Management Environmental Assessment

Bureau of Land Management
Roseburg District Office
South River Field Office
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U.S. Department of the Interior, Bureau of Land Management
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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 1995a, p. 29) directs that activities beneficial to the creation of late-successional habitat be planned and implemented in the Late-Successional Reserves (LSRs). Thinning operations are to be conducted in forest stands up to 80 years old, if needed to create and maintain late-successional forest conditions.

The Olalla/Lookingglass Watershed Analysis (USDI, BLM 1998, p. 106) noted there were approximately 2,040 acres of mid-seral (30 to 80 years old) stands in the LSR land use allocation that may be suitable for density management. The current vegetative conditions and ownership patterns are indicative of the need to provide late-successional habitat in the Late-Successional Reserves managed by the Bureau of Land Management (BLM).

The *South Coast-Northern Klamath Late-Successional Reserve Assessment* (LSRA), and with specific respect to LSR 259, the amendments reviewed by the Regional Ecosystem Office and found to be consistent with objectives of the Standards and Guidelines in the Northwest Forest Plan for managing LSRs, provide guidance for determining what forest stands warrant silvicultural treatments to achieve desired forest stand conditions.

The *South Coast-Northern Klamath* LSRA listed LSRs 259 and 261, which encompass the analysis area, as high priorities for management actions based on their large size, key links to the LSR network, and land ownership pattern. Management priorities identified in the LSRA for LSRs 259 and 261 include enlarging existing interior late-successional habitat blocks, maintaining and improving habitat connections between and within the LSRs, and creating late-successional habitat where absent (USDI and USDA 1998, pp. 63-66, Map #6, and Map #8).

II. Proposed Action

The action proposed is density management on approximately 650 acres of mid-seral stands within LSRs 259 and 261 in the Olalla Creek-Lookingglass Creek fifth-field watershed. Approximately 840 acres of mid-seral stands were initially identified as candidate stands for treatment through operational inventories. Approximately 190 acres were dropped from further analysis, as described in Chapter Two, based on stand examinations and field verification by silviculture and wildlife staff.

The proposed density management would yield between six and eight million board feet (MMBF) of timber, not chargeable toward the Roseburg District's annual allowable sale quantity (ASQ) of 45 MMBF. The timber volume would support local and regional manufacturers and

economies, and contribute toward the assumptions of the Roseburg District *Proposed Resource Management Plan/Environmental Impact Statement* (PRMP/EIS (USDI, BLM 1994)) that BLM management programs (including timber sales) would support 544 jobs and provide $9.333 million in personal income, annually.

This environmental assessment (EA) considers the environmental consequences of the alternatives, including the alternative of No Action, in order to provide sufficient evidence and analysis for determining whether there would be impacts exceeding those considered in the PRMP/EIS that 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 and USDI 1994a);
- The FSEIS *for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* (USDA and USDI 2001a);
- The FSEIS *for Management of Port-Orford-Cedar in Southwest Oregon* (USDA and USDI 2004a).

Implementation of actions proposed in this analysis would conform to requirements of the ROD/RMP, which 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 and 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 and USDI 2001b), and the *Record of Decision and Resource Management Plan Amendment for Management of Port-Orford-Cedar in Southwest Oregon, Coos Bay, Medford, and Roseburg Districts* (USDI, BLM 2004).

III. Objectives

The objective of the proposed action is reduction of the tree density of mid-seral age stands to maintain stand vigor, consistent with stand and landscape objectives for LSRs described in Appendix E of the Roseburg District ROD/RMP (p. 153).

Reducing stand densities would:

- Aid achieving LSRA objectives by protecting and enhancing conditions of late-successional forest ecosystems, which serve as habitat for late-successional and old-growth forest related species (ROD/RMP p. 153);
- Promote the development of old-growth characteristics including snags, logs on the forest floor, large trees, and canopy gaps that enable establishment of multiple tree layers and diverse species composition (USDA and USDI 1994a, p. B-5);
- Maintain the health and vigor of the stands, and promote the growth of the remaining

trees;
- Retain hardwoods as stand components;
- Maintain native species diversity and structural composition of the forest stands (LSRA, pp. 62);
- Maintain and improve late-successional habitat connections within and between LSRs (LSRA, pp. 65-66);
- Create larger blocks of interior late-successional habitat (LSRA, pp. 65-66);
- Decrease the risk of large scale disturbance from fire, wind, insects, and diseases that would destroy or limit the ability of the reserves to sustain viable species populations (USDA and USDI 1994a, p. B-5); and
- Acquire desired vegetation characteristics to attain Aquatic Conservation Strategy objectives by controlling stocking, and managing stands and desired non-conifer vegetation in the riparian areas (ROD/RMP p. 25).

IV. Decision Factors

Factors to be considered when selecting among alternatives would include:

- The degree to which the objectives previously described would be achieved, including: the manner in which density management would be conducted with respect to cost, the method(s) of yarding, and type of equipment; 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;
- Achievement of LSRA objectives; and
- Compliance with applicable laws including, but not limited to, the Clean Water Act and the Endangered Species Act.

Chapter Two
DISCUSSION OF ALTERNATIVES

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

I. Alternative One – No Action

Under this alternative, density management would not be applied to the proposed units. The stands would continue to develop along present growth trajectories characterized by dense stocking and closed canopies. Over time, persistence of high levels of canopy closure would lead to increased suppression mortality and potential stagnation of stand growth, unless these trajectories were altered by a natural disturbance.

None of the proposed construction, decommissioning, or renovation of roads for access to the proposed units would be undertaken. Road maintenance would continue to be conducted on an as-needed basis to provide resource protection, accommodation of reciprocal users, and protection of the government's investment in the roads.

II. Alternative Two – Proposed Action

Under this alternative, density management treatments would be applied to approximately 650 acres of mid-seral stands in LSRs 259 and 261. The acreage would be divided among 17 units comprising two timber sales, to be authorized individually, and designated as Deep Six (located in Section 27, T. 28 S., R. 8 W., W.M.) and Olly Cat (located in Sections 7 and 19, T. 30 S., R. 7 W., W.M.; and Sections 1, 11, 13, and 23, T. 30 S., R. 8 W., W.M.). Maps of the proposed units are included in Appendix A.

A. Treatments

The development of late-successional and old-growth forests characteristic of southwest Oregon were largely the result of fires of varying intensities. These included both natural fires and those set by indigenous peoples for the purpose of managing vegetative conditions to meet their needs. Today, there are limits to the extent fire may be used as a management tool for manipulating vegetative conditions because of concerns over potential impacts to adjoining private property and air quality. Mechanical treatment represents the most effective method available for managing vegetation in a manner that would lead to the development of late-successional and old-growth forest habitat.

Density management treatments would be designed to mimic natural disturbances that reduce stand density and move stand development toward late-successional conditions presented in the *South Coast-Northern Klamath LSRA* (pp. 28 and 82).

Three types of thinning treatments would be applied, individually or in combination, within the proposed density management units to break up stand homogeneity and accentuate landscape diversity across the project area. Light thinning would retain 90 to 100 trees per acre, moderate

thinning would retain 60 to 80 trees per acre, and heavy thinning would retain approximately 50 trees per acre. Unthinned areas and openings would also be interspersed within the units. Ponderosa pine, western redcedar, Douglas-fir, and incense-cedar would be planted in the openings and heavy thinning areas, based on site conditions.

In LSR 261 (Deep Six units), at least ten percent of each stand would remain unthinned to retain processes and conditions, such as thermal and visual cover, natural suppression and mortality, small trees, natural size differentiation, and undisturbed coarse woody debris. Openings would be up to one-quarter acre in size, and in combination with heavily thinned areas would not exceed ten percent of the total treated acres.

In LSR 259 (Olly Cat units), at least ten percent of the treated area would remain unthinned to retain processes and conditions, such as thermal and visual cover, natural suppression and mortality, small trees, natural size differentiation, and undisturbed coarse woody debris. Openings would be up to 0.8 acres in size and would be limited to two percent of the total treated acres. Heavily thinned areas would not exceed 50 percent of the total treated acres.

Table 2-1. Approximate Acres by Treatment Type in the Proposed Units.

Deep Six A	13	13.75	21	0	0.25	48
Deep Six B	1	0	10	0	0	11
Deep Six C	4	0	30	0	0	34
Deep Six D	5	28.75	0	0	0.25	34
Deep Six E	2	0	9.75	0	0.25	12
Olly Cat B	0	0	31	0	0	31
Olly Cat C	1	0	51	0	0	52
Olly Cat D	6	0	0	21	0	27
Olly Cat E	4	0	45	0	0	49
Olly Cat F	12	0	18	0	0	30
Olly Cat G	3	0	0	31	0	34
Olly Cat J	22	0	54.2	0	0.8	77
Olly Cat K	4	0	0	35.5	0.5	40
Olly Cat L	1	0	14	0	0	15
Olly Cat M	7	0	17	0	0	24
Olly Cat O	10	18	20.5	0	0.5	49
Olly Cat P	13	9	50.2	10	0.8	83

B. Criteria Common to All Treatments

Trees would be removed primarily from the suppressed and intermediate canopy classes, with trees 20 inches or larger in diameter at breast height (DBH) generally marked for retention. Outside of "no-harvest" buffers, 20 inch DBH or larger trees may be cut and removed, if necessary to meet density objectives of the marking prescription. Any trees felled for operational purposes within the "no harvest" buffers would be left in place to provide instream wood and protection for stream banks.

Older remnant trees may be present, but are not the numerically predominant stand components or the focus of density management. Large remnant trees would be retained to the greatest degree practical, with removal limited to situations where trees are located in a proposed road right-of-way where no suitable alternative access exists, at landing areas, or represent operational safety concerns subject to Oregon State laws and regulations.

Sound hardwood and conifer snags would be retained and protected to the greatest degree practicable. This would be accomplished by marking rub trees around the snags or by including snags in untreated areas. Where snag retention would pose an unacceptable safety risk or where retention of unthinned groups of trees would conflict with project objectives, snags would be cut and retained on site as coarse woody debris to supplement existing down wood in Decay Classes 3, 4, and 5 retained under contract provisions.

To maintain structural and habitat diversity, retention tree selection would not be based solely on the healthiest best formed trees but would include trees with broken or deformed tops that could provide future roosting and nesting structure. Hardwoods selected for retention would generally be greater than 10 inches DBH and exhibit a reasonable likelihood of surviving the density management treatment. Less common (numerous) conifer species would also be favored for retention, in sufficient numbers to maintain them as stand components.

C. Riparian Treatments

Variable-width "no-harvest" buffers would be established to protect stream bank integrity, maintain streamside shade, and provide a filtering strip for overland run-off. These buffers would be a minimum slope distance of 20 feet wide on intermittent non-fish-bearing streams and 50 feet wide on fish-bearing streams, measured from the top of the stream bank. Determination of the final width would be based on factors, such as unique habitat features, streamside topography, and vegetation. Whether a stream is intermittent or perennial, fish-bearing, its susceptibility to solar heating, and proximity to Essential Fish Habitat would also be considered in determining specific buffer widths. Trees would be felled away from these "no-harvest" buffers.

No ground-based equipment operations would be allowed within the "no-harvest" buffers. If it is 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 cable yarding corridors across streams would be clearly demonstrated by the purchaser.

Corridors would be a maximum of 20 feet wide and laid out perpendicular to stream channels at locations and in a manner approved by the contract administrator.

D. Yarding Operations

Yarding would utilize a combination of cable and ground-based systems. Table 2-2 presents a summary of the number of acres of each yarding method and seasons of operation for each unit.

Table 2-2. Acres by Yarding Methods and Season of Operation.

Deep Six A	35	0	35	0	35
Deep Six B	10	0	10	0	10
Deep Six C	30	0	30	0	30
Deep Six D	29	0	29	29	0
Deep Six E	10	0	10	0	10
Olly Cat B	31	10	21	10	21
Olly Cat C	51	0	51	0	51
Olly Cat D	21	0	21	21	0
Olly Cat E	45	10	35	10	35
Olly Cat F	18	9	9	18	0
Olly Cat G	31	0	31	14	17
Olly Cat J	55	15	40	55	0
Olly Cat K	36	5	31	36	0
Olly Cat L	14	0	14	14	0
Olly Cat M	17	0	17	17	0
Olly Cat O	39	0	39	12	27
Olly Cat P	70	7	63	7	63

1"Dry Only" means that yarding and hauling operations would be limited to the traditional "dry season" of May 15 to mid-to-late October, subject to bark slip and seasonal wildlife restrictions.
2"Any Season" means that yarding and hauling operations could occur throughout the year, subject to seasonal restrictions for ground-based operations, bark slip, and wildlife.

Skyline cable yarding would be the primary harvesting system because of the steep terrain in the project area. Equipment would be capable of maintaining a minimum of one-end log suspension to reduce 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 capability would be required so yarding corridors could be spaced at intervals of 200 feet, when practical, to reduce the number of yarding corridors and landings and limit the area of soil disturbance and compaction. Where necessary, yarding corridors would be waterbarred, by hand, and covered with woody debris to minimize the potential for erosion and sediment problems. Where deemed necessary by the contract administrator, trees cut to clear corridors within the units would be replaced by

reserving trees otherwise intended for cutting, if needed to maintain the desired post-treatment stand density.

The use of ground-based equipment would be limited to the dry season, typically between May 15 and the onset of regular autumn rains in mid-to-late October. If the weather is unusually wet during the dry season, ground-based operations would be delayed or stopped until soil moisture is low enough, as determined by the soil scientist, to resist compaction. If autumn weather conditions remain dry, operations could be extended with a provisional waiver.

Skid trails would be pre-designated and limited to slopes less than 35 percent, using existing skid trails to the greatest degree practical (ROD/RMP, p. 131). Skid trails would be spaced an average of 150 feet and forwarder trails would be spaced an average of 120 to 150 feet, whenever practical. Harvester and shovel swing yarder trails would be spaced an average of at least 50 feet. Primary skid trails, including existing trails that would be re-used, and landings would collectively affect no more than 10 percent of the ground-based harvest area. Primary skid trails are defined as trails with mineral soil exposed on more than 50 percent of the trail.

Landings, primary skid trails, and other areas identified by the soil scientist, silviculture staff, or contract administrator would be subsoiled upon completion of operations to break up the soil, reduce bulk density, and re-establish tilth. Subsoiled areas would have slash placed over the soils or other treatments to retard erosion, if necessary. Main skid trails and forwarder trails not subsoiled would be mapped so it could be treated, if needed, after a future management activity, such as another density management operation.

Ground-based yarding equipment would be prohibited from operating in the flat, poorly drained portion of Olly Cat unit F containing the meandering ephemeral draws tributary to the main intermittent stream channel.

E. Access

Existing permanent roads would provide primary access for density management operations and timber hauling. Access to suitable landing areas would be provided by the construction of approximately 3.4 miles of new roads, and the renovation of approximately 1.4 miles and reconstruction of approximately 0.3 miles of system roads, roads previously decommissioned, or non-system roads (i.e. jeep roads).

New roads would be constructed on ridge tops or stable side slopes and outside of riparian areas to the extent practicable, reducing the need for excavation and modification to the existing slopes, contours, and natural drainage patterns. The running surface of temporary roads would be 12 to 13 feet wide.

Road renovation could include grading; repairing; realigning; surfacing; or widening existing roadbeds. It could also include cleaning and reshaping drainage ditches; cleaning, repairing, or adding drainage structures; and clearing vegetation and trees from cut and fill slopes.

In the construction of temporary roads or the renovation of existing unsurfaced roads the intent is to use and decommission them in the same operating season they are constructed or renovated. If the roads could not be utilized in that time frame because of events, such as extended fire closure, the BLM would winterize the roads for use the following year. Winterizing would include applying mulch or other erosion control measures and blocking roads to vehicle access before the onset of regular autumn rains, to the extent practicable. In either event, temporary roads would be decommissioned after use.

Decommissioning of temporary roads would generally consist of removing drainage structures, constructing water bars or drainage dips, subsoiling the road bed, covering with woody debris or slash, and blocking to vehicular use. Unsurfaced, renovated roads would be decommissioned in a similar fashion unless prohibited under third-party access rights, in which case they would be weatherized and blocked to prevent vehicular use and reopened in the future if needed.

Table 2-3 displays, by unit, the estimated miles of road construction or renovation proposed. Final length and location of the roads would be subject to refinement during field layout. As indicated on the project proposal maps in Appendix A, most of the road construction would be located within individual density management units.

Table 2-3. Miles of Proposed Road Construction and Renovation and Disposition of the Road Following Completion of Density Management.

Deep Six A	Construct temporary road	0.15 miles	Decommission
	Renovate road	0.33 miles	Decommission
Deep Six D	Construct temporary roads	0.36 miles	Decommission
Olly Cat C	Renovate road	0.21 miles	Decommission
Olly Cat D	Construct temporary road	0.47 miles	Decommission
Olly Cat E	Reconstruct road	0.15 miles	Decommission
	Construct temporary road	0.10 miles	Decommission
Olly Cat F	Construct temporary road	0.27 miles	Decommission
Olly Cat G	Reconstruct road	0.13 miles	Decommission
	Construct temporary road	0.23 miles	Decommission
Olly Cat J	Construct temporary roads	0.72 miles	Decommission
	Renovate road	0.38 miles	Decommission
Olly Cat K	Construct temporary road	0.25 Miles	Decommission
	Renovate road	0.39 miles	Decommission
Olly Cat L	Construct temporary road	0.31 Miles	Decommission
Olly Cat M	Construct temporary road	0.15 Miles	Decommission
Olly Cat O	Construct temporary roads	0.24 Miles	Decommission
Olly Cat P	Construct temporary road	0.17 Miles	Decommission
	Renovate road	0.10 miles	Decommission

F. 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 to July 15 when active cambial growth results in bark being less firmly attached to tree boles and more susceptible to mechanical damage, particularly in younger trees. Circumstances may exist, however, where it would be practical to waive this restriction, such as in the use of harvester-forwarder equipment capable of severing trees, setting them aside, and transporting them to landings without damaging adjoining trees.

Yarding and hauling of timber from areas accessed by unsurfaced roads would be restricted to the period between May 15 and the onset of autumn rains, usually around mid-October. If the weather is unusually wet during the dry season, ground-based operations would be delayed or stopped until soil moisture is low enough to resist compaction. If autumn weather conditions remain dry, operations could be extended with a provisional waiver.

A northern spotted owl (*Strix occidentalis caurina*) nest site is located within 65 yards of Deep Six unit D. To avoid effects to spotted owls from disturbance, operations on this unit would be prohibited from March 1 to June 30, unless surveys determine spotted owls are not present, not nesting, or the nesting attempt failed. Other units may require seasonal restrictions if surveys determine that spotted owl nesting sites are within disruption distances.

Density management within 100 yards of any known occupied marbled murrelet site, or any unsurveyed suitable murrelet nesting habitat in Zone 1 or the Zone 2 restriction corridor would be prohibited from April 1 to August 5, and subject to Daily Operating Restrictions (DOR) from August 6 to September 15 to avoid disturbance during the nesting and fledging season. Daily Operating Restrictions prohibit commencement of operations until two hours after sunrise and require operations to cease two hours before sunset. In areas of Zone 2 outside of the restriction corridor, operations would be subject to Daily Operating Restrictions from April 1 to August 5. These restrictions would be waived if two years of surveys indicate the area is unoccupied by murrelets.

G. Evaluating Achievement of Coarse Wood and Snag Objectives

It is anticipated that coarse woody debris would be adequately provided for because contract provisions would stipulate reservation of existing coarse woody debris in Decay Classes 3, 4, and 5. Snags felled for safety or operational reasons would be retained on site to supplement existing coarse woody debris; and tops of trees broken out during density management operations, as well as natural events such as windthrow, wind break, snow break, and suppression mortality would provide additional coarse woody debris.

As previously described sound hardwood and conifer snags would be retained and protected to the greatest degree practicable.

The potential need for additional trees to meet snag and coarse wood needs would be factored into the marking prescriptions.

Surveys would be conducted after the first winter following completion of the density management treatment, in order to monitor levels of coarse wood and numbers of snags. In the event that deficits exist, additional trees reserved under the marking prescription would be felled or girdled to meet the appropriate objectives. Felling and/or girdling would be accomplished under a service contract or by qualified District personnel.

III. Actions and Alternatives Considered but not Analyzed in Detail

The following alternatives to the proposed action considered by the Interdisciplinary Team or proposed by members of the public were not analyzed in detail because they would not meet the objective for the proposed action, or were not considered reasonable.

A. Units Dropped or Deferred

As noted on page 1, approximately 840 acres were identified for consideration in this analysis, but approximately 190 acres were eliminated upon further review. Four proposed units in Section 9, T. 30 S., R 7 W., W.M. and Sections 11, 15, and 23, T. 30 S., R 8 W., W.M. were deemed unsuited based on stand stocking, average tree size, general stand condition, or the feasibility of access or logging. Five units in Section 21, T. 28 S., R 8 W., W.M. were deferred based on a possible marbled murrelet detection, which may indicate occupancy in the area.

B. Helicopter Yarding vs. Building or Reconstructing Roads

Prior to development of the proposed alternative, the BLM received comments that helicopter yarding should be consider as an alternative to construction of new roads. Helicopter yarding was considered but determined not be a reasonable alternative for the following reasons:

- Primary roads already access all of the units proposed for treatment in this analysis. New construction would be limited to providing access to advantageous yarding locations or locating landings off of main road systems to avoid impeding traffic.
- Using representative appraisal criteria for a comparison of costs indicates that helicopter yarding would be more than two times more expensive than traditional cable yarding methods. Helicopter yarding the proposed density management 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 (M) loaded on a truck. For the estimated 3 million board feet of timber that would need to be helicopter yarding if no new roads were constructed, helicopter yarding costs would be approximately $1,281,000 (3 M x $427/M). By comparison, using a 40-foot tower, an average yarding distance of 425 feet, and a production rate of four truck loads per day cable yarding yields a production cost of $177 per thousand board feet loaded on a truck. Cable yarding costs would be approximately $531,000 (3 M x $177/M). The difference of more than $750,000 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 roads would be approximately $1,000. The cost of renovating road beds would be comparable to temporary road construction. Construction and subsequent decommissioning of an estimated 180 stations (3.4 miles) of temporary spur roads would cost approximately $72,000. Reconstruction of 90 stations (1.7 miles) of roads and subsequent decommissioning would be approximately $36,000. The total road construction costs would be approximately $108,000. The savings from not constructing roads would not offset the additional logging costs of using a helicopter.

IV. Resources that Would Remain Unaffected by the Alternatives

The following resources or critical elements of the human environment would not be affected under either alternative because they are absent from 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 (p. 32), cultural resources would not be affected. No measurable increase or decrease in the introduction or rate of spread of noxious weeds is anticipated (p. 32).

There are no energy transmission or transport facilities and/or rights-of-way in the immediate project area. No commercially usable energy facilities or resources are present in the proposed units. The proposed route of a natural gas pipeline through the Olalla Creek/Lookingglass Creek Watershed would not pass through any of the proposed units or cross any of the BLM controlled roads to be used for hauling timber. As a consequence, no adverse affect on energy resources would be anticipated.

Chapter Three
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 BLM manages approximately 27,390 acres (27 percent) of the 103,109 acres in the Olalla Creek-Lookingglass Creek fifth-field watershed (USDI 1998). The forested lands within the watershed have been subjected to clearing and conversion to agricultural use; insect damage; stand-replacing wildfires; windthrow events; timber salvage; and regeneration harvest of mature and old-growth timber. These factors and others have shaped and influenced the vegetative cover and age class distribution of forest stands in the watershed.

Aerial photography was used to determine the existing vegetative conditions in the watershed. For all ownerships, approximately 24, 626 acres (24 percent) is non-forest land, primarily dedicated to agricultural and residential uses. There are 15,338 acres (15 percent) of early seral forest, from 0 to 30 years old. Approximately 37,766 acres (37 percent) are mid-seral forest stands, from 31 to 80 years old. Late-seral forests, at least 80 years old, make up the remaining 22,263 acres, representing 22 percent of the watershed.

On BLM-managed lands there are 5,056 acres (18 percent) in early seral stands, 5,655 acres (21 percent) in mid-seral stands, and 15,286 acres (56 percent) in late-seral stands in the watershed. The late-seral stands on BLM-managed land represent 69 percent of the late-seral stands in the watershed.

The proposed units are in the grand fir vegetation zone, which means in the absence of disturbance, such as wildfire, insects, or diseases, the dominant tree regeneration would be grand fir. Fire was the major disturbance before timber harvesting began. The historic fire regime was considered to be mixed severity with fire frequency ranging from 35 to 100 years. Under this fire regime and these site conditions, Douglas-fir probably dominated stands for hundreds of years until grand fir gradually became co-dominant with Douglas-fir and other species.

The forest stands comprising the proposed density management units are typically dense, even-aged, and single-canopied, ranging from 42 to 61 years old (see Table 3-1) that, following previous timber harvesting, were established by planting, aerial seeding, or natural regeneration. Prior to implementation of the Northwest Forest Plan, these stands were managed for timber production as the primary objective through the application of pre-commercial thinning and fertilization. In terms of tree growth, the Deep Six Units are more productive than the Olly Cat Units due to a combination of soils, precipitation, and topography.

Table 3-1. Summary of Current Stand Conditions.*

Olly Cat	42-61	164-290	156-200	10.4-13.4	0.5-0.74	98-100
Deep Six	42-54	134-159	157-234	14.7-16.5	0.46-0.67	98-100

*Table B-2 in Appendix B provides more detailed and unit specific current stand condition information.

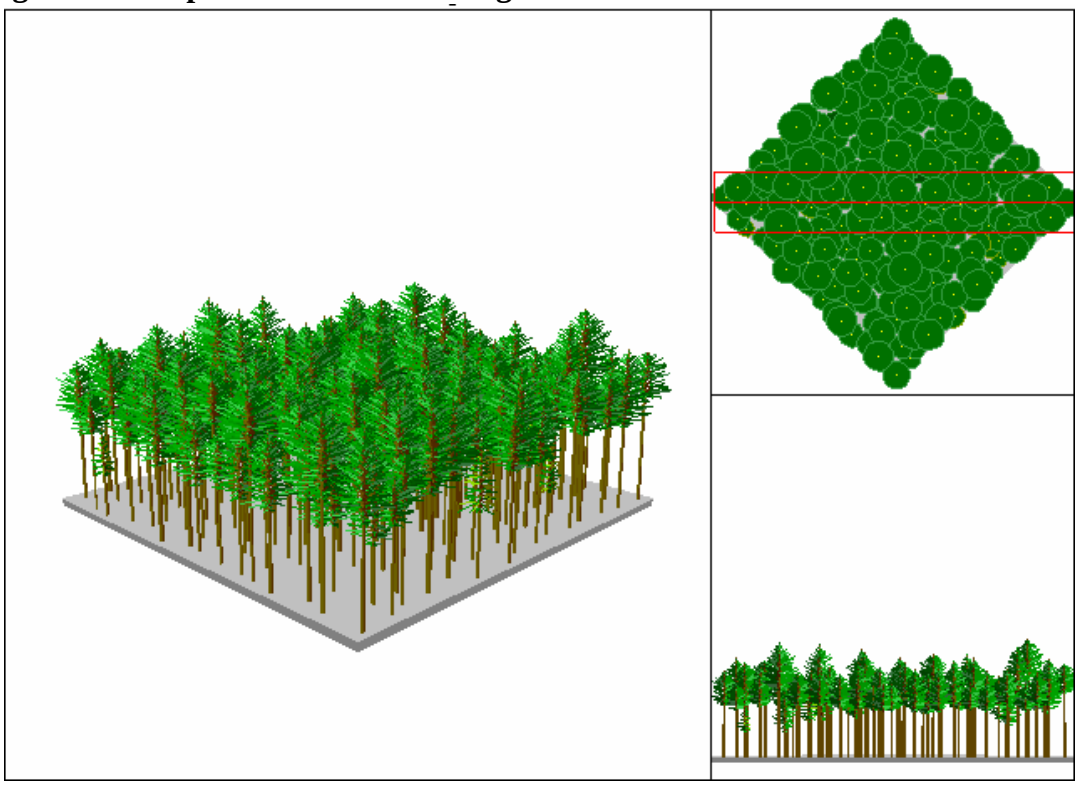
Douglas-fir is the dominant conifer species with grand fir, western redcedar, incense-cedar, western hemlock, Pacific yew, ponderosa pine, and sugar pine also being present. Hardwood species include chinkapin and madrone on the drier slopes, with bigleaf maple growing on moister slopes and north aspects. The major shrub species are rhododendron, vine maple, Oregon grape, and salal. Herbs include western swordfern, Oregon oxalis, vanilla leaf, and bald-hip rose.

As presented in Table 3-1, crown closure currently ranges from about 98 to 100 percent. As a result, ground cover and understory development are patchy and sparse. Hardwoods, which are generally shade intolerant, are being overtopped by the conifers and as a result are gradually dying out. Live crown ratios of conifers (ratio of live crown to total height of the tree) are estimated to be greater than 30 percent, which is the level considered important for maintaining or improving stand health and vigor.

Relative stand densities of the proposed units are currently above 0.55, with the exception of one stand which has a relative density of 0.46. Relative stand density is a measure of stand stocking compared to a theoretical maximum. As a general rule, at a relative density of 0.55, competition among trees would result in suppression mortality and reduced tree vigor (Drew and Flewelling 1979). Thinning to a relative density below 0.30 creates a more open stand and is designed to improve structural and species diversity by allowing more sunlight to reach the forest floor so understory herbaceous plants, forbs, shrubs, and conifer and hardwood regeneration can become established and grow. The understory plant diversity in thinned stands is more similar to old-growth stands than unthinned stands (Chan, et al. 2006, and Bailey and Tappeiner 1998).

A representation of existing stand conditions shown in Figure 3-1 was derived from stand examination data.

Figure 3-1. Representation of Existing Stand Conditions.



The proposed units have few trees and snags (averaging less than five per acre) larger than 18 inches DBH. Five units (Deep Six units B and C and Olly Cat units B, J, and P) have scattered grand fir and Douglas-fir trees left from previous harvests in the 1950s and 1960s that have slightly larger diameters than the rest of the unit.

Surveys for Coarse Woody Debris (CWD) determined decay class 3, 4 and 5 logs on the forest floor were abundant in some units (see Table 3-2). These are large older logs remaining from the previous timber harvest and are in various stages of decay from hard to soft and powdery. Decay class 1 and 2 logs are recent additions to the coarse woody debris component that still have the bark intact. These are represented in lesser amounts and have smaller diameters, reflecting the size of the current stands.

Table 3-2. Existing Amounts of Coarse Woody Debris by Decay Class and Total Pieces per Acre.

Units	Volume (cubic feet per acre)						Total Pieces per Acre
	Decay Class 1	Decay Class 2	Decay Class 3	Decay Class 4	Decay Class 5	Total in All Decay Classes	
Deep Six	8-128	0-171	86-1,829	499-2,010	0-428	1,369-3,298	66-124
Olly Cat	0-72	0-48	0-1,438	305-3,099	0-2,649	1,047-4,841	36-116

For the Coast Range Physiographic Province (Deep Six Units), the LSRA (p. 90) recommends 3,600 to 9,400 cubic feet per acre of CWD (minimum four inch diameter and three feet long) occur at stand age 80 within the first site potential tree height of any perennial stream. Within

the second site potential tree height of perennial streams or the first site potential tree height of intermittent streams, the recommended range is 1,600 to 2,300 cubic feet per acre.

For the Klamath Mountains Physiographic Province (Olly Cat Units), the LSRA (p. 90) recommends 650 to 1,300 cubic feet per acre of CWD (minimum four inch diameter and three feet long) occur at stand age 80 within two site potential tree heights of any perennial stream and within the first site potential tree height of intermittent streams. All of the Olly Cat units have more than 650 cubic feet per acre of CWD.

Port-Orford-Cedar

Port-Orford-cedar (POC) has not been found in or near the proposed units or along potential haul routes. The Port-Orford-cedar risk key identified in the *Resource Management Plan Amendment for Management of Port-Orford-Cedar in Southwest Oregon, Coos Bay, Medford, and Roseburg Districts* (USDI 2004, p. 33) was used to determine the risk to POC is low. Consequently, no POC management practices are required and POC will not be discussed further in this analysis.

II. Wildlife

Three categories of wildlife to be discussed in this analysis are Survey and Manage Species, Special Status Species, and migratory birds.

A. Survey and Manage Species

We do not expect that the litigation over the Annual Species Review process in Klamath-Siskiyou Wildlands Center et al. v. Boody et al. will affect this project, because the development and design of this project exempt it from the Survey and Manage program. In Northwest Ecosystem Alliance et al. v. Rey et al. the U.S. District Court modified its order on October 11, 2006, amending paragraph three of the January 9, 2006 injunction. This most recent order directs:

> "Defendants shall not authorize, allow, or permit to continue any logging or other ground-disturbing activities on projects to which the 2004 ROD applied unless such activities are in compliance with the 2001 ROD (as the 2001 ROD was amended or modified as of March 21, 2004), except that this order will not apply to:
>
> a. Thinning projects in stands younger than 80 years old;
> b. Replacing culverts on roads that are in use and part of the road system, and removing culverts if the road is temporary or to be decommissioned;
> c. Riparian and stream improvement projects where the riparian work is riparian planting, obtaining material for placing in-stream, and road or trail decommissioning; and where the stream improvement work is the placement large wood, channel and floodplain reconstruction, or removal of channel diversions; and
> d. The portions of project involving hazardous fuel treatments where prescribed fire is applied. Any portion of a hazardous fuel treatment project involving commercial logging will remain subject to the survey and management requirements except for

thinning of stands younger than 80 years old under subparagraph a. of this paragraph."

The project thins stands that are approximately 42 to 61 years old. For the foregoing reason, the density management project meets exemption criteria "a" described above. Therefore, Survey and Manage Species will not be discussed further in this analysis.

B. Special Status Species

Twenty-four Special Status Species, listed under the Endangered Species Act or designated as Bureau Sensitive or Bureau Assessment, are known or suspected to occur on the Roseburg District. 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 absent. Consequently, these species are eliminated from further discussion (see Appendix C, Table C-1). The nine remaining species that may be affected are addressed below.

1. Threatened and Endangered Species

a. 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 (CWD), 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 BLM District these habitat features are generally found in stands that are at least 80 years old, which are referred to as suitable or nesting, roosting, and foraging (NRF) habitat. No NRF habitat would be treated by the proposed action.

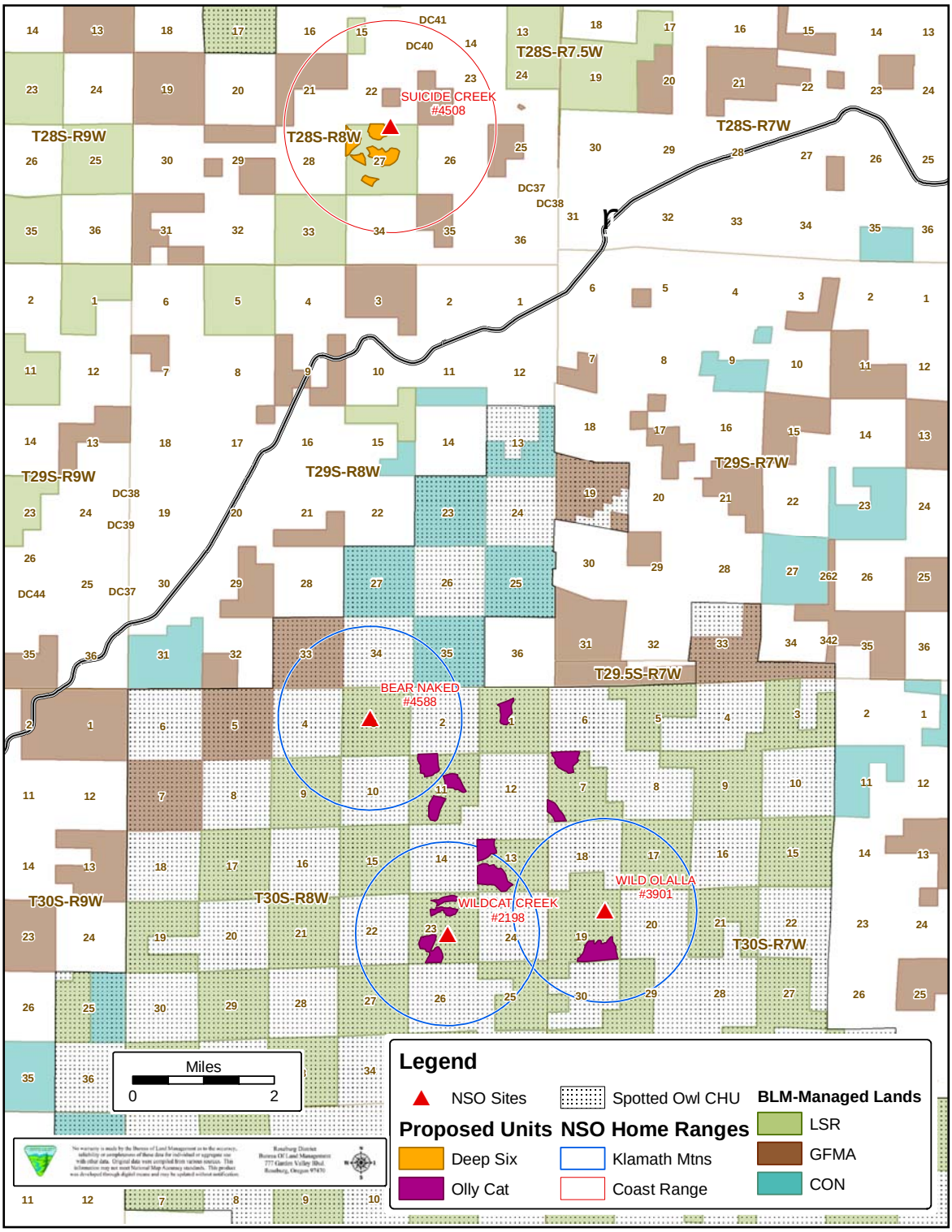
Stands that provide sufficient canopy cover and sub-canopy space for spotted owl movement, but do not contain nesting, roosting, or foraging components are referred to as dispersal-only habitat. Forested areas that do not currently provide functioning habitat for spotted owls are called unsuitable habitat, and areas that would never provide for spotted owl use (such as rock outcrops or water bodies) are called non-habitat.

Surveys have identified four spotted owl sites with home ranges that overlap some of the density management units (see Map 3-1).

The proposed units are considered to be spotted owl dispersal-only habitat because of the relatively small tree size (quadratic mean diameters are between about 11 and 16 inches), high tree density (approximately 134 to 366 trees per acre) with 98 to 100 percent canopy cover, and lack of nesting structure.

Northern spotted owl NRF habitat within one-quarter mile of proposed units is surveyed yearly as part of effectiveness monitoring (Lint, et al. 1999). Therefore, the proposed action would not affect any unsurveyed suitable spotted owl habitat.

Map 3-1. Northern Spotted Owl Sites and Home Ranges near the Olalla-Lookingglass Density Management Units.



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 Mountains Physiographic Province and 1.5 miles in the Oregon Coast Range Physiographic Province (USDI 1991). Current habitat availability in these home ranges is presented in Table 3-3 and shown on maps in Appendix C.

Table 3-3. Acres and Percent of Spotted Owl Habitat Types in Affected Home Ranges, Including BLM-Administered and Private Lands.

	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres
	834	25	370	11	2,187	64	0	0	3,393
	401	9	1,958	43	1,832	41	325	7	4,517
	429	13	2,244	66	656	19	61	2	3,392
	480	14	1,841	54	1,028	30	42	1	3,392

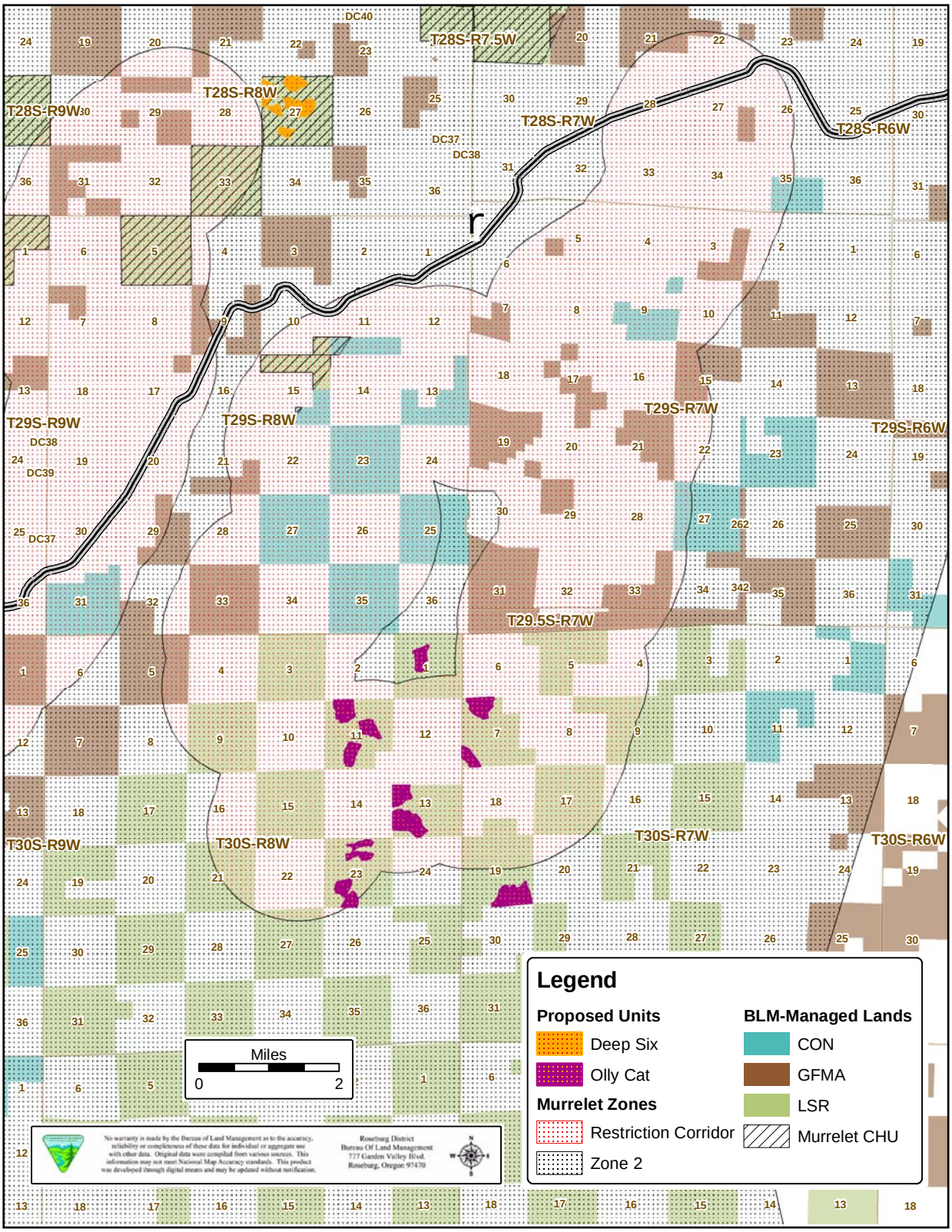
The Olly Cat units are within Critical Habitat Unit (CHU) OR-62, which was designated by the U.S. Fish and Wildlife Service (Service) for the survival and recovery of the spotted owl (Federal Register 1992). The Deep Six units are not within a northern spotted owl Critical Habitat Unit.

b. Marbled Murrelet

The marbled murrelet (*Brachyramphus marmoratus*) spends most of its life in coastal areas, typically nesting up to 35 miles inland on platforms or large branches in trees (Lank, et al. 2003), although nesting murrelets have been documented as far inland as 50 miles on the Roseburg District. Murrelets do not build nests, but create a depression to hold one egg. Suitable habitat for murrelets is generally characterized by trees greater than 18 inches DBH, multi-storied canopies with moderate closure, limb size and substrate (such as moss) sufficient to support nest cups, flight accessibility, and protective cover from weather conditions and potential predators (Manley 1999, Burger 2002, Nelson and Wilson 2002). Nest cups are rarely found in deciduous trees. Nest trees may be scattered or clumped throughout a stand.

Two murrelet management zones were adopted from the Forest Ecosystem Management Assessment Team report ((FEMAT) USDA, et al. 1993). In Oregon, Zone 1 generally extends 35 miles inland from the coast and Zone 2 extends from the Zone 1 boundary to 50 miles inland. The Zone 1 management restrictions were subsequently extended into Zone 2 within 1.3 miles of five major streams on the Roseburg District through consultation with the U.S. Fish and Wildlife Service in 2005 (File No. 1-15-05-I-0596, Figure 1). Zone 1 is expected to include most murrelet sites, and therefore consultation with the Service resulted in more restrictions on forest management activities there than in Zone 2 (File No. 1-15-05-I-0511).

Map 3-2. Marbled Murrelet Zones and Restriction Corridor in Relation to the Olalla-Lookingglass Density Management Units.



Olly Cat units C, D, E, F, G, J, K, L, M, and O occur in the 1.3 mile management restriction corridor in Zone 2; Olly Cat units B and P, and the Deep Six units occur in Zone 2 (see Map 3-2). Suitable murrelet habitat occurs in Olly Cat unit P and within 100 yards of Olly Cat units B, C, D, E, and P; and Deep Six unit A. Two years of protocol surveys (Pacific Seabird Group 2003) would be conducted to determine murrelet occupancy.

The Deep Six units are in Critical Habitat Unit (CHU) OR-06-d, which was designated by the U.S. Fish and Wildlife Service for the survival and recovery of the marbled murrelet (Federal Register 1996). The Olly Cat units are not within a marbled murrelet Critical Habitat Unit.

2. Bureau Sensitive and Bureau Assessment Species

In the Oregon/Washington BLM, Bureau Sensitive and Bureau Assessment species are managed in accordance with BLM Manual Section 6840 (USDI, BLM 2001a). Bureau Sensitive species are those taxa eligible for federal listed, federal candidate, state listed, or state candidate (plant) status. Bureau Assessment species are those plant and vertebrate taxa on List 2 of the Oregon Natural Heritage program, but not listed as federally endangered or threatened, designated as a federally proposed or candidate species, state listed, or Bureau Sensitive. BLM Manual Section 6840 policy states that Bureau actions must not contribute to the need for future listing of Bureau Sensitive and Bureau Assessment species under the Endangered Species Act.

The **Chace Sideband** (*Monadenia chaceana*), **Green Sideband** (*Monadenia fidelis beryllica*), and **Oregon Shoulderband** (*Helminthoglypta hertleini*) snails are endemic to northwestern California and southwestern Oregon. When active, these snails may be found using herbaceous vegetation, ferns, leaf litter, or moss mats in moist, shaded areas near refugia. Food sources appear to include leaf litter, fungus, and detritus. Refugia include interstices in rock-on-rock habitat, soil fissures, or the interior of large woody debris (Weasma 1998a, Weasma 1998b, and Frest and Johannes 2000). Suitable habitat for these species is present in the Deep Six units and Olly Cat units C, M, and P. Surveys conducted in the spring of 2006 did not find any of these mollusk species in the proposed units. Surveys would be completed, using accepted protocol, in the spring of 2007.

The **northern goshawk** (*Accipiter gentilis*) is a large forest-dwelling hawk found throughout temperate forested regions in the northern hemisphere. Goshawks forage below the forest canopy for a variety of birds and small mammals. In the Pacific 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, and Daw and DeStefano 2001). More than a dozen goshawk observations have been made at various locations throughout the South River Resource Area. Goshawks are not expected to nest in the proposed units because of the relatively small tree size and high tree density; however, the stands may be used for foraging.

The **Townsend's big-eared bat** (*Corynorhinus townsendii*) is an insectivorous bat species found throughout the western United States 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 few large remnant trees in Deep Six units B and C and Olly Cat units B, J, and P may provide some limited foraging and roosting opportunities for Townsend's big-eared bats.

The **Pacific pallid bat** (*Antrozous pallidus pacificus*) is an insectivorous bat 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). Deep Six units B and C and Olly Cat units B, J, and P may provide some limited foraging and roosting opportunities for Pacific pallid bats where large hollow trees or snags are present.

The **fringed myotis bat** (*Myotis thysanodes*) is an insectivorous bat species found throughout the western U.S., utilizing a range of habitats, from sagebrush to Douglas-fir forests (reviewed in Verts and Carraway 1998). Hibernacula and roost sites are known to 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. Deep Six units B and C and Olly Cat units B, J, and P may provide some limited foraging and roosting opportunities for fringed myotis bats where large snags are present.

3. Migratory Birds

Executive Order 13186, issued in 2001, directed agencies to integrate conservation principles, measures, and practices into planning processes to restore and enhance the habitat of migratory birds and ensure that environmental analyses consider the effects of agency actions and plans on migratory birds, with an emphasis on species of concern. This Executive Order directed agencies to utilize existing management plans, such as Partners in Flight's Conservation Strategy for Landbirds in Coniferous Forests of Western Oregon and Washington (Altman 1999, may view online at http://www.orwapif.org/pdf/western_forest.pdf).

Partners in Flight (PIF) is an international coalition of government agencies, conservation groups, academic institutions, private organizations, and citizens dedicated to the long-term maintenance of healthy populations of native landbirds. Its bird conservation plans are used as guidelines by private and government organizations, including the BLM.

The proposed units contain mid-seral (42 to 61 year old) forests with closed canopies and open understory. After the density management, the proposed units would be expected to develop a deciduous understory.

The PIF strategy identified 20 species of concern (focal species), which were chosen based on their conservation needs or association with habitat types and attributes. The PIF strategy assumes that management actions affecting focal species would also affect other species that use

the same habitat types and attributes. Three high-priority focal species likely to be affected by the proposed action include the hermit warbler, Wilson's warbler, and winter wren.

The hermit warbler forages in closed canopy stands with dense crowns and would be expected to use the proposed units. Other species using similar habitat types and attributes are the golden-crowned kinglet and chestnut-backed chickadee.

Wilson's warbler is an insectivorous species that inhabits and forages in deciduous shrub and understory layers in a wide range of forest age classes. The proposed units generally would not provide habitat for Wilson's warbler but areas with early-seral shrub habitat may be used. Other species associated with similar habitat types and attributes are the Swainson's thrush and warbling vireo.

The winter wren forages on the ground and low understory in structurally complex areas, is found most commonly in older forests, thought to use interior forest habitat, and sensitive to habitat fragmentation. It forages on shrubs, root wads, down logs, ferns, and herbaceous vegetation. Other species associated with similar habitat types and attributes are the orange-crowned warbler and rufous hummingbird. The proposed units currently lack suitable structural complexity for this species. Density management is expected to create habitat suited to this species, however.

III. Soils

Soils in the project area are predominantly derived from sandstone, siltstone, and metamorphic rock (Johnson, et al. 2004, Wert, et al. 1977). The rock types range from highly fractured, meta-sedimentary rock that is hard to moderately hard on steep side slopes and ridges, to soft and highly weathered sedimentary rock on toe slopes and benches.

Slopes within the proposed units are mainly gentle to moderate (10 to 60 percent slopes), with areas of steep slopes (60 to 80 percent) near ridges and rock outcrops, and below the slope breaks toward streams. The terrain is mainly convex (rounded) and smooth or planar (flat) topography, with some benches. Steeper slopes (up to 110 percent) above some stream banks and stream confluences would be included in the "no-harvest" buffers established on streams within or adjacent to proposed units.

Soil depths range from shallow (less than 20 inches) to moderately deep (20-40 inches) and deep (40-60 inches). Generally, the moderately deep and deep soils are located on mid to lower side slopes, benches, and concave slopes (depressions). The shallow soils are located on steep to very steep slopes, such as along upper ridges or above stream channel side slopes.

Surface soil textures include loams, silt loams, and clay loams. Subsoil textures are loams; clay loams; silty clay loams; and clays. Gravel contents range from low to high (5 to 60 percent). The soil textures are moderately cohesive to cohesive (which reduces the erosion potential) and are moderately well drained to well drained (Johnson, et al. 2004). The flatter portion of Olly Cat unit F contains an area of poorly drained to somewhat poorly drained soils and is more susceptible to compaction because of the moist soil conditions.

In the previous harvest entry, approximately 65 percent of the area in the proposed units was tractor harvested. Tractor yarding was generally limited to slopes of less than 45 percent, but did extend to some 70 percent slopes with skid road and trail gradients up to 46 percent. These old roads and trails cover about 15 to 20 percent of the ground based yarding areas.

The old roads and major skid trails displaced the topsoil (surface 3 to 6 inches), especially where the roads and skid trails were cut into sloping ground. Moderate and heavy compaction (compaction deeper than 12 inches) is prevalent in these areas. Currently, little erosion is occurring. Most duff layers range from one-half inch to two inches deep. Hardwoods, conifers, brush, and herbaceous plants have revegetated the past slope and road fill failures. Some of the steeper side slopes above stream channels contain areas of bare soil between the established vegetation; however, other landslides have not occurred in the proposed units. The side slopes of the stream segments affected by the slope and road fill failures in the 1950s and 1960s have been stabilized by the roots of the plants growing there now.

A slope stability inventory of the project area was completed using aerial photographs taken in 1964, 1967, 1978, 1999, and 2004. Table 3-4 presents the results from the slope stability inventory.

Table 3-4. Slope and Road Fill Failures in Proposed Density Management Units That Occurred After Timber Harvesting in the 1950s and 1960s.

Deep Six A	Road fill failure.	0.09	No travel distance.
Deep Six B	In-unit slope failure.	0.07	Traveled 280 feet to an intermittent stream channel.
Deep Six D	In-unit slope failure.	0.01	No travel distance.
Olly Cat E	Failed fill along skid road.	0.14	No travel distance.
Olly Cat O	Road fill failure.	0.08	Traveled down slope 280 feet to a bench.
	Road fill failure.	0.07	Traveled down 560 feet to an intermittent stream channel.
Total		0.46	

Other slope failures have not developed since the late 1960s. Timber harvesting in the 1950s and 1960s resulted in less than one percent of the proposed units having slope and road fill failures. Consequently, slope stability is not considered an issue and will not be discussed further in this analysis.

IV. Water Resources

A. Stream Flow

The climate in the Olalla Creek-Lookingglass Creek Watershed is a Mediterranean type characterized by cool, wet winters and hot, dry summers. Annual precipitation within the

watershed ranges from approximately 30 inches at Winston to 70 inches at the highest elevations. Annual precipitation collected at a weather station near Reston and the Deep Six units is 52 inches, and at Upper Olalla, near the Olly Cat units, annual precipitation averages 41 inches (USDI 1998, p.56). Most precipitation is in the form of rain, concentrated between November and March.

Stream flow volumes closely follow the precipitation pattern. Peak stream flows occur from November to March, and low stream flows occur from July to October. Streams located within the proposed units are first and second order headwater streams that are generally intermittent and have no surface flow during the dry season.

1. 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 the area between 2,000 and 5,000 feet in elevation that may alternately receive snow and 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 250 acres in the proposed density management units are located in the TSZ. The remainder of the acreage proposed for density management is below the TSZ in the rain dominated zone. The Olalla Creek-Lookingglass Creek Fifth Field Watershed is comprised of six sixth field watersheds (subwatershed). The proposed density management units in Deep Six are located in the Tenmile Creek Subwatershed and those in Olly Cat are located in the Olalla Creek, Thompson Creek, and Berry Creek subwatersheds. Areas within each subwatershed and the percent of each that is located in the TSZ are presented in Table 3-5.

Table 3-5. Acres, Percent of Area, and Percent of Area in Openings in the Transient Snow Zone.

Subwatershed/Watershed Name	Total Forested Acres	Area in TSZ (percent)	TSZ Area in Openings[1] (percent)
Berry Creek Subwatershed	11,955	17	0
Lookingglass Creek Subwatershed	8,932	0	0
Morgan Creek Subwatershed	8,077	11	0
Olalla Creek Subwatershed	13,839	6	<1
Tenmile Creek Subwatershed	20,450	9	<1
Thompson Creek Subwatershed	18,191	49	<1
Olalla Creek-Lookingglass Creek Watershed	81,444	18	<1

[1] Based on GIS analysis and aerial photo interpretation and includes acres in Shep Boyardee Commercial Thinning and Power Wagon Density Management.

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 increases in peak flow based on the number of acres in a watershed 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 watershed indicate that, although past timber harvest created some openings, at least 99 percent of the forested lands in the TSZ have canopy closures greater than 30 percent and the potential for peak flow enhancement from rain-on-snow events in the Olalla Creek-Lookingglass Creek Watershed is low (Watershed Professionals Network 1999).

2. Peak Flows and Roads

Roads may alter the natural drainage characteristics of channels and change the runoff characteristics of watersheds (Furniss, et al. 1991). Roads can increase the drainage density of a watershed, acting as a preferential pathway for surface water runoff, resulting in a decrease in the volume of overland flow that infiltrates into the ground water or soil water storage. Increased drainage density increases the rate runoff leaves a basin, resulting in higher peak flows during times of snow melt or rainfall and reduced stream flows in late summer. Jones (2000) found a 13 to 36 percent increase in peak flows (with greater than one-year return period) related to the density of midslope roads in seven of eight small basins studied. The magnitude of peak flow enhancement also depends on whether or not road segments drain directly into stream channels. Roads not connected to stream channels, such as ridge-top roads, 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.

Roads may modify storm peaks by reducing infiltration on compacted surfaces, allowing rapid surface runoff, or by intercepting subsurface flow and surface runoff and channeling it directly into streams (Ziemer 1981). Peak flows have been shown to increase substantially when roads occupy more than 12 percent of the watershed (Watershed Professionals Network 1999, IV-15). It is likely that midslope forest roads have marginally increased the magnitude of peak flows by intercepting subsurface flow and surface runoff, extending the drainage network, and channeling water into streams; however, roads occupy less than three percent of the Olalla Creek-Lookingglass Creek Watershed. Therefore, it is unlikely peak flows are being measurably affected by the present road density in the watershed.

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 (Oregon Department of Environmental Quality 2003).

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

1. Stream Temperature

Water temperature is a key factor affecting the growth and survival of aquatic organisms. The effect of stream temperature on aquatic organisms, such as fish, amphibians, and

macroinvertebrates, varies between species and within the life cycle of a given species (Lantz 1971; Oregon Department of Environmental Quality 1995). Factors influencing water temperature include elevation, slope, aspect, local topography, stream flow patterns, channel geometry, vegetation, stream shading, and distance from the headwaters.

The most common cause of elevated stream temperatures associated with timber harvesting is a reduction in streamside shade that can cause streams to be more susceptible to increases in temperature by solar radiation reaching the stream surface (Moore and Miner 1997). Streams in or adjacent to the proposed units were determined, by ocular estimates, to be well shaded with dense stands of conifers and hardwoods.

2. Sediment

No known sediment data exists for the streams located 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 can cause detrimental changes to streams and their inhabitants (Castro and Reckendorf 1995).

Roads may directly alter streams by increasing erosion and sedimentation, which in turn may alter stream channel morphology. Roads can act as a link between sediment sources and streams, and often account for most of the sediment problems in a watershed. Roads can be hydrologically connected to the stream channel at road and stream crossings, where discharge is sufficient to create gullies in the roadside ditch, and where road fillslopes encroach on streams.

Within the project area, the 28-8-27.1, 30-8-13, and 30-7-19 roads may be contributing sediment to adjacent stream channels because surveys identified these roads having surface erosion from water flowing over the road surface.

Other potential sources of sediment could be old roads and skid trails. An assessment, described in the soils section (p. 24), however, concluded old roads and skid trails used during timber harvesting in the 1950s and 1960s were not contributing sediment to streams.

C. Water Rights

No surface water rights exist for domestic use within one mile downstream of proposed units. No effects to downstream water users are anticipated and water rights will not be discussed further in this analysis.

V. Fisheries and Aquatic Resources

The proposed density management units are predominantly located in upland areas with a few intermittent stream channels nearby. There are several larger perennial and fish-bearing streams below the proposed units and along portions of the haul routes. Aquatic habitat conditions and fish presence or absence were noted during site visits.

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 (*Oncorhynchus clarki clarki*), fall and spring Oregon Coast Chinook salmon (*Oncorhynchus tshawytscha*), and the Oregon Coast coho salmon (*Oncorhynchus kisutch*).

A. Aquatic Habitat Conditions

Aquatic Habitat Inventory surveys were conducted by the Oregon Department of Fish and Wildlife in 1995 and 1996 on 44 stream reaches in the watershed, totaling approximately 51 miles. The results of these surveys are summarized in the Olalla-Lookingglass Watershed Analysis (USDI 1998, pp. 79-83) 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 quality, and habitat access.

1. 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 substrate. Gravel and small cobbles that are one-half to four inches in diameter and relatively free from embedded fine sediment provide ideal spawning substrate for salmonids (Bell 1986).

The presence of fines may limit the quality of spawning sites in reaches with spawning size gravel. Fine sediment deposition can fill interstitial spaces reducing oxygen flow to eggs, smothering eggs, or forming an impenetrable layer preventing alevin emergence (Waters 1995).

Riffles are considered to be in a "desirable" condition when they contain less than 10 percent fines (sand and organics) and more than 35 percent gravel. Twenty-six, out of the 44 surveyed reaches, had a desirable rating for the amount of sand and organic material in riffles, and twenty-three met the desirable criteria for the amount of gravel in riffles.

Generally, intermittent and small perennial stream channels adjacent to units had moderate amounts of gravel and fines in riffles. Perennial channels were comprised of disconnected pools with water flowing subsurface in riffle units. During winter flows, riffles would provide additional spawning habitat.

2. Large Woody Debris

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

The Oregon Department of Fish and Wildlife considers a stream reach in desirable condition when it contains more than 20 pieces of large wood (6 inches in diameter and 10 feet long) and the volume of large wood exceeds 1,060 cubic feet (Foster, et al. 2001). Nine of the surveyed stream reaches met the desirable criteria for large wood pieces, 11 met the desirable criteria for large wood volume, but none met the desirable criteria for the number of key pieces of large wood. Key pieces are defined as large wood more than 33 feet long and 24 inches in diameter. The desirable condition is to have more than three key pieces per 328 feet of stream length.

High gradient intermittent and perennial headwater streams located adjacent to proposed density management units generally had a high volume and number of pieces of large woody debris. Riparian forests in steep and confined headwaters, such as those located in the project area, contribute more large woody debris (May and Gresswell 2003), and without redistribution by large flood events, these large woody debris pieces are retained for longer periods of time.

Habitat forming woody debris pieces range from logs larger than 24 inches in diameter to hardwoods larger than six inches in diameter (Foster, et al. 2001). Approximately one key piece and ten other large wood pieces per 100 feet of channel were found in streams adjacent to proposed units.

3. Pool Quality

Pools are important habitat features for juvenile rearing during low flow months when high stream temperatures add to stress and high flow events when off channel pools provide refuge habitat. Salmonids typically are found in greater numbers and are larger in size in deep pool habitats (Roni 2002, and Rosenfeld, et al. 2000).

The Oregon Department of Fish and Wildlife considers stream reaches to be in a desirable condition when pool habitat area exceeds 35 percent of the total stream habitat and have more than four complex pools (those with large woody debris) per mile (Foster, et al. 2001). Thirty-three out of the 44 surveyed reaches met the desirable criteria for pool area and two of these met the criteria for complex pools. Fourteen reaches met the desirable criteria for pool frequency (less than five channel widths between pools).

Fish-bearing streams adjacent to Olly Cat units D and G are about four to six feet wide and have moderate gradients and similar amounts of fish habitat available. Although both are perennial streams, some reaches (i.e. downstream from unit D) consist of a series of disconnected pools and subsurface flow through riffles. Pool habitat was formed by large wood and boulder scour pools.

4. Habitat Access

Access to streams by migrating fish can be restricted by culverts. Adult anadromous fish are capable of reaching culverts with jump heights of about four feet; however, they can be restricted from reaching the culvert when the outlet pool depth is less than 1.5 times the height of the jump. Juvenile fish are often prevented from migrating upstream by jumps more than six inches. Culverts with in-pipe slope gradients greater than 0.5 percent can also block juvenile salmonid

fish passage by increasing water velocities during high flow events (Watershed Professionals Network 1999).

Four culverts on fish bearing streams in the Olalla Creek-Lookingglass Creek Watershed have been replaced since 2002 improving access for anadromous and resident fish to more than five miles of spawning and rearing habitat. In association with the culvert replacements, willow cuttings and hardwood and conifer seedlings were planting to protect bank stability and provide shade to the stream. Six other culverts in the watershed are known fish passage barriers. The culvert on Wildcat Creek, downstream from Olly Cat unit P in section 19, T. 30 S., R. 7 W., W. M. has been identified as a barrier to resident fish. The other five culvert barriers in the watershed are located in headwater streams outside of the project area and block access for resident fish.

B. Special Status Species

The National Marine Fisheries Service designated the Oregon Coast coho salmon Evolutionary Significant Unit (ESU) as a threatened species in 1998 (Federal Register 1998a Vol. 63/No. 153). In February 2004 the Ninth Circuit Court of Appeals upheld a 2001 ruling removing the threatened status of Oregon Coast coho salmon. The species was proposed for re-listing as a threatened species (Federal Register 2004 Vol. 69/No. 113); however, on January 19, 2006 a decision was issued that the species did not warrant listing the under the Endangered Species Act (Federal Register 2006 Vol. 71/No. 12).

The Oregon Coast coho salmon is currently considered a Bureau Sensitive Species and is found in Olalla and Lookingglass Creeks and some of their major tributaries, including Willingham, Wildcat, and Tenmile Creeks. The nearest distribution limits are 0.8 miles downstream from Olly Cat unit C and 0.9 miles downstream from Deep Six unit A.

The Oregon Coast steelhead trout ESU was proposed as a candidate for threatened species designation in 1998 (Federal Register 1998b Vol. 63/No. 53) but was downgraded by the National Marine Fisheries Service to a “Species of Concern” (Federal Register 2005 Vol. 69/No. 73)

Distribution of steelhead trout closely resembles that of coho salmon. Steelhead trout are found in Olalla and Lookingglass creeks more than 0.8 miles downstream from the nearest proposed unit.

The Umpqua chub (*Oregonichthys kalawatseti*) is a Bureau Sensitive Species. Surveys have found the Umpqua chub in Lookingglass and Tenmile creeks (Simon 1998 and Markle, et al. 1991) more than six miles downstream from the nearest proposed unit.

The Pacific lamprey (*Lampetra tridentate*) is a Bureau Assessment Species that may be found in some third order or larger tributaries of the Umpqua River. Although the Pacific lamprey’s complete distribution is unknown, it was not detected in surveys conducted in streams adjacent to or downstream from the proposed units.

The Coastal cutthroat trout is a Bureau Tracking Species and was previously listed as an endangered species as the Umpqua cutthroat trout ESU (Federal Register 2000, Vol. 65, No. 76). It has a wide distribution and is found above many natural anadromous fish barriers. Although its complete distribution is unknown, it is common in many third and some perennial second order streams throughout the watershed. Resident cutthroat trout are present in streams adjacent to Olly Cat units D and G and downstream from the other proposed units.

C. Essential Fish Habitat

Streams and aquatic habitat currently 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). The distribution of Essential Fish Habitat closely resembles the current distribution of coho salmon in Olalla and Lookingglass Creeks. Essential Fish Habitat is located about 0.8 miles downstream from Olly Cat unit C and 0.9 miles downstream from Deep Six unit A.

VI. Botany

Special Status Species

1. Vascular Plants

There are 27 Special Status vascular plant species that might be expected to grow in the project area based on the presence of suitable habitat. Surveys would be conducted for those vascular plant Special Status Species described in Appendix D as being expected in the project area because suitable habitat is present. Surveys would begin in the spring of 2007.

2. Fungi

One Bureau Sensitive fungi species (*Dermocybe humboldtensis*) has been documented in the Olalla Creek-Lookingglass Creek Watershed. The known occurrence of *Dermocybe humboldtensis* is in the Bushnell-Irwin Rocks Area of Critical Environmental Concern/Research Natural Area, more than three miles northeast of Deep Six units A and D.

Four other species (*Arcangeliella camphorata*, *Phaeocollybia gregaria*, *P. oregonensis*, and *Rhizopogon chamaleontinus*) are suspected based on the habitat and host species present. These Bureau Sensitive fungi 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 and USDI 2004b p. 148).

Most Special Status fungi species are highly isolated in their occurrence. They produce short-lived, ephemeral sporocarps or fruiting bodies that are seasonally and annually variable in occurrence (USDA and USDI 2004b p. 148). Richardson (1970) estimated that sampling every

two weeks would fail to detect about 50 percent of macrofungal species fruiting in any given season. In another study, less than ten percent of species were detected in each of two consecutive years at any one of eight sites (O'Dell, et al. 1999).

VII. Noxious Weeds

There are scattered infestations of noxious weeds within the project area, particularly Himalayan blackberry (*Rubus discolor*) and Scotch broom (*Cytisus scoparius*). These infestations also occur along the access roads.

Actions taken to contain, control, and eradicate existing infestations are undertaken through implementation of the *Roseburg District Integrated Weed Control Plan and Environmental Assessment* (USDI, BLM 1995b). Activities include inventorying weed infestations, assessing risk for spread, and applying control measures in areas where management activities are planned. Control measures may include releasing biological agents, mowing, hand-pulling, and the use of approved herbicides. Noxious weed treatments would be undertaken regardless of whether or not the proposed action is implemented.

Management practices that would be implemented in conjunction with the proposed action would be focused on preventing the introduction of new infestations or the spread of existing ones. Prevention measures would 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 working in infested areas;
- using native seed when mulching and seeding; 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.

VIII. Cultural/Historical Resources

A cultural resource inventory was conducted for the Deep Six units. No cultural resources were identified.

Inventories have not been conducted for the Olly Cat units. The inventory is expected to be completed in the spring of 2007. 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. 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 the State Historic Preservation Office, in the form of extraction of a portion of the information contained within the resource. Consequently, cultural/historical resources would not be affected and will not be addressed further in this analysis.

Chapter Four
ENVIRONMENTAL CONSEQUENCES

This chapter discusses specific resource values that may be affected and the nature of the short-term and long-term effects, including those that are direct, indirect, and cumulative, which may result from implementation of the alternatives. The discussion is organized by individual resources. It addresses the interaction between the effects of the proposed 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 agencies of the Federal government are required to analyze the environmental effects of past actions when describing the cumulative environmental effect of a proposed action in accordance with Section 102 of the National Environmental Policy Act (NEPA). The CEQ noted the "[e]nvironmental analysis required under NEPA is forward-looking," and [r]eview of past actions is only required to the extent that this review informs agency decision making regarding the proposed action." This is because a description of the current state of the environment inherently includes effects of past actions. Guidance further states "[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 – No Action

Old-growth stands typically developed at low tree densities, while young managed stands are developing at higher densities (Tappeiner, et al. 1997). In the absence of density management, the proposed units would continue to develop as dense, relatively homogeneous, even-aged, single-storied stands, dominated by Douglas-fir. Crown closure would remain close to100 percent, preventing the establishment and growth of an understory.

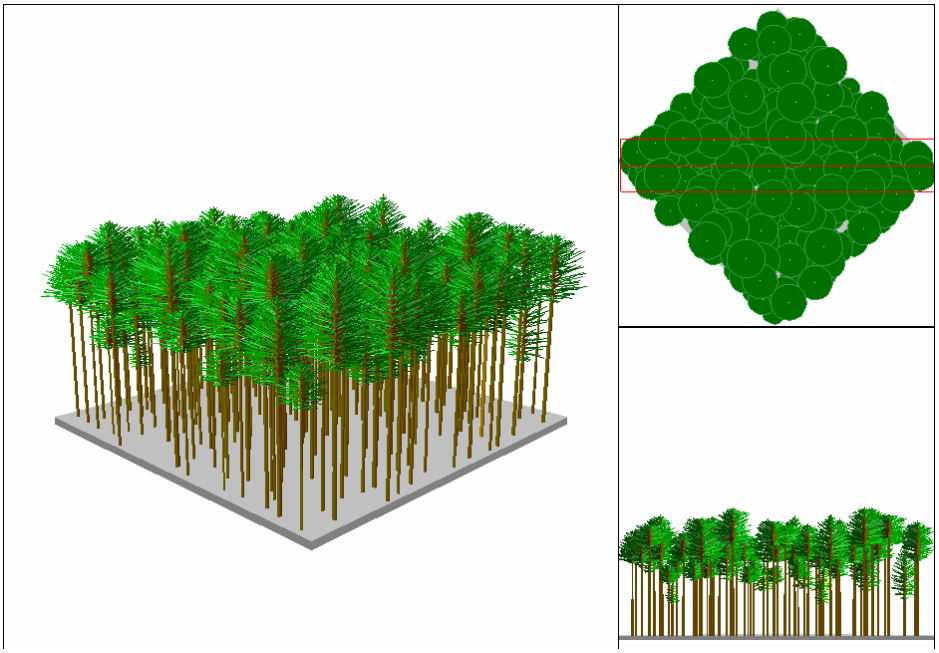
Competition would reduce resources, such as water, nutrients, and sunlight, available for individual tree diameter growth and crown expansion. This competition would result in increased suppression mortality and the gradual elimination of hardwoods and shade-intolerant species, such as sugar pine and ponderosa pine. Live crown ratios of overstory trees would decrease from between 26 and 46 percent to approximately 20 percent. This would decrease the ability of the overstory trees to respond to disturbances that reduce stand density. Closely spaced trees with small crowns have a reduced photosynthetic capacity resulting in decreased diameter growth and diminished resistance to attacks from diseases and insects. As trees increase in

height with little increase in diameter, they become unstable and more susceptible to wind damage (Wonn 2001, and Wilson and Oliver 2000).

Recruitment of snags and coarse woody debris would occur primarily from suppression mortality, mostly from intermediate and suppressed trees with smaller diameters. Small diameter snags would contribute to the coarse woody debris on the forest floor for a relatively short time before decaying. Organon modeling projected the LSRA objective of five snags per acre larger than 20 inches DBH would be met when the stands reach about 140 years old.

Southwest Oregon Organon version 8.0 was used to project changes in stand structure and composition. Figure 4-1 is a visual representation of the anticipated untreated stand conditions, such as size and spacing of trees, canopy layers, openings, and crown widths, when the stand would be considered to be late-seral at about 80 years old.

Figure 4-1. Visual Representation of Untreated Stand Conditions.



B. Alternative Two – Proposed Action

Density management can promote structural diversity, increase biological diversity, and provide conditions favorable to late-successional species. Research in old-growth stands indicated the average tree diameter when stands were 50 years old was greater than what typically occurs in stands with high tree densities, and the growth rates persisted (Tappeiner, et al. 1997). The slower growth rates in young, managed stands are the direct result of higher tree densities.

Disturbances sufficient to promote Douglas-fir regeneration in naturally occurring stands are generally absent in young, managed stands. Thinning initiates and promotes tree regeneration, shrub growth, and development of multi-storied stands even when the treatments focus on management of overstory tree density (Bailey and Tappeiner 1998).

Reducing stand densities by thinning from below would remove trees from the suppressed and intermediate canopy layers that would normally die from suppression. After density management, the stands would eventually reach a density where mortality suppression would begin again, and create snags of larger diameter than would occur in untreated stands.

Density management would provide spatial and structural diversity across the landscape and enhance the development of late-seral forest conditions by allowing sunlight to reach the forest floor, allowing establishment and development of understory vegetation. Variable density thinning and creation of openings would also provide a mosaic of size classes, species, and structural diversity.

Physical damage to existing coarse woody debris would be expected during felling and yarding operations, but additional coarse woody debris would be generated in the following ways: non-merchantable wood left in the units; mechanical damage to reserve trees, such as broken out tops; snow break and windfall; and snags felled for safety reasons. In the long term, larger trees that die and become snags would also provide additional coarse wood as they deteriorate and fall to the forest floor.

Table 4-3 illustrates the average stand conditions anticipated following the proposed application of the different thinning densities, compared with no treatment. Table 4-4 summarizes and contrasts anticipated average stand conditions of untreated and treated stands in 20 years.

Table 4-3. Comparison of Average Stand Conditions between No Treatment and Treated Stands Immediately Following Density Management.

Treatment	Trees per Acre	Basal Area (square feet per acre)	Quadratic Mean Diameter (inches)	Relative Density	Crown Closure (percent)
Unthinned	220	172	12.0	0.55	100
Light Thin	90-115	120	13.9	0.35	82
Moderate Thin	70-80	100	14.5	0.30	67
Heavy Thin	50-60	70	15.3	0.20	44

Table 4-4. Comparison of Average Stand Conditions between No Treatment and Treated Stands 20 Years After Density Management.

Treatment	Trees per Acre*	Basal Area (square feet per acre)	Quadratic Mean Diameter (inches)	Relative Density	Crown Closure (percent)
Unthinned	201	266	15.6	0.77	100
Light Thin	111	203	18.3	0.55	100
Moderate Thin	85	175	19.4	0.46	87
Heavy Thin	54	126	20.7	0.33	60
Heavy Thin with understory trees	191	299	17.0	0.84	100

*Comparison is for overstory trees and does not include the ingrowth of seedlings.

1. Light Thinning

Light thinning would provide for individual tree growth while maintaining stand-level growth (providing full-site occupancy by trees). Approximately 14 percent of the available light would be allowed through the canopy immediately after a light thinning (Chan, et al. 2006). Subsequent growth and canopy closure would reduce this level to approximately eight percent within about 15 years after density management. Relative stand density, canopy closure and the amount of sunlight reaching the forest floor would return to pre-treatment levels after 20 years. Development of an herbaceous plant and shrub understory would be limited by the low amount of available light. Five snags per acre larger than 20 inches DBH, recommended by the LSRA, would be attained when the stands are about 130 years old.

Figure 4-2 represents the anticipated post treatment condition immediately after the light thinning with approximately 90 to 115 trees per acre and 82 percent crown closure. Figure 4-3 represents the anticipated post treatment conditions 20 years and 100 years, respectively, after the light thinning.

Figure 4-3. Representation of the Anticipated Post Treatment Condition Immediately After the Light Thinning.

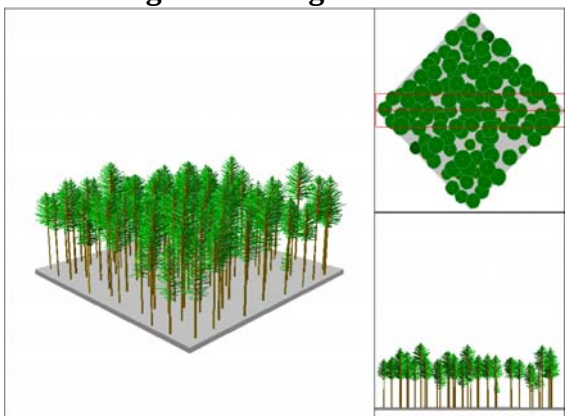
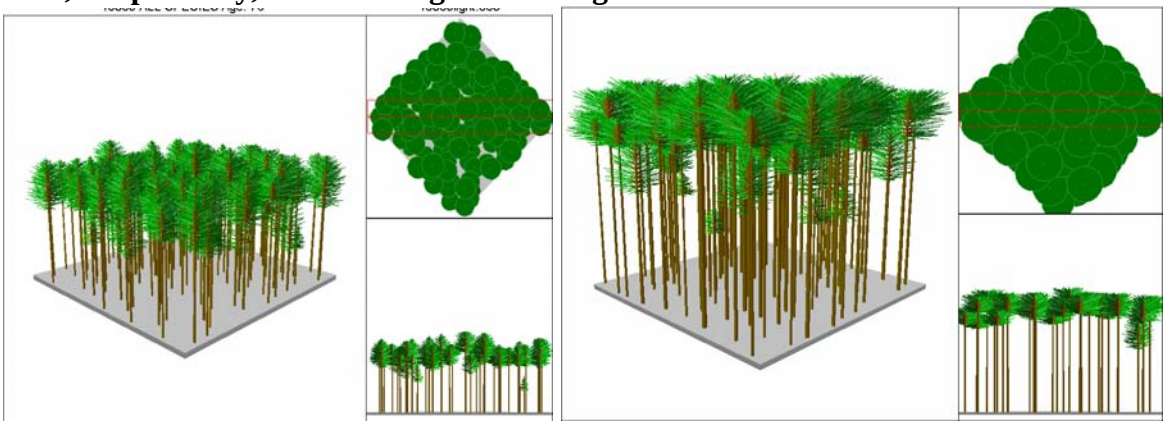


Figure 4-3. Representation of Anticipated Post Treatment Conditions 20 Years and 100 Years, Respectively, After the Light Thinning.



2. Moderate Thinning

Thinning to a relative density ranging between 0.25 and 0.30 would provide for individual tree growth while maintaining stand level growth. Moderate thinning would allow shade tolerant herbaceous plants and shrubs to develop while maintaining hardwoods and other conifers in addition to Douglas-fir. Approximately 29 percent of the available light would be allowed through the tree canopy after a moderate thinning (Chan, et al. 2006). The effects of this level of thinning would last for about 20 years when relative density approaches 0.55 and canopy closure returns to 100 percent. As with light thinning, the LSRA recommendation for five snags per acre larger than 20 inches DBH would be attained when the stands are about 130 years old.

Figure 4-4 represents the anticipated post treatment condition immediately after the moderate thinning with approximately 70 to 80 trees per acre and 67 percent crown closure. Figure 4-5 represents the anticipated post treatment conditions 20 years and 100 years, respectively, after the moderate thinning.

Figure 4-4. Representation of the Anticipated Post Treatment Condition Immediately After the Moderate Thinning.

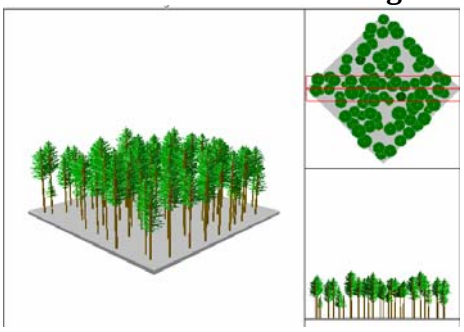
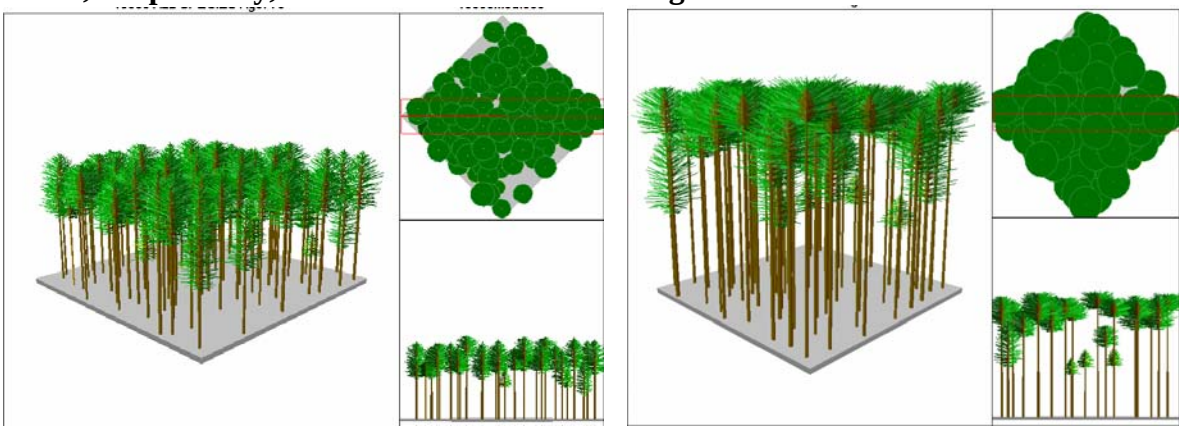


Figure 4-5. Representation of Anticipated Post Treatment Conditions 20 Years and 100 Years, Respectively, After the Moderate Thinning.



3. Heavy Thinning

Thinning to a relative density ranging between 0.20 and 0.25 would promote understory development and vertical diversity by encouraging the establishment and growth of conifer

seedlings, shrubs, and hardwoods (Hayes, et al. 1997). Heavy thinning provides the best opportunity for increasing individual tree growth, developing trees with large branches, and shortening the time needed to attain large trees. The crowns of the leave trees would increase in length and volume because of the more open conditions. Post-treatment crown closure would be about 40 to 50 percent and allow enough light to support shade intolerant plants in the understory. Understory trees retained in the heavy thinned treatment areas would persist longer than those in the moderate or light thinning treatment areas. Heavy thinning would have the longest period of accelerated growth and produce the largest trees over time. The LSRA objective of ten or more Douglas-fir trees at least 40 inches DBH would be met first in the heavy thinning treated areas. Average quadratic mean diameter of the retained trees 20 years after the heavy thinning would be about 21 inches DBH in comparison to about 16 inches DBH in unthinned areas. Snags would need to be created to meet the LSRA recommendation of five snags per acre larger than 20 inches DBH.

If conifers do not become established in the heavy thinning stands, then up to 300 trees per acre of ponderosa pine, sugar pine, incense-cedar, western redcedar, western hemlock, or grand fir would be underplanted, depending on site conditions. Underplanting with these species would enhance structural and species diversity.

Figure 4-6 represents the anticipated post treatment condition of the heavy thinning areas after an understory was established. Figure 4-7 represents the anticipated post treatment conditions 20 Years and 100 Years, Respectively, after the heavy thinning and an understory was established.

Figure 4-6. Representation of the Anticipated Post Treatment Conditions After the Heavy Thinning and an Understory was Established.

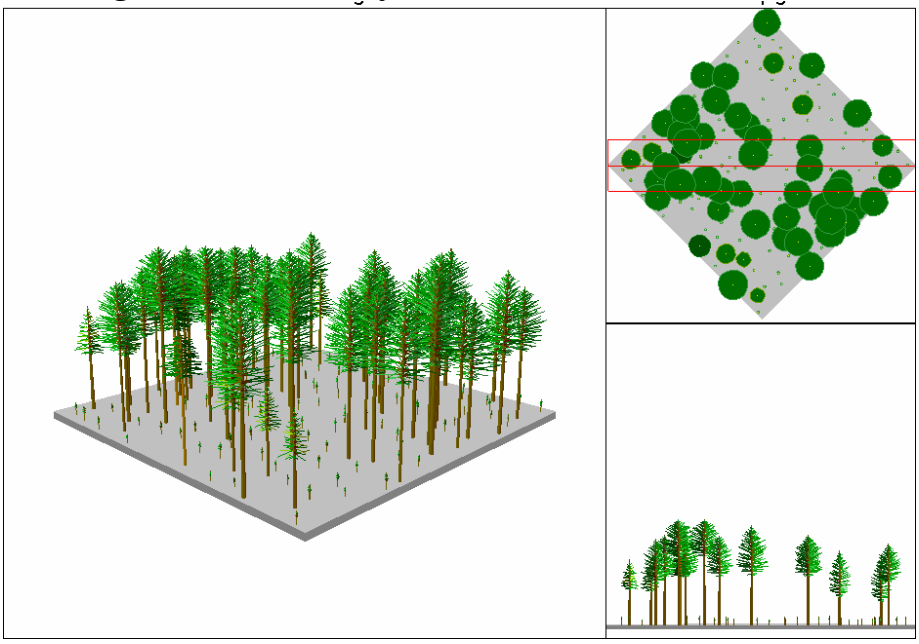
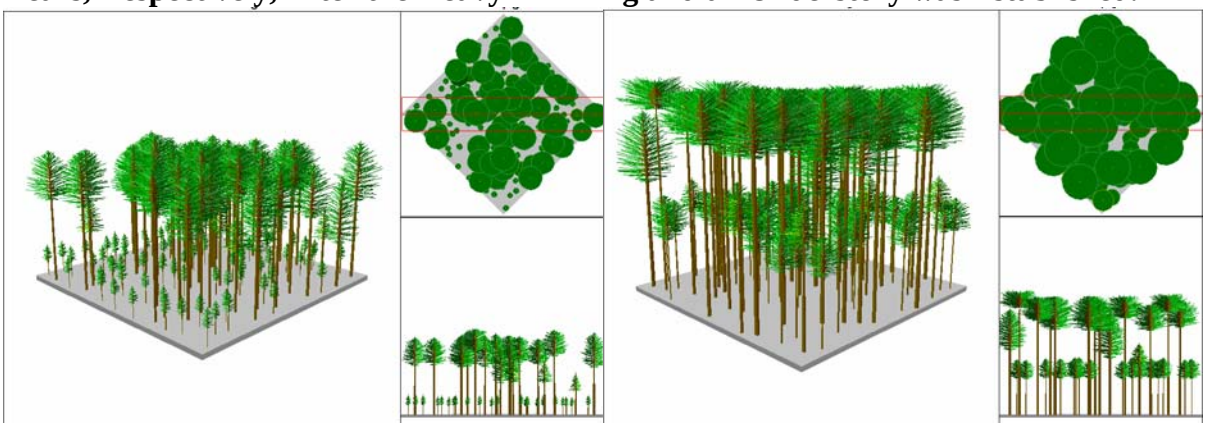


Figure 4-7. Representation of the Anticipated Post Treatment Condition 20 Years and 100 Years, Respectively, After the Heavy Thinning and an Understory was Established.



4. Openings

Trees that develop large limbs are generally open-grown when young and grow under these conditions for 30 years or longer. Openings created in the forest canopy ranging in size from 0.25 acres in LSR 261 and up to 0.8 acres in LSR 259 consistent with LSRA guidelines concerning the maximum size of openings and percent of area in openings created by density management treatments. These openings would allow herbaceous plants and shrubs to become established and bordering trees to develop large limbs.

5. Unthinned Areas

Unthinned areas, depending on the size, may develop similar to what was described in the no action alternative. The inclusion of unthinned areas would provide differentiation in tree spacing, thermal and visual cover, natural suppression and mortality, size differentiation, and undisturbed coarse woody debris within the units, however, trees on and close to the perimeter would benefit from trees being removed in the thinned areas by having more growing space and less competition.

6. Effects to Forest Age-Class Distribution in the Olalla Creek-Lookingglass Creek Watershed

The PRMP/EIS (Vol. I, p. 4-4) assumed that most private lands would be intensively managed with final harvest on commercial economic rotations averaging 50 years. Based on this assumption, the PRMP/EIS (Vol. I, p. 4-30) concluded that private forest lands would contribute very little, if any, late-seral forest habitat in the watershed.

Based on aerial photo interpretation, it is estimated that harvest of private timber lands in the watershed totaled 3,221 acres from 2002 to 2005, an annual average of 1,074 acres. Effects of timber harvests from 2002 to 2005 on the current age class distribution in the Olalla Creek-Lookingglass Creek fifth-field watershed is presented in Table 4-5 and Table 4-6.

Table 4-5. Harvest in the Olalla Creek-Lookingglass Creek Watershed from 2002 to 2005.

Ownership	Acres Harvested From 2002 to 2005	
	Mid Seral Stands 31 to 80 Years Old (acres)	Late Seral Stands at Least 81 Years Old (acres)
BLM	0	0
Private	1,836	1,385

Table 4-6. Change in Age Class Distribution for All Ownerships in the Olalla Creek-Lookingglass Creek Watershed from 2002 to 2005.

Olalla Creek-Lookingglass Creek Watershed	Early Seral Stands 0 to 30 Years Old		Mid Seral Stands 31 to 80 Years Old		Late Seral Stands at Least 81 Years Old		Total Forested Acres
	Acres	Percent	Acres	Percent	Acres	Percent	
Conditions in 2002	15,117	19	39,602	51	23,648	30	78,367
Conditions in 2005	18,338	23	37,766	48	22,263	28	78,367

The Dickerson Heights timber sale, authorized in March 2006, would reduce BLM-managed late-seral forest in the watershed by 128 acres from 15,286 acres to 15,158 acres, representing a reduction of approximately 0.8 percent in the present amount of late-seral forest managed by the BLM within the Olalla Creek-Lookingglass Creek Watershed. Other regeneration harvest on BLM-managed lands in the watershed is not planned for the foreseeable future.

Other than the Dickerson Heights timber sale, and 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 Olalla Creek-Lookingglass Creek Watershed has been limited to the authorization of 161 acres of commercial thinning and density management under the Shep Boyardee Commercial Thinning and Power Wagon Density Management decisions.

The proposed route of the Williams Connector Natural Gas Pipeline passes through the watershed. Based on preliminary information regarding the location and anticipated width of the right-of-way, it was estimated that approximately 30 acres of forest vegetation would be cleared and converted to non-forest condition. Approximately four acres of the pipeline right-of-way would be on BLM-managed land. About one acre of early seral forest and three acres of late-seral forests on BLM-managed land would be converted to non-forested land. The remaining 26 acres would be on private land where 18 acres of early seral and eight acres of mid-seral forests would be converted to non-forest land.

Assuming a rate of private harvest comparable to that illustrated in Table 4-2, and including the effects of the pipeline and the Dickerson Heights timber sale, there would be an approximate 16 percent reduction in mid-seral forest and a 21 percent reduction in late-seral forest in the watershed over the next decade. The reduction in late-seral forests would be partially offset over the same time period as approximately 101 acres of 70 to 80 year old stands on BLM-managed lands develop and mature into late-seral forest.

Other potential forest removal could occur in association with road construction conducted under reciprocal rights-of-way agreements. Exact amounts and age classes that would be removed are difficult to quantify but are not anticipated to exceed a total of 100 acres over the next decade. The proposed action would treat 650 acres of mid-seral forest in the watershed. Taken together with the Shep Boyardee and Power Wagon acreage this would amount to 14 percent of the mid-seral stands managed by the BLM in the watershed. While density management and commercial thinning would reduce tree densities in the treated stands, it would not affect 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 watershed.

Overall age-class distribution of forest lands managed by the Roseburg District BLM would tend toward older seral stages because Matrix lands are managed on harvest rotations of 80 to 110 years of age and 69 percent of the BLM-managed in the watershed is in Late-Successional Reserves and Riparian Reserves land use allocations, which are not scheduled for regeneration harvest, as illustrated in the PRMP/EIS (Vol. I, pp. 4-27 and 4-28).

II. Wildlife

A. Alternative One – No Action

Barring large-scale natural disturbances, existing habitat conditions in the project stands would be maintained and they would continue to develop along their present growth trajectories. Overstocked stand conditions would result in relatively slow growth rates unfavorable to the development of late-successional forest characteristics, particularly large diameter trees, high crown volume, large branches, cavities, large snags, and CWD. The current function of the proposed units as wildlife habitat would remain unchanged over the short term.

Availability of late-successional forest habitat is the primary wildlife concern in the Olalla Creek-Lookingglass Creek Watershed because of the effects of past and expected future timber harvests. Forest stands in the watershed begin functioning as late-successional habitat at approximately 80 years old, when characteristics like large diameter trees, a secondary canopy layer, snags, and cavities in large trees have developed.

Harvest of both mid-seral and late-successional forest on private lands would create and maintain an abundance of early-seral and mid-seral habitat, but this habitat would generally be of poorer quality for migratory birds because of the intensive forestry management practices applied. Deciduous and minor conifer tree species are generally targeted for elimination in favor of Douglas-fir when harvested lands are reforested. Other practices, such as herbicide application for the eradication of competing brush and hardwood species further simplify species and structural diversity in these forests. Stands managed in this manner would not be expected to provide high levels of habitat attributes such as large woody debris, large residual trees, snags, deciduous trees, and a well-developed deciduous shrub layer.

At present, of the 75,719 acres (73 percent) in the watershed in private ownership there are approximately 6,977 acres in late seral forest. The amount of late-seral habitat on private land in

the watershed is expected to be effectively eliminated because forest management practices are assumed to be on a 50 year rotation.

Approximately 15,287 acres (56 percent of the 25,999 forested acres) of the BLM-managed land in the watershed are composed of late-seral stands. The other 10,711 acres are early-seral and mid-seral stands. Approximately 18,887 acres (69 percent) of the BLM-managed land within the watershed are reserved from harvest and are currently or are expected to become late seral forests in the future, however, habitat quality is not expected to be the same in stands where large snags and down wood were removed during harvest and tree species diversity decreased during planting and precommercial thinning. Therefore, under current management direction late-seral habitat availability is expected to generally remain constant or gradually increase on BLM-managed land in the watershed.

B. Alternative Two – Proposed Action

1. Special Status Species

a. Threatened and Endangered Species

i. Northern Spotted Owl

The proposed density management would modify approximately 369 acres of dispersal-only habitat in four spotted owl home ranges (see Table 4-5). Density management in the proposed units would modify dispersal-only habitat by reducing vertical and horizontal cover. Spotted owls are expected to continue using these stands though, because canopy cover would be at least 40 percent and the average tree diameter would be at least 11 inches, figures widely accepted as a threshold for dispersal function (Thomas, et al. 1990). Heavily thinned areas may be used less, however, until canopy cover returns to pre-project levels in approximately 10 to 15 years, because of increased exposure to predation.

Table 4-5. Acres by Treatment Type within Northern Spotted Owl Home Ranges.

Northern Spotted Owl Site	No Treatment (acres)	Light Thin (acres)	Moderate Thin (acres)	Heavy Thin (acres)	Total Treated (acres)	Total (acres)
Suicide Creek	25	43	71	0	114	139
Bear Naked	4	0	45	0	45	49
Wild Olalla	13	10	50	10	70	83
Wildcat Creek	40	18	107	15	140	180
TOTAL	82	71	273	25	369	451

Deep Six unit A is located between the Suicide Creek spotted owl nest site and suitable habitat to the south. Thinning would potentially limit utility of the stand for access to the suitable habitat (see Map C-1, Appendix C). Heavy thinning would not occur in Deep Six unit A, although, a one-quarter acre opening would be created in the unit. More than half of the unit would receive

no treatment (13 acres) or light thinning (~14 acres), and the remainder of the unit would receive moderate thinning (21 acres). Consequently, the spatial arrangement and density management prescription would not be expected to prevent spotted owl use of the adjacent suitable habitat. Disruption of spotted owls from noise would not be expected, because chainsaw operation within the 65 yard disruption threshold and heavy equipment operation within the 35 yard disruption threshold would be seasonally restricted from March 1 to June 30 if within the disruption threshold, such as for Deep Six unit D. Seasonal restrictions could be waived until March 1 of the following year if surveys indicate that spotted owls are not present, not nesting, or failed in nesting. This would ensure that noise disruption would not cause spotted owls to abandon nests or fledge prematurely.

The Olly Cat units are within Critical Habitat Unit (CHU) OR-62. Although dispersal habitat would be modified, habitat availability and connectivity would continue to provide for the survival and recovery of spotted owls because a minimum average canopy closure of 40 percent would be maintained in combination with the structural elements needed to support spotted owl dispersal. The U. S. Fish and Wildlife Service agreed that density management activities are not likely to adversely affect spotted owl critical habitat (File No. 1-15-05-I-0511, p. 28) or preclude the intended function of Critical Habitat because the primary constituent elements would persist post-treatment, canopy cover would not fall below 40 percent, and adequate dispersal habitat would be available in the project area pre-harvest and post-harvest.

The proposed action would not reduce the ability of the affected home ranges to support spotted owls because:

- The proposed units do not contain NRF habitat and the dispersal-only habitat would retain its functionality,
- Existing CWD and snags would be reserved to the extent possible and continue to provide habitat features for spotted owl prey species,
- The amount and distribution of untreated dispersal-only habitat in affected home ranges would allow spotted owls to access NRF habitat,
- Noise disruption would not affect nesting or fledging activities, and
- The Northern Spotted Owl CHU OR-62 would retain its functionality.

Density management would:

- Stimulate the development of suitable habitat features (including large-diameter trees, trees with nesting structure, understory hardwood and conifer trees, and shrubs), which would decrease the amount of time the proposed units would need to develop into suitable spotted owl habitat,
- Create CWD and snags, which are important features for spotted owl prey species, and would also accelerate the development of future large CWD and snags,
- Stimulate the development of contiguous suitable habitat in LSR 261, which would improve its ability to support reproductive owl pairs, and
- Decrease the risk of large scale catastrophic loss of spotted owl dispersal-only habitat from fire, insects, or windthrow by maintaining tree growth and vigor.

ii. Marbled Murrelet

With the sole exception of Olly Cat unit P, the proposed units are not considered to be suitable marbled murrelet habitat. Olly Cat unit P would be surveyed to determine if murrelets are nesting in the unit. Density management operations would be subject to Daily Operating Restrictions (DOR) from April 1 to August 5, if murrelets are detected. These daily operating restrictions prohibit the commencement of operations until two hours after sunrise and require cessation of operations two hours before sunset. The DORs would be waived if murrelets are not detected. The suitable murrelet habitat in Olly Cat unit P would be marked with the help of a wildlife biologist to retain suitable nest trees and maintain habitat functionality. Therefore, the proposed action would have no effect on availability of suitable murrelet habitat.

No effect to murrelets from noise disruption would be expected because suitable murrelet habitat within 100 yards of proposed units would be surveyed to determine if murrelets are present (Pacific Seabird Group 2003). Proposed units in the 1.3 mile restriction corridor and adjacent to suitable murrelet habitat include Olly Cat units C, D, and E. These units would be subject to seasonal restrictions from April 1 to August 5 and DOR from August 6 to September 15, if murrelets are detected in adjacent habitat within 100 yards of these units. Proposed units in Zone 2 and adjacent to suitable murrelet habitat include Olly Cat units B and P, and Deep Six unit A. These units would be subject to DOR from April 1 to August 5, if murrelets are detected in adjacent habitat within 100 yards of these units. The restrictions would be waived if murrelets are not detected.

The proposed density management would continue to provide for the survival and recovery of the murrelet because habitat availability and connectivity in CHU OR-O6-d would be maintained and protected. In the long term, the development of trees with large branches, platforms, and suitable nesting substrate would provide stand characteristics preferred by nesting murrelets. Density management would also stimulate the development of contiguous suitable habitat in the CHU and LSR 261, which would improve the ability to support reproductive murrelets, and decrease the risk of large scale catastrophic loss from fire, insects, or windthrow by maintaining tree growth and vigor.

b. Bureau Sensitive and Bureau Assessment Species

i. Chace Sideband, Green Sideband, and Oregon Shoulderband Snails

Surveys were conducted for these three snail species where suitable habitat exists. Olly Cat units C, M, and P were surveyed to protocol standards and these snail species were not found. Deep Six units were surveyed in the fall of 2006 with none of these snail species being found. Surveys would be completed in the spring of 2007. If these species are found, they would be protected by altering unit configurations or buffering the site to provide suitable microclimate, undisturbed substrate, and suitable habitat (vegetation or coarse woody debris). These measures would maintain viable populations of these species in the project area. The proposed action could benefit these species by creating additional coarse woody debris and conditions favorable for establishment and growth of herbaceous vegetation. Consequently, it is not expected the proposed action would contribute to the need to list these species as threatened or endangered.

ii. Northern Goshawk

The proposed units are currently marginal goshawk foraging habitat because of the high tree density and small tree diameters, factors which limit goshawk prey species and goshawk maneuverability. Density management would improve foraging conditions by reducing tree densities but may reduce foraging habitat by decreasing canopy cover. The stands, however, would remain functional foraging habitat. The proposed action could benefit goshawks by accelerating the development of suitable nest trees and improving habitat conditions for goshawk prey species. Consequently, it is not expected the proposed action would contribute to the need to list this species as threatened or endangered.

iii. Townsend's Big-Eared Bat, Pacific Pallid Bat, and Fringed Myotis Bat

Caves, mines, or suitable rock outcrops, which are the primary roosting and hibernating structures used by these species, are not present in the proposed units. The proposed action would reserve, except where necessary to mitigate safety hazards, or clear road rights-of-way, large remnant trees that could provide roosting habitat. 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. Density management would benefit these species by accelerating the development of large trees suitable for roosting. Consequently, the proposed action would not be expected to contribute to the need to list these bat species as threatened or endangered.

2. Migratory Birds

Hermit warblers would continue to use the proposed units, although density management could decrease foraging and nesting opportunities by reducing canopy volume. The effects of density management would last for approximately 10 to 15 years. Foraging and nesting opportunities would improve in the long term as residual trees grow and canopy volume increases. Maintaining "no-harvest" buffers along streams and untreated areas would provide refugia for Hermit warblers to continue using the proposed units.

Wilson's warblers would continue to use the proposed units, although density management could decrease foraging and nesting opportunities by damaging existing understory vegetation. The effects of density management would last for approximately 10 to 15 years. Density management would improve habitat conditions for Wilson's warbler by creating conditions favorable for establishment and growth of understory trees, shrubs, and herbaceous vegetation. Maintaining "no-harvest" buffers along streams and untreated areas would provide refugia for Wilson's warblers to continue using the proposed units.

Density management would both remove and create structural complexity used as habitat by the winter wren. A limited amount of existing CWD, shrubs, and understory trees may be damaged or removed, but the proposed action would also create CWD and allow understory shrubs and trees to become established and grow. Maintaining "no-harvest" buffers along streams and

retaining coarse woody debris would provide the species with refugia and provide for continuity of use.

Density management would reduce tree densities but 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-successional forest habitat. The proposed action may temporarily reduce the utility of the proposed units for some wildlife species by removing canopy cover and horizontal structure; however, they would remain functional and regain structural characteristics within 10 to 15 years. Additionally, late seral habitat would continue to develop because Matrix lands are managed on harvest rotations longer than 80 years and Late-Successional and Riparian Reserves are not scheduled for regeneration harvest. Consequently, these factors indicate the proposed action would not cause cumulative effects on the availability and functionality of late seral habitat in the Olalla Creek-Lookingglass Creek Watershed or to wildlife species associated with it.

Actions that would reduce the amount of mid- and late-seral forests used by wildlife include the Williams Connector Natural Gas Pipeline, which would convert about 30 acres of forest vegetation to non-forest conditions, and regeneration timber harvesting. These actions would reduce mid-seral forests approximately 16 percent and late-seral forests approximately 21 percent in the watershed over the next decade.

Forest stands on privately-owned lands are managed primarily for timber production on assumed rotations of 50 years or less. These younger stands would generally have closed canopies and little understory development and would, consequently, be expected to provide habitat only for canopy-foraging birds, such as the hermit warbler.

Harvest of both mid-seral and late-successional forest on private lands would create early-seral habitat, but this habitat would generally be of poorer quality for migratory birds because of the intensive forestry management practices applied. Deciduous and minor conifer tree species are generally targeted for elimination in favor of Douglas-fir when harvested lands are reforested. Other practices, such as herbicide application for the eradication of competing brush and hardwood species further simplify species and structural diversity in these forests. Stands managed in this manner would not be expected to provide high levels of habitat attributes such as large woody debris, large residual trees, snags, deciduous trees, and a well-developed deciduous shrub layer.

III. Soils

A. Alternative One – No Action

Under the No Action Alternative, there would be no soil displacement or compaction from road and landing construction, or yarding associated with density management. The compacted soils of the old roads and main skid trails would continue to recover slowly over time, as plant roots, organic matter, and small animals interact with the soil. The effects of compaction can last for decades, especially at lower depths (Amaranthus, et al. 1996). Some slight recovery has been found in severely compacted soils after ten years (Powers, et al. 2005). The duff layer and soil

organic matter would slowly increase with the accumulation of needles, twigs, small branches, and decomposing larger woody material, absent a fire of sufficient intensity to consume the material.

B. Alternative Two – Proposed Action

Limited and localized soil displacement, erosion, and compaction could be expected as a consequence of landing construction, and cable and ground-based yarding. Decreased soil productivity is expected to be negligible because the following practices would limit the area subjected to soil displacement and alteration of surface water flow:

- Cable yarding equipment would maintain a minimum of one-end log suspension and a minimum of 100 feet lateral yarding capability to reduce the number of yarding corridors and landings needed, thereby reducing the amount of soil displacement and compaction;
- Yarding corridors would be water-barred where necessary to reduce the potential for surface water channeling and soil erosion;
- Ground-based 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 practical. Cumulatively, landings and primary skid trails would affect less than ten percent of the entire ground-based harvest area;
- Landings and primary skid trails would be subsoiled, reducing anticipated increases in soil bulk density by 80 percent (Andrus and Froehlich 1983). After subsoiling, primary skid trails would be water-barred. Trails would be mulched or otherwise treated to reduce the potential for erosion; and
- Ground-based yarding equipment would be prohibited from operating in the flat, poorly drained portion of Olly Cat unit F containing the meandering ephemeral draws tributary to the main intermittent stream channel.

Recent monitoring of commercial thinning activities indicates cable yarded areas (including landings) disturbed less than two percent of the soil. Commercial thinnings using tractors, rubber tired skidders and shovel loaders affected three to eight percent of the ground-based harvested areas in the Diet Coq, Tater Tot, Taylor Made, and Smoke Screen commercial thinnings. Harvester/forwarder operations (Taylor Made commercial thinning) had similar results, except the area affected and depth of compaction, generally, was less than with tractor and rubber tired skidder operations.

The proposed density management would result in comparable amounts of soil disturbance. Overall, cable yarding and ground-based operations would be expected to disturb about 11 acres or less than two percent of the proposed units.

No cumulative effects to soils would be anticipated because any effects would be confined to the proposed units and would not exceed the level and scope of effects considered and addressed in the PRMP/EIS (USDI 1994, Chapter 4, pp. 12-16).

IV. Water Resources

A. Alternative One – No Action

1. Stream Flow

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

a. Peak Flows and Transient Snow Zone

There would be no direct effect to peak flows because absent density management there would be no change in the level of canopy closure on BLM-managed lands within the TSZ that would modify snow capture or snow melt rates, which could enhance peak flows.

The risk of increased peak flows because of past and recent timber harvesting on both private and BLM-administered land within the Olalla Creek-Lookingglass Creek Watershed and in the TSZ is considered to be low (see discussion in Chapter 3, pp. 25-26).

b. Peak Flows and Roads

There would be no change in the system of roads managed and maintained by the BLM and therefore no additional contribution by these roads to potential changes in peak flows.

2. Water Quality

a. Stream Temperature

There would be no direct effect on stream temperature because there would be no change in streamside shade on stream reaches located on BLM-managed forest lands.

b. Sediment

There would be no change in the system of roads managed and maintained by the BLM and therefore no additional contribution by these roads to potential changes in sediment.

B. Alternative Two – Proposed Action

1. Stream Flow

No measurable effect to stream flow would be anticipated as a result of density management because the project would involve partial removal of vegetation on areas constituting three percent or less of each affected subwatershed. In an overview of several studies, Satterlund and Adams (1992, p.253) found water yield responses were less substantial when partial cutting systems remove a small portion of the cover at any one time. Where individual trees or small

groups of trees are harvested, the remaining trees generally use any increased soil moisture that becomes available following timber harvest.

a. Peak Flows and Transient Snow Zone

Peak flow increases primarily occur where the TSZ has less than 30 percent crown closure (Watershed Professionals Network 1999, IV-11). The light, moderate, and heavy thinning treatments on 250 acres in the TSZ would maintain crown closures exceeding 30 percent. Openings ranging from one-quarter to 0.8 acres in size would affect less than one-tenth of one percent of the forested TSZ acres in the Wildcat Creek and Willingham Creek seventh-field watersheds in the Thompson Creek Subwatershed. The Oregon Watershed Assessment Manual risk assessment model indicates there would be a low risk of peak flow enhancement resulting from the proposed density management (Watershed Professionals Network 1999, IV-11).

b. Peak Flows and Roads

Approximately 3.8 miles of roads would be constructed or renovated and decommissioned after density management. New road construction would not extend the drainage network or contribute to a potential increase in peak flow because the new roads would be located on ridge tops or stable side slopes to the greatest extent practical. These roads would be out-sloped to the greatest degree practical in lieu of the construction of ditch lines and installation of cross drains. Where out-sloping is not practical because of road grade, the roads would be in-sloped and drain dips installed to assure that flow is dispersed onto adjoining slopes rather than concentrated in the road drainage network. Consequently, the roads would be disconnected from the drainage network and would have no potential for affecting peak stream flows.

Peak flows have been shown to increase substantially when roads occupy more than 12 percent of the watershed (Watershed Professionals Network 1999, IV-15). Peak flows would not be measurably affected by the proposed road construction because even after the proposed road construction less than three percent of the Olalla Creek-Lookingglass Creek Watershed would be occupied by roads.

2. Water Quality

a. Stream Temperature

Density management adjacent to riparian areas 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 increases in stream temperatures. Variable width “no-harvest” buffers established along streams would retain shading and hence maintain water temperature.

b. Sediment

Density management in riparian areas can cause localized soil disturbance and a short-term potential for erosion, primarily associated with yarding operations. “No-harvest” buffers

established on streams in or adjacent to proposed units would prevent disturbance to stream channels and stream banks and intercept surface run-off allowing sediment transported by overland flow to precipitate out before reaching active waterways.

Cable yarding across stream channels may occur in Deep Six units D and E, and Olly Cat units F and P. Cable yarding across stream channels could disturb stream banks and increase sediment delivery to streams. Yarding corridors, however, would be designed and constructed to minimize disturbance of the stream banks and channels, and prevent sediment from reaching the stream. Consequently, there would be a negligible increase in sediment as a result of these yarding corridors.

Forest roads can be a major contributor of sediment to streams (Reid 1981, Reid and Dunne 1984). As described in Chapter 2 (p. 8), new road construction would be outside of riparian areas on ridge tops or stable locations. These new roads would not cross stream channels or 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 renovation or reconstruction would occur in riparian areas, improvements to the road surface and drainage would reduce the potential of sediment to be delivered to stream channels. Road renovation and reconstruction 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.

Decommissioning of temporary roads would be designed to restore the natural hydrologic flow (USDI, BLM 2001). Any increases in sediment delivery to streams following road decommissioning would be limited to the first wet season after decommissioning and would remain localized because the removal of temporary culverts and fill material, and blocking the roads to vehicle use would effectively eliminate any concerns for sediment delivery to streams.

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 the transport of 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 timber 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.

Density management on 650 acres would affect less than one percent of the 78,367 forested acres in the Olalla Creek-Lookingglass Creek Watershed. The proposed action when considered with past, present and reasonably foreseeable future timber harvesting on BLM-managed land in the TSZ was determined to maintain the low risk for increased peak flows. Consequently, there would be no cumulative effect on peak flows associated with timber harvesting in the Olalla Creek-Lookingglass Creek Watershed.

Given the negligible (less than one percent) increase in road density and disconnection of new roads from the stream drainage network, no enhancement of peak flows would be expected in individual streams or at the scale of the Olalla Creek-Lookingglass Creek Watershed.

Variable width "no-harvest" buffers would be established on streams adjacent to proposed density management units, with widths determined in part by susceptibility of individual streams to solar heating. Consequently, primary streamside shading would be maintained and no measurable change in heating potential or cumulative change in stream temperatures would be expected in the Olalla Creek-Lookingglass Creek Watershed.

New road construction and road renovation would be primarily located on ridge top locations without connecting 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 Olalla Creek -Lookingglass Creek Watershed

The variable width "no-harvest" buffers established along streams would precipitate sediment in overland run-off and prevent sedimentation of streams, such that there would be no cumulative degradation of water quality in the Olalla Creek -Lookingglass Creek Watershed.

V. Fisheries and Aquatic Resources

A. Alternative One – No Action

The amount of large wood provided to streams by the overstocked project stands would be limited in the near term and growth of large trees for future recruitment would be delayed. As existing large in-stream 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 (i.e. fire) that reduces stand densities and allows larger trees to develop and enter the stream.

Absent road-related work, particularly renovation and decommissioning, aquatic habitat would continue to be affected by run-off and sediment generated from roads with poor drainage, blocked cross drains, and inadequate rock surfacing. Over time these roads would contribute increasing amounts of sediment to streams as they further deteriorate, further impairing spawning substrate and rearing habitat.

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

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

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

B. Alternative Two – Proposed Action

1. Aquatic Habitat Conditions

a. Substrate/Sediment

Stream substrate is unlikely to be affected by density management because "no-harvest" buffers at least 20 feet wide would be established on all streams. Equipment operations would be prohibited within these buffers so 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 density management would be intercepted by the vegetated "no-harvest" buffers and settle out before reaching stream channels. These buffers would also provide root strength sufficient to protect and maintain bank stability and prevent sediment generated by abnormal bank erosion from entering streams where it could accumulate and become embedded in streambed gravels (USDA, et al. 1993).

The major potential for effects comes from road related activities (i.e. construction, renovation, and decommissioning), as well as timber hauling over the roads, which can contribute sediment to streams and affect substrate quality (Furniss, et al. 1991). Access for timber hauling would be provided by existing roads wherever practical and utilize temporary roads where there is no long-term need for management access. Road construction and renovation would 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 Olalla Creek-Lookingglass Creek Watershed, although these improvements would generally be too small to measure.

A total of 3.4 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. Two exceptions exist where temporary road construction in Olly Cat unit E and

accessing unit G would cross intermittent, non-fish bearing streams. Hauling would be restricted to the dry season when the streams have no surface flow. The roads would be decommissioned prior to the onset of autumn rains by removing temporary culverts and fill material, stabilizing and mulching stream banks, and blocking the roads to vehicular use. This would effectively eliminate any concerns for sediment associated with the roads.

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 density management 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). Most stream reaches had large woody debris sufficient to trap and store sediment in headwater reaches.

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 is generally from mid-October to mid-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.

b. Large Woody Debris

The removal of small trees adjacent to stream channels could result in a short term reduction in available wood, however, smaller diameter wood does not persist in the stream channel 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). Existing large woody debris would be reserved to provide for the short term, while density management would accelerate the growth of large diameter trees that would provide future 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. Trees removed for new ridge top road construction would be in locations where they are unlikely to contribute large woody debris to streams. Trees removed for reconstruction of two temporary stream crossings would not appreciably change the availability of large woody debris because the trees are small and the affected area would be confined to the immediate vicinity of the stream crossings.

Fish habitat enhancement in the watershed has included the addition of logs to a one mile reach in Thompson Creek. The logs have improved fish spawning habitat by allowing gravel to accumulate and produced complex rearing habitat for resident and anadromous fish. Over the long term, habitat will continue to improve because of increases in the availability and recruitment of large key logs that enter stream channels to provide long-term channel stability and habitat in fish bearing reaches.

c. Pool Quality

Pool habitat availability would remain unaffected by density management, road construction, renovation, and decommissioning because no existing large wood would be removed from streams. Density management in riparian areas 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 essentially unchanged. The removal of some smaller trees may reduce the amount of pool forming woody debris in the short term. 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.

d. Habitat Access

Access to spawning and rearing habitat would be unaffected by density management or road related activities. Road construction and renovation would not involve installing or replacing culverts on any fish-bearing streams. Culverts installed during temporary road construction 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

Density management and timber hauling could result in the deposition of fine sediment and a temporary increase in turbidity, which can hinder the survival of eggs and alevin buried in gravel. Fine sediment and increased turbidity can also reduce spawning success; foraging ability, impair breathing by clogging gill membranes, and increase overall stress levels in fish (Waters 1995). The proposed density management would not result in fine sediment reaching stream channels because the vegetation and uncompacted soil in the “no-harvest” buffers would filter out sediment from runoff. The magnitude of the road related effects are expected to be so small as to not be measurable at the project level scale because most of the roads crossing streams are surfaced and the unsurfaced roads would be used during the dry season.

3. Essential Fish Habitat

Density management is not anticipated to have any adverse effect on Essential Fish Habitat. Any potential sediment resulting from the proposed density management would be intercepted by the vegetated “no-harvest” buffers and be filtered out before reaching stream channels or aquatic habitat. Existing large woody debris would be reserved to provide for short term in-stream wood needs, while density management adjacent to streams would provide long term sources of large wood for in-stream habitat. Consequently, there would 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 and not adversely affect Essential Fish Habitat. Substrate and pool habitat components would be unaffected. Where haul does occur near Essential Fish Habitat, the application of project design criteria and Best Management Practices described above would prevent adverse effects from road related activities. Any increase in sediment and effects to spawning substrate would be localized and discountable.

Density management would not cumulatively affect aquatic conditions because "no-harvest" buffers along streams would ensure future long-term sources of large wood for in-stream recruitment; shade to maintain water temperatures; and uncompacted soils and ground vegetation to prevent overland transport of sediment from reaching streams and possibly degrading spawning substrates. While localized improvements in aquatic conditions might be expected at the project level, overall results at the Olalla Creek-Lookingglass Creek Watershed level would be negligible.

VI. Botany

A. Alternative One – No Action

1. Vascular Plants

No direct effects to Special Status vascular plant species would result from this alternative, however, in the absence of management to create forest gaps or control competing vegetation, populations of some Special Status Species, such as Kincaid's lupine and Wayside aster, which require open growing conditions and abundant sunlight may decline because a decreasing availability of light necessary for these species to grow.

2. Fungi

Under this alternative, the proposed units would continue to function as fungi habitat and no loss of sites would be expected because microclimate conditions of temperature and humidity would be maintained by retaining the current forest canopy. Soil organic matter, forest litter, and large woody debris providing growth substrate would remain intact and undisturbed.

B. Alternative Two – Proposed Action

1. Vascular Plants

No direct effects to Special Status plant Species would be anticipated as a result of the proposed action. In the event that species identified in Appendix D are located during 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 of Bureau Sensitive fungi species described on pages 31 and 32, because they are outside of the proposed units.

As previously described, the presence of these species in the project area is unknown because surveys are not considered practical. If any of these species are present in the proposed 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* (USDA and USDI 2004b, pp. 150-154).

Opening up the forest canopy would alter the forest microclimate by reducing shade, resulting in more 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 body) production (Luoma, et al. 2004). The degree of reduction depends on many factors described above. Density management would retain a large number of potential host trees, so loss of all sites would be unlikely. The remaining host trees would 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 would also recover.

At the fifth-field watershed level, forests on BLM-managed lands would provide nearly 21,000 acres of suitable fungi habitat. Nearly 69 percent of the BLM-managed land is allocated to Riparian Reserves and Late-Successional Reserves that would provide long-term habitat stability.

When considering all ownerships, there are more than 60,000 acres of suitable fungi habitat in the watershed, as presented in Table 4-6 on page 40. Based on the average annual harvest on private lands from 2002 to 2005, a reduction of five percent in available suitable habitat could be expected during the next three years. While difficult to precisely estimate, this loss would be partially offset by growth and development of younger forest stands such that habitat would remain abundant and well-distributed. Consequently, no cumulative effects to the overall availability of habitat would be anticipated, nor is it anticipated that the proposed density management would contribute to a future need to list any of the five fungi species discussed on page 31 as threatened or endangered.

VII. Monitoring

Monitoring the effects of the proposed action, if implemented, would be done in accordance with the ROD/RMP, Appendix I (pp. 84-86, 191-192, and 195-199). Specific resources to be monitored would include: Late-Successional Reserves; Water and Soils; Wildlife Habitat; Fish Habitat; and Special Status Species Habitat.

Chapter Five
LIST OF AGENCIES/PERSONS CONTACTED AND PREPARERS

This project was included in the Roseburg BLM Project Planning Update (Summer 2006). If a decision is made to implement the proposed action, a notice of decision would be published in *The News-Review*, Roseburg, Oregon.

I. Agencies and Persons Contacted

Adjacent Landowners
American Forest Resource Council
Cascadia Wildlands Project
Cow Creek Band of Umpqua Tribe of Indians
Klamath Siskiyou Wildlands Center
Oregon Natural Resources Council
Umpqua Watersheds, Inc.
Umpqua Valley Audubon Society

II. The Following Agencies, Organizations, and Individuals Would be Notified of the Completion of the EA

American Forest Resource Council
Cascadia Wildlands Project
Cow Creek Band of Umpqua Tribe of Indians
Douglas Timber Operators
Klamath Siskiyou Wildlands Center
National Marine Fisheries Service
Oregon Department of Environmental Quality
Oregon Department of Fish and Wildlife
Oregon Natural Resources Council
Umpqua Watersheds, Inc.
U.S. Fish and Wildlife Service
Ronald S. Yockim, Attorney-at-Law
Umpqua Valley Audubon Society

III. List of Preparers

Jay Besson	Project Leader
Susan Johnson	Silviculture
Chris Langdon	Wildlife/T&E
Helmut Kreidler	Engineering
Paul Meinke	EA Writer/Editor
Gary Basham	Botany/Noxious Weeds
Ward Fong	Soils
Cory Sipher	Fisheries
Jill Ralston	Hydrology
John Royce	Management Representative

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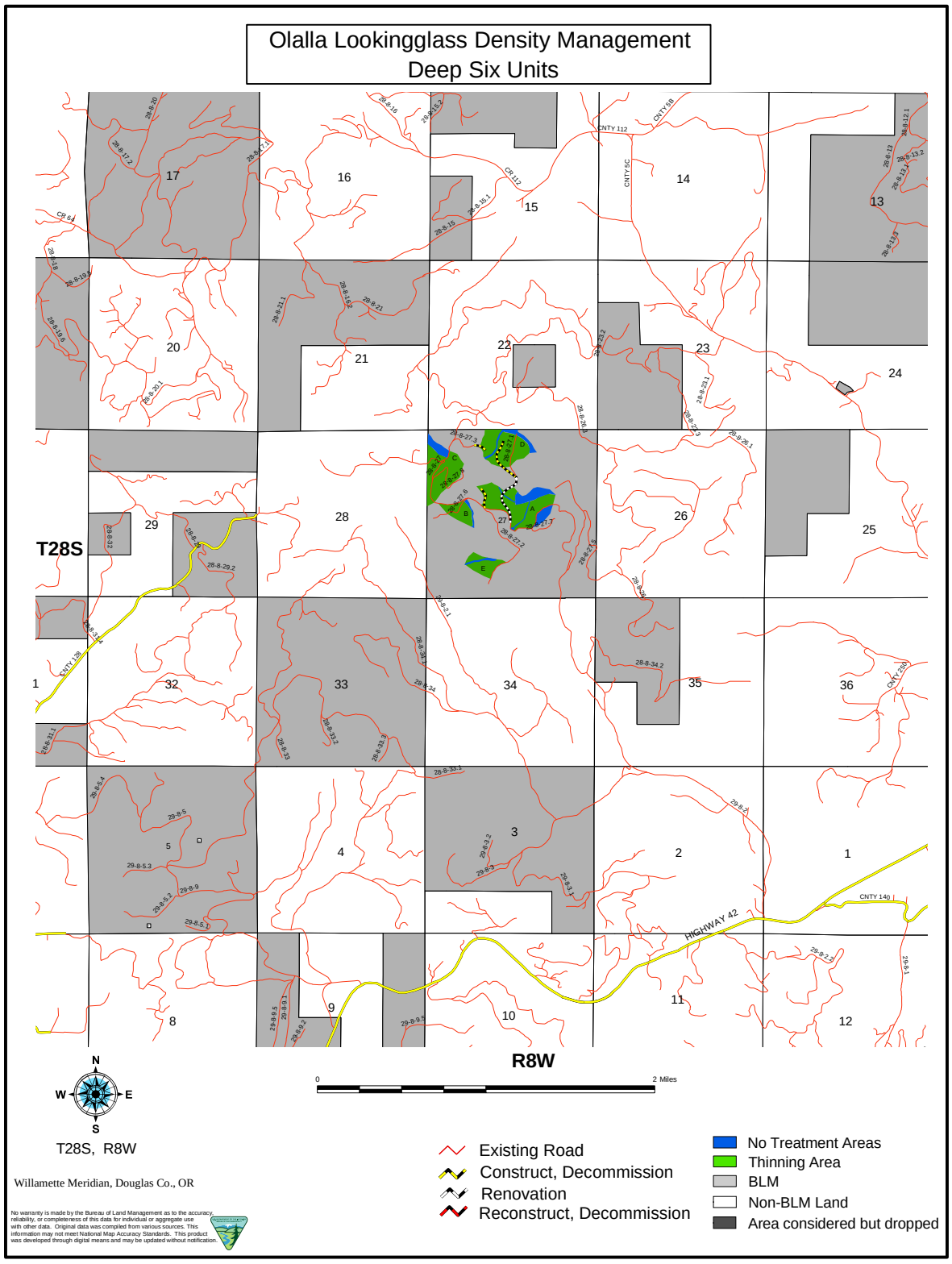
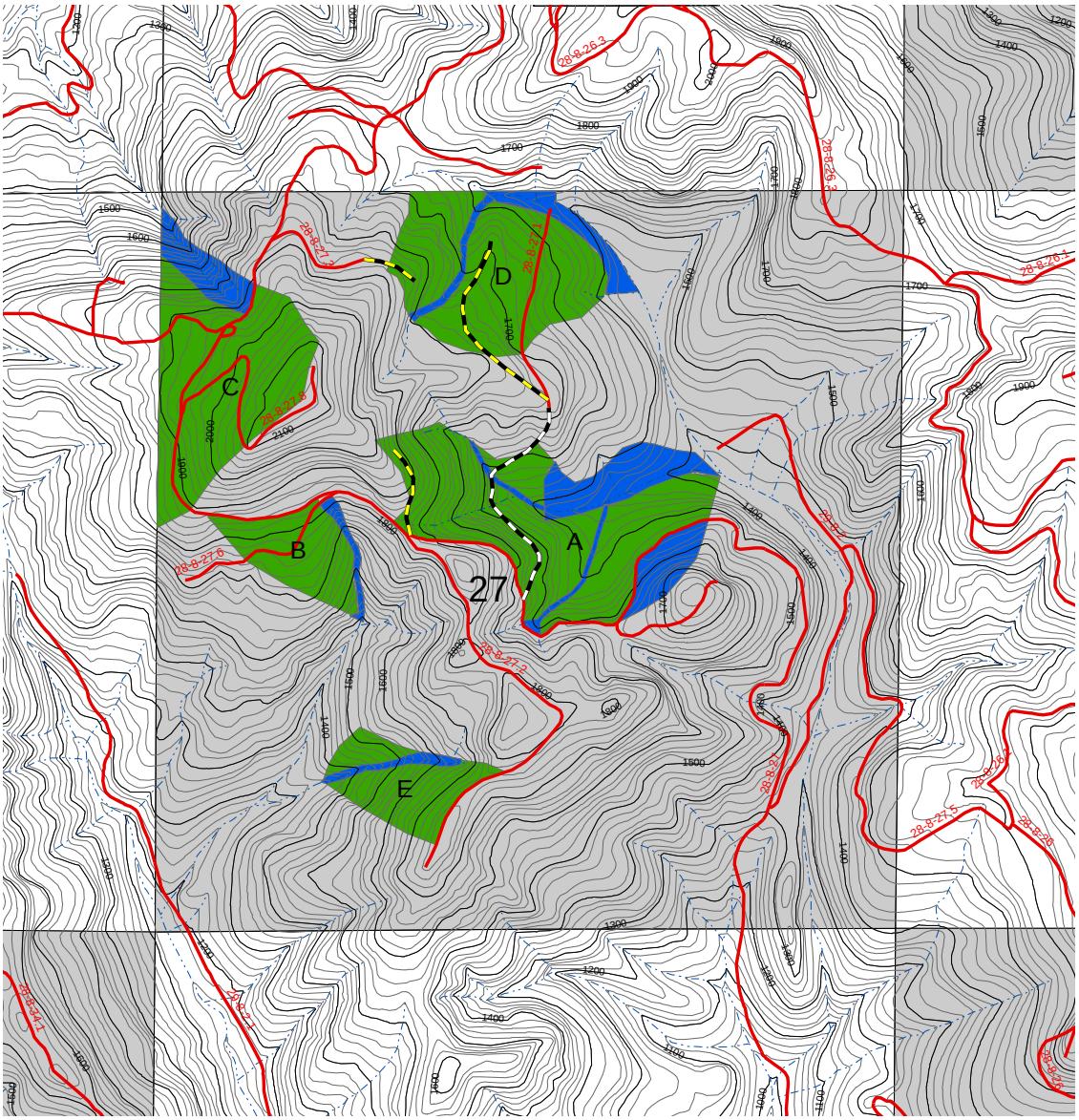
Appendix A

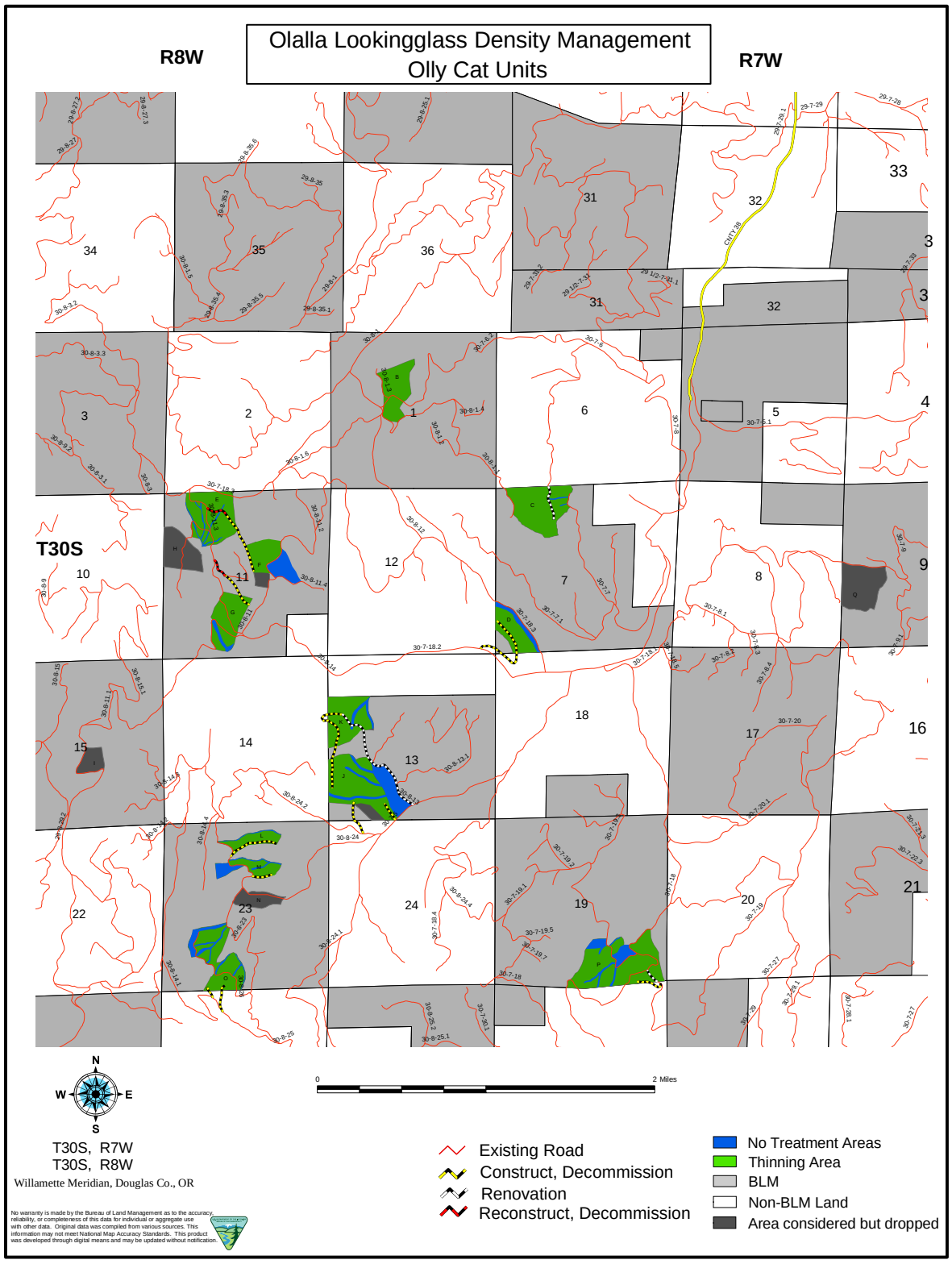
Maps of the Proposed Project Area and Units


Olalla Lookingglass Density Management
Deep Six Units
T28S
R8W
HIGHWAY 42
CNTY 140
CNTY 112
CR 112
CR 6-4
CNTY 135
CNTY 283
N
W
E
S
T28S, R8W
Willamette Meridian, Douglas Co., OR
0
2 Miles
Existing Road
Construct, Decommission
Renovation
Reconstruct, Decommission
No Treatment Areas
Thinning Area
BLM
Non-BLM Land
Area considered but dropped
No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of this data for individual or aggregate use with other data. Original data was compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

Olalla Lookingglass Density Management

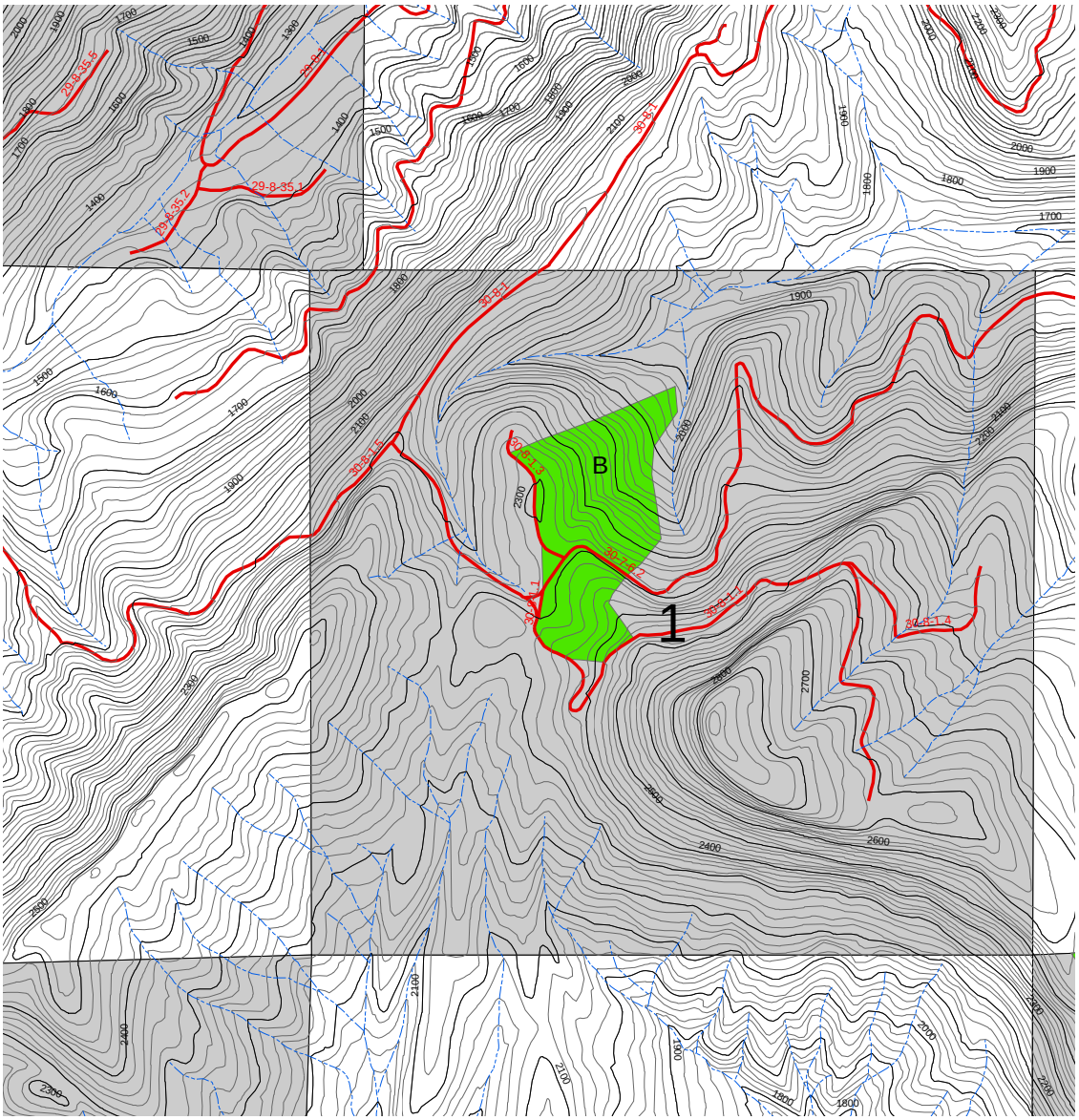
Deep Six Units




Olalla Lookingglass Density Management
Olly Cat Units
R8W
R7W
T30S
N
W
E
S
0
2 Miles
T30S, R7W
T30S, R8W
Willamette Meridian, Douglas Co., OR
Existing Road
Construct, Decommission
Renovation
Reconstruct, Decommission
No Treatment Areas
Thinning Area
BLM
Non-BLM Land
Area considered but dropped
No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of this data for individual or aggregate use with other data. Original data was compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

Olalla Lookingglass Density Management

Olly Cat Units



T30S, R8W

Willamette Meridian, Douglas Co., OR

Existing Road

Construct spur

No Treatment Areas

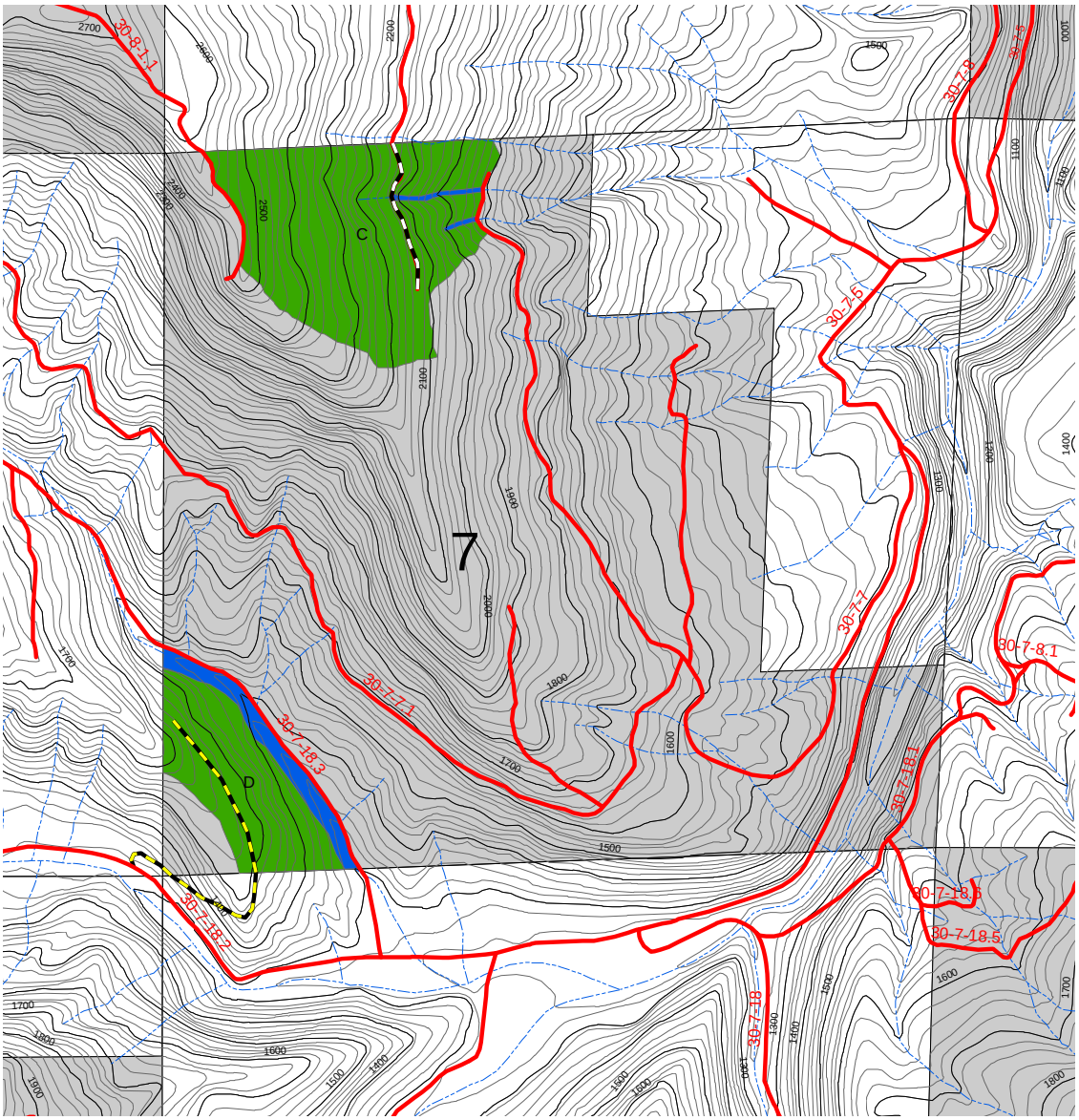
Thinning Area

LSR

Non-BLM Land

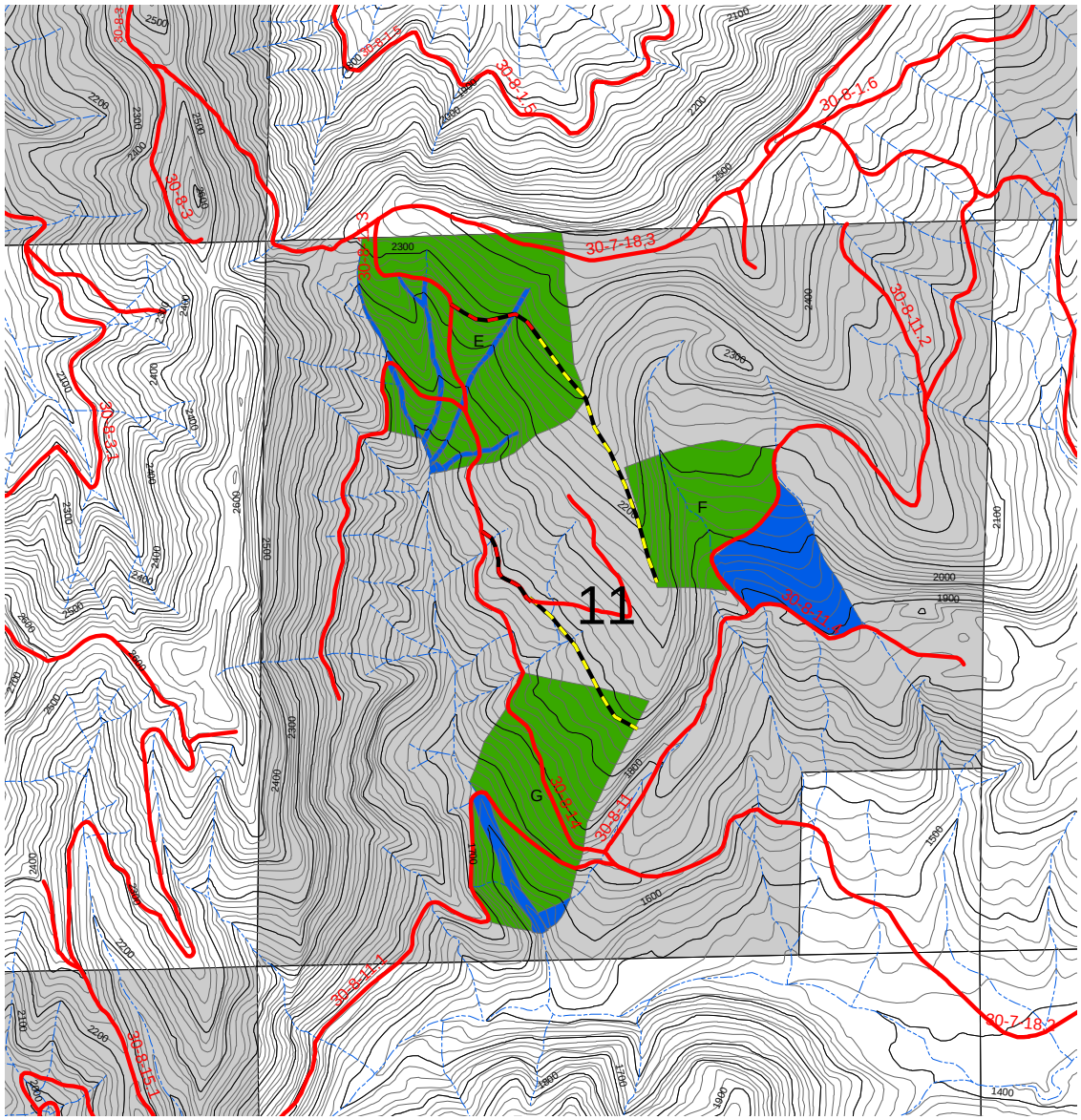
Olalla Lookingglass Density Management

Olly Cat Units



Olalla Lookingglass Density Management

Olly Cat Units



0 4,000 Feet

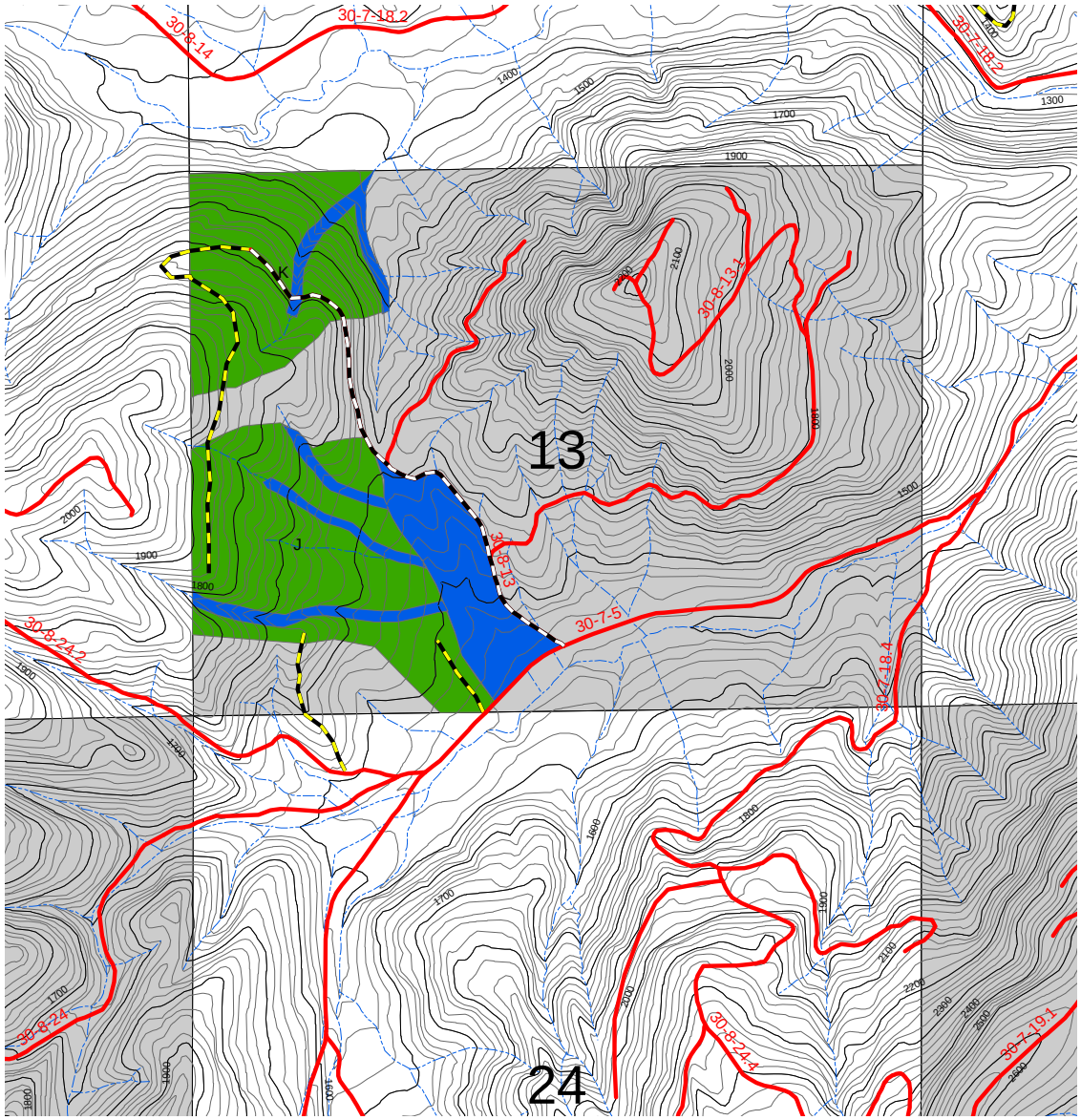
N
W E
S

T30S, R8W
Willamette Meridian, Douglas Co., OR

- Existing Road
- Construct, Decomisssion
- Reconstruct, Decomission
- Renovation
- No Treatment Areas
- Thinning Area
- LSR
- Non-BLM Land

Olalla Lookingglass Density Management

Olly Cat Units



0 4,000 Feet

N
W E
S

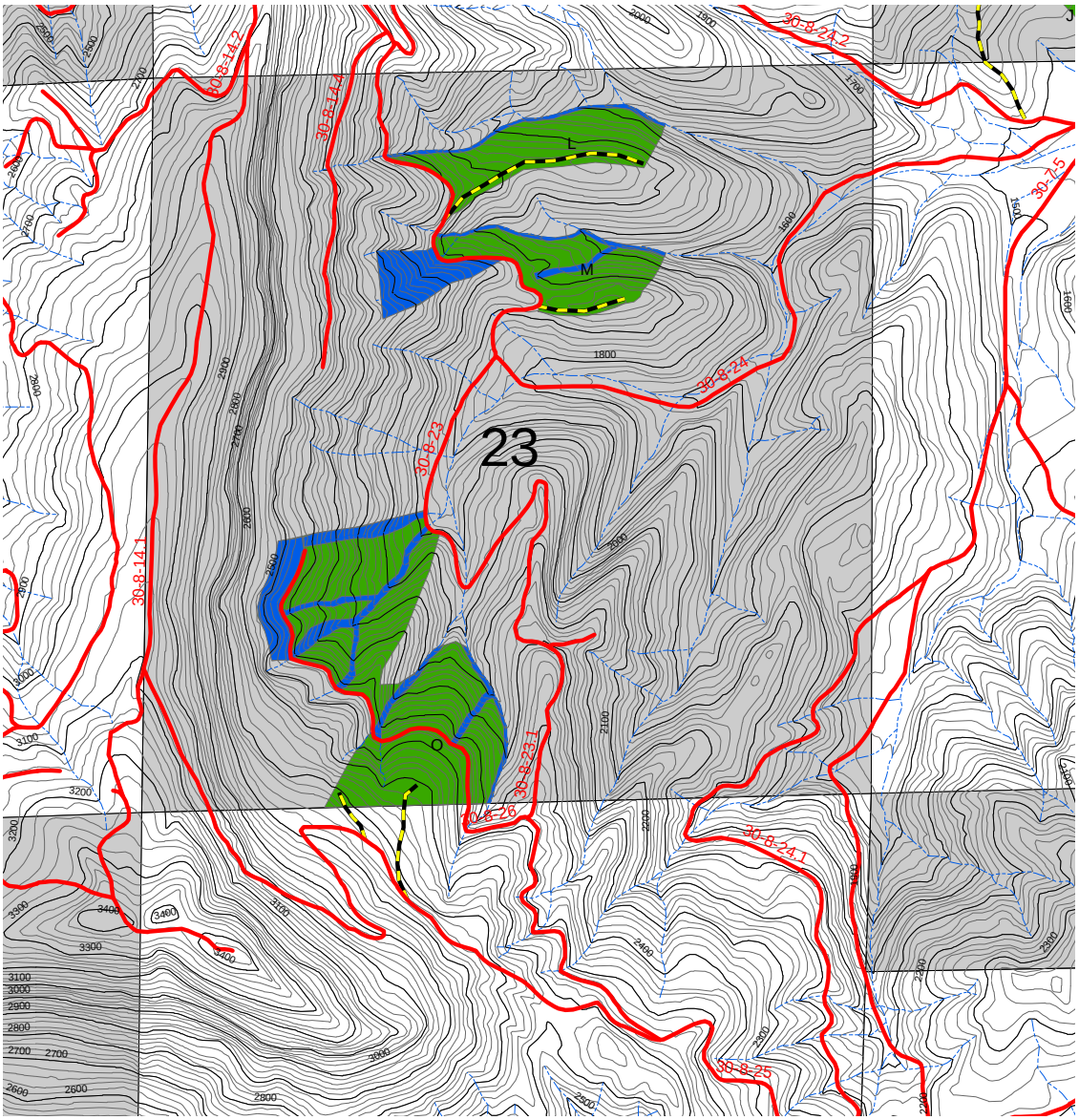
T30S, R8W
Willamette Meridian, Douglas Co., OR

- Existing Road
- Construct, Decomisssion
- Reconstruct, Decomission
- Renovation

- No Treatment Areas
- Thinning Area
- LSR
- Non-BLM Land

Olalla Lookingglass Density Management

Olly Cat units



T30S, R8W

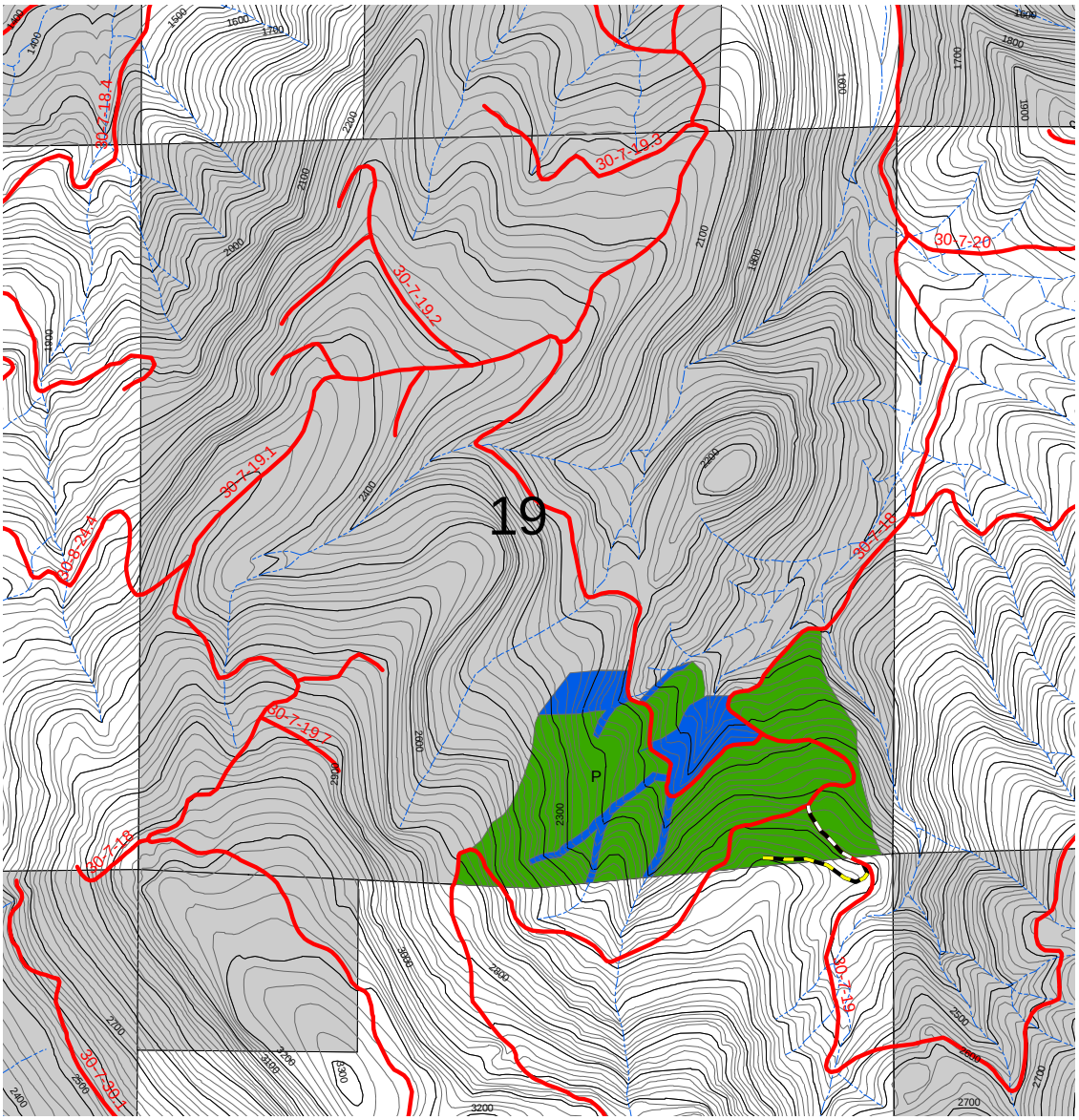
Willamette Meridian, Douglas Co., OR

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of this data for individual or aggregate use with other data. Original data was compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

- Existing Road
- Construct, Decomisssion
- Reconstruct, Decomission
- Renovation
- No Treatment Areas
- Thinning Area
- LSR
- Non-BLM Land

Olalla Lookingglass Density Management

Olly Cat Units



Appendix B

Silviculture

Table B-1. Existing Amount of Coarse Woody Debris by Decay Class and Total Pieces per Acre by Unit.

Unit		Volume (cubic feet)						Total Pieces (per acre)
		Decay Class 1	Decay Class 2	Decay Class 3	Decay Class 4	Decay Class 5	Total Coarse Wood	
Olly Cat	B	0	25	71	736	358	1,190	100
	C	0	10	590	813	971	2,385	87
	D	72	39	155	305	1,129	1,700	123
	E	0	2	597	1,195	1,091	2,884	81
	F	0	0	550	531	0	1,081	96
	G	35	2	6	732	273	1,047	48
	J	19	21	592	723	902	2,256	87
	K	4	0	254	917	309	1,484	94
	K	0	0	360	1,826	839	3,022	87
	M	0	0	247	718	2,649	3,615	77
	N	0	8	236	1,053	476	1,772	36
	O	57	27	171	926	607	1,788	81
	P	6	9	1,438	1,681	1,280	4,414	110
Deep Six	A	128	39	661	499	111	1,438	74
	B	38	171	86	599	428	1,369	66
	C	99	0	282	1,181	184	1,746	114
	D	8	44	281	2,010	396	2,739	124
	E	34	0	1,829	1,435	0	3,298	85

Table B-2. Existing Stand Conditions.

Unit		Acres	Age	Trees at Least Seven Inches DBH (per Acre)	Quadratic Mean Diameter	Basal Area (per acre)	Relative Density	Average Crown Ratio	Volume (Organon mbf per acre)
Deep Six	A	30	54	134	14.7	157	46	42	27
	B	10	44	159	15.4	206	60	37	30.3
	C	34	42	158	16.5	234	67	37	44.5
	D	16	47	153	15.3	193	57	39	35.5
	E	12	49	148	14.8	177	52	46	25.5
Olly Cat	B	30	57	237	11.3	165	54	37	18.6
	C	52	50	227	12.7	200	63	37	31.9
	D	27	48	290	11	191	63	26	27.9
	E	49	42	210	11.7	156	51	38	19.9
	F	15	56	184	13.1	172	54	41	20.5
	G	42	56	220	12	172	55	43	18.1
	H	32	38	265	10.9	170	57	35	18.3
	H	32	38	265	10.9	170	55	43	18.1
	I	12	42	202	11.5	146	47	42	11.6
	J	80	61	164	13.4	161	50	32	25.5
	K	39	45	256	11.3	174	59	31	25.4
	L	13	46	247	11.7	185	60	34	28.2
	M	17	47	366	10.4		74	26	32
	N	14	51	199	12.3	163	52	39	23.1
	O (north)	48	44	247	11.4	176	58	33	25.5
	O (south)	48	44	269	11.2	186	61	31	23.7
	P	77	51	226	11.3	159	52	35	25.4
	Q	38	46	228	10.8	145			

Dark gray shaded units were eliminated from detailed analysis.

Table B-3. Stand Conditions Following Density Management Treatments.

Unit		Density Management Treatment	Stand Age	Trees per Acre	Basal Area	Quadratic Mean Diameter	Relative Density	Percent Crown Closure	Tree Species to Use for Underplanting
Deep Six	A	Light with one 0.25 acre opening	54	80	100	15.1	0.29	62.9	
	A	Moderate	54	60	100	17.6	0.28	58.4	
	B	Moderate	44	77.3	100	15.4	0.29	57.6	
	C	Moderate	42	67.7	100	16.5	0.28	54.8	
	D	Light with one 0.25 acre opening	47	73.9	125	17.6	0.35	65.5	
	E	Moderate with one 0.25 acre opening	49	83.8	100	14.8	0.30	65.2	
Olly Cat	B	Moderate	57	94.6	98	13.7	0.30	56.9	
	C	Moderate	50	67.8	112	17.4	0.31	54.0	
	D	Heavy	48	53.3	69	15.4	0.20	39.2	DF/IC/PP
	E	Moderate	42	72.5	80	14.2	0.24	54.7	
	F	Moderate	56	87.2	100	14.5	0.30	66.8	
	G	Heavy	56	54.6	70	15.3	0.20	44.3	
	J	Moderate with one 0.8 acre opening	61	73.5	104	16.1	0.30	56.1	PP/IC/DF
	K	Heavy with one 0.5 acre opening	45	67.2	92	13.8	0.21	45.4	DF/IC/WRC
	L	Moderate	46	87.3	100	14.5	0.30	63.0	
	M	Moderate	47	102.3	100	12.8	0.29	61.2	
	O (North)	Light	44	112.3	100	13.3	0.31	69.0	
	O (South)	Moderate with one 0.5 acre opening	44	104.3	120	12.8	0.31	69.5	
	P	Light with one 0.8 acre opening	51	120.6	120	13.5	0.37	80.0	
	P	Moderate	51	86.4	100	14.6	0.29	64.1	
	P	Heavy	51	60.0	80	15.6	0.23	49.4	PP

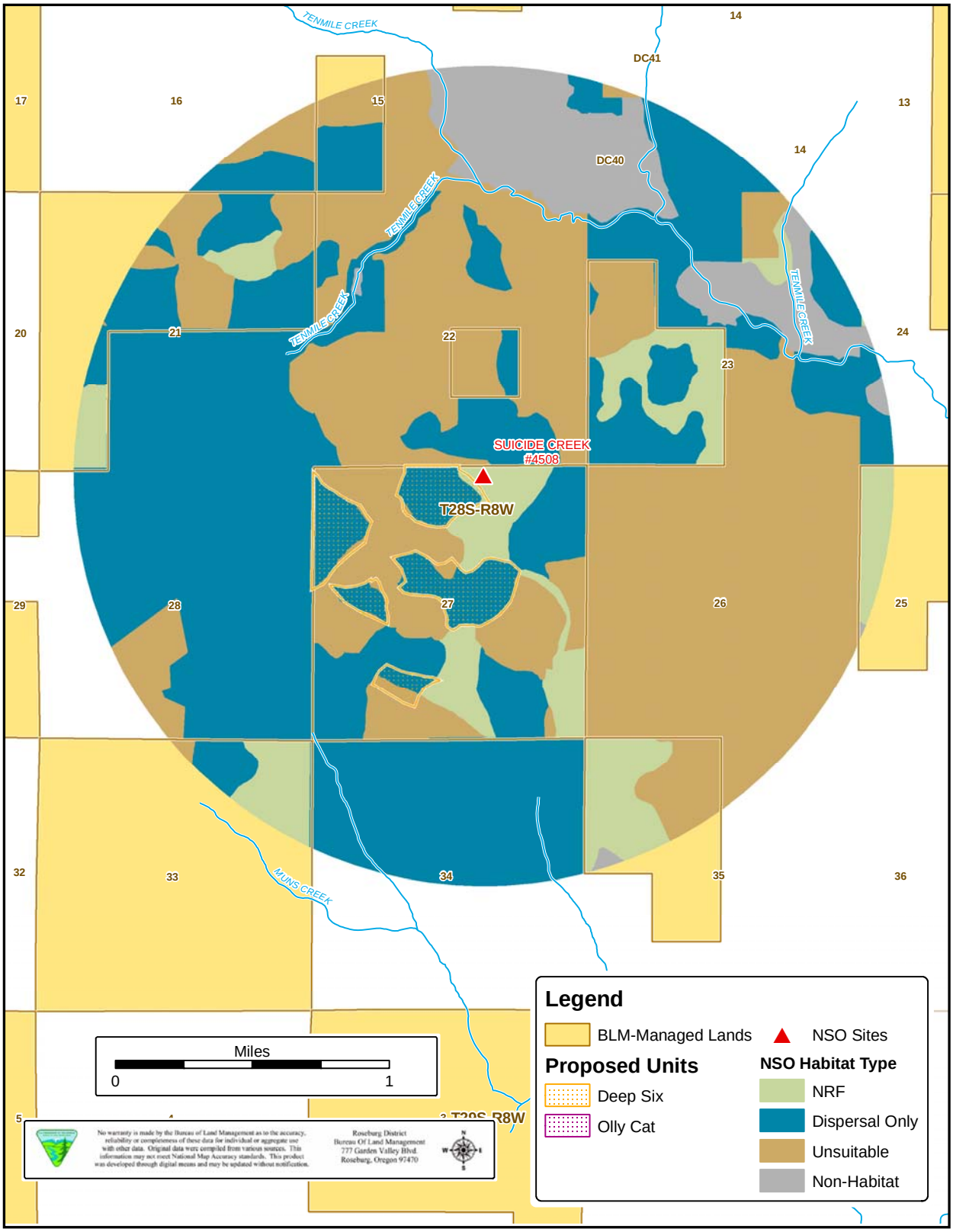
Appendix C

Wildlife

Table C-1. Special Status Wildlife Species Eliminated from Further Consideration.

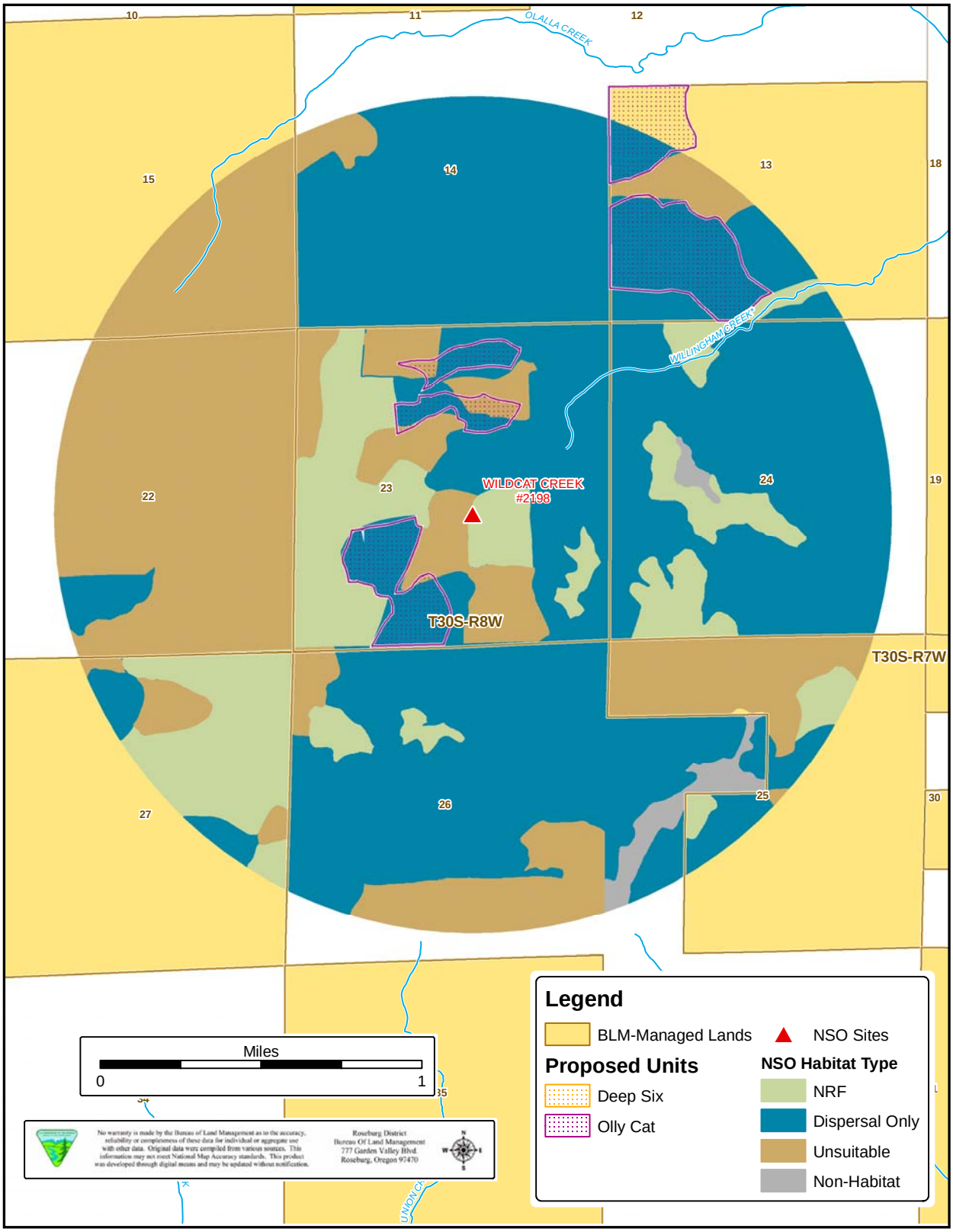
Status	Common Name	Scientific Name	Habitat Features Used	Reason Eliminated
Federal Threatened	Bald Eagle	*Haliaeatus leucocephalus*	Large trees near large bodies of water (Buehler 2000, Isaacs and Anthony 2004)	No habitat
Bureau Sensitive	American Peregrine Falcon	*Falco peregrinus*	Cliffs or other sheer vertical structure, generally in open habitat near water (White et al. 2002)	No habitat
Bureau Sensitive	Columbian White-Tailed Deer	*Odocoileus virginianus leucurus*	Oak woodland	No habitat
Bureau Sensitive	Crater Lake Tightcoil	*Pristiloma arcticum crateris*	Herbs, woody debris, or rocky cover in or near perennially wet areas of mature forest in Western Cascades (Duncan et al. 2003)	Out of species' range
Bureau Sensitive	Klamath Tail-Dropper	*Prophysaon sp. nov.*	Moist mature forest (Frest and Johannes 2000)	Area policy
Bureau Sensitive	Lewis' Woodpecker	*Melanerpes lewis*	Open woodlands with ground cover and snags (Tobalske 1997)	No habitat
Bureau Sensitive	Oregon Vesper Sparrow	*Podecetes gramineus affinis*	Grassland, farmland, sage. Dry, open habitat with moderate herb and shrub cover (Jones and Cornely 2002)	No habitat
Bureau Sensitive	Purple Martin	*Progne subis*	Nests in artificial structures, nest boxes, or cavities or woodpecker holes in snags. Uses open habitats: burns, clearcuts, open water, urban areas (Horvath 2003).	No habitat
Bureau Sensitive	Rotund Lanx	*Lanx subrotundata*	Umpqua River and major tributaries (USDA and USDI 1994)	No habitat
Bureau Sensitive	Scott's Appatanian Caddisfly	*Allomyia scotti*	Low-gradient streams with gravel and cobble substrates (Wiggins 1977)	Protected by Riparian Reserves if present
Bureau Sensitive	Western Pond Turtle	*Clemmys marmorata*	Marshes, ponds, lakes, rivers with emergent structure; and adjacent forest (Storm and Leonard 1995)	No habitat
Bureau Assessment	Foothill Yellow-Legged Frog	*Rana boylii*	Low-gradient streams with bedrock or gravel substrate (Corkran and Thoms 1996)	No habitat
Bureau Assessment	Harlequin Duck	*Histrionicus histrionicus*	Larger fast-flowing streams and riparian areas (Thompson et al. 1993, Robertson and Goudie 1999)	No habitat
Bureau Assessment	White-Tailed Kite	*Elanus leucurus*	Low-elevation grassland, farmland or savannah and nearby riparian areas (Dunk 1995)	No habitat

Map C-1. Northern Spotted Owl Habitat within 1.5 Miles of the Suicide Creek Site.

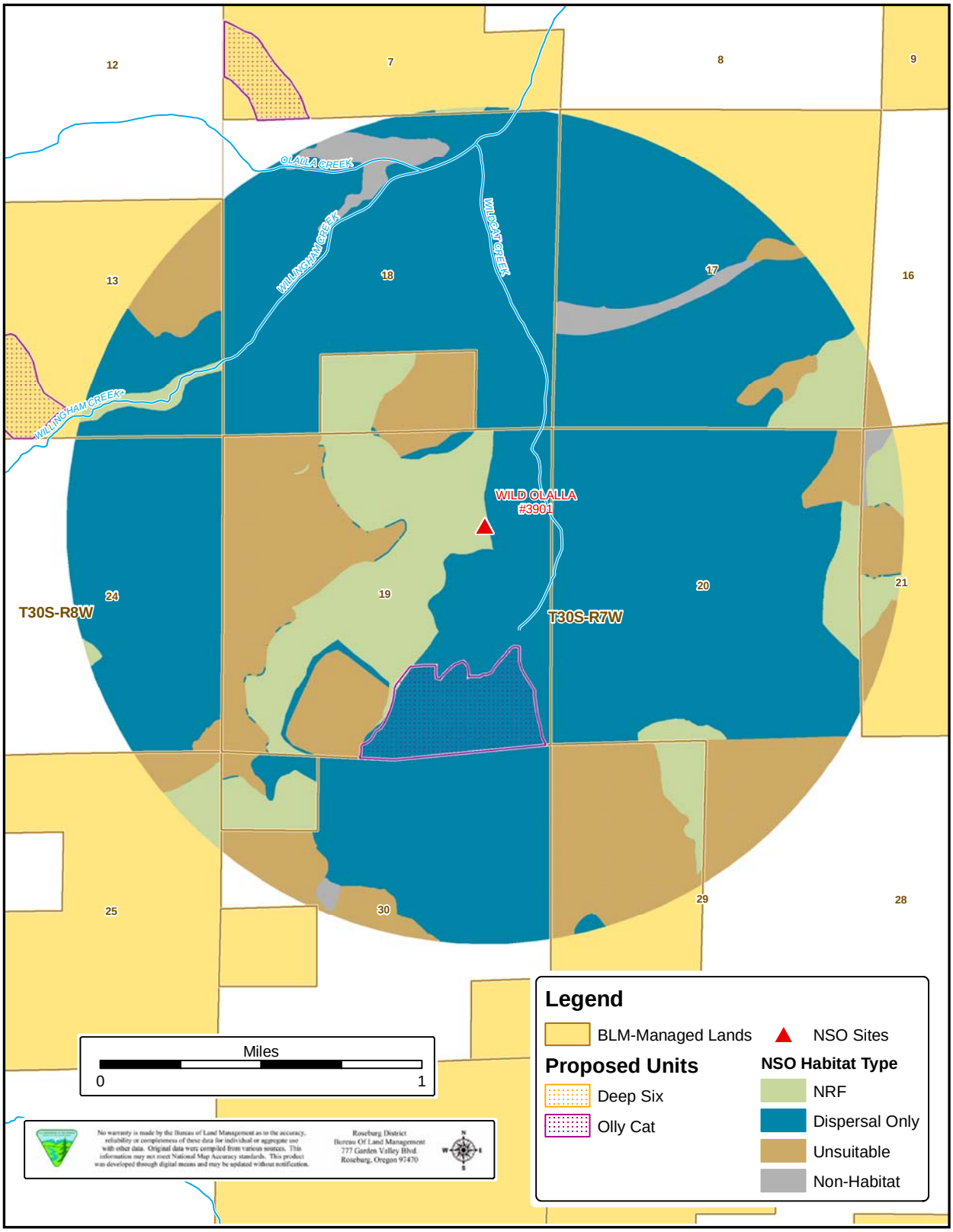


Map C-2. Northern Spotted Owl Habitat within 1.3 Miles of the Bear Naked Site.

Map C-3. Northern Spotted Owl Habitat within 1.3 Miles of the Wildcat Creek Site.



Map C-4. Northern Spotted Owl Habitat within 1.3 Miles of the Wild Olalla Site.



Appendix D

Botany

Table D-1. Special Status Plant Species Summary

Scientific Name	Taxon	Status	Habitat Present	Survey Completed
Plagiobothrys hirtus	Vascular Plant	Federal Endangered	No	N/A
Lupinus sulphureus ssp. *kincaidii*	Vascular Plant	Federal Threatened	Yes	Scheduled To Be Surveyed Spring 2007
Arabis koehleri var. *koehleri*	Vascular Plant	Bureau Sensitive	No	N/A
Bensoniella oregana	Vascular Plant	Bureau Sensitive	Yes	Scheduled To Be Surveyed Spring 2007
Calochortus coxii	Vascular Plant	Bureau Sensitive	No	N/A
Calochortus umpquaensis	Vascular Plant	Bureau Sensitive	No	N/A
Cimicifuga elata	Vascular Plant	Bureau Sensitive	Yes	Scheduled To Be Surveyed Spring 2007
**Corydalis aquae-gelidae*	Vascular Plant	Bureau Sensitive	No	N/A
**Cypripedium fasciculatum*	Vascular Plant	Bureau Sensitive	Yes	Scheduled To Be Surveyed Spring 2007
Epilobium oreganum	Vascular Plant	Bureau Sensitive	No	N/A
**Eucephalis vialis*	Vascular Plant	Bureau Sensitive	Yes	Scheduled To Be Surveyed Spring 2007
Festuca elmeri	Vascular Plant	Bureau Assessment	Yes	Scheduled To Be Surveyed Spring 2007
Frasera umpquaensis	Vascular Plant	Bureau Sensitive	Yes	Scheduled To Be Surveyed Spring 2007
Horkelia congesta ssp. *congesta*	Vascular Plant	Bureau Sensitive	Yes	Scheduled To Be Surveyed Spring 2007
Horkelia tridentata ssp. Tridentata	Vascular plant	Bureau Assessment	Yes	Scheduled To Be Surveyed Spring 2007
Kalmiopsis fragrans	Vascular Plant	Bureau Sensitive	Yes	Scheduled To Be Surveyed Spring 2007
Lathyrus holochlorus	Vascular plant	Bureau Sensitive	Yes	Scheduled To Be Surveyed Spring 2007
Limnanthes gracilis var. *gracilis*	Vascular Plant	Bureau Sensitive	Yes	Scheduled To Be Surveyed Spring 2007
Perideridia erythrorhiza	Vascular Plant	Bureau Sensitive	Yes	Scheduled To Be Surveyed Spring 2007
Perideridia howellii	Vascular Plant	Bureau Sensitive	Yes	Scheduled To Be Surveyed Spring 2007
Romanzoffia thompsonii	Vascular Plant	Bureau Sensitive	Yes	Scheduled To Be Surveyed Spring 2007
Sisyrinchium hitchcockii	Vascular Plant	Bureau Sensitive	No	N/A
Adiantum jordanii	Vascular Plant	Bureau Assessment	Yes	Scheduled To Be Surveyed Spring 2007
Asplenium septentrionale	Vascular Plant	Bureau Assessment	Yes	Scheduled To Be Surveyed Spring 2007
**Botrychium minganense*	Vascular Plant	Bureau Tracking	No	Scheduled To Be Surveyed Spring 2007
**Botrychium montanum*	Vascular Plant	Bureau Assessment	No	N/A

Scientific Name	Taxon	Status	Habitat Present	Survey Completed
Carex brevicaulis	Vascular plant	Bureau Assessment	Yes	Scheduled To Be Surveyed Spring 2007
Carex comosa	Vascular Plant	Bureau Assessment	Yes	Scheduled To Be Surveyed Spring 2007
Carex gynodynama	Vascular Plant	Bureau Assessment	Yes	Scheduled To Be Surveyed Spring 2007
Carex serratodens	Vascular Plant	Bureau Assessment	Yes	Scheduled To Be Surveyed Spring 2007
Cicendia quadrangularis	Vascular Plant	Bureau Assessment	No	N/A
**Coptis aspleniifolia*	Vascular Plant	**	No	N/A
**Coptis trifolia*	Vascular Plant	Bureau Assessment	No	N/A
**Cypripedium montanum*	Vascular Plant	Bureau Tracking	Yes	Scheduled To Be Surveyed Spring 2007
Eschscholzia caespitosa	Vascular Plant	Bureau Assessment	Yes	Scheduled To Be Surveyed Spring 2007
**Galium kamtschaticum*	Vascular Plant	**	No	N/A
Iliamna latibracteata	Vascular Plant	Bureau Assessment	Yes	Scheduled To Be Surveyed Spring 2007
Mimulus tricolor	Vascular Plant	Bureau Assessment	Yes	Scheduled To Be Surveyed Spring 2007
Pellaea andromedaefolia	Vascular Plant	Bureau Assessment	Yes	Scheduled To Be Surveyed Spring 2007
**Plantanthera orbiculata*	Vascular Plant	**	No	N/A
Polystichum californicum	Vascular Plant	Bureau Assessment	Yes	Scheduled To Be Surveyed Spring 2007
Sedum laxum ssp. *heckneri*	Vascular Plant	Bureau Assessment	No	N/A
Romanzoffia thompsonii	Vascular plant	Bureau Sensitive	Yes	Scheduled To Be Surveyed Spring 2007
Scirpus subterminalis	Vascular plant	Bureau Assessment	No	N/A
Utricularia gibba	Vascular Plant	Bureau Assessment	No	N/A
Utricularia minor	Vascular Plant	Bureau Assessment	No	N/A
Wolffia borealis	Vascular Plant	Bureau Assessment	No	N/A
Wolffia columbiana	Vascular Plant	Bureau Assessment	No	N/A
Chiloscyphus gemmiparus	Bryophyte	Bureau Sensitive	No	N/A
Trematodon boasii	Bryophyte	Bureau Sensitive	No	N/A
Crumia latifolia	Bryophyte	Bureau Assessment	No	N/A
Diplophyllum plicatum	Bryophyte	Bureau Assessment	No	N/A

Scientific Name	Taxon	Status	Habitat Present	Survey Completed
Funaria Muhlenbergii	Bryophyte	Bureau Assessment	No	N/A
**Kurzia makinoan*	Bryophyte	Bureau Assessment	No	N/A
**Marsupella emarginata* var. *aquatica*	Bryophyte	**	No	N/A
**Orthodontium gracile*	Bryophyte	**	No	N/A
Pseudoleskeella serpentinensis	Bryophyte	Bureau Assessment	No	N/A
**Schistostega pennata*	Bryophyte	Bureau Assessment	Yes	Scheduled To Be Surveyed Spring 2007
Tayloria serrata	Bryophyte	Bureau Assessment	Yes	Scheduled To Be Surveyed Spring 2007
**Tetraphis geniculata*	Bryophyte	Bureau Assessment	Yes	Scheduled To Be Surveyed Spring 2007
Tetraplodon mnioides	Bryophytes	Bureau Assessment	Yes	Scheduled To Be Surveyed Spring 2007
Tripterocladium leucocladulum	Bryophyte	Bureau Assessment	Yes	Scheduled To Be Surveyed Spring 2007
**Tritomaria exsectiformis*	Bryophyte	Bureau Assessment	No	N/A
**Bryoria pseudocapillaris*	Lichen	Bureau Sensitive	No	N/A
**Bryoria spiralifera*	Lichen	Bureau Sensitive	No	N/A
**Bryoria subcana*	Lichen	Bureau Assessment	No	N/A
Calicium adspersum	Lichen	Bureau Assessment	Unknown	Scheduled To Be Surveyed Spring 2007
**Hypogymnia duplicata*	Lichen	Bureau Tracking	Yes	Scheduled To Be Surveyed Spring 2007
**Leptogium cyanescens*	Lichens	Bureau Tracking	Yes	Scheduled To Be Surveyed Spring 2007
**Lobaria linita*	Lichen	Bureau Assessment	Yes	Scheduled To Be Surveyed Spring 2007
**Niebla cephalota*	Lichens	Bureau Assessment	No	N/A
**Nephroma occultum*	Lichen-	Bureau Tracking	Yes	Scheduled To Be Surveyed Spring 2007
Pannaria rubiginosa	Lichen	Bureau Assessment	Yes	Scheduled To Be Surveyed Spring 2007
Pilophorus nigricaulis	Lichen	Bureau Assessment	No	N/A
**Pseudocyphellaria perpetua*	Lichen	Bureau Tracking	No	N/A
**Pseudocyphellaria rainierensis*	Lichen	Bureau Tracking	Yes	Scheduled To Be Surveyed Spring 2007
Sulcaria badia	Lichen	Bureau Assessment	Yes	Scheduled To Be Surveyed Spring 2007
Stereocaulon spathuliferum	Lichen	Bureau Assessment	Yes	Scheduled To Be Surveyed Spring 2007
**Teloschistes flavicans*	Lichen	Bureau Assessment	No	N/A

Scientific Name	Taxon	Status	Habitat Present	Survey Completed
**Tholurna dissimilis*	Lichen	Bureau Assessment	No	N/A
Arcangeliella camphorata	Fungi	Bureau Sensitive	Yes	Surveys not practical
**Bridgeoporus nobilissimus*	Fungi	Bureau Sensitive	No	N/A
Dermocybe humboldtensis	Fungi	Bureau Sensitive	Yes	Surveys not practical
Phaeocollybia californica	Fungi	Bureau Sensitive	Yes	Surveys not practical
Phaeocollybia gregaria	Fungi	Bureau Sensitive	Yes	Surveys not practical
Phaeocollybia olivacea	Fungi	Bureau Sensitive	Yes	Surveys not practical
Phaeocollybia oregonensis	Fungi	Bureau Sensitive	Yes	Surveys not practical
Ramaria spinulosa var. diminutiva	Fungi	Bureau Sensitive	Yes	Surveys not practical
Rhizopogon chamalelontinus	Fungi	Bureau Sensitive	Yes	Surveys not practical
Rhizopogon exiguus	Fungi	Bureau Sensitive	Yes	Surveys not practical

N/A = Not Applicable
*Survey and Manage Species in 2003
**Survey and Manage Species in 2003. Currently, Not a Special Status Species.

APPENDIX E
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 are 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	
Areas of Critical Environmental Concern	X		
Cultural Resources		X	X
Environmental Justice		X	
Farm Lands (prime or unique)	X		
Floodplains	X		
Invasive, Non-native Species		X	X
Native American Religious Concerns	X		
Threatened or Endangered Wildlife Species		X	X
Threatened or Endangered Plant Species	X		
Wastes, Hazardous or Solid	X		
Drinking and Ground Water Quality		X	X
Wetlands/Riparian Zones		X	
Wild & Scenic Rivers	X		
Wilderness	X		
Visual Resource Management		X	