2010 THINNINGS PROJECT
UPPER WILLAMETTE RESOURCE AREA
BLM EUGENE DISTRICT
ENVIRONMENTAL ASSESSMENT
DOI-BLM-OR-E060-2009-0007-EA

1.0 INTRODUCTION
The Upper Willamette Resource Area of the Eugene District Bureau of Land Management (BLM) proposes to implement commercial thinning and Density Management projects on approximately 1600 acres in the Upper Coast Fork of Willamette River and Row River 5th field watersheds. The locations are as follows:

- Fawn Peak (T.23S., R.03W., Sec. 13)
- Little Creek (T.23S.,R.03W., Sec. 23)
- Stennett Butte (T.23S., R.03W., Sec. 15)
- Raisor (T.22S., R.04W., Sec. 13)
- Cedar Creek (T.,22S.,R.04.,Sec. 1)
- Wilson Creek (T.22S., R.03W., Sec. 9)
- Perkins Creek (T.21S., R.02W., Sec. 27)

All of the proposed harvest areas, with the exception of Perkins Creek, are within designated northern spotted owl Critical Habitat. The Land Use Allocations for these acres are Matrix and Riparian Reserve. Project actions may include timber harvest, instream habitat restoration, road construction, road improvements and road decommissioning.

Perkins Creek is part of a cooperative Density Management Study between the BLM, U.S. Geological Survey Biological Resources Division, Oregon State University, and the U.S. Forest Service Pacific Northwest Research Station.

2.0 PURPOSE AND NEED
The need for action in Matrix and Riparian Reserves has been established through the results of field reviews and stand examinations, which indicate that stands (ages 30-80 years) would benefit from thinning or density management release. Currently, the stands are dense, overstocked and uniform in structure. This results in reduced tree growth and stand vigor. Treatment would increase stand vigor, growth rates, crown differentiation and stand complexity. In addition, treatments would also be designed to retain or enhance the Primary Constituent Elements (PCEs) necessary to support spotted owls. Primary Constituent Elements are the physical and biological features that support nesting, roosting, foraging and dispersal, and are determined to be essential for the conservation of the spotted owl. These elements, as they relate to this project, include stand characteristics such as moderate to high canopy closure, multi-storied and multi-species canopies, large trees with a high degree of deformities (e.g., cavities, broken tops), and large snags and down logs.

The need for action in Perkins Creek is demonstrated by the insufficiency of scientific knowledge, and the continuing requirement of research, on the effects of density management on the development of late-successional forest characteristics.

The purposes of the actions in Matrix are to meet the objectives given in the 1995 Eugene ROD/RMP (pg 34). Some listed objectives are to: (1) Produce a sustainable supply of timber and other forest commodities to provide jobs and to contribute to community stability; (2) Provide habitat for a variety of organisms associated with both late-successional and younger forests and maintain valuable structural components, such as down logs and snags. Additional direction for road management is stated on page 98 of the 1995 RMP. It directs us to, "manage roads to meet the needs identified under other resource programs."

The purposes of the actions in Riparian Reserves are to enhance or maintain late-successional forest conditions, and to provide habitat for Special Status Species, and other terrestrial species (1995 RMP, pp. 18, 23).

The purposes of the actions in Perkins Creek is to determine how to manage 30-70 year old stands to accelerate the development of late-successional forest characteristics, research the response of species to density management treatments, and monitor the effects of density management treatments in riparian treatments on aquatic dependent species.

2.1 CONFORMANCE

This EA conforms to the Eugene District Record of Decision and Resource Management Plan (2008 ROD/RMP). The 2008 ROD allowed for a two year transition period from the old resource management plan to the application of the new resource management plan. Site specific projects for which a decision has not been signed prior to the effective date of the ROD, for which NEPA documentation began prior to the effective date of the ROD, and for which a decision on the project is signed within two years of the effective date of the ROD may be implemented consistent with the management direction of either the 1995 resource management plan or the 2008 resource management plan.

This EA meets this criteria and is consistent with the 1995 *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl* (Northwest Forest Plan {NSO-ROD}) (USDA Forest Service and USDI Bureau of Land Management, April 1994), and the *Eugene District Resource Management Plan* (RMP)(1995) and all plan amendments in effect on the day of completion of this EA, including the *2007 Record of Decision To Remove the Survey and Manage Mitigation Measure Standards and Guidelines from Bureau of Land Management Resource Management Plans within the Range of the Northern Spotted Owl*. The 2010 Thinnings project file contains additional information compiled by the Interdisciplinary Team (ID Team) to analyze effects and is available for review at the Eugene District Office.

2.2 SCOPING

Scoping information about the 2010 Thinning Project was first provided in the October 2008 *Eye to the Future.* No scoping comments were received.

ISSUES

The ID Team brought forward additional concerns related to resources that had potential of being affected by the proposed actions. The resource concerns related to the issues are analyzed in Section 3.0: Affected Environment and Environmental Consequences.

Issues identified:

1. How would project activities affect the Primary Constituent Elements (PCEs) necessary to support Northern spotted owls?

3.0 ALTERNATIVES

This section describes alternatives identified by the interdisciplinary team. Please refer to Appendix A for maps of the project proposal.

3.1 ALTERNATIVE 1: NO ACTION

Under this alternative no actions would take place. Commercial thinning, road management, and aquatic habitat restoration actions would not occur within the proposed project area.

3.2 ALTERNATIVE 2: GROUND-BASE AND CABLE LOGGING SYSTEMS

This alternative consists of seven commercial thinning areas encompassing approximately 1060 upland acres. They are delineated as follows:

- Fawn Peak 173 upland acres.
- Little Creek 238 upland acres.
- Stennett Butte 163 upland acres.
- Raisor 235 upland acres.
- Cedar Creek 134 upland acres.
- Wilson Creek 78 upland acres.
- Perkins Creek 38 upland acres.

Stands would be thinned from below. Trees selected for harvest would be the suppressed, intermediate, and co-dominant conifer trees, leaving the larger trees. This prescription would result in a stand with variable spacing, between 15 and 35 feet between remaining conifers and hardwoods. All hardwoods and Pacific yew would be retained, except where necessary to accommodate logging systems and for safety. In Stennet Butte and Little Creek, western hemlock infected with dwarf mistletoe would be removed to reduce the spread to remaining western hemlock trees. Susceptible conifer trees within 50 feet from the edge of six root rot pockets in Cedar Creek would be removed. The resulting gaps would be approximately two acres or less and would be planted with incense-cedar.

Perkins Creek would be proportionally thinned to an average of 37 trees per acres as outlined in the Density Management Study Plan (Cissel et al. 2006). Douglas-fir, western redcedar, and hemlock would be thinned while all minor species such as incense-cedar, Pacific yew and hardwoods would be retained.

Riparian Reserve Management

Silvicultural treatments would occur in the outer edges of the Riparian Reserve and would be treated the same as the uplands. Areas of no harvest, in close proximity to streams and wetlands, would vary between 25 feet and 200 feet. Approximately 503 Riparian Reserve acres would be treated. The approximate riparian acres proposed for treatment in each section are as follows:

- Fawn Peak 44 acres
- Little Creek 106 acres
- Stennett Butte 82 acres
- Raisor 108 acres
- Cedar Creek 48 acres
- Wilson Creek 63 acres
- Perkins Creek 52 acres

An average of 120 linear feet per acre of coarse wood debris (2 trees/acre) and 3 snags/acre would be created within portions of treated Riparian Reserves in Cedar Creek, Raisor Road, and Stennett Butte. See the implementation file for maps of specific areas.

Logging Systems

Thinning would be accomplished with a combination of cable and ground-based yarding systems. Cable yarding would be proposed for approximately 1070 acres and ground-based yarding would be proposed for approximately 490 acres (see maps in Appendix A).

Roads

See Appendix B for road tables, which details much of the following information.

Construction, Maintenance, Renovation, and Improvements: Approximately 38 miles of existing BLM controlled roads would be utilized as part of the project. Of that, approximately 23 miles of road would need maintenance, including added crushed rock surfacing. There would be approximately 4.5 miles of proposed new temporary road construction and approximately 1.5 miles of new permanent road construction. Approximately 17 miles of Weyerhaeuser Company controlled road would be used for timber and rock haul.

Culvert Replacements and New Installations: Between 25 and 50 stream crossing (non-listed fish) culverts have been identified for replacement. In addition, between 8 and 26 cross drain culverts have been identified for replacement. Approximately 5 stream crossing (non-listed fish) culverts would be installed in addition to the replaced stream crossing culverts. Approximately 21 cross drain culverts would be installed in addition to the replaced cross drain culverts.

Road Decommissioning: Approximately 7 miles of road would be decommissioned (long-term > 5 years). Actions may include entrances barricaded, slopes water-barred, stream and cross drain culverts removed, stream channels and banks restored to a more natural condition, and drain dips installed. Approximately 3.5 miles of road would be fully decommissioned (permanent). Actions in addition to decommissioned (long-term > 5 years) may include road bed tilled and/or receive slash or brush, and mulching and native species planting of disturbed areas.

3.3 ALTERNATIVE 3: WILSON CREEK HELICOPTER LOGGING

This alternative differs from Alternative 2 in the following areas:

Logging Systems

In Wilson Creek, approximately 85 acres of thinning would be accomplished with helicopter yarding systems.

Roads

Temporary spurs D, E, F, and G would not be constructed in Wilson Creek. This would be a decrease of approximately 4000 feet of road building as compared to Alternative 2.

3.4 DESIGN FEATURES FOR THE ACTION ALTERNATIVES

Harvest

1) Retain Pacific yew and hardwoods except where necessary to accommodate safety and logging systems.

2) Apply seasonal restrictions or suspension of all harvest and road activities that would occur within 1/4 mile of known nesting peregrine falcons, bald eagles, spotted owls, great grey owls, accipiter hawks, and other owls, hawks, or raptors if they are located at any time during project activities.

3) Apply reasonable and prudent measures, consistent with consultation of the United States Fish and Wildlife Service, to minimize disturbance to Northern spotted owl pairs and their progeny including:
- No harvest actions (including felling, yarding, decking) and road work (including construction and pre-harvest renovation) shall occur between March 1 and July 15 in all years the project is active.
- Log hauling and post-harvest road decommissioning are not subject to this restriction.
- Quarry activities: Blasting and rock crushing in Fawn Peak Quarry (T. 23 S., R. 3 W., Sec. 13) can occur only from July 16 to February 28. Any newly proposed quarry use must be evaluated for potential seasonal restrictions and authorized for use.
- Any of the above restrictions may be waived or modified by the Area wildlife biologist based on relevant survey information regarding occupation or nesting activity.

4) Retain snags and down logs in decay classes 3, 4, 5 on site. Remnant trees (> 28 inch DBH) would be retained, undamaged when possible, and would not be cut except those in road construction, landings, and yarding corridors, and those posing safety hazards.

5) Retain created snags, within Wilson Creek, marked with orange wildlife tags. If inadvertently felled or knocked down, these would be left on site as CWD.

6) Create snags and down logs within treated portions of Riparian Reserves in Cedar Creek, Raisor Road and Stennett Butte units; create an average of 120 linear feet/acre of down wood (3 trees per acre) and approximately 3 snags/acres. Snags would be created from live reserve trees 16-24 inches DBH. Creation would occur between July 1st and February 28th to minimize disturbance to nesting birds and animals.

7) Place cable corridors on the landscape to avoid felling large trees (> 28 inch DBH) and snags, and to minimize disturbance to down logs.

8) Existing down logs, snags, existing root wads and large diameter stumps would be retained on site; Down logs and root wads that present a hazard to logging operations or that are needed to close roads may be relocated within the project area.

9) Minimize the number of cable corridors through mapped TPCC areas.

10) Limit log lengths to 40' in length where necessary to minimize damage to residual trees, snags and coarse woody debris during yarding.

11) Restrict cutting and yarding during sap flow (April 1st to June 15th).

12) Utilize, when operationally feasible, falling and yarding techniques for the protection of retention trees, existing coarse woody debris, snags, and reserve areas.

13) Require one-end suspension of logs while skidding and cable yarding; intermediate supports may be required to accomplish this objective.

14) Space cable corridors 150 feet apart and minimize width to 12 feet: As determined by the Authorized Officer, if needed yarding corridors may be made erosion resistant by water barring or slash placement.

15) Approve mechanical harvester system when:

- Capable of directionally falling trees
- Traveling on the cushion of slash created by the harvesting process
- Where slopes are less than 35%
- Soil moistures are low (typically July 1st – Oct 1st)

16) Apply the following requirements to ground base yarding areas:

- Require felling of trees to lead of the skid trails and maximize winching distances.
- Placement of skid trails would be avoided within 100 feet of streams.
- All skidding equipment would remain on the designated skid trails.
- Average distance between skid trails would be 150 feet or greater where feasible.
- Use existing skid trails, where possible.
- Avoid placing skid trails on rocky soils.
- Restrict ground-based yarding to seasonally dry period when soil moisture content provides the most resistance to compaction. This is usually July 1st through October 1st.
- Till, where feasible, compacted skid trails, with an excavator to a depth of 18 inches, when soil moisture is appropriate (generally July 1st to October 1st).
- To reduce erosion and restore soil productivity, pull slash, logging debris and brush from the adjacent forest floor onto the skid trails.
- If tillage cannot be accomplished the same operating season, skid trails and temporary native surface roads would be left in an erosion resistant condition and blocked prior to the onset of wet weather. This would include construction of drainage dips, water bars, lead off ditches, and barriers (root wads or brush piles) to prevent vehicle access until final blockage and/or tilling.

17) Keep a Spill Contamination Kit (SCK) on-site during any operation within the project area; prior to starting work each day, all machinery would be checked for leaks and necessary repairs would be made.

18) Removal, notification, transport and disposal of any diesel, hydraulic fluid, or other petroleum product eased into soil and/or water would be accomplished in accordance with U.S. EPA and DEQ Laws, and regulations.

19) Cover and burn landing piles along permanent roads.

20) Pile, cover and burn slash, less than 6" in diameter and greater than 3' in length, within 25 feet of either side of the permanent roads within harvest areas.

21) Scatter landing piles, along temporary roads, on top of the road surface to remove the fuel concentrations, slow erosion and deter OHV use. Resulting fuel bed would not be deep and continuous.

Piles along temporary roads not scattered on the road surface may be covered and burned.

22) Cover all piles to be burned with plastic, in compliance with the Oregon Smoke Management Plan.

23) Prevent the spread of noxious weeds from other locations by:

24) All Equipment (graders, towers, cats, dump trucks, trucks) used as part of the timber sale operation would be cleaned prior to coming to the project area.

25) Use gravel from a weed-free source as determined by the sale administrator.

26) Treat all the roads to be used as part of the timber sale for weeds prior to the implementation of the timber sale; these treatments could include (but are not limited to) mowing, cutting, mulching and grubbing.

Helicopter Yarding

27) Yard with a helicopter capable of suspending logs free and clear of the ground and treetops.

28) Construct helicopter landings on BLM managed lands unless otherwise approved by the Administrative Officer.

Roads

29) Limit use of native surfaced roads to the dry season (generally between July 1st and October 1st). Waterbars, drain dips, and/or lead-off ditches may be required to create an erosion resistant condition on roads during seasonal closures. Access to such roads shall be blocked during closures.

30) Pull back stream banks at removed crossings to an angle of natural repose.

31) Disturbed areas would be planted with native seed and mulched with native straw or wood mulch before the first rains

32) Require the following along perennial streams:

33) Stream flow would be routed around the construction activity as much as possible (e.g. temporary flow diversion structure).

34) Sediment containment structure placed across the channel below the work section (i.e. straw bales) as needed.

35) Work site would be pumped free of standing water

36) Fish would be removed from the project area and block nets placed above and below the worksite.

37) After installation, the disturbed section would be planted with native seed and mulched with native straw or wood mulch before the first rains

38) Apply Oregon Department of Fish and Wildlife (ODFW) in-water guidelines to all in stream activities. Work would be done between the dates of July 1st through October 1st.

39) Implement the following combination of methods during heavy and/or prolonged rainfall or freezing and thawing periods to minimize sedimentation from the gravel surfaced roads into stream channels:

40) Keep ditch line, cross drains, and leadoff ditches clean and free to flow, while minimizing disturbance to existing ditch line vegetation.

41) Sediment traps may be installed in ditch lines lacking vegetation and having the potential to deliver sediment to streams.

42) Prior to and during haul operation, rock surfacing and road maintenance would be assessed throughout the project area and haul route.

43) If erosion and road degradation occur after freeze and thaw periods, log haul operations may be discontinued.

Road Decommissioning

44) Place sediment containment structure across perennial stream channel below the work section.

45) Locate fill or waste material outside of the riparian area and position a location that would avoid direct or indirect sediment discharges to streams or wetlands.

46) Reduce road sediment delivery by constructing road drainage features (drain dips or waterbars) on either side of restored stream channels.

47) Restore stream banks, where appropriate, with native plants, native straw or wood mulch, and planted with western red cedar where appropriate.

48) Till, where road subgrade conditions warrant, compacted road surfaces with an excavator when soil moisture is appropriate (generally between July 1 and October 1st). If tillage is not possible then waterbars and lead-off ditches would be constructed to reduce sedimentation to streams and wetlands. Logging debris and brush would be placed along roadbed to reduce erosion and block access.

49) Earthen barricades with brush and slash additions would be constructed to block vehicle access.

50) Recycle culverts removed from stream crossings or relief drainage sites.

4.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL EFFECTS

ISSUE 1: How would project activities affect the Primary Constituent Elements (PCEs) necessary to support Northern Spotted Owls?

4.1 AFFECTED ENVIRONMENT:

The Northern Spotted Owl (*Strix occidentalis caurina*; spotted owl) was listed as Threatened under the Endangered Species Act in 1990. Discussions of the spotted owl's habitat, current population status, areas of geographic concern, conservation needs, and Critical Habitat are found in the Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans (Chapter 3 pp. 283-298).

Spotted Owl Habitat: Generally, the proposed units show relatively small tree size, high tree density, uniform age distribution, and low amounts of useful large CWD and snags. The units also lack nesting structure, well-developed understory and shrub layers, sub-canopy flying space, and a variety of roosting choices for thermoregulation. Individual remnant trees with nesting structure are present in the project area, but because of their location in mid-seral stands they are not expected to provide for spotted owl use. The proposed units are considered primarily spotted owl dispersal habitat with limited foraging opportunities due to these stand conditions. Conditions in Wilson Creek and Perkins Creek are slightly different, however. Wilson Creek has a larger proportion of hardwood trees and large wetland areas, resulting in greater structural complexity; therefore this unit is spotted owl foraging habitat. Perkins Creek was thinned approximately 10 years ago and provides marginal dispersal habitat due to low canopy cover.

Approximately 470 acres of suitable habitat exists within 0.25 mile of proposed units; most (430 acres) is to the east of Fawn Peak.

Critical Habitat and Area of Concern: The proposed units, except for Perkins Creek, are within the Willamette/North Umpqua Critical Habitat Unit (CHU 13). CHUs are lands identified by the US Fish and Wildlife Service (Service) as essential for the conservation and recovery of listed species. CHU 13 was designated to provide one large and two smaller blocks of habitat to support resident owl pairs, and is also intended to provide a bridge of forested habitat across the Umpqua and Willamette valleys and between the Oregon Coast Range and Western Cascade Provinces. The Service called this an "Area of Concern" (AOC) when originally designating spotted owl Critical Habitat (Tweten 1992). The relevant Biological Opinion issued by the Service requires that actions in CHU/AOC maintain habitat function at both the stand and landscape scale (USDA and USDI 2008, page 6).

Spotted Owl Sites and Home Ranges: The effects of habitat modification to spotted owl sites in the Western Cascades physiographic province are assessed by evaluating habitat availability in generalized nest patches, core areas, and home ranges with radii of 300 meters, 0.5 miles, and 1.2 miles respectively (USDI and USDA 2008, pages 11-17). The home ranges of six known sites overlap the proposed units; previous timber harvest has impaired the ability of these home ranges to provide for spotted owl life history requirements (current habitat conditions are detailed in Table 3). Information on the location and status of the spotted owl sites in the project area is available from surveys conducted beginning in the 1990s (detailed in Appendix B).

4.1.1 ENVIRONMENTAL EFFECTS

Alternative 1:

No direct or indirect effects to spotted owls, their habitat, or Critical Habitat would occur under this alternative. Stands would not be modified and no potential for noise disturbance would exist. The proposed units would continue to provide for spotted owl use at current levels, and habitat development would continue along current trajectories. In Perkins Creek, where thinning has already occurred and the overstory trees are well-spaced, foraging habitat would develop in approximately 20-30 years and suitable habitat in 50-100 years. Wilson Creek would develop into suitable habitat in approximately 40 years, given the existing large remnant trees, diversity of tree species, and understory development. The development of suitable habitat in the remaining stands would depend on the release of overstory trees by competition mortality or natural disturbance (fire, windthrow, disease, or insect attack), events that are unpredictable. This process could take up to 100 years.

Alternative 2:

In Wilson Creek, approximately 142 acres of foraging habitat would be affected and approximately 1422 acres of dispersal-only habitat would be affected in the remainder of the project area. Vertical and horizontal cover would be reduced in treated areas through overstory tree removal, with varying levels of residual tree density. Harvest would also damage existing shrub and herb layers, and may also damage or destroy some coarse woody debris and snags. Additionally, up to 20 large-diameter remnant trees would be felled for road building in Wilson Creek; these trees would be left on site as CWD. Although these trees currently show late-successional characteristics, their scattered locations in a mid-seral stand limit their utility for spotted owls. However, any loss would represent a qualitative reduction in the potential for future habitat development.

Spotted owls would be expected to continue to utilize treated areas because post-project canopy cover and horizontal cover would continue to allow spotted owls to use stands. Canopy cover after treatment would be 40% or greater, a figure used as a threshold for dispersal function (Thomas et al. 1990). However, thinning has been shown to negatively affect spotted owl use (Glenn et al. 2004, Meiman et al. 2004, Pearson 2007), and spotted owls would likely utilize thinned stands less than unthinned stands for approximately 15-20 years until canopy cover and shrub/understory layers recover and develop further.

Thinning under Alternative 2 would not be expected to limit spotted owl movement or use of other stands in the project vicinity. Three of the proposed units (Cedar Creek, Raisor Road, and Wilson Creek) do not overlap any known spotted owl home ranges; the remaining units occur at the periphery of affected home ranges (0.75 miles or more from site centers). When the distance from known sites is considered with the availability of adjacent unthinned dispersal habitat, it is reasonable to assume that spotted owl use of affected home ranges would be unchanged.

The effects of the proposed action would be consistent with those described in the Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans (4-644 to 4-683). The FEIS reported habitat projections at large spatial scales (no smaller than fifth-field watersheds) and across decades, with an emphasis on projected conditions in the year 2056. The general conclusion reached is that implementation of the 2008 Eugene District ROD/RMP would contribute to the spotted owl conservation needs detailed on FEIS pages 3-286 and -287 in this timeframe.

The proposed action would accelerate the development of habitat features used by both spotted owls and their prey, like large trees and snags, multiple canopy layers, herbaceous and shrub vegetation, and large CWD. These features would develop in varying time frames; for example response from understory vegetation would take only years, while recruitment of large CWD could take hundreds of years. Removal of existing remnant trees in Wilson Creek could delay the development of suitable habitat for many decades in that stand.

<u>Noise Disruption</u>*:* Alternative 2 would have no effect to spotted owls from noise disruption because all activities would meet the minimum disruption distance, as established by the US Fish and Wildlife Service, from any

known spotted owl site, estimated spotted owl site, or unsurveyed suitable habitat; or operations would be seasonally restricted from March 1 to July 15. This would ensure that noise disruption would not cause spotted owls to abandon nests or fledge prematurely. As described above, the proposed units are at the periphery of known spotted owl home ranges; only the portion of Fawn Peak would require harvest and quarry activity restrictions.

<u>Critical Habitat and Area of Concern:</u> Alternative 2 would not negatively affect the ability of CHU 13 to support spotted owl recovery. Thinning would not affect spotted owl nesting habitat; only foraging and dispersal-only habitat would be treated. Although thinning would degrade spotted owl foraging and dispersal-only habitat in the short term (as described above), affected stands would retain their current function. Additionally, the configuration of thinning units, when considered with riparian buffers and surrounding untreated stands, would not preclude owls from moving through the landscape to use existing suitable habitat patches. This would allow for both movements of individual owls across the landscape, and for generational gene flow between the Western Cascades and Coast Ranges provinces.

Primary Constituent Elements (PCEs) of Critical Habitat such as large remnant trees, snags, and CWD would be maintained except where removal is necessary for safety or operational reasons. In these cases any trees or snags felled would be left on site as CWD. This is relevant primarily in Wilson Creek, where many large remnant trees that are PCEs exist. Although these remnants have suitable nesting features their current utility for spotted owls is low because they are scattered through a mid-seral stand and many are located near an edge with early-seral habitat on private land. Proposed road construction in this unit would remove up to 20 such trees. Sufficient remnant trees, however, would remain in the unit that their availability at the stand scale would be unaffected.

Although Alternative 2 would degrade approximately 1473 acres of spotted owl foraging and dispersal-only habitat in the short term, treated stands would continue to provide some function for owls, PCE availability at the stand scale would be maintained, and the ability of CHU 13 to support nesting and inter-provincial connectivity would not be compromised.

Thinning under Alternative 2 would also accelerate the development of PCEs like large trees and snags, multiple canopy layers, large CWD, and contiguous blocks of suitable habitat. Therefore, the proposed action would help CHU meet its goal of furthering the conservation and recovery of spotted owls.

<u>Alternative 3:</u>
Effects from Alternative 3 would be similar to Alternative 2, except in Wilson Creek. Under Alternative 3, helicopter yarding would be used in the eastern portion of Wilson Creek rather than building roads for cable yarding. Therefore, falling large remnant trees would not be required as in Alternative 2. Approximately 16 additional acres of foraging habitat would be thinned (160 acres total) because of the improved access a helicopter would provide. Acres treated in other units would not change.

Large remnant trees would not be felled for road building under this Alternative. Although these trees are not currently providing for spotted owl nesting, they would provide the first such opportunities in the stand when the younger trees grow enough to provide a more continuous canopy. Therefore, approximately 15 additional acres of suitable spotted owl habitat would develop under Alternative 3 as compared to Alternative 2.

Table 1. Acres and types of spotted owl habitat associated with affected sites. Figures in parentheses are percentages of project areas.

Site Name	Project area[1]	Existing Condition				Effects	
		Alternatives 1, 2, and 3			Alt. 1	Alternatives 2 and 3	
		Non-Habitat	Unsuitable	Suitable	Dispersal or Foraging	Dispersal or Foraging	Dispersal or Foraging Degraded
BAR CREEK	Patch	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	Core	0 (0%)	0 (0%)	0 (0%)	5 (1%)	5 (1%)	0 (0%)
	HR	0 (0%)	202 (7%)	120 (4%)	290 (10%)	206 (7%)	84 (3%)
DENNIS HAMBRICK	Patch	0 (0%)	0 (0%)	19 (26%)	32 (45%)	32 (45%)	0 (0%)
	Core	0 (0%)	8 (2%)	29 (6%)	194 (39%)	194 (39%)	0 (0%)
	HR	0 (0%)	92 (3%)	73 (2%)	424 (14%)	397 (13%)	27 (1%)
LEWIS CREEK	Patch	0 (0%)	14 (20%)	39 (55%)	0 (0%)	0 (0%)	0 (0%)
	Core	0 (0%)	106 (21%)	102 (20%)	42 (8%)	42 (8%)	0 (0%)
	HR	3 (0%)	716 (24%)	189 (6%)	502 (17%)	496 (17%)	6 (0%)
LOWER EDWARDS CREEK	Patch	0 (0%)	2 (2%)	41 (58%)	28 (39%)	28 (39%)	0 (0%)
	Core	0 (0%)	70 (14%)	208 (42%)	113 (23%)	113 (23%)	0 (0%)
	HR	8 (0%)	319 (11%)	571 (19%)	423 (14%)	406 (14%)	17 (1%)
SCORPION BUTTE	Patch	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	Core	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	HR	0 (0%)	10 (0%)	28 (1%)	204 (7%)	126 (4%)	78 (3%)
STENNETT BUTTE	Patch	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	Core	0 (0%)	13 (3%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	HR	0 (0%)	219 (7%)	46 (2%)	523 (18%)	482 (16%)	41 (1%)
[1] Nest Patch = 70 ac., Core Area = 500 ac., Home Range = 2955 ac.							

4.2 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES COMMON TO ALL ACTION ALTERNATIVES

4.2.1 VEGETATION: AFFECTED ENVIRONMENT

Stands proposed for treatment are well-stocked and were naturally or artificially regenerated after timber harvest. Perkins Creek has additionally been commercially thinned in 1980 and 2001. Stand ages vary throughout the project areas. Perkins Creek and Wilson Creek stands range between 65-80 years old. Cedar Creek and Raisor Road stands range between 40-65 years old. Little Creek, Stennet Butte and Fawn Peak are the youngest with average stand age ranging 30-40 years old. Occasional older remnant trees exist throughout the project area.

All sections are dominated by Douglas-fir, with smaller components of western hemlock, western redcedar, grand fir and incense-cedar. Hardwoods such as chinquapin and madrone tend to exist on ridgetops and rocky areas, while bigleaf maple, black cottonwood and red alder are generally found in riparian areas or disturbed areas within the project area. Minor amounts of Pacific yew are also present. The dominant understory vegetation consists of salal, vine maple, Oregon grape, and swordfern.

Stands are currently in, or are entering the stem exclusion phase. This occurs where the dense overstory trees compete with each other and suppress the growth of smaller trees and vegetation in the understories. Stands are largely uniform in structure. The Little Creek, Stennet Butte and Fawn Peak contain 200-340 trees per acre with an average dbh of 12". The Cedar Creek and Raisor Road range between 150-220 trees per acre with average dbh of 13-15" dbh. Wilson Creek has approximately 120 trees per acre with average dbh of 17" dbh. All stands but Perkins Creek in the project area contain average basal areas between 180-220 feet squared. Perkins Creek, which has been commercially thinned twice, is the exception and is not densely stocked, averaging 50 trees per acre with an average dbh of 20 inches and basal area of 90 feet squared.

There are pockets of western hemlock in Little Creek and Stennet Butte infected with dwarf mistletoe (*Arceuthobium tsugense* subsp. *tsugense*). Lightly infected trees have no measurable growth loss, but severely infected trees can lose up to 40% of their potential growth (Hennon, 2001). Mortality occurs as a direct result of the infection or attacks by other diseases and insects on the already weakened tree. Dwarf mistletoe infections may also affect the quality and usable volume of wood.

Cedar Creek has a few small areas of laminated root rot (*Phellinus weirii*) adjacent to Spur A. Pockets are not yet large and appear generally less than 100 feet in circular diameter. This disease is affecting the Douglas-fir on site (the only conifer species in the vicinity of the observed root rot) by weakening root systems. Tree growth on infected trees is reduced and susceptible trees (in this case Douglas-fir) are eventually killed from stress or by blowing down from weakened root stability. The root disease is known to spread approximately one foot per year from its center (Thies and Sturrock 1995).

Special Status Plant Species
Surveys, using established protocols, were done in fall and spring of 2008 for federally listed threatened or endangered and BLM Special Status vascular plants, lichens, and bryophytes.

Surveys for Special Status fungi were not conducted as per BLM information Bulletin OR-2004-145, which states that pre-disturbance surveys are not practical to conduct (due to the sporadic and unpredictable nature of fungi fruiting bodies, hence surveys are not required.

> *Survey Findings:*
> *Vascular plants: Orobanche pinorum*, clustered broomrape, a District review species, was found at Raisor Road. This species is a Eugene district review species, no mitigations are required, only documentation.
> *Bryophytes: Teraplodon mniodes* (Bureau sensitive, dung moss) and *Tayloria serrata* (Bureau sensitive, moss) both occurred at Fawn Peak. Both species are dung mosses, growing on old bones or the dung of carnivores. Guidance for managing Bureau sensitive species requires that the BLM manage these species so as not to increase the need to list the species under the Endangered Species Act. Tetraplodon is known from only 15 sites in Oregon, Washington and California.
>
> *Lichens: Leptogium platynum* (Bureau Strategic, dung moss) occurs on rock outcrops and the edge of gravel roads (via natural erosion from the rock outcrops) in Fawn Peak and Little Creek. *Leptogium rivale*, (Bureau strategic species) occur in creeks at Fawn Peak. Bureau Strategic status requires documentation of the species in GeoBOB, the BLM's special status species database. This gathers the information needed to determine status. Management of sites is only needed in situations where it is thought that the species may become a Bureau sensitive at the next review.

Invasive Plants
The units in the project area have very low levels of weed infestations. The majority of the project area is behind locked gates, which reduces the spread of noxious weeds and invasive plants by limiting the amount of traffic. The weeds present at all the units are Blackberries (Himalayan and cutleaf) and Scotch Broom. There is false brome at Wilson Creek, Stennett and Little Creek. There are also small infestations of St. Johnswort, tansy ragwort, Canada thistle, Herb Robert, meadow knapweed and bull thistle restricted to roadsides.

The infestations of false brome, herb Robert and meadow knapweed are small and isolated and far from other known infestations. These populations could be eradicated. Eradication prior to logging would prevent the spread of these weeds.

Table 2: Invasive Plant Survey Results

Unit Name	Survey area acres	Species Present	Roadside	Interior	Acres occupied by invasive plants (estimate)
Fawn Peak	403	Scotch broom Blackberries (Himalayan , cutleaf)	4 acres 7 acres	2 acres 1 acres	3%
Little Creek	578	False brome Scotch broom Blackberries	2 acres 2 5		1%
Stennett Butte	344	Meadow Knapweed Herb Robert False Brome Blackberries Scotch Broom	1 <1 <1 2 1		1%
Raisor Road	483	Scotch Broom Blackberries	10 2		2%
Cedar Creek	234	Scotch Broom Blackberries	3 4	2	4%
Wilson Creek	307	False Brome Blackberries (Himalayan , cutleaf)	7 3	1 3	5%
Perkins Creek	142	Scotch Broom Blackberries	4 4		6%

4.2.2 VEGETATION: ENVIRONMENTAL CONSEQUENCES

Alternative 1: No Action
Under the no action alternative, the project area would remain untreated. These stands would experience suppression, mortality, and reduced growth from tree to tree competition. The dense closed canopy would develop stagnant growth conditions that reduce individual tree growth potential, understory vegetative growth, structural diversity and species diversity. The Cedar Creek root rot areas would continue to expand through root to root contact (Thies and Sturrock, 1995). Stennet Butte and Little Creek hemlock dwarf mistletoe would continue to spread throughout the surrounding stand reducing the growth of existing hemlocks in the area and decreasing future hemlock recruitment into the understory. Because the mistletoe would not immediately kill the hemlock, they would still occupy the site and reduce growth of surrounding species as well. Eventually, other species would be able to outcompete hemlock in infected areas (Giels et. al., 2002).

The Density Management Study at Perkins Creek would not be completed as described in the proposed action, not completing the Density Management Study on silvicultural approaches to accelerate the development of late-successional forests.

Under the no action alternative, forest succession would progress and effects to Special Status plant species would depend on how each species is impacted by forest succession. Little is known about the succession of Leptogium platynum or Leptogium rivale. Both would probably continue unless some major catastrophic event occurs (flood or fire). The dung mosses would continue through time as long as dung continues to be deposited.

The mosses are able continue at a site on old dung (5+ years).

The No Action Alternative would have the least susceptibility to further introduction of invasive plant species as concluded by the Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans (Ch. 4 pg. 628).

Alternatives 2 and 3:
For both alternatives, the proposed thinning would reduce stand density, decreasing tree to tree competition and accelerating tree growth resulting in larger trees over time. In Stennet Butte and Little Creek, removing the infected western hemlock trees would reduce the spread of dwarf mistletoe, increase future wood quality, and increase healthy recruitment of hemlock seedlings in the understory. Removing trees around the root rot pockets in Cedar Creek would minimize the spread of the disease into the surrounding stand. Planting non-susceptible species such as incense-cedar in these root rot pockets would ensure the long-term presence of non-host species on site.

For Perkins Creek, remaining trees may develop large, complex tree crowns. Light on the forest floor would be increased creating conditions conducive to conifer and hardwood seedling establishment. This would create canopy layering, a greater range of tree sizes and tree species diversity over time.

No mitigations are required for Bureau Strategic species *Leptogium rivale* and *Leptogium platynum*. *Leptogium rivale* occurs in streams that will be buffered, protecting the species from direct disturbance and maintain the riparin microclimate. The rock outcrops that *Leptogium platynum* grows on are TPCC withdrawn. These sites would maintain the species and continue to supply individuals to the roads below the rock outcrops. Sites in the roads would be buried with the addition of rock to the road surface.

Invasive Plants: The final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans examined timber harvesting and road management activities for the potential to introduce and spread invasive plant species. The portions of the Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans that describe the results of the analysis are incorporated here by reference (Chapter 4 pages 627-642). The FEIS concludes that over the long-term (10+ years) the potential for introduction and spread of invasive plants would be higher in the harvest land base as opposed to the nonharvest land base.

4.2.3 WILDLIFE: AFFECTED ENVIRONMENTS

Key Habitats:
Coarse Woody Debris: Coarse Woody Debris (CWD) is an important habitat feature for many wildlife species. CWD provides refuge habitat, foraging sites, and travel corridors for species with low mobility and small home ranges (*e.g.* invertebrates, small mammals, and amphibians). Stand exam data show CWD distributed across a variety of diameters and decay classes; most CWD is either suppression mortality of current trees (small-diameter/low decay class) or residue from the previous harvest (large-diameter/high decay class, Table 3). Field review of the proposed units indicates that CWD is more regularly distributed in Riparian Reserves and irregularly distributed in upland areas; with the greatest amounts present in Riparian Reserves.

Proposed harvest areas contain an average of 1445 linear feet/acre (lf/ac) of down logs greater than 8 inches in diameter. Amounts were similar at Raisor Road and Wilson Creek (949-811 lf/ac), at Cedar Creek, Little Creek, and Stennet Butte (1553, 1680, and 1410 lf/ac), and were highest at Fawn Peak (2273 lf/ac).

Large, moderately decayed down logs provide the best currently available habitat features. Proposed harvest areas contain an average of 441 lf/ac of down logs ≥ 20 inch diameter in decay classes 3 and 4. Amounts are similar at Cedar Creek, Raisor Road, Stennet Butte, and Wilson Creek (239-522 lf/ac) and higher at Fawn peak and Little Creek (1133 and 978 lf/ac).

Hard CWD (especially small diameter) provides much less function for wildlife and generally represents potential future wildlife habitat after further decay. Most of the low decay class CWD has been recruited in the past few decades and is of small diameter. Proposed harvest area contain an average of 107 lf/ac of decay class 1-2 CWD, with a notably higher amount present in Cedar Creek (150 lf/ac). Decay class 1-2 logs ≥ 20 inches diameter were found only in Wilson Creek.

Table 3: Average levels of CWD (linear feet/acre) and snags (number/acre), 2010 Thinning. Shaded cells show ranges most valuable for wildlife.

Decay Class	Diameter[1]							
	8" - 15"		**16" - 19"**		**≥20"**		**All**	
	CWD	Snags	CWD	Snags	CWD	Snags	CWD	Snags
1	15	2.9	0	0	3	0	18	2.9
2	71	2.5	12	0.3	6	0.2	89	3.0
3	187	0.8	55	0	180	0	422	0.8
4	206	0.3	127	0	261	0	593	0.3
5	99	0	79	0	145	0	323	0
All	**578**	**6.5**	**273**	**0.3**	**595**	**0.2**	**1445**	**7.0**

[1] **Large-end diameter for CWD, Diameter at breast height for snags**

Snags: Snags are especially important to primary and secondary cavity nesting birds (songbirds, woodpeckers, owls) and roosting bats. Stand exam data show an average of 7 snags per acre in the proposed units. However, more than 90% of these snags are in small diameters (8-15 inches) that do not provide for many wildlife life history needs due to their small size and/or short lifespan. Large moderately decayed snags are most important to wildlife. Stand exam data show an average of only 0.5 snag per acre (7% of the average) that are 16 inches diameter or greater.

Approximately 400 snags were created in Wilson Creek in 2004 by girdling or topping live trees; these snags are small-diameter and low decay class due to their recent creation. Most of the treated area (86 of 126 acres) falls within Riparian Reserves.

Wetlands: None of wetlands, which exist within the project area, are of sufficient size to support breeding populations of either painted turtles or western pond turtles. Other Special Status Species that may be present in such habitats are not expected to be impacted by the proposed action and will not be analyzed in this EA because project design features would maintain or improve all habitat elements.

Special Status Species

Special Status wildlife species and habitats that may be impacted by the proposed alternatives are discussed below.

Bald eagles are a migratory species that will both overwinter and nest on the District. Bald eagles typically choose to nest in large trees with open canopies near large bodies of water, and are sensitive to disturbance while nesting (Buehler 2000, Isaacs and Anthony 2003). The northwest corner of T23S-R03W-S09 (Wilson Creek) is potential bald eagle nesting habitat because of nesting structure in large remnant trees and proximity/line of sight to Cottage Grove Reservoir. However, the likelihood of bald eagle nesting in this habitat is low due to the small patch size.

Harlequin ducks nest on the ground, in tree cavities, on cliffs or on stumps, usually within 5 meters of water although distances of up to 150 feet have been recorded. The lower reaches of Wilson Creek could provide suitable nesting habitat for harlequin ducks based on stream size and availability of logs and rocks as loafing sites. However, the area of potential habitat is small and the probability of harlequin ducks using the project area is low.

The purple martin is the largest North American swallow. Snags with woodpecker cavities are thought to be the most important habitat features for these populations (Brown 1997). Purple martin nests are typically found in open areas near water (Brown 1997, Horvath 2003). The project area could provide nesting opportunities for purple martins where large snags or trees with woodpecker holes are present, particularly in the east portion of Wilson Creek. Purple martins are also known to nest on private land approximately 1/3 of a mile to the east of Wilson Creek.

The *Fringed Myotis* is an insectivorous bat species found throughout the western U.S. The species appears to utilize a range of habitats, from sagebrush to Douglas-fir forest (reviewed in Verts and Carraway 1998). Known hibernacula and roost sites include caves, mines, buildings, and large snags (Weller and Zabel 2001).

Townsend's Big-Eared Bat is an insectivorous species associated with a variety of habitats, including desert scrub, pinyon-juniper, and coniferous forest (reviewed in Verts and Carraway 1998). Townsend's big-eared bat typically roosts and hibernates in mines and caves, but it has been found roosting in hollow trees as well (Fellers and Pierson 2002). Large remnant trees in the proposed units could provide foraging and roosting opportunities for these bat species, particularly in the east portion of Wilson Creek.

Salamander Slugs have been found in the Oregon Coast Ranges and Western Cascades; it is suspected to occur on the District, but has not been detected. Little is known about the life history and habitat requirements of this species. Sites where salamander slugs have been found included moist conditions and large coarse woody debris. Similar mollusk species require leaf litter, fungus, and/or detritus as food sources, as well as refugia from desiccation during dry periods. Potential habitat for the salamander slug exists throughout the project area, although habitat quality is difficult to assess due to lack of detailed knowledge of habitat requirements.
<u>Other Raptors:</u> A variety of raptors may also be present in the project area. Species found on the Eugene District include northern goshawks, Cooper's hawks, sharp-shinned hawks, merlins, red-tailed hawks, osprey, and barred owls. These species nest in a range of forested environments. Most hunt below the forest canopy, although red-tailed hawks (open habitats) and osprey (water bodies) are exceptions. The two species most likely to be using the project area are discussed below.

A northern goshawk site is located in T22S-R03W-S15, to the southeast of the Wilson Creek unit. Goshawks forage below the forest canopy and typically nest in larger-diameter trees with branches large enough to support their nests. Stands used by goshawks for nesting and foraging are generally older, with relatively open understories. Although Wilson Creek is more than a mile away from the site, the proposed unit could be used for foraging, and could also support goshawk nesting in larger trees.

Multiple osprey sites have been located in or near the Wilson Creek unit. The Laurel Mountain 1 site is located in Riparian Reserves within the unit. The Laurel Mountain 2 site is located in T22S-R03W-S10 and the Laurel Mountain 3 site was located in T22S-R03W-S16 (the nest tree has blown down); both of these sites are located on private land. Ospreys require tall snags or trees on which to construct nests.

<u>Migratory Birds:</u> Seven of these species (bald eagle, harlequin duck, marbled murrelet, northern goshawk, peregrine falcon, streaked horned lark, and vesper sparrow) are addressed above. Habitat for five other species (black swift, mourning dove, rufous hummingbird, willow flycatcher, and wood duck) would not be affected by the proposed action. The remaining three species that could potentially be affected by the proposed action are discussed below.

The band-tailed pigeon is a fruit- and seed-eating bird that is widely distributed across North and South America. Nesting in Oregon is generally in mature, closed canopy conifer stands, while more open forest stands and agricultural lands are used for foraging. Band-tailed pigeons travel widely in search of food, giving the species a nomadic nature. Mineral springs and deposits are also thought to be key habitat features.

The olive-sided flycatcher is an aerial insectivore associated with edge habitats between mature and early-seral stands, and large openings in late-seral habitat. It uses tall trees and snags for singing and foraging perches.

Purple finches are widely distributed, breeding in the Pacific states, the northeastern US, and Canada. The species typically uses early- to mid-seral coniferous habitat, but may also be found in agricultural and suburban settings. Purple finches' main diet is seeds, supplemented by fruit and insects.

4.2.4 WILDLIFE: ENVIRONMENTAL CONSEQUENCES

Alternative 1: No Action

Coarse Woody Debris and Snags**:** Existing CWD and snags would not be physically degraded or removed, nor would their quality or function change due to alteration of surrounding microclimate. Stands would continue to recruit small to medium-sized CWD and snags, primarily through suppression mortality. Although the numbers recruited would be higher than in treated stands, diameters would be smaller than in stands where tree growth was accelerated by thinning. Existing large-diameter CWD and snags would continue to decay and disappear from the stand within 50 years. These features would not be replaced until natural processes created the necessary growing space for the development of large-diameter trees.

Special Status Species: No direct effects to any Special Status Species would occur under this alternative. Habitat would be unaffected and would continue to provide for wildlife use at current levels, and no potential for noise disturbance would occur. Alternative 1 would indirectly affect Special Status Species by allowing habitat development to continue on its current trajectory. The development of late-successional features would depend on the release of overstory trees by competition mortality or natural disturbance. In Perkins Creek, where thinning has already occurred and the overstory trees are well-spaced, late-successional habitat would develop in 50-100 years. Wilson Creek would develop into late-successional habitat in approximately 40 years, given the existing large remnant trees, diversity of tree species, and understory development. The development of late-successional habitat in the remaining stands would depend on the release of overstory trees by competition mortality or natural disturbance (fire, windthrow, disease, or insect attack), events that are unpredictable. This process could take up to 100 years.

Alternatives 2 and 3: Action Alternatives

Coarse Woody Debris and Snags: Project Design Features would physically retain existing CWD and snags where possible in proposed units. However, harvest operations would damage some down logs (particularly those in decay class 4-5), and some snags could be felled for safety reasons or be inadvertently knocked over. Changes in microclimate due to overstory removal could also adversely affect CWD and snag function and quality until stand canopy conditions recover in 5-15 years.

Less small-diameter CWD and snags would be recruited in the first 50 years post-treatment compared to the No Action alternative because these trees would be harvested. Additionally, existing CWD and snags would continue to decay and disappear from the stands in this timeframe. Consequently, thinned stands would experience a reduction in CWD and snags compared to untreated stands for several decades; this reduction would negatively impact wildlife like forest floor invertebrates, amphibians, spotted owl prey species, and cavity nesting birds. A decrease in CWD would also diminish ecological functions such as moisture retention and nutrient cycling. Maintenance of untreated stream and wetland buffers and the eventual natural conversion of created snags to down logs would ameliorate this effect. Additionally, thinning would accelerate the development of large trees, and therefore long-term recruitment of large CWD and snags compared to the No Action Alternative.

Special Status Species:

Bald Eagle: Alternatives 2 and 3 would have similar effects to bald eagles. Harvest is not proposed in the small patch of potential bald eagle habitat, therefore noise disturbance is the only possible effect to bald eagles. Surveys for bald eagles would be conducted in the area and project timing would be modified to eliminate noise disturbance if nesting is detected. Therefore, neither Alternative would adversely affect bald eagles.

Harlequin Duck: Alternatives 2 and 3 would have similar effects to harlequin ducks. No-entry buffers along the lower reaches of Wilson Creek would protect the small area of potential habitat from both direct modification, as well as visual and noise disturbance.

Salamander Slug: Alternatives 2 and 3 would have similar effects to the salamander slug. Potential effects to this species are difficult to predict given the limited knowledge of its distribution and habitat requirements. Based on information for other similar mollusk species, most suitable habitat in the project area would be protected by no- entry riparian and wetland buffers. Additionally, large suitable CWD would be reserved when possible in upland areas. Therefore, adverse effects to the salamander slug would be unlikely. These Alternatives would indirectly benefit this species over the course of several decades by accelerating the development of large CWD and other habitat features typical of unmanaged stands.

Purple Martin**:** Under Alternative 2, suitable purple martin nest trees and snags would generally be reserved from harvest. However, some of these trees would be felled for safety and road building, which would have a direct negative effect on the species. Additionally, harvest operations adjacent to suitable nest trees during the breeding season could cause negative effects to purple martins through noise disturbance. Effects would be negligible throughout most of the project area because suitable nest sites are scattered and rare. The potential for adverse effects is much higher in Wilson Creek, however, where many large remnant trees exist and purple martins are known to nest nearby. However, these effects would be small when considered at the watershed scale and insignificant to the purple martin population as a whole. Thinning would indirectly benefit purple martins by accelerating the development of large-diameter trees that would eventually provide suitable nesting cavities.

Alternative 3 would protect suitable nest trees by eliminating road building in the east portion of Wilson Creek and therefore reduce direct effects to purple martins. Although some trees could be felled for safety reasons under this Alternative, the elimination of road building would essentially remove potential adverse effects to habitat. The potential for noise disturbance during the breeding season would remain under this Alternative, but these effects would last only one breeding season and not reduce future nesting opportunities in the stand. Given the small area affected, effects to purple martins under Alternative 3 would be immeasurable.

Bats: Under Alternative 2, trees and snags suitable for bat use would generally be reserved from harvest, but some of these trees would be felled for safety and road building, particularly in the east portion of Wilson Creek. In addition, harvest operations adjacent to suitable roost trees could cause noise disturbance to fringed myotis and Townsend's big-eared bats. It is unknown if these bat species are using the project area, and in many cases would be difficult to determine before felling if large trees or snags were truly suitable roost trees. Alternative 2 could have adverse effects to these bats at the stand scale. However, effects would likely be insignificant at the watershed and population scales given the relatively small number of trees affected and temporary nature of potential noise disturbance. This Alternative would indirectly benefit these species over the course of decades by accelerating tree growth and the subsequent development of suitable habitat features like deeply fissured bark and suitably-sized cavities.

Under Alternative 3, helicopter yarding in the east portion of Wilson Creek would largely eliminate the need to fall suitable bat roost trees and therefore have fewer direct effects to these species. Some suitable trees could still be felled for safety reasons, and the potential for noise disturbance would remain, but these effects would be insignificant given the small area affected. This Alternative would also indirectly benefit these species over the course of decades by accelerating the development of suitable habitat features like deeply fissured bark and cavities.

Raptors: Alternatives 2 and 3 would have similar effects to the raptor species. Surveys for both northern goshawk and osprey would be conducted at Wilson Creek starting in spring of 2009. If either is found to be nesting in or near the unit, project design or timing would be changed to eliminate effects from modification of nesting structure or from noise disruption. Indirect effects to osprey would be minimal, as the species would use the stand only for nesting. The proposed action would maintain habitat function for goshawk, and would improve conditions over the course of decades by increasing sub-canopy flying space and accelerating development of nesting structure.

Migratory Birds: Alternatives 2 and 3 would have similar direct and indirect effects on migratory birds and their habitats. Partial removal of overstory trees would reduce canopy cover and volume, and operations would remove or damage understory vegetation, snags, and some large remnant trees. This would reduce nesting and foraging opportunities for the species listed above in the short term, particularly the olive-sided flycatcher. Alternative 3 would reduce the need to fell remnant trees and would therefore have less impact to migratory birds. Thinning would also stimulate growth in residual trees, understory trees, shrubs, and herbaceous vegetation over the course of several decades. These effects would benefit these and other migratory bird species that use mature and late-successional habitat.

Project Design Features that are intended, in part, to mitigate effects on migratory birds include: favoring a diverse residual tree species mix, retention of large remnant trees where possible, retention of snags where not prevented by operational and safety concerns, retention of existing Decay Class 3, 4 and 5 coarse woody debris, and creation of snags and coarse woody debris.

4.2.5 HYDROLOGY AND FISH: AFFECTED ENVIRONMENT

Hydrology:
This project is located in the Coast Fork Willamette 4th Field Watershed (HUC 17090002). Two predominate streams in this watershed include the Coast Fork Willamette River, and Row River. Both of these rivers are near the proposed harvest units. Cottage Grove Reservoir is on the Coast Fork Willamette river system, and Dorena Reservoir is on the Row River system. Both were constructed in the 1940's for flood control purposes.

Peak Flows: All of the sub-watersheds, except for Lower Big River and Upper Big River, within the planning area are within the rain-dominated hydroregion. Precipitation in the project area is between 45 to 60 inches annually and the majority occurs in the form of rainfall between October and April. The project area ranges in elevation from about 960 to 2500 feet. Lower Big River and Upper Big River sub-watersheds are within the rain-on-snow hydroregion. The Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans identifies sub-watersheds within the rain-dominated and rain-on-snow hydroregions that are currently susceptible to increases in peak flows. None of the sub-watersheds within the planning were identified as currently susceptible to increases in peak flows. The portions of Chapter 4 - Water (pg. 753-758) and Chapter 4 - Fish (pg. 800-801) of the Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans that describe the current conditions for water quantity and peak flows are incorporated here by reference.

Water Rights: On private lands adjacent to the Cedar Creek, Raisor Road, and Stennett Butte units, water rights have been issued to private landowners for the beneficial uses of water for domestic purposes, irrigation, and forest management (water storage).

Streams, Wetlands and Springs: About 200 tributary streams exist within or adjacent to the project area. Most of these are perennial and either first or second order streams. Some of those streams are not connected by surface flow to the rest of the system. Thirty-four wetlands and thirty-two springs have also been identified.

Water Quality: The Oregon Department of Environmental Quality (ODEQ) developed Total Maximum Daily Loads (TMDLs) for temperature, bacteria, dissolved oxygen and turbidity for the Upper Willamette Subbasin in September 2006. Temperature and mercury (via sedimentation) may have a causal link to forest management and therefore those parameters have been addressed in the Eugene BLM Water Quality Restoration Plan approved by ODEQ in July 2008. That plan outlines a comprehensive strategy for implementing, monitoring, and evaluating management to address water quality impairment on BLM lands in the Willamette Basin.

Table 4: Streams near the Project Area on the 303(d) Water Quality Limited List			
Stream or Waterbody	Temperature	Mercury	Other
Coast Fork Willamette	X	X	Aquatic weeds, DO, Iron, pH, phosphorus
Cottage Grove Reservoir		X	
Dennis Creek		X	
Mosby Creek	X		
King Creek	X		
Row River	X		
Dorena Reservoir		X	

Mosby Creek and tributaries within the Mosby Creek watershed are also listed as “Core Cold-Water Habitat” by the Oregon Department of Environmental Quality. “Core Cold-Water Habitat” designations identify and ensure the protection of colder water habitats that provide more optimal conditions for salmon and steelhead juvenile rearing. In addition, these areas provide colder holding waters for pre-spawning adults (Oregon Administrative Rules 340-041-0001 Water pollution division 41).
The State water temperature criteria for streams within or adjacent to the project area is 18° C (64.4°F) since these streams are designated for trout rearing and migration. In July of 2002, the BLM monitored instantaneous flow, stream temperatures, and stream channel and riparian conditions in Big River in conformance with the Willamette Basin TMDL. The results of the monitoring indicated that the 7-day average maximum stream temperature in Big River did not exceed 18°C; and therefore was not included on 303(d) list.

Water temperature monitoring has been conducted at five locations at the Perkins Creek unit in conjunction with the density management study. Three of these sites were located on King Creek (Streams 3 and 6). This monitoring occurred between the years 1997 – 2001 and there were no days when the 7-day average maximum exceeded the 18°C state criteria. The DEQ monitored King Creek at river mile 0.1 between 1999-2003 and there were 19 days when the 7-day average maximum exceeded the 18°C threshold. In 2004, King Creek was added to the 303(d) list of water quality limited streams for elevated summer temperatures.

In 2008, the BLM developed a Water Quality Restoration Plan for the Willamette Basin which included a condition assessment of stream shade, goals and objectives for recovery, and proposed management measures (BLM, 2008). The Water Quality Restoration Plan was approved by the Department of Environmental Quality July 18, 2008. The Department of Environmental Quality identified increases in solar loading to streams, due to a lack of riparian vegetation from forestry, mining, agriculture, and urban activities as the primary sources of increases in stream temperature in the Upper Coast Fork Willamette, Row River and Mosby Creek watersheds. These activities have predominantly occurred along streams on non-BLM-administered lands. Of the 661 perennial stream miles in the Row River watershed, 73 (11%) occur on BLM-administered lands. Of the 195 perennial stream miles in the Mosby Creek watershed, 45 (23%) occur on BLM-administered lands. Of the 298 perennial stream miles in the Upper Coast Fork Willamette watershed, 77 (26%) occur on BLM-administered lands.

Solar radiation is the most important source of radiant energy affecting stream temperature (USDI, 2008). Forest trees near stream channels can block solar radiation and cast shadows across the stream. The Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans analyzed changes to stream shade as a surrogate for describing effects to stream temperature. The portion of the Final

Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans (Chapter 3 Water – pages 336-341) that describes the correlation between stream shade and stream temperature is incorporated here by reference.

As part of the Water Quality Restoration Plan, the BLM modeled stream shade levels using the Rapid Effective Shade model (Park and Hawkins, 2007) to determine the average existing shade within the Row River, Mosby Creek and Upper Coast Fork Willamette watersheds (BLM WQRP, 2008). Existing stream shade conditions in the watersheds are shown on Table 5.

Table 5: Average Existing Stream Shade in the Row River, Mosby Creek and Upper Coast Fork Willamette Watersheds.

5th Field Watershed	Average Existing Shade – All Streams	Average Existing Shade – BLM Streams
Row River	72%	86%
Mosby Creek	68%	84%
Upper Coast Fork Willamette	58%	84%

Based on modeling results, the existing shade on BLM-administered lands is relatively high compared to the site capacity (89%). The portions of the Water Quality Restoration Plan (pages 9-1 to 9-44) that describe the current shade conditions on BLM-administered lands are incorporated here by reference.

Mercury: Elevated mercury levels are an ongoing water quality problem in the Upper Coast Fork Willamette 5th Field watershed. Methyl mercury is accumulating in fish in Cottage Grove Reservoir and the Coast Fork Willamette River. The abandoned Black Butte mine has been characterized by Oregon DEQ as a likely source of mercury to downstream waterbodies, especially Cottage Grove Reservoir (BLM WQRP 2008). Timber harvest, road construction and maintenance, off highway vehicle use, or other activities that result in soil disturbance, increase the potential for sediment delivery and thus mercury to streams.

Table 6: Water Quality Recovery Goals from WQRP			
Element	**Goal**	**Passive Restoration**	**Active Restoration**
Temperature *Shade*	• Achieve coolest water possible through achievement of percent effective shade targets	• Allow riparian vegetation to grow up to reach target values.[1]	• Use prescriptions that ensure long-term riparian vegetation health. • Implement prescriptions that increase growth rate and survival of riparian vegetation. • Plant native species from local genetic stock to create a stand that will result in increased tree height and density. • Control invasive riparian and aquatic species
Temperature *Channel Morphology*	• Increase the amount of large wood in channels. • Improve riparian rooting strength and stream bank roughness. • Decrease bed load contribution to channels during large storm events. • Increase the ratio of wood-to-sediment during mass failures.	• Follow Eugene District Best Management Practices, TMDL Strategy and RMP direction for RMA widths considering floodplains, wetlands and unstable areas. • Retain blowdown within channel and riparian areas to allow for large wood recruitment promoting channel evolution and sediment retention.	• Where the site potential includes conifer, promote riparian conifer growth for future large wood recruitment (e.g. pre-commercial thinning; commercial thinning including variable density thinning, thinning from below, leaving unthinned clumps, and creating small gaps/openings). • Encourage woody riparian vegetation versus annual species (e.g. brush cutting and conifer underplanting). • Stabilize stream banks where indicated. • Maintain and improve road surfacing. • Reduce road densities by decommissioning non-essential roads. • Increase culverts to 100-yr flow size and/or provide for overtopping during floods. • Minimize future slope failures through stability review and land reallocation if necessary. • Ensure that unstable sites retain large wood to increase wood-to-sediment ratio.
Mercury ***Sediment***	• Reduce erosion of disturbed soils at sites having potential delivery to streams	• NA	• Implement erosion control measures described in BMPs in Appendix 1

[1] Passive versus active restoration of riparian areas. If current percent effective shade is greater than or equal to the TMDL target shade (from TMDL shade curve) and vegetation is at potential for the site disturbance regime, then the stream is considered recovered in terms of percent effective shade and the riparian area is not considered a candidate for active restoration for the purposes of temperature recovery.

Oregon DEQ has mercury monitoring sites in the watershed near the Black Butte mine, Cottage Grove Reservoir, and Dorena Reservoir. As a result of this monitoring the DEQ determined that legacy mining represented a significant source of mercury in the Upper Coast Fork Willamette watershed, but did not appear to be a major source of mercury in the Dorena system in the Row River watershed where the Perkins Creek unit is located (BLM WQRP 2008).

Fish Species and Distribution*:*
There are several anadromous and resident fish species that occur within the Upper Coast Fork Willamette, Mosby Creek, and Row River watersheds (See Table 7).

Table 7. Fish Species within the Upper Coast Fork Willamette, Mosby Creek, and Row River watersheds.

Common Name	Scientific Name
Chinook Salmon	*Oncorhynchus tshawytscha*
Rainbow Trout	*Oncorhynchus mykiss*
Cutthroat Trout	*Oncorhynchus clarkii*
Mountain Whitefish	*Prosopium williamsoni*
Largescale Sucker	*Catastomus macrocheilus*
Brook Lamprey	*Lampetra richardsoni*
Sculpin Species	*Cottidae sp.*

Chinook salmon only occur in the Mosby Creek and Row River watersheds and are part of the Upper Willamette River Chinook Evolutionary Significant Unit. The Upper Willamette River Chinook Evolutionary Significant Unit was listed as threatened under the Endangered Species Act on June 28, 2005 (70FR37160). The Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans describes the status of the species, including life history, populations, status and distribution, and key limiting factors for the Upper Willamette River chinook Evolutionary Significant Unit. Appendix J-Fish (pages 338-342), of the Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans that describe the status of this species is incorporated here by reference.

Prior to the construction of Dorena and Cottage Grove Dams, most of the Upper Coast Fork Willamette and Row River watersheds were accessible to chinook salmon and had naturally spawning populations (BLM, 2000). Currently, Mosby Creek is one of the few tributaries of the Coast Fork Willamette River that is entirely accessible to anadromous fish species (BLM, 2000). Chinook distribution in Mosby Creek occurs from the confluence with the Row River to river mile 14.5. In the Upper Coast Fork Willamette watershed, chinook distribution ends below Cottage Grove Reservoir. In the Row River watershed, chinook distribution ends below Dorena Reservoir.

Oregon Chub, a federally listed endangered species, is native to the Willamette River; though no known populations exist on BLM-administered lands.

Resident fish occur throughout the Upper Coast Fork Willamette, Mosby Creek, and Row River watersheds. The primary resident fish bearing streams within the project area are shown on Table 10.

Aquatic Habitat:
The Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans describes the aquatic ecosystem conditions and processes for ecosystems typical of the Upper Coast Fork Willamette, Mosby Creek, and Row River watersheds with particular emphasis on watershed conditions and processes. The Final Environmental Impact Statement concluded that:

- Habitat degradation is a factor for decline for Upper Willamette River chinook Evolutionary Significant Unit, and is a major risk factor that continues to threaten population segments.
- Large wood, stream temperature, sediment, and water flow have the greatest influence on aquatic habitat and the ability of aquatic habitat to support fish populations.
- The abundance and survival of fish species is often closely linked to the abundance of large woody debris in stream channels. The current amount of large woody debris channels is low.
- Eighty-seven percent of streams on BLM-administered lands, in the Cascades province, had less

than 22% embeddedness of fine sediment.

Table 8: Resident Fish Bearing Streams within the Project Area	
Stream	**Watershed**
Cedar Creek	Upper Coast Fork Willamette
Beck Creek, tributary to Cedar Creek	Upper Coast Fork Willamette
Wilson Creek	Upper Coast Fork Willamette
Boulder Creek	Upper Coast Fork Willamette
Little River	Upper Coast Fork Willamette
Bar Creek	Upper Coast Fork Willamette
Ewing Creek	Upper Coast Fork Willamette
Numbers Creek	Upper Coast Fork Willamette
Dennis Creek	Upper Coast Fork Willamette
Weyerhaeuser Creek	Upper Coast Fork Willamette
Johnson Creek	Upper Coast Fork Willamette
Tributary to Big River	Upper Coast Fork Willamette
King Creek	Row River
Mosby Creek	Mosby Creek

The portions of Chapters 3 (pages 365-390) of the Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans that describe the aquatic ecosystem conditions and processes are incorporated here by reference.

Upper Willamette River chinook critical habitat was designated on August 2, 2005 (70FR52630). Approximately 14 stream miles within the Mosby Creek watershed are designated as critical habitat for the Upper Willamette River Chinook. Critical habitat extends from the confluence with Row River to river mile 14.5. The National Marine Fisheries Service Critical Habitat Analytical Review Team (CHART) rated watersheds in Oregon as having a high, medium, or low conservation value for listed salmonids (USDC NOAA, 2005). The Mosby Creek watershed is rated as having a low conservation value for chinook (USDC NOAA, 2005).

Large wood is an important component of aquatic habitats, from headwater channels to estuaries in forested ecosystems (Dolloff and Warren 2003) and is delivered to stream channels from various processes (Naiman et al., 2000). The Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans concluded that prior to the 20th century, large channels and large rivers such as the Willamette River were full of wood or blocked by wood jams and accumulations, but that wood loading in the Pacific Northwest has generally declined to 1/100th of historical amounts. A detailed description of the importance and function of large wood, wood recruitment processes, and a description of the decline of large wood in stream channels can be found in the Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans on pages 372-383 and is incorporated here by reference.

Over the last 60 years, the amount of large wood within stream channels in the Upper Coast Fork Willamette, Mosby Creek, and Row River watersheds has also declined (BLM, 2000, BLM 1995). Timber harvest began in the watersheds in the late 1940's. Many riparian trees were removed which reduced the recruitment of large woody debris to stream channels. Existing instream large wood was also removed from streams, because log jams were believed to obstruct fish migration.

Several fish bearing streams were cleared through a splash-damming process in which a dam-break flood was induced to transport trees. These torrents scoured sediment and wood from streambeds and banks and left many larger stream channels scoured to bedrock (Sedell and Luchessa 1982, Montgomery et al. 2003).

Although this analysis focuses on the ecosystem process that affect aquatic habitat, benchmarks provide a method for comparing values of key components. While the condition of aquatic habitat is dynamic and depends on climate, geology, vegetation, and disturbance history, it is useful to know whether the value of a habitat feature in a reach of stream is "high" or "low". For example, knowing whether a reach has a "high" or "low" amount of large woody debris or fine sediments is useful when evaluating the condition of aquatic habitat and its influence on fish species. In Western Oregon, the Oregon Department of Fish and Wildlife considers the amount of large wood in stream channels to be high if there are more than 48 pieces per mile and low if there are less than 16 pieces per mile (Foster et al, 2001).

The current amount of large wood within stream channels in the watersheds is a reflection of natural disturbance and past management. Aquatic habitat inventories and watershed analysis have documented the current amount of large wood in surveyed stream channels. Compared to the benchmark values, the average amount of large wood in stream channels is approximately 16 pieces per mile and considered "low".

The amount of large wood within stream channels is also dependant in part on the amount of trees available on the landscape over time that can be delivered to stream channel from riparian mortality, debris flows or from channel migration. The Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans (pages 375-383) concluded that approximately 47% of riparian area forests on BLM-administered lands in the planning area lacked large conifers. Data from the Oregon Department of Fish and Wildlife aquatic habitat inventories in these watersheds indicate that there is generally a lack of conifers greater than 20 inches in diameter within areas that have the potential to deliver large wood to stream channels. In Western Oregon, the Oregon Department of Fish and Wildlife considers the amount of conifers greater than 20 inches in diameter to be "high" if there are more than 300/1000 feet along the stream channel, within 30 meters of each side of the stream channel, and "low" if there are fewer than 150/1000 feet (Foster et al, 2001). The average number of conifers greater than 20 inches in diameter along surveyed streams in the planning area is approximately 157/1000 feet.

Fish Passage***:*** A road inventory was conducted in planning area that included an assessment of road and culvert conditions. Three culverts were identified as limiting or preventing fish passage for resident fish species.

Sediment Delivery to Stream Channels: Fine sediments (sand, silt, and clay at less than 2 millimeters) enter and leave river channels naturally, but increased suspended sediment (turbidity) and sedimentation (embeddedness) can adversely affect fish (Anderson et al. 1996). Forest management activities can lead to accelerated rates of erosion and sediment yield (FEMAT 1993, V-6).

The effects of fine sediment on fish habitat are generally expressed as the percent of embeddedness at reach scales. Embeddedness is defined as the degree to which larger particles (such as boulders, cobble, and gravel) are surrounded and/or covered by smaller particles (silt, sand). Increases in sedimentation or embeddedness can reduce fish-spawning and rearing habitat, fish egg and fry survival, and food availability (Chamberlin et al. 1991, Hicks et al. 1991).

The background rate of fine sediment delivery entering stream channels in the Upper Coast Fork Willamette, Mosby Creek and Row River watersheds is estimated to be approximately 100-500 tons per square mile per year (Swanson et al. 1982, Grant et al. 1991, Stallman et al. 2005). However, this is an overestimate of the natural level in the watersheds, since this background rate includes both natural and human-made sources. Although the natural levels of embeddedness for the watershed in the Cederholm study were 10% embeddedness, natural, "good", or "properly functioning" levels for the Cascades province vary between 20% embeddedness (ODFW), 22% (EPA), 26% embeddedness (Murphy and Hall, 1981), and 52% (Murphy and Hall, 1981). The average amount of embeddedness in stream channels within the planning area is approximately 13% and considered low compared to these levels. Additionally, in 2004, the Oregon Department of Environmental Quality reported the results of stream conditions in western Oregon for all ownerships, as part of Section 305(b) of the federal Clean Water Act (CWA). This assessment found that 87% of the stream channels on BLM-administered lands in the Cascades province had fine sediment levels less than 22% and were rated as "good"; where 13% were fair (22-35% embeddedness) or poor (>35% embeddedness).

Increased concentrations of suspended sediment (turbidity) can also have direct effects on fish behavior, physiology, and growth (Anderson et al. 1996). Currently, there are no stream miles listed by the Oregon Department of Environmental Quality as turbidity impaired that occur on BLM-administered lands within the Upper Coast Fork Willamette, Mosby Creek, or Row River watersheds.

Road runoff and landslides are the primary routes of sediment delivery to stream channels (BLM, 2008). The Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans described the process, travel distances, and current amount of sediment entering stream channels from the existing road network. Reference road modeling was used to determine the amount of sediment delivery to stream channels from existing roads (BLM, 2008 FEIS Appendix J). The analysis concluded that the average sediment delivery to stream channels from the existing road network in the Upper Coast Fork Willamette watershed averaged 43 tons per mile per year; and 17 tons per mile per year in the Mosby Creek and Row River watersheds. The portions of Chapters 3 (pages 343-347) of the Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans that describe the current sediment delivery from roads to streams are incorporated here by reference.

In the three watersheds, roads and skid roads from past timber harvesting have impacted the stream network. As a result of past logging activities, skid roads and log culverts were constructed over stream channels or on soils susceptible to compaction. Erosion of the road bed has occurred over time which has mobilized and increased the delivery of fine sediment to stream channels. Disturbance to streambanks from stream crossings has led to streambank erosion where streambanks have become undercut. At some locations, stream channels were buried with road related debris when the road was constructed. At several locations, the road network has become hydrologically connected to the stream channel network where hillslope interflow is intercepted by the road segment and subsurface flows are converted to surface flows. Many roads, like Road 23-3-8.1, carry water during winter storm events which has extended the natural stream system. This had altered the timing and magnitude of water flow to stream channels and resulted in accelerated runoff of fine sediments from the road to stream channels (Furniss et al, 1996).

Off-highway vehicle (OHV) use on these existing roads has also deteriorated the road surface. Road No. 22-3-6 in the Cedar Creek unit is eroded and is currently a chronic source of fine sediment delivery to a nearby stream channel. Active OHV also occurs near the Perkins Creek unit and within the Stennett Butte unit. OHV use of these unmaintained roads has led to an increase in fine sediment delivery to stream channels as a result of sediment from eroded wheel ruts, roadside ditchlines, and cutbanks.

Approximately 90 stream crossings and ditch relief culverts on existing roads in this project area are not functioning properly due to rust, mechanical damage, being undersized, or otherwise having a risk of failure. Detailed information is available in the Engineering report. Existing private roads that provide vehicular access to the west side of Wilson Creek and to the south end of the Little Creek unit, are surfaced with a type of aggregate prone to accelerated weathering. This has resulted in an increase of fine sediment on the road during heavy haul use. The Little Creek road runs parallel to Little River, a fish bearing stream. There are five bridges along this road and these locations currently route road related sediment to Little Creek during wet weather. Because the rock aggregate on this road breaks down under truck haul, fine sediment is also entering Little River along the entire reach during dry weather due to excessive dust. Wilson Creek road also has similar problems with the rock aggregate surfacing, but the connection to streams is not as prevalent as that of the Little River access road.

Landslides occur on a small percentage of forest lands, over a variety of forest types, whether managed or unmanaged (BLM, 2008). Timber harvesting activities can influence the rate of shallow colluvial landsliding, mass failures, and debris torrents depending on the harvest location, type of harvest, design and operation (BLM, 2008).

Miller (2003), Miller and Benda (2005) and Miller and Burnett (2007) developed a GIS-based mass wasting hazard model for western Oregon to estimate the susceptibility to shallow colluvial landsliding to stream channels and wood recruitment to stream channels. The Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans analyzed the current relative landslide density within western Oregon, including the Upper Coast Fork Willamette, Mosby Creek and Row River watersheds. The analysis concluded that non-forested areas and riparian areas currently had the highest landslide density compared to Late-Succession Management Areas and the harvest land base (BLM, 2008). The portions of Chapters 3 (pages 347-351) of the Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans that describe the current relative landslide density conditions and processes are incorporated here by reference.

In the planning area, several unstable areas within the riparian area were identified. An unstable headwall was identified at the initiation point of Stream 44 on the Stennett Butte unit. At the Fawn Peak unit, unstable slopes were found adjacent to Streams 8, 12 and at Seep 6. The unit with the greater percentage of stream adjacent stability issues was Little Creek. Many of the streams in the north central portion of the section, which are tributaries of Bar Creek, displayed active and past bank erosion, several unstable headwalls, and at one location an old translational landslide.

4.2.6 FISH AND HYDROLOGY: ENVIRONMENTAL CONSEQUENCES

Alternative 1: No Action

Peak Flow: The sub-watersheds within planning area would not be susceptible to an increase in peak flows under Alternative 1. The Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans identifies sub-watersheds, including those within the planning area, that are currently susceptible to increases in peak flows or that would become susceptible as a result of timber harvest. The portions of the Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans that describe the results of the analysis are incorporated here by reference (Chapter 4 – Water, pages 753-758).

Stream Temperature: Under the Alternative 1, no actions would occur on BLM-administered lands that would contribute to an increase in existing stream temperature from BLM-administered lands. Existing shade would be maintained in the primary and secondary shade zones since trees would not be removed within Riparian Reserves. Over time, riparian vegetation would continue to grow and stream shade would increase along streams, but would not contribute to an overall decrease in stream temperature since the riparian areas are currently near or at site capacity.

Fine Sediment Delivery: For this analysis, 1 ton/mile/year is assumed to be equivalent to between .75 cubic yards/mi/year and 1.25 cubic yards/mi/year. The average (1.0) is used to convert tons/mi/year to cubic yards/mi/year. Using this assumption, existing levels of fine sediment delivery (43 cubic yards per mile per year in the Upper Coast Fork Willamette; and 17 cubic yards per mile per year in the Mosby Creek and Row River watersheds) from existing roads would continue in these watersheds under the Alternative 1. Fine sediment delivery to streams from road related sources would continue since deteriorating undersized stream crossing culverts would continue to deteriorate, and lead-off ditches or relief culverts would not be maintained (or new ones installed).

During a 2008/2009 road inventory, approximately 90 culverts were identified that would be at risk of failure because they are undersized, plugged, or currently failing. Calculating the amount of sediment delivered to streams if these culverts were to fail requires the following assumptions. In order to estimate sediment volume, the assumptions included using an average road prism width of 40 feet, because this is the typical BLM road width; an 18” culvert has a 4’active channel width, a 24” culvert has a 6’ active channel width, a 32” culvert has a 7’ active channel width, a 56” culvert has a 12’ active channel width, and a 72” culvert has a 20’ active channel width; and the average fill depth is 10’. It is assumed that the depth of fill multiplied by the active channel width multiplied by 1.5 (to account for the slop above the culvert failure) multiplied by the average road prism width would give an approximate estimate of how much sediment would be delivered to streams if high-risk culverts were to fail.

Based on these calculations and assumptions, it is estimated that the amount of sediment that would enter the stream channel from the existing culverts and/or roads failing would increase from existing levels from 35 cubic yards for an 18" culvert to 177cubic yards for a 72" culvert failed.

Fine sediment delivery to stream channels from unauthorized OHV use on a trail in the Cedar Creek would continue to increase under Alternative 1. For this analysis, it is assumed that 2 cubic yards/mi/year of sediment would be delivered to stream channels for each mile of road and/or trails with OHV use. Using this assumption, approximately 2 cubic yards/mi/year would continue to be delivered to the adjacent stream channel.

Large Wood Delivery***:*** Under Alternative 1, trees would not be removed within Riparian Reserves. Riparian Reserves would become dominated by mature and structurally complex forests over time and the availability of trees that could potentially be delivered to stream channels would increase (BLM, 2008).

Cumulative Effects: Fine sediments enter and leave river channels naturally, but increased suspended sediment (turbidity) and sedimentation (embeddedness) can adversely affect fish (Anderson et al. 1996.) Although existing levels of embeddedness within fish bearing streams within the Upper Coast Fork, Row River, and Mosby Creek watersheds is considered "low" or "properly functioning", Suttle et al. (2004) suggests that there is no threshold below which fine sediment would be harmless to fish, and the deposition of fine sediment in the stream channel (even at low concentrations) can decrease the growth of salmonids.

The 90 culverts identified as being at risk of failure would continue to pose a high risk for road failure. Many of the culverts were previously designed only to pass water and not sediment and large wood. This has resulted in culverts plugging due to large wood transport, sediment deposition at the inlet due to the backwater effect, and high velocity flows exiting the culvert resulting in channel scour. The plugging of a culvert during flood flows can result in overtopping and failure of the road prism. The road fill material is then directly delivered to a stream channel, eroding streambanks and increasing fine sediment within downstream habitat. Fine sediment delivery to fish bearing streams would also increase over time as a result of continued OHV activity. As trail surfaces deteriorate over time, additional fine sediment would be mobilized and delivered to stream channels during winter storm events.

Although the timing of culvert and road failure is unpredictable, the amount of sediment delivered to stream channels would increase (35-177 cubic yards) at 90 locations over the three watersheds. The relative increase of sediment for each watershed combined with the sediment delivered from OHV trails would increase from current conditions by 39%. However, this is likely an overestimate since it assumes all culverts would fail simultaneously, when there is a greater probability that they would vary temporally.
Sub-lethal effects (e.g. decrease in growth) to fish would continue to occur within fish bearing streams where fine sediment delivery has increased over time from road related and OHV trail sources. The extent of these sub-lethal effects would not occur over the entire watersheds, but would be limited to the areas where road and stream crossings have created chronic sediment inputs to fish bearing stream channels over time.

Although no actions would occur on BLM-administered lands that would contribute to an increase in stream temperatures, streams that flow onto BLM-administered lands that currently have water temperatures that exceed DEQ standards would continue as a result of existing or increased solar loading to stream channels from forestry, agriculture, and urban activities on non-BLM-administered lands (DEQ, 2005).

In the long term, increases in fine sediment delivery to stream channels from road related sources and OHV activities would be greatest under the No Action alternative, since activities such as road decommissioning, undesignated OHV trail closure, and replacement of high risk road-stream crossings and road drainage improvements that would reduce long-term chronic sediment sources to stream channels would not occur.

Alternatives 2 and 3: Action Alternatives

Peak Flow: The sub-watersheds within planning area would not be susceptible to an increase in peak flows under Alternatives 2 and 3. In the rain-dominated hydroregion, timber harvesting influences peak flows in stream channels only where a large proportion of existing vegetation is removed within a short time period of time in a sub-watershed (BLM, 2008). The Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans identifies sub-watersheds within the rain-dominated hydroregion that would be susceptible to increases in peak flows as a result of timber harvest. The analysis used assumptions regarding the number of acres harvested on BLM-administered lands and non-BLM-administered lands to determine if the sub-watershed would be susceptible to increases in peak flows as a result of timber harvest. For non-BLM-administered lands, the acres harvested within the rain dominated sub-watersheds are within the modeled assumptions, and the proposed actions for BLM-administered lands are within the scope of the modeled assumptions. Therefore, the portions of Chapter 4 - Water (pg. 753-758) and Chapter 4 - Fish (pg. 800-801) of the Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans that describe the effects of timber harvest on peak flows and fish are incorporated here by reference.

The two sub-watersheds within the rain-on-snow hydroregion would not become susceptible to increases in peak flows. The Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans also identified sub-watersheds within the rain-on-snow hydroregion that would be susceptible to increases in peak flows as a result of timber harvest. The analysis used assumptions regarding the number of acres harvested on BLM-administered lands and non-BLM-administered lands to determine if the sub-watershed would be susceptible to increases in peak flows as a result of timber harvest. For non-BLM-administered lands, the acres harvested within the rain-on-snow sub-watersheds are within the modeled assumptions. Therefore, the portions of Chapter 4 - Water (pg. 753-758) and Chapter 4 - Fish (pg. 800-801) of the Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans that describe the effects of timber harvest on peak flows and fish are incorporated here by reference.

Stream Temperature***:*** Under Alternatives 2 and 3, commercial thinning within Riparian Reserves in the Perkins Creek density management study unit would reduce stream shade and result in an increase in stream temperature of 3-6 degrees (depending on stream flow). Increased stream temperatures can result from the removal of shade-producing riparian vegetation along fish-bearing and smaller tributary streams that supply cold water to the fish bearing streams (Beschta et al. 1987, Bisson et al. 1987). In the Perkins Creek density management study unit, commercial thinning would occur to within a 10-20 foot retention area on either side of the stream channel and to a 50 foot retention area on either side of two stream channels within the variable retention buffer. A retention area of 10 feet along a stream channel typically provides a 20% angular canopy density and 50% effective shade (BLM, 2008). This reduction in shade would result in increased stream temperatures within the stream channels within the unit. Removal of trees within the secondary shade zone, along streams within the variable retention area, would reduce canopy closure to 20-30% which would also reduce effective shade and contribute to an increase in stream temperature until stream shade returned to pre-treatment levels in approximately 30 years following harvest.

In all other units within the project area, commercial thinning within the Riparian Reserves would not contribute to an increase in stream temperature. Trees would not be removed within the primary shade zone (25 feet on either side of seeps and springs, 75 feet on first and second order non-fish bearing streams, and up to 200 feet on fish bearing or larger order streams), and at least fifty percent canopy closure would be maintained in the secondary shade zone. The Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans found that maintaining full retention within the primary shade zone and 50% canopy closure in the secondary shade zone would result in the retention of sufficient shade to avoid any measureable increases in water temperature. The portions of the Final Environmental Impact Statement that describe the results of this analysis (Chapter 4, pages 759-760) are incorporated here by reference.

Fine Sediment Delivery: The removal and replacement of existing culverts at stream crossings, road decommissioning, and OHV trail decommissioning would require the operation of heavy equipment within and adjacent to stream channels. These activities would temporarily (less than two weeks) disturb the riparian vegetation, expose soil, and increase stream turbidity and fine sediments.

Under Alternatives 2 and 3, approximately 84 existing culverts that have been identified as having a safety risk or impacts to water quality would be replaced and 11 existing culverts would be removed in conjunction with the proposed road decommissioning. Approximately three of these culverts would be removed or replaced on or near a fish bearing stream channel. The removal and replacement of culverts that would be beneficial for fish species and aquatic habitat would also result in short-term increases in sediment delivery and turbidity to fish bearing stream channels. Approximately 60 of the culverts would not be replaced in conjunction with timber harvesting, but would be replaced as funding becomes available for restoration or road maintenance work.

It is estimated that 2.6 cubic yards of sediment would be delivered to stream channels at the culvert removal and replacement sites in the short term (less than one year). Although the short term increase in fine sediment delivered to fish bearing stream channels would be greatest under Alternative 2 and 3, the long term reduction of chronic sediment delivery to stream channels would be reduced to the greatest degree under these Alternatives. This short term increase would be 93% less than the amount that would result under Alternative 1 from culvert and road failures.

In the long-term, decreases in sediment delivery would result from upgrading permanent roads by replacing culverts, adding cross drains, adding aggregate, and decommissioning existing roads with chronic fine sediment delivery to stream channels. Replacement culverts sized to accommodate 100-year storm events would improve drainage and reduce the risk of catastrophic failure during major flood events and impacts to downstream spawning and rearing trout habitat. In order to estimate the reduction of sediment from these activities, it is assumed that 2 cubic yards of sediment per road mile is delivered from each site and there are approximately two sites per road mile. Currently, 43 cubic yards of sediment per mile per year (32,680 cubic yards/watershed/year, .05 cubic yards/mi/year) occur from the existing roads (760 square miles of roads) in the Mosby Creek watershed; and 17 cubic yards per mile per year (or 12,005 cubic yards/watershed/year) occur in the Upper Coast Fork Willamette River watershed (765 square miles of roads). Based on these assumptions, under Alternatives 2 and 3, the amount of sediment delivered to stream channels as a result of these road activities would be reduced by 22% (9.5 cubic yards/mi/year) in the Mosby Creek Watershed, and by 21% (3.5 cubic yards/mi/year) in the Upper Coast Fork Willamette River watershed.

Fish species have the ability to cope with some level of sediment at various life stages, and increases in fine sediment and turbidity can have both beneficial and detrimental effects to salmon and other fish species (BLM, 2008). Increases in sediment at the sites would temporarily (less than two years) increase embeddedness. In order to the determine the effect on spawning and incubating gravels, a relationship established by Greig and co-authors (2005) between suspended sediment load and the accumulation of sediment is used. Greig and co-authors found fine sediments delivered typically mobilize and move out of the stream system during fall rains and that the accumulation of fines within spawning redds involved less than 0.1% of the available sediment load.

Using this assumption, the amount of sediment that would affect spawning habitat and fish survival in the short-term from all sources would be less than a .002% increase from the current rate (approximately 0.9 cubic yards/mi/year) in the Mosby Creek watershed and less than .002% (0.9 cubic yards/mi/year) in the Upper Coast Fork Willamette watershed. Lisle and co-authors (1992) established a relationship between the volume of fine sediment accumulated within spawning gravels, bedload, and fish survival rates. Based on the relationship described by Lisle (1992), an increase of 0.9 cubic yards/mi/year would not be an amount that would affect spawning habitat or fish survival.*Turbidity*

The proposed culvert activities would increase turbidity from instream disturbance. Turbidity would increase above 25 nephelometric turbidity units for approximately several hours each day over a one to two week period.

Best Management Practices such as sediment control structures would be utilized to prevent turbidity from increasing above 50 nephelometric turbidity units in order to meet ODEQ standards. Turbidity levels would decrease and return to background levels within approximately 2-24 hours (NOAA, 2008) after cessation of stream channel disturbance.

At certain levels, elevated turbidity can increase cover, reduce predation rates, and improve survival (NMFS, 2008). Many studies have shown that fish can tolerate sediment exposure for short periods (McLeay et al. 1983); typically 3-5 days (Sigler et al, 1984) before adverse effects occur. However, chronic exposure and increased greater than 25 nephelometric turbidity units can cause physiological stress responses that reduce feeding and growth in coho salmon (BLM, 2008). Bisson and Bilby (1982) found that juvenile coho salmon avoided water with turbidities that exceeded 70 nephelometric turbidity units. However, the timing, frequency, and duration of exposure is often more important in determining the effects to fish that the overall concentration or amount (BLM, 2008; NMFS, 2008).

If best management practices such as sediment traps are utilized, the increases in turbidity would be below the threshold that would have adverse effects to fish, since the increase in turbidity would be less than would be short-term and would occur during and shortly after construction. Direct mortality of fish would not occur as a result of the proposed action since increases in turbidity and fine sediment (embeddedness) would not be elevated to lethal levels. Adverse effects to resident fish species would include temporary avoidance, reduced feeding, and gill stress (Suttle et al, 2004, Bash et al, 2001) since the duration of the increase would occur beyond 3-5 days and at concentrations above 25 nephelometric turbidity units. The magnitude of the adverse effects to fish populations would be limited to the project reach and would not reduce fish populations because of the limited magnitude and duration of the effect.

Additionally, culvert activities within fish bearing streams would occur between July and October to minimize the impacts to fish populations. During this time period, adverse effects would be limited to resident fish species since anadromous fish do not occur within streams where culvert activities would take place.

The proposed temporary road construction would occur predominately at ridgetop locations, so there would be no direct mechanism for sediment to enter fish bearing stream channels as a result of the road construction. The exception to this is in Alternative 2 where a temporary road would cross two non fish bearing streams. The Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans described the basic erosion rates for newly constructed roads based on the underlying geology. Based on these estimates it is assumed that approximately 60 cubic yards/acre/year of sediment would be delivered to the two stream channels for 1-2 years. However, this is an overestimate since Best Management Practices would be applied to reduce the amount of sediment entering the stream channel during and following construction. Typically, Best Management Practices for roads (e.g. straw mulching, end hauling, and sediment fences) would reduce sediment delivery to streams by 90-95% (URS, 2000). Therefore, with the application of Best Management Practices approximately three cubic yards/acre/year would be delivered to the stream channel. The project design features also provide for soil stabilization at stream crossing sites after culvert removal (decommissioning). Under Alternative 3, this road would not be constructed and no sedimentation would occur at the site.

Decommissioning roads (see engineering report) would restore the hydrologic connectivity of stream channels and would reduce the potential for future road prism failure. Tilling (where feasible) would help restore water infiltration to the soil and reduce the potential of surface runoff reaching nearby streams. For these reasons, road decommissioning would have long-term beneficial effects to downstream fish habitat by reducing fine sediment delivery to stream channels. Decommissioning Road No. 22-3-6 , which is currently being used as an OHV trail in the Cedar Creek area, would hydrologically restore the stream channel reduce or eliminate road related sediment delivery to the stream channel. In total, 9.4 miles of road would be decommissioned. This would reduce sediment delivery to stream channels by .235 cubic yards/mi/year (or .06% from the current rate) in the Mosby Creek watershed; and by .094 cubic yards/mi/year (or .06% from the current rate) in the Upper

Coast Fork Willamette River watershed.

At the Wilson Creek unit, hauling on Laurel Mountain Road could result in localized areas of sediment input to nearby streams due to surface rock wear under both Alternatives 2 and 3. The Laurel Mountain Road is an old railroad grade and at some locations, relief drainage to divert runoff away from streams is not possible without redesigning the road. This road is not controlled by the BLM. By comparison, the use of the Weyerhaeuser Tie Road to the north would have less potential for direct sediment delivery to streams since the Tie Road does not cross many streams and has adequate relief drainage, and rock surfacing.

Log haul via road 23-3-15.1 would include the reconstruction of several failing stream crossings and result in an increase of fine sediment delivery to streams for a short period of time. Sediment generated from road surfaces from winter hauling would be primarily delivered to ditch lines and then out of the ditchlines via ditch relief culverts before reaching stream channels. Sediment directed to hillsides by ditch relief culverts would filter into the soil prior to the sediment reaching stream channels. Brake *et al*. (1997) found that on established logging roads within the Oregon Coast Range, the maximum observed distance sediment traveled below a ditch relief culvert with vegetation filtering or a stream crossing culvert with stream material present (LWD, boulders, debris, etc) was typically not more than 6.21 meters. Within the project area, the majority of stream crossings occur on non-fish bearing streams or are greater than 6.21 meters from the crossing, so sediment delivered from the road surface would not reach fish bearing streams.

Timber falling and yarding, ground based skidding, and other timber harvest activities have the potential to increase fine sediment delivery to stream channels as exposed soil is delivered from overland flow (BLM, 2008). However, because logs will be directionally felled and yarded away from stream channels, cable yarding landings would be located primarily on ridgetop locations outside Riparian Reserves, the topography is relative flat near the stream channel, and because vegetation buffers would exist between the stream channel and the harvest unit; soil disturbance near the stream channel and subsequent sediment delivery to stream channels would not occur.

<u>Large Wood Delivery</u>***:*** Under Alternatives 2 and 3, commercial thinning would occur within Riparian Reserves. Riparian Reserves would become dominated by mature and structurally complex forests over time and the availability of trees that could potentially be delivered to stream channels would increase. The Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans concluded that in all fifth field watersheds, including the Upper Coast Fork Willamette, Row River, and Mosby Creek, the large wood contribution to stream channels would increase over time. The analysis also concluded that thinning within wood source areas (e.g. riparian areas), would increase the amount of larger diameter trees compared to unthinned areas. The proposed action would be within the assumptions of the FEIS analysis. Therefore, the portions of Chapter 4 - Fish of the Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans (Chapter 4 - Fish, page 779-799) that describe the effects of large wood delivery on fish and aquatic habitat are incorporated here by reference.

Cumulative Effects:
Under Alternatives 2 and 3, fine sediment delivery would increase in the short term from all activities by 4.8 cubic yards/year for up to two years following construction; and spatially over two fifth field watersheds. This increase would be 93% less than if the replacement of deteriorated and/or undersized stream crossing and relief culverts did not occur and road/culvert failure occurred. Additionally, the replacement of deteriorated and/or undersized culverts and decommissioning roads with potential impacts to impact aquatic life and water quality would greatly reduce the risk of mass wasting and the chronic erosion and sedimentation thus providing benefits to the overall health of the aquatic ecosystem within the watershed. Cumulatively, these activities under Alternatives 2 and 3 would reduce the existing rate of sediment entering stream channels by 21% in the Mosby Creek watershed and by 22% in the Upper Coast Fork Willamette watershed.

Contributing to an increase in water temperature of 3-6 degrees would occur along tributaries of King Creek.

King Creek is currently listed by ODEQ for impaired water temperatures. Under Alternatives 2 and 3, water quality standards and goals of the Water Quality Restoration Plan would not be met for up to 30 years until the canopy begins to close and solar radiation decreases.

4.2.7 SOILS: AFFECTED ENVIRONMENT

Field inspection during sale planning provided verification of the Lane County Soil Survey. The primary upland soil contained is Peavine silty clay loam, with Kinney cobbly loam, Klickitat stoney loam, and Honeygrove silty clay loam soils as minor components. Kilchis and Cumley soils occupy sensitive sites that have limitations for operations.

Peavine soils are present in much of the project area. These soils are moderately deep and well drained, with silty clay loam topsoil over silty clay and clay subsoils. Nutrient status and resiliency are high, as is water holding capacity in the upper 20 inches. Peavine soils occupy gradual and moderate slopes throughout the extensive sale areas. Coarse content within the soil profile is less than 20% and surface rock is uncommon.

These sites are available for ground based harvest systems where slopes are less than 35 %, provided the full suite of mitigations are applied to reduce the severity and extent of compaction and displacement.

Honeygrove soil series is deep and well drained, with silty clay loam topsoils over clay subsoils. These sites have high productivity and resiliency. The low amount of coarse fragments, high clay content, and high organic matter all combine to produce a high water holding capacity. This soil series typically occurs on broad stable ridges and slopes less than 25%.

These sites are available for ground based harvest systems where slopes are less than 35%. However, these soils are slow to dry due to the high clay content and the absence of coarse fragments.

Cumley soils are the most widespread in Lane County. Cumley soils usually occur in depressional topography adjacent to streams and wetlands, or on old landslide topography that has benches and short steep slopes. The soils are deep with high nutrient status and plant available water. Topsoil is a silty clay loam with silty clay and clay subsoil. Permeability is moderately slow, due to the high clay content and minimal coarse fragments.

These soils have a seasonal high water table at 2 to 3 feet as evidenced by mottles. These sites are perennially too moist to permit ground based systems without substantial compaction occurring. Cumley soils are only dry between 4 to 12 inches for less than 45 days during the summer months.

Kinney soils are deep and well drained, with weathered bedrock at 55 inches. The surface soil is cobbly loam, the subsoil cobbly clay loam with 25 to 45% coarse content. Kinney soils occupy variable slopes. Nutrient status, plant available water, and resiliency are all high. Risk of surface erosion may be high due to the loamy texture and high gravel content.

These soils are available for ground based harvest systems provided the full suites of mitigations are met (see Project Design Features).

Klickitat series occurs on moderately steep to very steep side slopes. The soils are moderately deep and well drained with a stony loam surface layer and cobbly clay loam subsoil. These soils are skeletal, with stone and cobble content ranging from 40 to 60%. Resiliency and productivity are classified as intermediate.

The Bohannon soil series is moderately deep and well drained, with gravelly loam topsoil over a cobbly loam subsoil. Coarse content averages at least 35 %, mostly pebbles in the upper reaches of the profile, with more cobbles at depth. These sites are classified as intermediate productivity and resiliency. Slopes where Bohannon soils occur in the project area are usually less than 25%.
Bohannon soils are available for ground based systems provided the full suites of mitigations are met (see

Project Design Features).

Blachly soil series is deep, with a silty clay loam topsoil and a heavy clay subsoil. These sites have high resiliency and productivity. The low amount of coarse fragments and high clay content create moderately slow internal drainage which makes these sites prone to compaction.

Blachly soils are available for ground based systems provided the full suites of mitigations are met (see Project Design Features).

Timber Production Capability Classification System (TPCC): This inventory is designed to identify sites capable of sustaining intensive timber management without degradation of their productive capacity. For this project, approximately 25 acres had been recorded as nonproductive non-forested lands prior to the field work. Existing polygons have been refined and some acreage slightly enlarged as part of project planning. No new withdrawn areas greater than 5 acres have been identified.

Road Density: Perkins Creek and Stennet Butte have the most roads, approximately seven miles each. Cedar Creek has the least, with about three and 1/2 miles. The other four sections range from five to six miles each, or about 20 acres of productive forest land currently committed to permanent infrastructure in each section.

4.2.8 SOILS: ENVIRONMENTAL CONSEQUENCES

Alternative 1: No Action

No additional compaction or displacement would occur as a result of harvest or road building.

Alternatives 2 and 3: Action Alternatives

Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans describe the effects of forest management soil productivity and are incorporated here by reference (Chapter 4 – pages 837- 842). The analysis showed that using the same practices used from 1995-2006 under the current resource management plan (as represented by the No Action Alternative) long-term conservation and the productive capacity of the forest soils across the planning area would be maintained.

The analysis also determined that timber harvest activities could cause soil compaction, displacement, and erosion. The duration and extent depends on factors such as soil characteristics, harvest method and mitigations.

For this project, the bulk of the thinning is proposed on sites with intermediate and high resiliency soils. These soil types can sustain substantial manipulation and still maintain nutrient capital, inherent physical and chemical properties, hydrologic function and natural rates of erosion. Project design features would minimize the potential for accelerated erosion throughout all phases of operation.

Cable Yarding: Approximately 1,070 acres, or 70% of the total acres planned for harvest, would be yarded with cable systems. Direct effects of cable yarding would be displacement of surface soils and organic matter, and discontinuous localized compaction within yarding corridors. These effects would be confined to a narrow strip less than 10 feet wide. Compaction would be deeper and more continuous for areas harvested in the winter when soils are wet. Project Design Features would limit the extent of these impacts and the potential for prolonged accelerated erosion.

After operations, bare soil exposure and compaction in corridors and associated landings would occupy about three percent of the cabled portions, or 32 acres in the seven sections. Full vegetative recovery is expected within five years for the highly resilient soils (Peavine, Kinney, and Honeygrove, and Blachly series'). Vegetative cover on the coarse textured intermediate resiliency soils is expected in less than 10 years (Klickitat, and Bohannon series'). Lateral yarding on steep slopes with coarse textured soils can create severe displacement and increase the potential for prolonged surface erosion. When feller bunchers are used on moderate slopes prior to cabling, these effects from lateral yarding may be reduced.

Ground Base Yarding: In general, ground based harvest would be planned where suitable soils occur and slopes are less than 35%, which is approximately 490 acres or 30%, within the seven sections proposed for harvest. These logging systems have the potential for more extensive compaction than cable systems because trails are wider and compaction extends deeper. Organic matter and topsoil would be displaced which would reduce long term site productivity within the skid trails. Best Management Practices and design features are routinely employed to reduce the spatial extent and the duration of these effects. Severity of effects would vary considerably depending on the types of ground based systems employed by the operator and the number of trips on any given trail segment. Studies indicate that after six trips all soil textures will become compacted to the point that soil function is impaired (Steinfeld, D., 1997).

Honeygrove, the soil type contained in three small polygons (approximately 15 acres) in Raisor Ck., has high clay content, in excess of 50% in the subsoil. These acres have been analyzed for ground based systems and under typical summer weather conditions, soil moisture remains above 25% in these soils, making these soils susceptible to compaction from ground-based yarding.

The other fine textured clay rich soils, Blachly and Peavine silty clay loams, also may not dry out enough to provide resistance to traditional equipment. The narrow window for dry soils on these sites presents a high risk for impacts, as they may not offer the consistency needed for contract administration (1995 RMP, Appendix C, Silviculture, pg. 166). Severe compaction would be minimized if low-ground-pressure (< 6 psi), track type machines like excavators, processors, and smaller feller bunchers are used. If rubber tired grapple skidders are utilized, compaction would increase due to the high psi and vibration.

After harvest, about fifteen percent of the ground base portions, or 75 acres, would be occupied by skid trails and landings. Compacted skid trails would be tilled to restore infiltration and hasten vegetative recovery. Utilizing old routes reduces new adverse impacts and provides the opportunity to treat residual effects in some areas.

Road Construction: Due to the proposed construction of new rocked roads (permanent and temporary) and renovation of existing road long term soils productivity would be irreversibly lost on 30 acres of productive forest land.

Proposed construction temporary native surface road and associated landings would result in the loss of topsoil, on about 10 acres of productive forest land. In general, these roads are planned on gradual grades and tillable soils. De-compaction with an excavator modified for tillage (full decommission) would improve infiltration and mitigate the potential for prolonged erosion. Root growth in the loosened soil areas would be better distributed and more vigorous, resulting in an accelerated improvement of soil structure and recovery back to a forested condition as compared to leaving untreated compacted surfaces. However, soil function and long term soil productivity would still be impaired for 50 to 100 years largely due to the loss of topsoil.

Timber Production Capability Classification System (TPCC): In Fawn Peak, Stennett and Little Creek units, the proposed action requires yarding through TPCC withdrawn sites. About 15 acres would be affected. This site is classified as such due to shallow soils with low resiliency. The thin organic layer and lack of soil depth makes for limited nutrient reservoir and moisture holding capacity to aid in vegetative recovery. For sites where soils are the limiting factor, the typical mitigation when yarding is full suspension, which is not feasible given the lack of tree height and unfavorable topography. Logging corridors could remain prone to accelerated surface erosion for decades. Some mitigation will be afforded by design features, including limiting the number of corridors across these sites, and sowing native grass as needed

Helicopter Yarding (Alternative 3): All effects are comparable to those discussed for Alternative 2. However, the proportion of different logging systems, and the amount of road constructed would be different in Wilson

Creek due to the addition of 85 acres of helicopter yarding. About 50 acres or 31% of the total acres would be harvested with cable systems, 26 acres or 16% with ground based machines, and 53% with helicopter.

Helicopter logging results in negligible displacement of surface soils or compaction (Dr. Ed Gross, Longterm Productivity Studies, Siskiyou National Forest, 1997). Two helicopter landings are tentatively planned on BLM land. Long term productivity would be irreversibly lost on two acres. The acreage added in the heart of the section is dominated by saturated soils. Tree removal in this portion is likely to increase the extent of high water table soils and promote windthrow of residual conifers, especially Douglas fir.

4.2.9 CULTURAL RESOURCES

Surveys would be conducted prior to project implementation. If sites are found, they would be evaluated to determine their potential for contributing to public, cultural heritage, and/or scientific purposes. The appropriate mitigations/protections would be taken if needed.

5.0 CONSULTATION

Endangered Species Act: The Upper Willamette River Chinook ESU was listed as threatened on June 28, 2005 (70 FR 37160) by the National Marine Fisheries Service; and critical habitat was listed on August 2, 2005 (70 FR 52630). Upper Willamette River Chinook and critical habitat only occur within the project area within Mosby Creek. All other proposed harvest units and road related activities would occur above large reservoirs that prevent Upper Willamette Chinook migration. Although one proposed haul route crosses Mosby Creek where Upper Willamette chinook occur, the road is paved, so there would be no mechanism/pathway for sediment to enter the stream channel. Therefore, the ESA effects determination of Upper Willamette River chinook and critical habitat would be *No Effect*.

Magnuson/Stevens Act (Essential Fish Habitat): Amendments to the Magnuson-Stevens Fishery Management and Conservation Act (MSA) in 1996 required the identification of all habitats essential to federally-managed fishery species and implementation of measures to conserve and enhance this habitat. The amendments also required federal agencies to consult with NMFS on activities that may adversely affect Essential Fish Habitat (EFH) of federally-managed commercial fishery species.The BLM may incorporate an Essential Fish Habitat (EFH) assessment into NEPA documents and public notices pursuant to 40 CFR section 1500. This Essential Fish Habitat (EFH) assessment is for chinook salmon, and fulfills the requirements as described in the Magnuson-Stevens Fishery Conservation Management Act (16 U.S.C 1855((b)).

The definition of EFH is: "...those waters and substrate necessary to fish for spawning, breeding, or growth to maturity." Any project that adversely affects such waters and substrate has an EFH consultation requirement. Therefore, the scope of actions requiring EFH consultations may include those located up slope from stream channels and associated riparian areas.

Because of the proximity of the harvest units and road-related activities to stream channels with chinook salmon (actions are above reservoirs), because there is no direct mechanism for sediment to enter the stream channel where hauling would occur across Mosby Creek (where chinook occur), and based on the rational provided in this EA, the proposed actions under all alternatives would not adversely affect Essential Fish Habitat for chinook salmon.

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APPENDIX A: MAPS

UNITED STATES
DEPARTMENT OF THE INTERIOR
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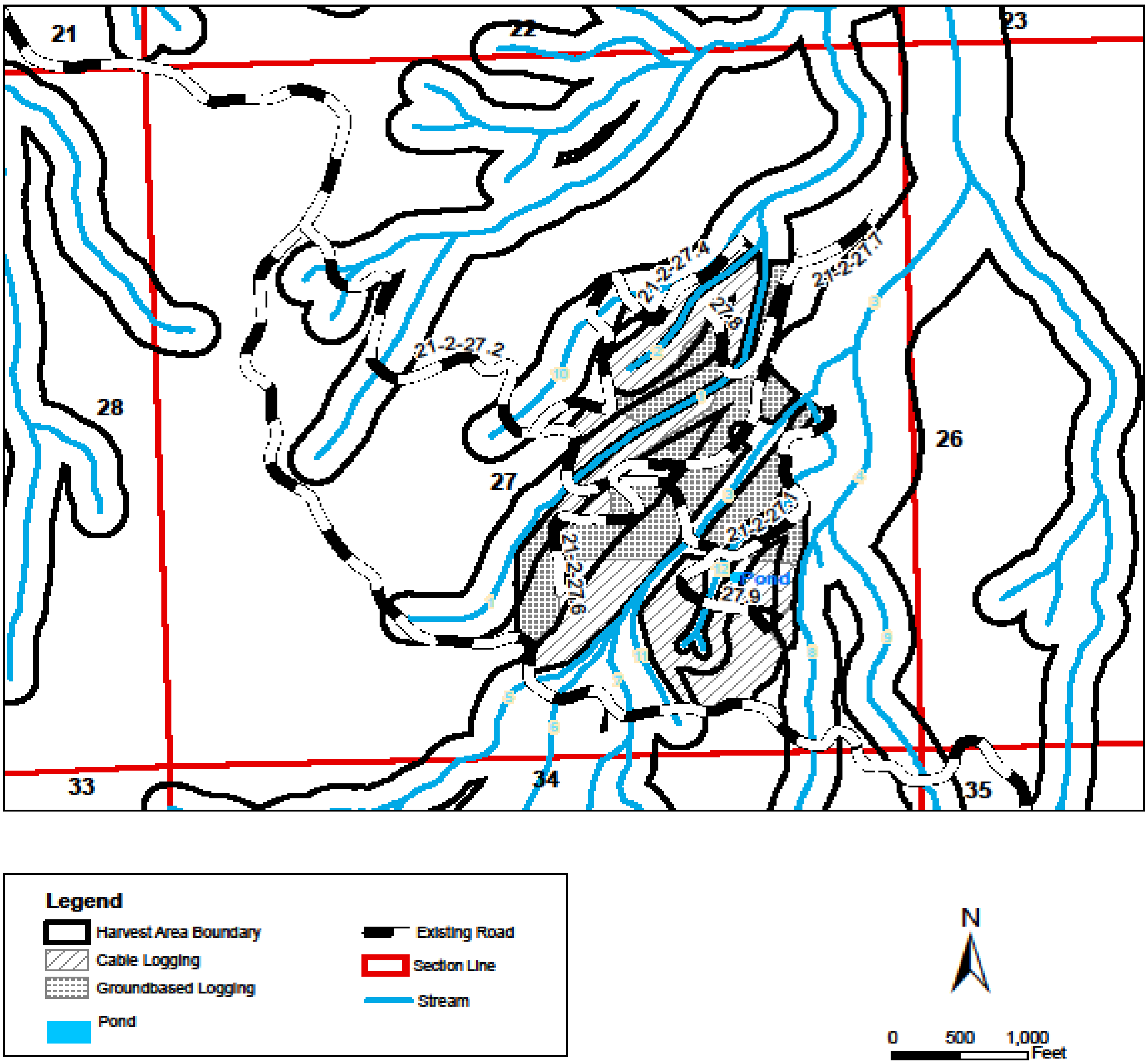
SHEET 1 of 1

ENVIRONMENTAL ASSESSMENT
Perkins Creek, T.21S., R02W., SEC. 27



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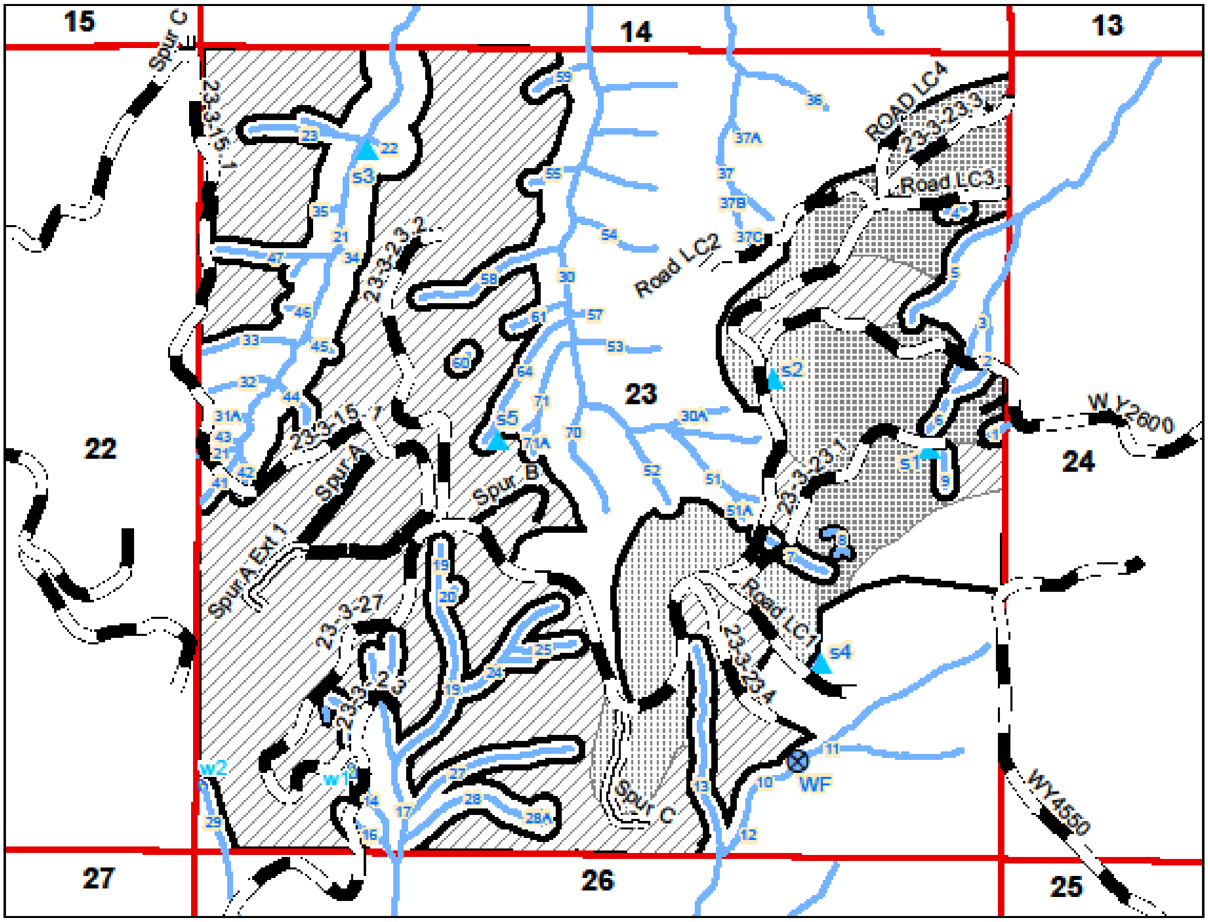
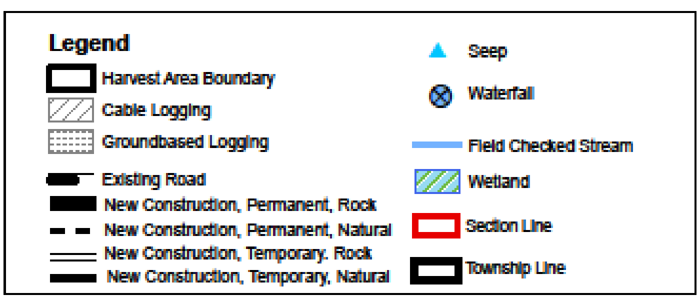
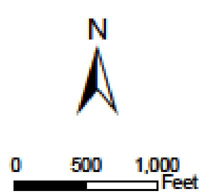
SHEET 1 of 1

ENVIRONMENTAL ASSESSMENT
Little Creek, T.23S., R03W., SEC. 23







07/01/2009

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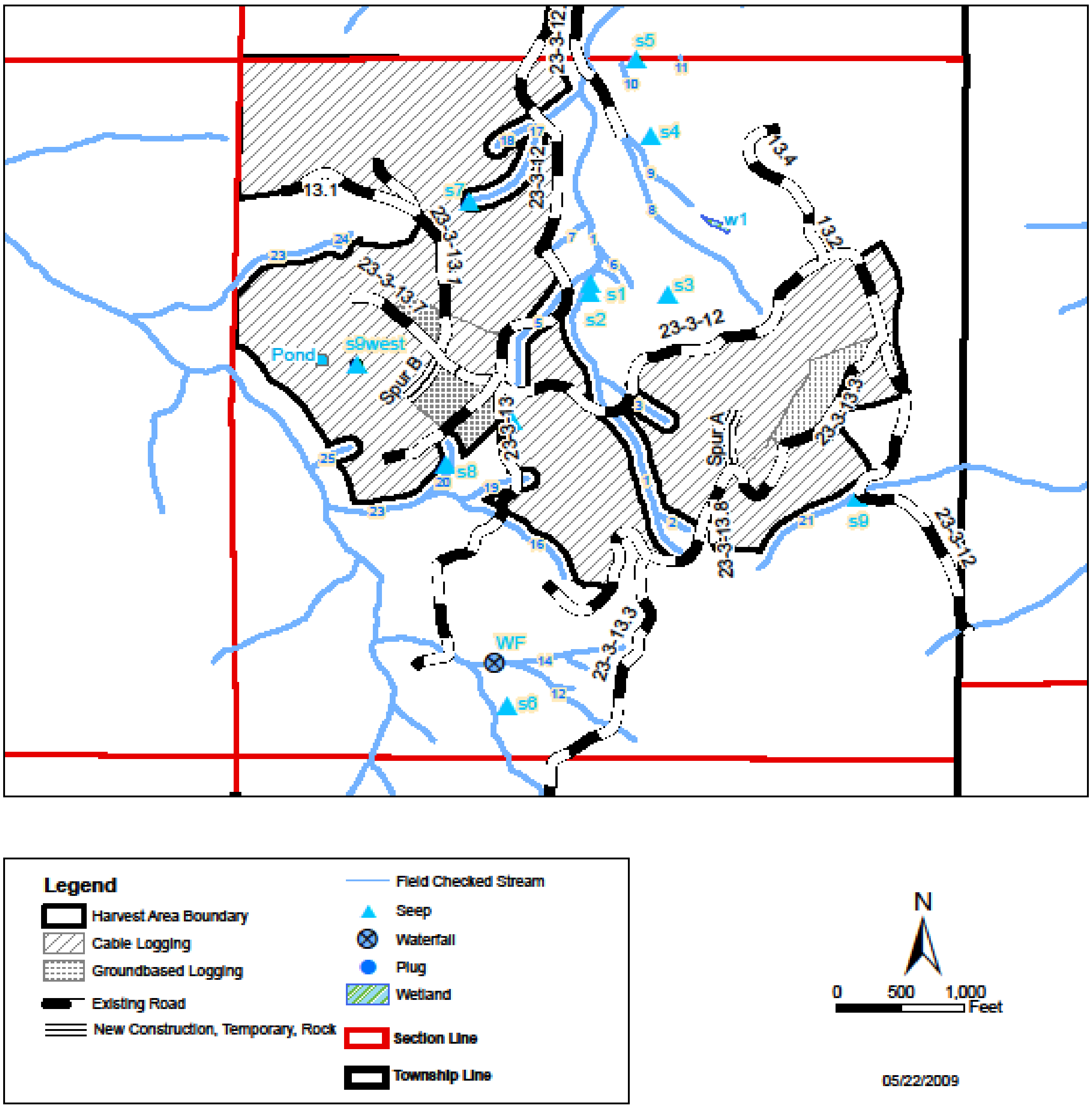
ENVIRONMENTAL ASSESSMENT

Fawn Peak, T.23S., R03W., SEC. 13



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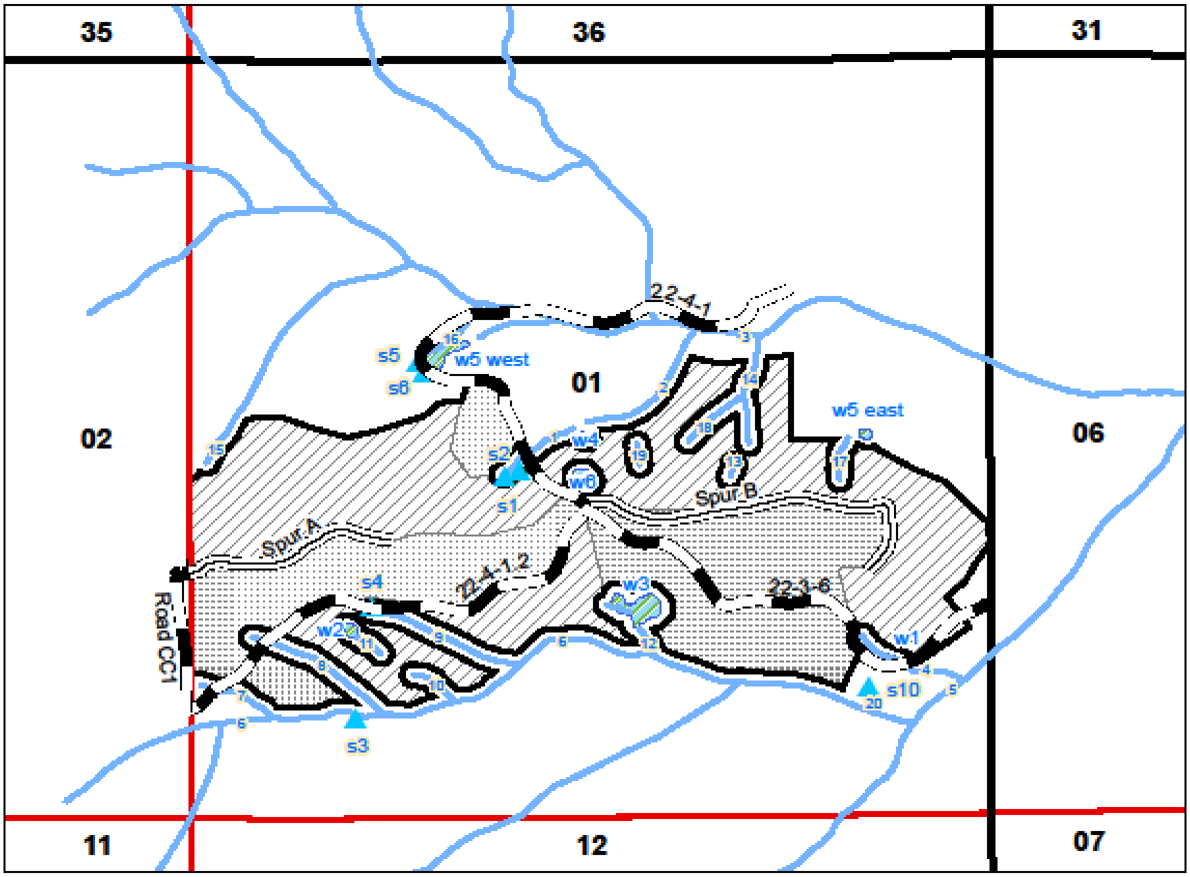
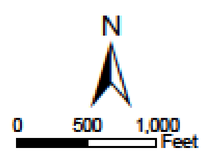
ENVIRONMENTAL ASSESSMENT
Cedar Creek, T.22S., R04W., SEC. 01



Legend

- Harvest Area Boundary
- Cable Logging
- Groundbased Logging
- Existing Road
- New Construction, Permanent, Rock
- New Construction, Temporary Rock
- Seep
- Field Checked Stream
- Wetland
- Section Line
- Township Line



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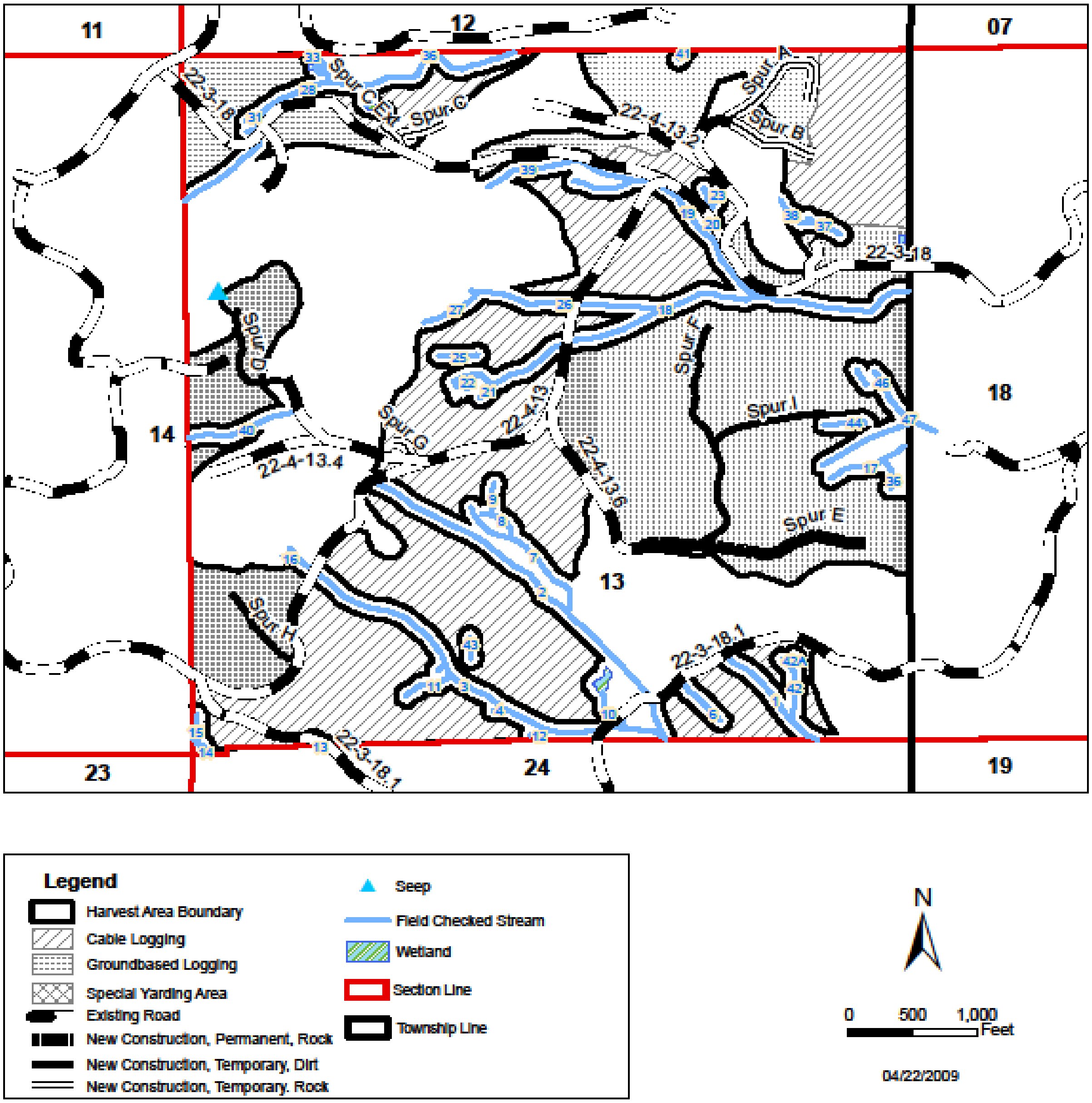
ENVIRONMENTAL ASSESSMENT
Raisor Road, T.22S., R04W., SEC. 13



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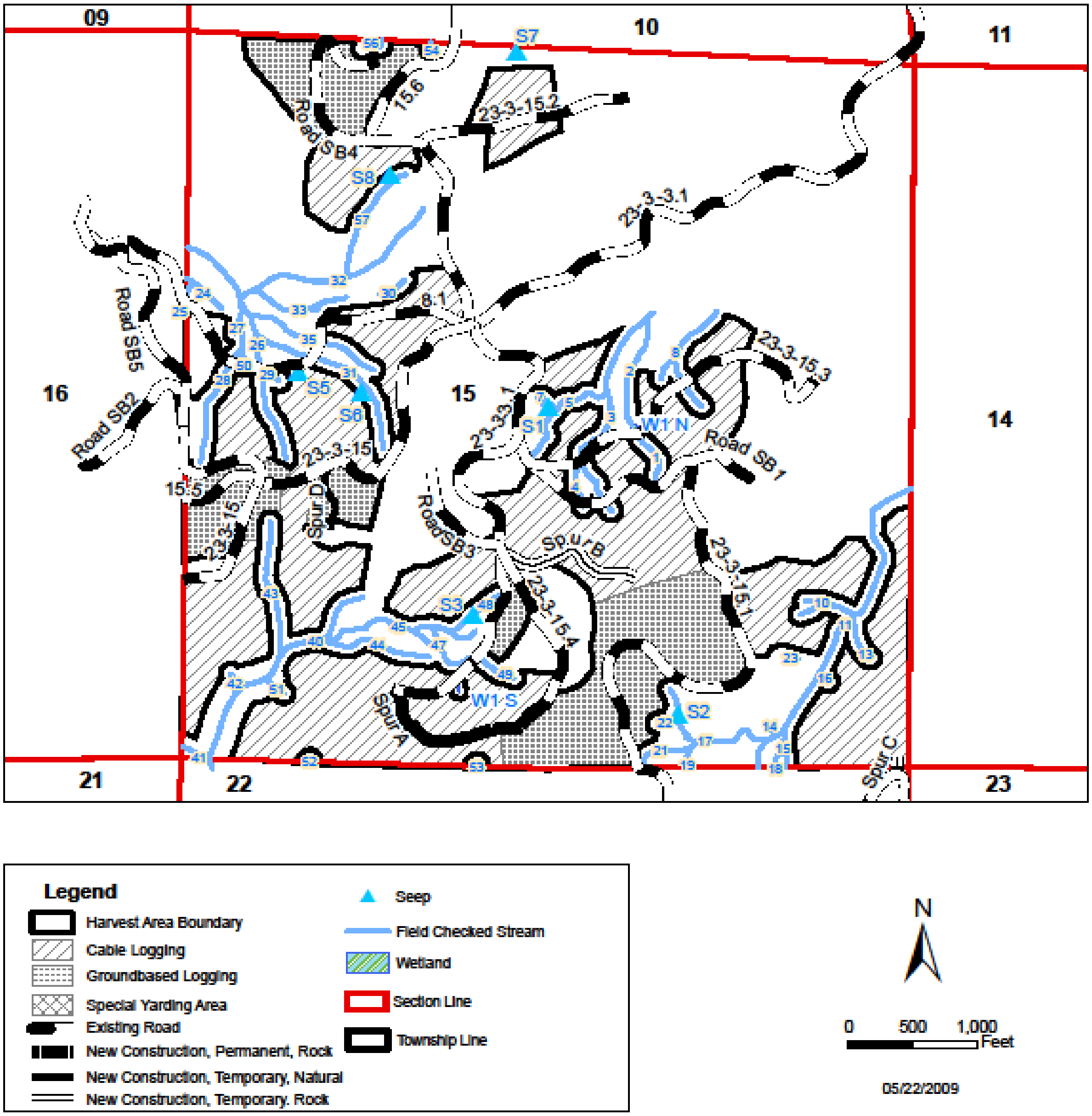
ENVIRONMENTAL ASSESSMENT
Stennett Butte, T.23S., R03W., SEC. 15



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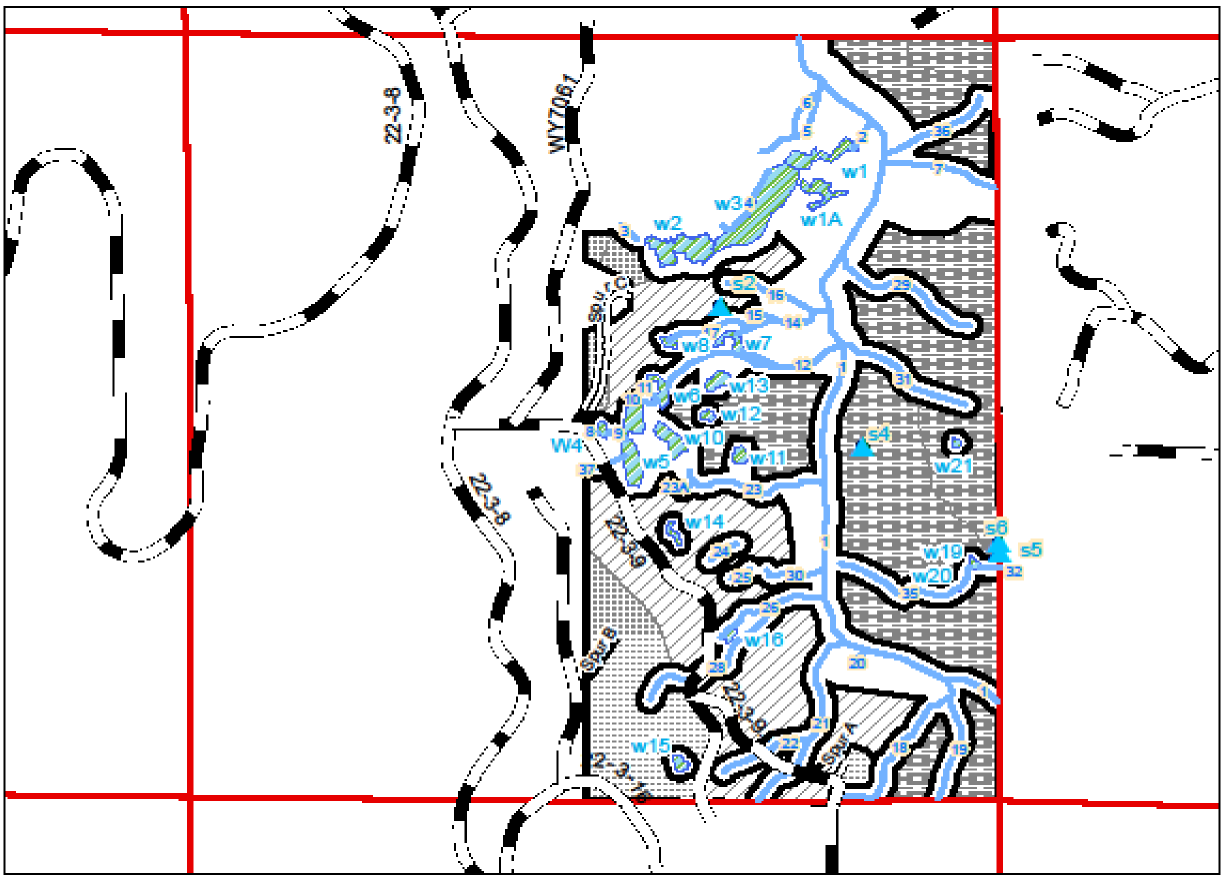
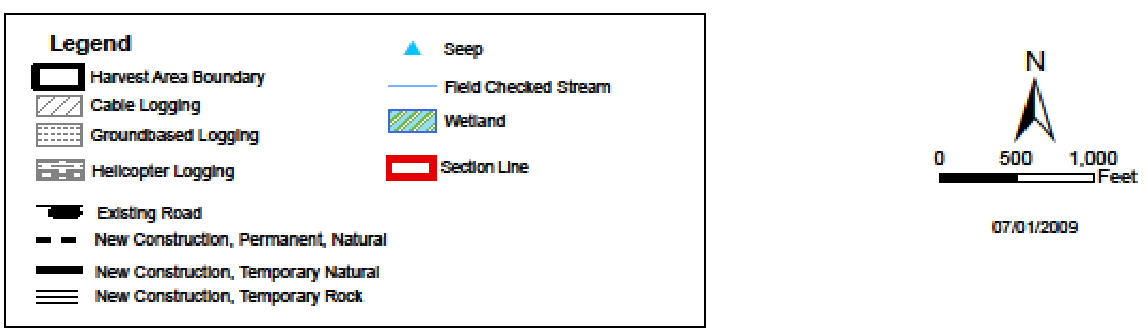
ENVIRONMENTAL ASSESSMENT

Wilson Creek, T.22S., R03W., SEC. 09



Alternative 3



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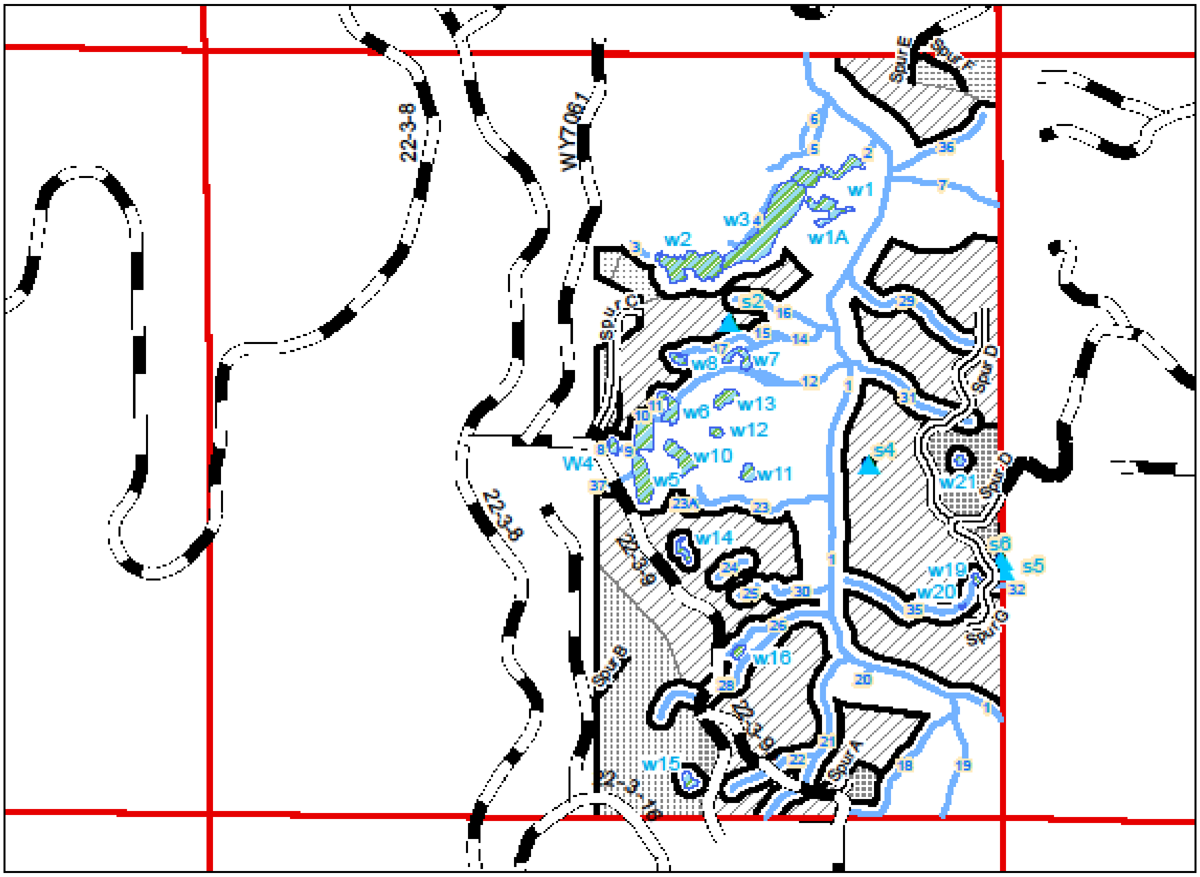
ENVIRONMENTAL ASSESSMENT

Wilson Creek, T.22S., R03W., SEC. 09



Alternative 2

Legend

- Harvest Area Boundary
- Cable Logging
- Groundbased Logging
- Existing Road
- New Construction, Temporary - Rock
- New Construction, Temporary - Natural
- Seep
- Field Checked Stream
- Wetland
- Section Line

N

0 500 1,000 Feet

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APPENDIX B: Charts and Tables

Table: 2010 Thinnings Roads – Proposed Road Construction, Maintenance, Renovation, and Improvement (miles are approximate numbers)		
Road Construction—Temporary	**Length (mile)**	**Comments**
Spur A (CC) Seg. B	0.28	8”-10” rock
Spur B (CC)	0.49	8”-10” rock
Spur A (WC)	0.03	8”-10” rock
Spur B (WC) Seg. B	0.06	Native surface
Spur C (WC) Seg. B	0.19	1 culvert installation, 8”-10” rock
Spur D (WC) Seg. B	0.43	2 culvert installations , 8”-10” rock
Spur E (WC)	0.06	Native surface
Spur F (WC)	0.09	Native surface
Spur G (WC)	0.19	3 culvert installations, 8”-10” rock
Spur A (RR)	0.21	8”-10” rock
Spur B (RR)	0.13	8”-10” rock
Spur C (RR)	0.09	1 culvert installation, 8”-10” rock
Spur D (RR)	0.17	Native surface
Spur F (RR)	0.36	3 culvert installations, native surface
Spur G (RR)	0.05	1 culvert installation, 8”-10” rock
Spur H (RR)	0.14	1 culvert installation, native surface
Spur I (RR)	0.18	Native surface
Spur B (SB)	0.21	1 culvert installation, 8”-10” rock
Spur C (SB) Seg. B	0.02	8”-10” rock
Spur D (SB)	0.10	Native surface
Spur A (FP)	0.09	8”-10” rock
Spur B (FP)	0.07	8”-10” rock
Spur A (LC) Ext.	0.14	8”-10” rock
Spur B (LC)	0.15	Native surface
Spur C (LC)	0.19	8”-10” rock
Spur D (LC) Seg. B	0.03	Native surface
Approx. Total (mile)	**4.5**	
Road Construction—Permanent		
Spur A (CC) Seg. A	0.02	8”-10” rock
Spur B (WC) Seg. A	0.03	1 culvert installation , 8”-10” rock
Spur C (WC) Seg. A	0.04	1 culvert installation, 8”-10” rock
Spur D (WC) Seg. A	0.17	2 culvert installations, 8”-10” rock
Spur E (RR)	0.34	8”-10” rock
Spur A (SB)	0.29	8”-10” rock

Spur C (SB) Seg. A	0.01	8”-10” rock
Spur A (LC)	0.32	3 culvert installations, 8”-10” rock
Spur D (LC) Seg. A	0.02	1 culvert installation, 8”-10” rock
23-3-15.1 (LC) Seg. F	0.04	8"-10" rock
Approx. Total (mile)	**1.5**	
Maintenance by Road Number		
Road SB1	0.04	0"-4" lift rock
Road SB2	0.10	0"-4" lift rock
21-2-21	2.74	19 culvert replacements, 0”-4” spot rock
21-2-27.2	1.01	2 culvert replacements, 0”-4” spot rock
22-3-4	0.52	1 culvert replacement, 1 stream culvert installation
		0”-4” lift rock
22-3-9	0.73	3 culvert replacement, 0”-4” lift rock
22-3-9.1	0.25	2 culvert replacements, 1 cross drain installation
		0”-4” lift rock
22-3-18	2.27	8 culvert replacements, 1 stream culvert installation
		4”-6” lift rock
22-4-1	0.33	1 culvert replacement, 4”-6” lift rock
22-4-1.2	1.14	6 culvert replacements, 1 cross drain installation
22-4-13	1.12	4 culvert replacements, 1 cross drain installation
		0”-4” lift rock
22-4-13.1	0.04	0”-4” lift rock
22-4-13.3	0.20	0”-4” lift rock
22-4-13.4	0.14	0”-4” lift rock
22-4-13.6	0.24	0”-4” lift rock
23-3-3.1	3.16	13 culvert replacements, 1 cross drain installation
		4”-8” lift rock
23-3-12	2.14	Asphalt surface, 5 culvert replacements
Road FP1	0.10	0”-4” lift rock
23-3-13.1	0.32	0”-4” lift rock
23-3-13.2	0.08	6”-8” lift rock
23-3-13.3	0.57	0”-4” lift rock
23-3-13.4	0.19	6”-8” lift rock
22-3-15	0.65	1 culvert replacement, 0”-4” lift rock
22-3-15.1 Seg. A	0.35	3 culvert replacements, 1 cross drain installation
		6”-8” lift rock
22-3-15.2	0.58	0”-4” lift rock
23-3-15.4	0.25	0”-4” lift rock
23-3-15.6	0.07	0”-4” lift rock
23-3-23.3	0.56	2 cross drain installations; 0”-4” lift rock
23-3-27 Seg. C-F	2.00	13 culvert replacements, 0”-4” lift rock

Approx. Total (mile)	**23.0**	
Renovation by Road Number		
22-3-6	0.65	Brushing, blading, ditching
22-4-13.2	0.10	Brushing, blading, ditching
Road SB4	0.16	Brushing, blading, ditching
23-3-13.1	0.20	Brushing, blading, ditching
		0”-4” lift rock
23-3-13.7	0.06	Brushing, blading, ditching
		0”-4” lift rock
23-3-13.8	0.08	Brushing, blading, ditching
		0”-4” lift rock
23-3-15.5	0.12	Brushing, blading, ditching
Road FP2	0.14	Brushing, blading, ditching
		0”-4” lift rock
23-3-23.1	0.38	Brushing, blading, ditching, 3 stream culvert installations, 1 cross drain installation
		0”-4” lift rock
23-3-23.2	0.47	Brushing, blading, ditching, 0”-4” lift rock
Road LC1	0.16	Brushing, blading, ditching, 1 stream culvert installation, 0”-4” lift rock
Approx. Total (mile)	**3.0**	
Improvement by Road Number		
23-3-15.1 Seg. C, E	1.06	Brushing, blading, ditching, widening, 2 culvert replacements, 2 stream culvert installations
		6 cross drain installations, 8”-10” lift rock
Approx. Total (mile)	**1.5**	

Table: Proposed Road Decommissioning (miles are approximate numbers)		
Decommission (long-term > 5 years)		
21-2-27.1	0.19	Barricade, pull culverts, water bars
21-2-27.4	0.25	Barricade, pull culverts, water bars
21-2-27.8	0.14	Barricade, pull culvert, water bars
21-2-27.9	0.21	Barricade, water bars
22-3-9	0.15	Barricade, water bars
22-4-13.2	0.10	Barricade, water bars
23-3-13	0.51	Barricade, pull culverts, water bars
23-3-13.1	0.20	Barricade, water bars
23-3-13.7	0.15	Barricade, water bars
Road FP2	0.07	Barricade, water bars
23-3-15.3	0.52	Barricade, pull log culverts, water bars

23-3-15.5	0.12	Barricade, water bars
23-3-23.1	0.40	Barricade, pull culverts, water bars
23-3-23.4	0.21	Barricade, water bars
Road SB4	0.16	Barricade, water bars
Road LC1	0.24	Barricade, pull culvert, water bars
Road LC4	0.09	Barricade
Spur A (CC) Seg. B	0.28	Barricade, water bars
Spur B (CC)	0.49	Barricade, water bars
Spur A (WC)	0.03	Barricade
Spur C (WC) Seg. B	0.19	Barricade, water bars
Spur D (WC) Seg. B	0.43	Barricade, pull culverts, water bars
Spur G (WC)	0.19	Pull culverts; water bars
Spur A (RR)	0.21	Barricade; water bars
Spur B (RR)	0.13	Barricade
Spur C (RR)	0.09	Barricades
Spur G (RR)	0.04	Barricade, water bars
Spur B (FP)	0.21	Barricade, water bars
Spur C (SB) Seg. B	0.02	Barricade
Spur A (FP)	0.09	Barricade
Spur B (FP)	0.07	Barricade
Spur A (LC) Ext.	0.14	Barricades, water bars
Spur C (LC)	0.19	Barricade, water bars
Approx. Total (mile)	**7.0**	
Full Decommission (permanent)		
22-3-6	0.65	Barricade, water bars, till
Road LC2	0.27	Barricade, pull culverts, water bars, till
23-3-3.1	0.30	Barricade, pull culvert, water bars, till
23-3-8.1	0.49	Barricade, pull culverts, water bars, till
Spur B (WC) Seg. B	0.06	Barricade, water bars, till
Spur E (WC)	0.06	Barricade, till
Spur F (WC)	0.09	Till
Spur D (RR)	0.17	Barricade, water bars, till
Spur F (RR)	0.36	Barricade, pull culverts, till
Spur H (RR)	0.14	Barricade, pull culvert, water bars, till
Spur I (RR)	0.18	Water bars, till
Spur D (SB)	0.10	Barricade, water bars, till
Spur B (LC)	0.15	Barricade, water bars, till
Spur D (LC) Seg. B	0.03	Barricade, till
Approx. Total (mile)	**3.5**	

The following table lists each unit, watershed location, and notable streams near the harvest areas.

Unit Name	5th Field Watershed	6th Field Watershed	Streams adjacent to Unit	Comments
Perkins Cr.	Row River (HUC 1709000201)	Upper Row River (HUC 170900020104)	King Creek	King Creek is a tributary of Row River.
Perkins Cr.	Mosby Creek (HUC 1709000202)	Lower Mosby Creek (HUC 170900020203)		Haul route
Wilson Creek	Upper Coast Fork Willamette (HUC 1709000203)	Cottage Grove Reservoir (HUC 170900020304)	Wilson Creek	Drains to Cottage Grove Reservoir.
Cedar Creek	Upper Coast Fork Willamette (HUC 1709000203)	Cottage Grove Reservoir (HUC 170900020304)	Cedar Creek to the north, Beck Creek to the south and east.	These streams flow into Cottage Grove Reservoir.
Raisor Road	Upper Coast Fork Willamette (HUC 1709000203)	Combs Creek (HUC 170900020303)	Johnson Creek and Ewing Creek. Numbers Creek is north of unit and Beaver Creek is south	These streams flow into the Coast Fork of the Willamette River
Stennett Butte	Upper Coast Fork Willamette (HUC 1709000203)	Lower Big River (HUC 170900020302) and Upper Big River (HUC 170900020301)	Dennis Creek to the west, Weyerhaeuser Creek to the south. Bar Creek to the east.	Dennis Creek flows into Garoutte Creek, Weyerhauser Creek flows to Little River, and Bar Creek flows to Big River.
Little Creek	Upper Coast Fork Willamette (HUC 1709000203)	Lower Big River (HUC 170900020302) and Upper Big River (HUC 170900020301)	Little River is south, and Bar Creek is north.	Little River is a tributary of Garoutte Creek, and Bar Creek is a tributary of Big River.
Fawn Peak	Upper Coast Fork Willamette (HUC 1709000203)	Upper Big River (HUC 170900020301)	Bar Creek is west of the unit, and Boulder Creek is east.	Both streams are tributaries of Big River.