Cox Creek Density Management
Environmental Analysis

Umpqua Resource Area

Coos Bay District

EA Number OR 125 – 03 - 10

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1 Purpose and Need

1.1 Background

The Bureau of Land Management (BLM) Umpqua Field Office proposes a project to implement conifer thinning, alder conversion, road construction/decommissioning, down woody debris/snag creation, and riparian restoration projects on approximately 1,400 acres in the Cox Creek Density Management Analysis Area. The purposes of these proposed treatments are to: 1) accelerate the development of late-successional characteristics within Late Successional Reserve (LSR) #261; and 2) restore riparian habitat in the Riparian Reserve (RR) land use allocations within two subwatersheds. All areas identified for harvest are the result of past logging practices, and the proposed treatments are necessary to achieve the objectives of the Late Successional Reserve land use allocation. The proposed action also includes thinning within a portion of the Matrix land use allocation that is located in the South Fork Coos subwatershed adjacent to LSR #261, to meet District Resource Management Plan objectives. This environmental assessment (OR 125–03-10) addresses the direct, indirect, and cumulative effects of the alternatives on the affected environment.

Late successional reserves (LSRs) are managed to protect and enhance conditions of late-successional and old-growth forest ecosystems, which serve as habitat for late-successional and old-growth related species including the northern spotted owl (USDA 1994, C-11). Goals in LSRs include: 1) protection and enhancement of late-successional and old-growth forest ecosystems; and 2) creation and maintenance of biological diversity associated with native species and ecosystems (USDA-USDI 1998).

Stand management in LSRs is encouraged in stands that would acquire late-successional characteristics more rapidly with treatment, particularly in stands that have been regenerated following timber harvests (USDA-USDI 1998). LSR stand management may include (but should not be limited to: 1) thinning prescriptions, varied within and among stands, to encourage development of diverse stands with large trees and a variety of overstory and understory species; and 2) killing trees to make snags and down woody debris (USDA-USDI 1998, B-6).

Much of the forest land designated as LSR within the southern Oregon Coast Range consists of young, dense forest stands less than 80 years of age, regenerated following timber harvests. These stands were originally intended to maximize timber production and are characterized by uniform structure, heavy stocking, slowing growth rates, and reduced vigor. Simulations suggest that these dense stands ($\geq$ 100 TPA) will develop along different successional pathways than more open old-growth stands, and that density management may be required to grow stands with old-growth characteristics from dense young stands (Tappeiner et al. 1997). Thinnings to about 50 TPA and crown ratios $\geq$ 60% produced growth in young trees similar to that in natural old-growth stands in early developmental stages (Curtis and Marshall 1986, Poage and Tappeiner 2002). Poage and Tappeiner (2002) suggest that heavy thinning of dense young-growth stands would stimulate rapid diameter growth rates, similar to those reported for old-growth trees when young, and would lead to development of trees with big stems, crowns, and branches, and facilitate development of multiple tree layers. Hence, for many forest stands within LSR's in the Oregon Coast Range, density management thinning, combined with snag and down wood creation, may accelerate the attainment of late-successional forest conditions across the landscape. Leaving dense stands in their current condition would prevent or retard the attainment of objectives established in the *Final - Coos Bay District Resource Management Plan and Environmental Impact Statement* and its *Record of Decision*, (RMP-ROD) (USDI, 1995).

The *South Coast - Northern Klamath Late-Successional Reserve Assessment* (USDA-USDI 1998; LSRA, hereafter) calls for activities to develop and enhance late-successional characteristics in LSR, and provides guidance for determining which forest stand conditions would warrant silvicultural treatment and what types of treatments would be appropriate to achieve desired forest stand conditions. The LSRA listed LSR # 261 as a high priority area for management actions based on its large size, key links to the Late-Successional Reserve network, and its land ownership pattern. Management priorities identified for LSR # 261 in the LSRA include enlarging existing interior late-successional habitat blocks and creating late successional habitat where absent (USDA-USDI 1998). The proposed action and all alternatives described in this environmental assessment have been designed to be consistent with guidance outlined in the LSRA.

An interdisciplinary team has developed a project to facilitate the development of late-successional conditions in the analysis area, as required by the Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-growth Forest Related Species Within the Range of the Northern Spotted Owl (hereafter referred to as the Northwest Forest Plan or NFP) and its R*ecord of Decision* (USDA-USDI 1994). Within the analysis area, treatment units were identified which could meet the management priority identified for LSR # 261 (enlarging existing interior late-successional habitat blocks) through acceleration of tree growth and maintenance or enhancement of horizontal variability. The team prioritized areas within the analysis area for treatment based on stand developmental stage (age), tree density, growth rates (e.g., radial growth, crown ratios), and management history, quantified with stand exam and stand structure data. Prescriptions were developed partially to emulate historic disturbance regimes (i.e. fire and wind) and influences of geomorphology. The treatments would be accomplished by a combination of commercial timber sale using skyline cable, helicopter, and ground based yarding systems depending on access and terrain. The proposed projects would include construction of new roads, renovation and improvement of existing roads. All new construction and most renovation would be appropriately decommissioned after use. The proposed projects could be accomplished by timber sale contracts sold tentatively in fiscal year 2004 and 2005.

1.2 Purpose

The proposed treatments include density management of conifer stands and hardwood conversion within LSR and Riparian Reserves, and commercial thinning in Matrix areas. The purpose of conducting Density Management Thinning (DMT) within LSR and Riparian Reserves is to accelerate the attainment of stand characteristics associated with late successional and old growth forests and to enhance structural diversity by maintaining or improving tree growth rates and vigor, manipulating species composition, and modifying spatial arrangement. These DMT treatments are intended to implement specific management opportunities that were identified within the *North Fork Coquille Watershed Analysis* (NFC WA, USDI, 2001), *South Fork Coos River* (USDI-BLM, 1999) and the LSRA in a manner consistent with the standards and guidelines outlined in existing planning documents described below. Failure to act would increase the risk to stands of catastrophic loss from wind disturbance and insect infestation as a result of tree form instability (Wilson & Oliver 2000) and growth stagnation. Evidence of past wind loss in young, dense stands in the analysis area is limited (Price, pers. comm.); several potential treatment units had >1% blowdown, with no observations of catastrophic losses.

The purpose of Commercial Thinning (CT) within the Matrix Land Use Allocation is to provide a sustainable supply of timber, manage developing stands to promote tree survival and growth while maintaining a balance between wood volume, wood quality and timber value, and to reduce the risk of loss from wind, insects, and disease (USDI, 1995, p53, 2-58).

1.3 Location of the proposed project

The proposed stands are within Late Successional Reserve, Riparian Reserve and Matrix land use allocations located within Coos County in the Cox Creek DM Analysis Area in Sections 30 of T. 25 S., R. 10 W., Sections 3, 4, 5, 6, 7, and 10 of T. 26 S., R. 10 and Section 1 of T. 26 S., R. 11W Willamette Meridian (see Maps in Appendix 2). The analysis area includes portions of the North Coquille and South Fork Coos subwatersheds. The Upper North Fork Coquille drainage within the North Coquille Subwatershed is a Tier 1 Key Watershed, meaning that it has been determined to contribute directly to the conservation of at-risk anadromous salmonids and resident fish species, and has a high potential of responding to restoration efforts.

1.4 Tiering

This EA is tiered to the Final - Coos Bay District Resource Management Plan and Environmental Impact Statement and its Record of Decision, (USDI-BLM, 1995); which is in conformance with the Final Supplemental Environmental Impact Statement on Management of Habitat for the Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl and its Record of Decision (USDA-USDI, 1994) (Northwest Forest Plan) and the Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standard and Guidelines (USDA-USDI, 2001). The RMP has been determined to be consistent with the standards and guidelines for healthy lands at the land use plan scale and associated timelines.

This EA incorporates by reference The South Coast-Northern Klamath Late-Successional Reserve Assessment (USDA-USDI, 1998) The Western Oregon *Program - Management of Competing Vegetation*, (USDI-BLM, 1989); the Western Oregon Transportation Management Plan, (USDI, 1996); the *North Fork Coquille Watershed Analysis* (USDI,

2001) and the *South Fork Coos Watershed Analysis* (USDI, 1999). Actions described in this EA are in conformance with the Aquatic Conservation Strategy (ACS) Objectives listed on page B-11 and the Standards and Guidelines for Riparian Reserves on pages C-31 to C-37 of the Northwest Forest Plan. A detailed analysis of the consistency of the action alternatives with the ACS is contained in Appendix 3. These documents are available for review at the Coos Bay District Office of the BLM, North Bend, Oregon.

The actions proposed in this EA are consistent with Oregon's Coastal Salmon Restoration Initiative (CSRI), the Coos and Coquille Watershed Association Action plans. The results of consultation for compliance with the Endangered Species Act are found in (U.S. Fish and Wildlife Service Biological Opinion number [1-15-03-F-0608], National Marine Fisheries Service (NMFS) concurrence letter (pending xx), NMFS March 18, 1997 Biological Opinion and Conference Opinion number OSB1997-0711 for activities covered in the Coos Bay District's RMP, and the NMFS October 18, 2002 Biological Opinion for Programmatic Activities (OSB 2002-00879).

The Analysis File contains additional information (i.e., public comments, specialists comments) used by the interdisciplinary team (IDT) to analyze impacts and alternatives and is hereby incorporated by reference.

1.5 Management Objectives

1. Accelerate the development of late-successional characteristics and improve stability in young, dense stands in the analysis area by: 1) returning individual trees in these stands to late-successional growth trajectories; 2) maintaining or enhancing horizontal structural diversity (e.g., variability in density, gaps); and 3) maintaining or enhancing species diversity.
2. Maintain and restore biological diversity, ecosystem processes, and successional pathways in LSR # 261 by mimicking stand-level (fire) and small-scale (wind, disease) disturbances in early- and mid-seral stands in the analysis area.
3. Maintain or enhance late-successional structural habitat complexity in LSR and RR areas, including overstory species diversity, multiple canopy layers, large green trees, large down logs, and snags.
4. Enlarge existing interior late-successional habitat blocks and create late-successional habitat where absent in the analysis area, using DMT.
5. Ensure multiple successional pathways in different portions of the landscape, by not applying a single prescription to all units, and by leaving portions of units untreated.
6. Restore conifer to portions of the landscape, which were historically conifer-dominated, by removing red alder, maintaining existing conifers and, planting conifers.
7. Protect rare and key habitats (wetlands, cliff habitats, talus habitats, grassy balds or meadows).
8. Manage the forest stand within the Riparian Reserves to acquire desired vegetation characteristics and to facilitate attainment of ACS Objectives (USDI-BLM, 1995p.2-27).

9. Manage the forest stand within the Matrix for the production of a sustainable supply of timber while providing for other resource objectives.
10. Manage the road system within the Cox Creek DM Analysis Area according to the Transportation Management Objectives established in the North Fork Coquille and South Fork Coos Watershed analysis.
11. Replace culverts at risk to avert potential catastrophic failure to portions of the transportation system.
12. Provide for habitat restoration projects where appropriate and within the scope of BLM regulatory authority.

1.6 Scoping

The scoping process identified the agency and public concerns relating to the proposed project and helped define the issues and alternatives that would be examined in detail in the EA. The public was informed of the planned EA through letters to those on the Resource Area's mailing and e-mail lists, and those receiving the Coos Bay *Planning Update*. The scoping letter, mailing list, and public responses are in Section A of the Analysis File.

1.7 Identified Issues

Scoping by the interdisciplinary team (IDT) identified the following major issues that were used to develop and analyze the action alternatives:

<u>Issue 1: Stand development and desired future conditions</u>

LSR # 261 includes many young managed stands. Young managed conifer stands within the analysis area are developing on a successional pathway different from the typical development of old-growth stands. Individual trees within these stands are developing under greater competition than the conditions that dominant conifers would have grown in naturally regenerated old-growth stands at an equivalent age (Tappeiner et al. 1997). These artificially high densities may prevent or retard development of late-successional characteristics. Reducing stand densities is necessary to maintain desired tree growth, increase tree stability, and to improve stand-level structural and species diversity. Returning young managed stands in the LSR to a late-successional development trajectory would eventually create late-successional habitat and enlarge existing interior late-successional habitat, facilitating Late Successional Reserve and Aquatic Conservation Strategy objectives.

<u>Issue 2: Short Term impacts to Late-Successional Ecosystems</u>
Management activities designed to facilitate achievement of Late-successional and Riparian Reserve objectives could cause some short-term negative impacts to species associated with late-successional and riparian habitats. For example, harvest activities in young stands could disrupt nesting of birds in adjacent old-growth stands. Construction of temporary roads[1] or improvements to existing old roads could hinder movements of

[1] Temporary roads are designed for short-term use (generally less than 5 years) after which they are closed to use and decommissioned so they are at low risk to failure from drainage problems. The National Marine Fisheries Service considers these roads "semi-permanent" (NMFS 1997).

wildlife. Snags, a key habitat feature of late-successional forest, may need to be felled in order to maintain a safe environment for workers. The negative impacts would often be confined to the 2-4 year period during the actual implementation. Some impacts could be avoided or reduced through alternative design criteria but with an economic tradeoff, which may make portions of the project unfeasible and prevent complete implementation.

1.8 Issues identified, analyzed, but not used to develop action alternatives

The following issues and concerns were identified during the scoping process. Analysis of these issues did not suggest different alternatives, nor would they influence the selection of an alternative. Therefore, they were not discussed further in this EA

Forest pathogens (spread)
Public scoping comments suggested that proposed treatments could lead to stand damage by pathogens or harmful insects, or to spread of forest pathogens or harmful insects. The four most common forest pathogens and primary insect pest and their potential effects on stand conditions in the affected environment are described below.

Port Orford cedar (*Chamaecyparis lawsoniana*) was not identified in the analysis area and the analysis area is outside the known range of Port Orford cedar; hence, movement of *Phytophthora lateralis* into or from treated units is unlikely. The proposed action could lead to damage to residual trees due to logging (described in Section 4.0), which could lead to increases in fungal diseases including *Armillaria* root rot, black stain root disease, or laminated root rot. The first two are primarily concerns in younger stands (age < 30), which make up only a small portion of the proposed treatment units. Laminated root rot, which survives in old stumps and roots, can affect trees of any age through root contact. The incidence of this disease is low in the analysis area (no patches observed). Mechanical damage could occur in treated units, and would probably affect < 2% of trees in units. Disease associated with this stress and injury could slightly increase levels of forest pathogens in analysis area; pathogen levels are estimated to be below levels in adjacent private plantations, which do not appear to be high. In general, pathogens would increase stand structural complexity by creating cavities, snags, and down wood in the treated areas.

Increases in down material and additional blowdown could lead to some bugkill, principally from the Douglas-fir beetle (*Dendroctonus pseudotsugae*). Douglas-fir beetle attacks Douglas-fir trees weakened by root rot or other stressors. Moderate levels of beetle-caused mortality can increase stand structural diversity by increasing the number of snags. When levels of down material exceed 3/ac., Douglas-fir beetle can reach infestation levels, leading to large losses of green trees (Hostetler and Ross 1996). The proposed action would limit the number of snags and down logs created in one time period, to minimize potential for Douglas-fir beetle infestation.

Mycorrhizae fungi and soil ecology
Public scoping revealed concern to soil ecology. There is limited data available on the effects of forest management as related to fungi richness and abundance. Mycorrhizal fungi are most active in the upper soil and humus layers. They are sensitive to increases in soil temperature, soil compaction, and the erosion that can accompany forest harvest (Molina et al. 1993). One common species of ectomycorrhizal fungi, chanterelle

(*Cantharellus cibarius*), was found to fruit in significantly lower numbers following thinning (Pilz et al. 2002). The declines were greatest in the most heavily thinned stands. It is possible that as the trees resume vigorous growth, and the forest canopy closes, that this species will begin to fruit at the same levels it did prior to the thinning, but further studies are required to verify this (Pilz et al. 2002).

As plant species composition changes during forest succession, the fungus communities undergo change (Molina et. al.1993). Since plant-species composition would not be altered in the thinning units, and the present fungal community would not be disturbed by thinning, the current species association would likely persist. Overall, the treatment area will not change from a fungal community to a bacterial community from this action. Nutrient cycling processes will not be impacted over the long term.

In alder dominated stands, fruiting bodies of Survey and Manage mycorrhizal fungi species have not been observed. Restoring these sites to conifer would likely restore conditions favorable for mycorrhizal associations to develop. Mycorrhizal inoculum may persist in the soil and humus layer or may be presently associated with the existing conifer.

The level of disturbance from either harvesting or road improvement will not alter the status of the soil fungi or overall ecology. For planned road construction, soil disturbance and compaction will alter the soil environment such that soil ecology will temporarily change. Planned road decommissioning on the newly constructed areas (roads or landings) will incorporate organic matter, increase soil aeration and infiltration to near forest conditions in an effort to regain fungal function and cycling processes of these forest surfaces.

Bear damage
Public scoping revealed a concern that the proposed treatments could encourage more damage by black bears. Would we be creating a new problem for ourselves that could prompt a need for bear removal in the future? During spring and early summer, black bears sometimes feed on the cambium layer of Douglas fir and western hemlock trees (Flowers 1987 [cited in Stewart et al. 1999], Stewart et al. 1999). The bears generally concentrate on young, fast-growing trees, and damage has been higher in thinned stands (Mason and Adams 1989 and Kanaskie et al. 1990 [both cited in Stewart et al. 1999]). Black bears typically target younger, smaller trees than those proposed for thinning in this EA. Stewart et al. (1999) stated the average diameter at breast height (dbh) of damaged trees was < 12 inches. In the Coos Bay District, extensive monitoring of previously harvested units has shown that bear damage is almost totally restricted to plantations 10-15 years old south of Highway 42, and is almost nonexistent elsewhere (Rick Schultz, Coos Bay District BLM, pers. comm); therefore, we do not expect proposed treatments to exacerbate any bear damage problems.

Impacts to Big Game
Elk are relatively common in the analysis area. Deer, bear, and cougar are also present. In a telemetry study of elk near the analysis area, Witmer (1981) found that elk seldom used dense young conifer stands such as those proposed for thinning. He suggested that heavy thinning could be used to stimulate shrub growth to improve forage for elk, but cautioned

against thinning all stands since these areas are sometimes used for cover. In Witmer's study, elk often used hardwood stands even though they were rare in his study area. In the east part of the analysis area, cover abounds in the old growth stands that surround most of the proposed units. Thinning stands and promoting forage growth should benefit elk, deer, and bear. Little old growth exists in the west part of the analysis area, but cover is still widely available as nearly 75% of the BLM-managed lands are > 25 years of age. The action alternatives would reduce open road densities, which should reduce harassment and poaching for all big game animals. Overall, the action alternatives are expected to have neutral or slightly beneficial impacts to elk and other big game. Hiding cover would be reduced but cover would still be widely available. Forage areas would increase and road densities would decrease, both of which should benefit big game.

Wildlife Species Associated with Dense, Young Stands
O'Neil et. al., (2001) list 4 species of vertebrates potentially present in the analysis area as being closely associated with small tree, single story, closed canopy habitats like the ones proposed for thinning in this EA. Two of these, sharp-shinned hawk and golden-crowned kinglet, were also listed as closely associated with other closed canopy habitats. The other 2, northwestern salamander and ruffed grouse, were also listed as closely associated with other habitats as well, so none of the species are exclusively associated with dense, young stands. Across all ownerships in the analysis area, these young stands are fairly common (see section 3.1.2 and Tables 9-1, 9.2), and many of these stands are quite dense. About 33% of the young stands considered for treatment in the analysis area will remain untreated; therefore, none of the action alternatives would threaten the persistence of wildlife species associated with dense, young stands nor would they reduce the availability of this habitat type to levels below the range of natural variability in the analysis area.

Pacific Yew
Public scoping revealed concern for the maintenance of Pacific Yew. No Pacific Yew has been observed in the treatment units but may occur within unmanaged portions of the analysis area. All conifers with low abundance in the treatment units, including Western red-cedar and Pacific Yew (if encountered), would be reserved from harvest and protected to the extent possible.

Roadless areas
Public Scoping requested disclosure of entries into roadless areas greater than 1000 acres. The Cox Creek Analysis Area does not contain a roadless area greater than 1000 acres. For road density analysis, refer to chapters 3 and 4.

1.9 Alternatives considered but eliminated from further discussion

Several activities originally considered as part of the proposed action were subsequently eliminated. These activities include: (1) treatment of an additional seven units (1E, 1F, 2A, 2B, 15, 20, and 17); (2) construction of an additional 0.3 miles of mid-slope road in units 1A, and 14; and (3) riparian restoration through hardwood conversion along the mainstem of Cox Creek. See Appendix 2 for unit locations.

1.9.1 Density Management units considered but eliminated

A number of young and mature stands in the analysis were rejected from the analysis due to stand characteristics or infeasibility of treatment. Two mature stands identified in the analysis area (units 1E, 1F) are currently on successional pathways that are likely to produce late-successional characteristics without stand manipulation, and include large residual overstory trees and high structural diversity. Another potential treatment area (unit 15) contained significant portions of desirable variability in spacing and densities and is in close proximity to a known spotted owl nest site; treatment benefits in this unit would be marginal compared with potential disturbance to the spotted owl pair. Two identified treatment units (17 and 20) currently have low tree density and may develop late-successional characteristics such as large trees and large limbs without manipulation (Winter et al. 2002); horizontal structural diversity for units 17 and 20 could be improved at this time with non-commercial treatment.

1.9.2 Hardwood conversion units considered but eliminated

Several units originally considered would be difficult to treat without significant infrastructure development or additional impacts. Stand manipulation in unit 2B would require major renovation of a steep mid-slope road within a Riparian Reserve that is currently closed by vegetation. Harvest by helicopter would also be unfeasible in this unit, and poor soil depth and quality would make non-commercial treatment only marginally successful. Additionally, within Unit 2A a valley and hillslope area currently dominated by red alder, would be unsuitable for hardwood conversion due to thin soil and slope conditions. It is likely that this stand has been hardwood-dominated historically (due to geomorphology and riparian influences).

1.9.3 New road construction considered but eliminated

Construction of two new mid-slope roads in units 1A and 14 was considered. These roads were needed for skyline access to portions of the treatment area. Because side slopes exceeded 60% (USDI 1995, pD3) and an alternative yarding method would be feasible, construction of these the roads was eliminated from consideration.

1.9.4 Riparian Restoration considered but eliminated

Restoration was initially proposed within a portion of the main stem of the Cox Creek Riparian Reserve (within the central portion of Sec. 31, T. 25 S. R. 10 W.), using hardwood conversion to reestablish conifers to historic densities. Success of conifers in this area would be low, due to red alder dominance and poor soil conditions (a legacy of past management). This proposal was therefore abandoned from the proposed action. Possibilities for non-commercial treatment by releasing existing conifer in this red alder-dominated area remain; a categorical exclusion currently covers any such treatments.

2 Alternatives including the proposed action

This chapter provides a description of each alternative. This chapter will also summarize the environmental consequences of the alternatives. Three alternatives are proposed. The two action alternatives are very similar in treatment type and acres and differ primarily in the method of implementation. Section 2.4 summarizes the main differences between the alternatives.

2.1 Alternative – No Action

Under this alternative none of the actions proposed in the Cox Creek Analysis Area would occur. The density management thinning areas identified for treatment would remain on current trajectories and the window of opportunity to achieve LSRA objectives may be missed. Stands would continue to move towards instability, growth stagnation, and increased risk from wind, insect, and disease damage. The density management treatments within the Riparian Reserves are designed to improve habitat conditions for riparian dependent/associated species would not be applied. Current stand compositions would remain the same, and stand densities and tree mortality would increase. Growth, development, and maturation of these stands would continue along present trajectories. No sustainable supply of timber would be developed in the Matrix land use allocation. None of the proposed new road construction, improvement, renovation, or culvert upgrades would occur. Road maintenance on seldom-used roads would not occur and existing roads that are currently closed due to vegetation would remain so.

Road decommissioning opportunities identified in this analysis and the recommendations for either decommissioning or closure from the Watershed Analyses (Appendix J) would not be undertaken. Road decommissioning could still occur but would require separate analysis of environmental consequences and different mechanisms for accomplishment.

2.2 Alternative A – Preferred Harvesting System

2.2.1 Overview

This alternative proposes to thin approximately 891 acres and convert approximately 55 acres of alder dominated stands to conifer. Approximately 443 acres of treatment would occur within the Riparian Reserve land-use allocation. Approximately 21 acres of commercial thinning would occur in the Matrix land use allocation; 2.2 miles of new temporary road would be constructed and 4.2 miles of road would be renovated or improved. About 1565 snags would be created and 2667 trees would be cut for down woody debris. The key components of Alternative A that make it distinct from Alternative B include:

i. Use of skyline cable yarding as the principle harvest system.
ii. Temporary road construction in LSR (USDA-USDI 1994, pC16).
iii. Risk of losing up to 18 high value snags[2].

[2] High-value snags are large snags in the early stages of decay which still have many of their limbs and bark and are at least about 75 feet high and are important for wildlife ecology. These snags are relatively scarce in the western portion of the analysis area.

iv. Replacement of 97 culverts, (mostly the small non-stream road grade ditch relief type) including three located on or near perennial, resident fish bearing streams.
v. Restoration activities not associated with timber sale activities.

These key components are described below, followed by a more detailed description of Alternative A.

2.2.2 Key components

Alternative A would use skyline cable yarding as the preferred logging system (USDI 1995, pD5) which would require new roads to allow access. Road construction is appropriate in the LSR when it is minimized and the potential benefits of silvicultural activities exceed the cost of habitat impairment (USDA-USDI 1994, p19-20). The new road construction would occur within the treatment units and would not fragment existing late successional habitat. Road construction would be limited to ridge tops and stable benches, would be temporary, would have natural surfaces, and would be decommissioned at the end of operations. The use of skyline cable systems would be approximately $969,000 less costly than using helicopter yarding (see Appendix 1).

Two snag patches totaling 18 snags have been identified as having high ecological value based on their decay condition and location in the landscape. The snags are located adjacent to units 1B and 9. The current lean and soundness of the snags in relation to the treatment area indicate that they could be considered safe to work near; however, it is the contractors who have the responsibility to ensure a safe working environment, and it would be their interpretation of the safety of the snags which would determine if the snags would need to be felled; therefore, the retention of the 18 snags would not be certain under this alternative. Protecting snags in unit 1B would make cable yarding unfeasible for the western portion of the unit because road 1b-2 could not be constructed. If the snags were felled, snags of similar size would be created by topping or inoculation would be applied in suitable nearby habitat.

Approximately 97 culverts were identified in a recent transportation inventory as currently in poor or unsatisfactory condition and would be replaced under Alternative A. These culverts are located on either intermittent/ephemeral channels that would be dry when the action occurs, or are cross-drain culverts servicing ditch runoff. Three of these culverts are located on or near perennial fish bearing streams. Three stream crossing culverts are planned for replacement on perennial streams. Two stream crossing sites are planned for replacement at milepost 1.45 and 4.35 on the 25-10-30.0 North Fork Coquille Road, and one at milepost 0.5 on the 25-10-35.0 Coal Creek Road These pipes would be replaced using the normal best management practices (BMP's) as listed in the design features section and fitted to match site requirements.

Restoration activities not associated with any timber sale activities are included in the analysis of this alternative. They include culvert replacements and the decommissioning of roads not required for transport of timber and replacement of large culverts affecting coho streams. Refer to section 2.2.9 for more information.

2.2.3 Density management thinning (DMT) prescriptions

The LSRA suggests the following process for silvicultural activities in LSRs: 1) identification of a condition in the landscape that would trigger a management recommendation, 2) determination of the seral stage of development (i.e. stand age) among other ecological stand and landscape characteristics; 3) determination of site-specific issues; and 4) proposal of an appropriate management activity (USDA-USDI 1998). In developing an appropriate management activity, the LSRA suggests development of competing treatments, growth modeling (using the Stand Projection System (SPS) or other model), and contrast of effects of the preferred treatment and no action by an IDT, to assess the desirability of applying a silvicultural treatment. (USDA-USDI 1998, pg. 77). These four steps are discussed below.

Within the landscape (LSR # 261), stands proposed for treatment share a condition that would trigger a management recommendation, namely that they are on paths of development different from those producing late-successional characteristics. These conditions are described in the Affected Environment section (3.1). The stands chosen for treatments described in this analysis fell into several seral stages, described by two broad age classes: stands aged 30-49 (1970's stands) and stands aged 50-79 (1950's stands), both described in the Affected Environment section. The LSRA suggests that these stand types have medium and low priorities for treatment, respectively. Young stands have a higher priority for treatment, since potential for response is higher. Several such stands are being treated to facilitate development of late-successional characteristics, outside the scope of this proposed action. Where stands aged 50-79 were not regenerated from natural disturbances (fire), low levels of down wood are present, and are not clearly on trajectories for late-successional conditions. For these types of stands, the LSRA suggests treatment opportunities exist. The 1950's stands proposed for treatment meet these criteria (Section 3.1).

Site-specific issues and modeling were used together when developing appropriate management activities in treatment units. Modeling of stand development in the proposed treatment units used SPS (USDI 1995b), as suggested by the LSRA (USDA-USDI 1998). A range of different silvicultural prescriptions was developed for each potential treatment unit, including a 'no action' prescription. Comparisons of the effects of these different thinning prescriptions on relative density and crown ratios at various points in stand development were used to select the most appropriate prescriptions.

Preferred prescriptions were selected for portions of each treatment unit based on the following goals: 1) emulating stand-level disturbance by fire; 2) mimicking small-scale disturbances (wind, disease and competition mortality); 3) attempting to provide sufficient growing space to obtain a stand average dbh of 20" between ages 50 and 60 (USDI 1999); 4) being feasible, using existing logging systems and contract administration; and 5) ensuring multiple successional pathways in different portions of the landscape (i.e. not applying a single prescription to all units and leaving portions of units untreated). Fire emulation prescriptions were similar to prescriptions described in the Managing for Landscape Level Diversity appendix to the North Fork Coquille Watershed Analysis (USDI 2001) for developing characteristics consistent with a wild stand that regenerated following stand replacement fire and subsequent low severity re-burns. Within treatment units, preferred prescriptions were assigned based on aspect class (north-east vs. south-west) and four topographic position classes (lower, middle, upper slope and ridge). Specific thinning prescriptions, their applicability to specific geomorphic positions, and applicability to the above goals are described below and in Table 2-1. See Appendix 2 Map A3 for locations of specific prescriptions.

Table 2-1 Treatment units, stand of which they are a part, treated acres, and additional design features. RD is relative density (described in Section 3.1). Prescriptions described in text.

EA Unit	Stand	Prescription	Acres	Additional design features
1A	1	Maximum diameter limit 17"	119	35' maximum spacing in 27.4 ac.; 50' maximum spacing in 92 ac.; hardwood conversion in 1.2 ac; create 2 snags/ac.; exclude S&M site
1B	3	Maximum diameter limit 16"	152	35' maximum spacing; hardwood conversion in 1.1 ac; create 1 snag/ac.
1C	2	RD 30	25	Add 10 trees/ac. if needed (to meet LSRA goals); create 1 snag/ac. Install 10 ¼ acre gaps.
1D	2	Maximum diameter limit 17"	22	Add 10 trees/ac. if needed; create 1 snag/ac.
1M	2	RD 30/ Maximum diameter limit 20"	63	Create 1 snag/ac (Matrix LUA)
3	3	Maximum diameter limit 16"	31	Maximum diameter limit 16" in 19 ac.; Maximum diameter limit 18" in 12.9 ac; create 2 snags/ac.
3	3	RD 35	10	Create 2 snags/ac
4	3	Maximum diameter limit 17"	24	Add 10 trees/ac. if needed; create 3 snags/ac.
4	3	RD 35	19	Create 3 snags/ac.
5A	3	Maximum diameter limit 16"	3	35' maximum spacing; create 1 snag/ac.
5B	3	Maximum diameter limit 16"	24	50' maximum spacing; create 1 snag/ac.
6N	3	Maximum diameter limit 17"	26	Create 1 snag/ac
6N (HWD)	3	Hardwood conversion	4	Create 3 snags/ac.
6N-S1/2	3	Maximum diameter limit 17"	15	Add 10 trees/ac. if needed
6S	3	Maximum diameter limit 17"	20	Create 3 snags/ac.
6S	3	RD 35	11	Create 3 snags/ac.
6S	3	Hardwood conversion	10	
7	3	Maximum diameter limit 16"	37	Create 3 snags/ac.
8	4	Maximum diameter limit 12"	15	Create 3 snags/ac.
8	4	RD 25	10	Create 3 snags/ac.
9	6	Maximum diameter limit 13"	11	Create 3 snags/ac.
9	6	Dominant tree retention	6	Create 3 snags/ac.
10A	8	Maximum diameter limit 13"	21	Create 2 snags/ac.
10B	8	NT	9	
11	8	RD 35	16	Retain red alder; create 3 snags/ac.
12	3	Hardwood conversion	26	
13	3	RD 25/ Maximum diameter limit 16"	6	Create 1 snag/ac
14	3	Maximum diameter limit 17"	29	Create 1 snag/ac
14	3	RD 35	28	Create 1 snag/ac
14	3	Dominant tree retention	12	Create 1 snag/ac
16	5	RD 35	7	Retain fire-tolerant species; create 2 snags/ac.
16	5	Maximum diameter limit 15"	7	Create 2 snags/ac.
16	5	Dominant tree retention	3	Create 2 snags/ac.
18	3	Hardwood conversion	10	Create 3 snags/ac.
19	7	RD 35	8	Create 3 snags/ac.
20S	9	RD 25	9	Create 1 snag/ac
21	NA	Hardwood conversion	3	Roadside conversion

24	9	RD 25	6	Retain fire-tolerant species; retain red alder; create 1 snag/ac.
24	9	Dominant tree retention	5	Create 1 snag/ac.
25	9	RD 25	18	Retain fire-tolerant species; retain red alder; create 2 snags/ac.
25	9	Maximum diameter limit 13"	13	Create 2 snags/ac.; exclude S&M site
26	9	RD 25	58	Retain red alder; create 2 snags/ac.

Maximum diameter limit thinning: The proposed action would include variable-density thinning practices in 571 ac., or 40% of the treatment area, using maximum diameter limits. Maximum diameter limits (MDL) were designed to mimic fire disturbance effects on north-facing middle and upper slopes, and all lower slopes. MDL thinning produces variable tree densities and spacing, leaving remnant trees, gaps, and islands of unthinned vegetation, and maintaining horizontal structural diversity. Carey (1995) suggests variable density thinning to promote stand structural diversity. Specific design criteria for MDL thinnings include removal of all trees < unit-specific diameter limits.
Some trees (generally < 3/ac.) with distinct structures (e.g., deformations, wolf trees) with diameters < unit-specific MDL would be maintained by this prescription. In units where modeling of the diameter limit approached the 50 tree per acre minimum required in the LSRA, additional trees would be marked for retention as described in Table 2-1.

Stand relative density thinning: Thinnings based on stand relative densities are proposed for areas with south to west facing aspects and upper slope topographic positions, to emulate the open densities and uniform spacing associated with fire effects in these landscape positions. Relative density thinnings would occur in almost 300 ac. or 21% of the treatment area, including in matrix allocations (Table 2-1). These thinnings would employ wide spacing (60- 122 TPA). Adjacent 300 year old stands averaged 30-35 dominant Douglas-fir trees per acre (average dbh 38 in.) (USDI 1976). Even-spaced thinnings would lack patchy, diverse understories and shrub diversity; biological legacies including large live trees, down wood, and snag levels would be comparable to MDL thinnings. Treatment units thinned to moderate densities (e.g., RD 35) would have increased wind firmness and minimal understory and shrub development. Treatment units with heavy thinning (RD < 30) would maximize understory and shrub development, and have increased gaps and down wood due to windthrow (Hayes et al. 1997). Deformed trees (e.g., trees with multiple tops, damaged tops, and cavities) and wolf trees would be chosen for retention.

Dominant tree retention: Dominant tree retention prescriptions would entail choosing the two largest trees/ ac. in an area and removing all trees within a 50' radius of these two. This prescription was developed to mimic the effects of small-scale disturbances including wind, patchy fire behavior, disease, and competition mortality. DTR prescriptions would result in small-scale canopy gaps, increased shrub cover, high unit-scale variation in tree densities and ages. This prescription would be applied to some ridges, slope lee sides and the windward sides of some gentle slopes in < 5% of the treatment unit areas.

Development of canopy gap areas: One unit (unit # 1C) would have canopy gaps created in addition to relative density thinnings. The development of secondary canopy layers, one criterion for transformation from mature to old-growth forest, may be more rapid where gaps occur (Gray and Spies 1996). Size of the installed gaps would be based on the crown

widths of old-growth trees and the minimum size of gaps needed to establish Douglas-fir trees (0.25 ac.) (Franklin 1977).
Hardwood conversion: In areas of anthropogenic disturbance, where red alder has become established outside of riparian water influence zones, hardwood conversion prescriptions are proposed. These prescriptions would remove all red alder, leaving any residual conifers, and replant with a range of species representative of surrounding upland associations. All red alders would be cut in units 6S, 12, and 18 and small portions of 1a and 1b totaling 55 ac. See Appendix 2 Map A3 for hardwood conversion areas.

Retention of unthinned areas: Over 30% of the area originally proposed for treatment would remain unthinned (Map A1, Appendix 2). Retention of unthinned stands in the analysis area would ensure the possibility of stands developing late-successional structures independent of manipulation, and retain different successional pathways and increased structural diversity in the analysis area. Natural young stands that are not overly dense and that are developing strong differentiation in tree sizes may require only time to develop old-growth structures (Winter et al. 2002). In contrast, unthinned areas that remained dense would follow different successional pathways. These dense stands would maintain a level of suppression mortality in the landscape to provide for short-term snag and down wood recruitment (USDA-USDI 1998). Retention of areas with high tree densities at a landscape scale is advocated by the LSRA (USDA-USDI 1998) and recent research (Muir et al. 2002).

Tree species retention: In addition to thinning intensities, prescriptions would modify tree species retention in units, based on differences in aspect/topographic position. Prescriptions would favor retention of fire-related species (i.e. Douglas-fir) in some south facing and ridgeline units that have high densities of fire-intolerant species (e.g., western hemlock, w. red cedar). In all other treatment units, no preference would be given to Douglas-fir or western red cedar, and all minor species (e.g., western red cedar and hardwoods other than red alder) > 8" dbh would be retained. All red alder would be retained in units 11, 24, 25 and 26, where cover by red alder is extremely low and representative of historic conditions. Retention of this red alder would maintain structural and species diversity, and lead to eventual canopy gaps as red alder senesced. Prescriptions would all include retention of all trees > 20" dbh.

Predicted results of prescribed thinning: The LSRA suggests contrasting the effects of preferred treatments with the no action alternative using SPS or other models. Modeling results suggested different trajectories for areas with and without treatment (Figure 2-1).

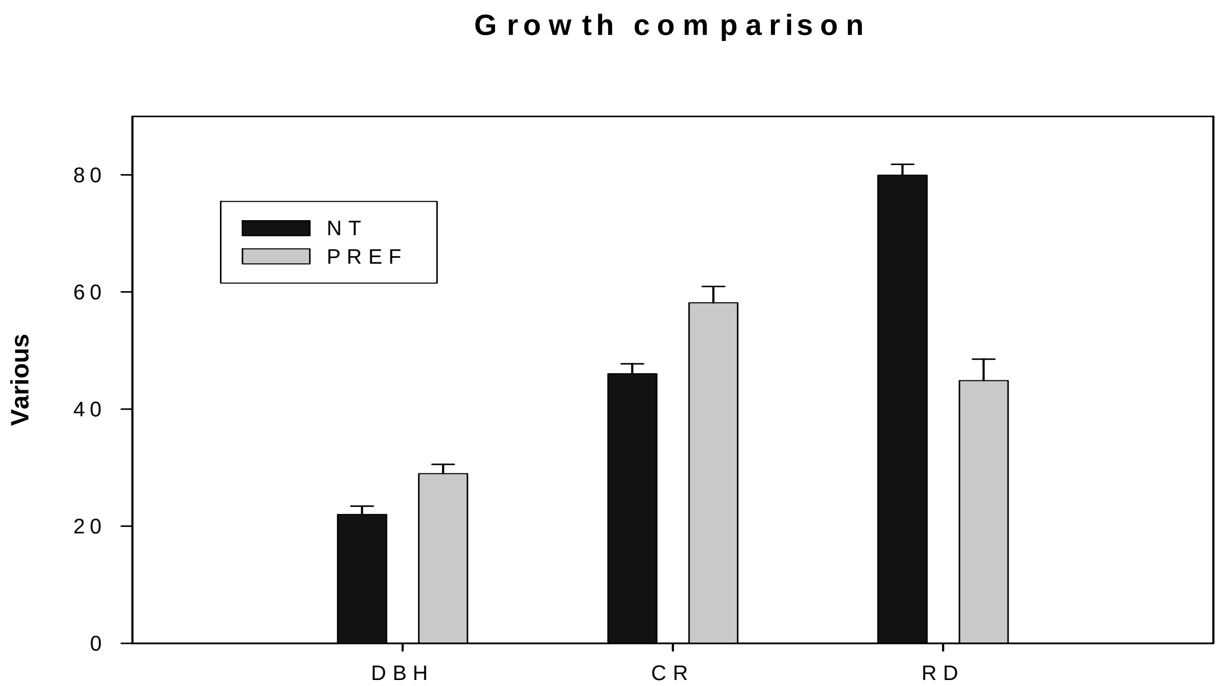

Figure 2-1 Predicted growth in proposed treatment units at stand age 80, with and without treatment. Results produced using SPS. 'NT' represents units with no treatment at stand age 80; 'PREF' represents units with the preferred silvicultural treatment at stand age 80. DBH is diameter at breast height (inches); CR is crown ratio (%); RD is relative density (0-100).

Without treatment, units at age 80 would be dense with intense competition, relatively small trees, and low crown depth. The same units modeled with the preferred prescriptions would have densities below those associated with competition mortality at age 80. With treatment, crown ratios and mean dbh would be higher. Trees in treatment units would average 29" dbh, which is 7" higher than without treatment; individual dominant trees would have much higher diameters. These results suggest that thinning would facilitate crown ratio and diameter development in the proposed units similar to that in trees in developing late-successional stands.

2.2.4 Commercial thinning prescription

The commercial thinning unit 1M in the Matrix land use allocation, Section 1, T. 26 S. R. 11 W., would retain approximately 60 trees per acre. Spacing would be varied throughout the unit but would be targeted to achieve a Relative Density of 30 (see relative density discussion above). Hardwoods would be thinned along with conifer. Stands would be thinned from below, primarily removing trees in the suppressed and intermediate canopy classes with some co-dominate trees removed where feasible. All existing snags and down logs would be retained unless they posed an unacceptable safety risk. The prescription is designed to continue to promote the development of intensively managed forests for the purpose of timber production while meeting other resource objectives.

2.2.5 Harvesting Systems

EA units 5B, 9 and portions of 1A, 1D, 6N would be harvested using a helicopter that allows the logs to be transported free and clear of the ground. The remaining units and portions of units would be harvested using a skyline cable system capable of one-end log suspension. See map A1 in Appendix 2 for logging systems description. Cutting of trees would be done manually with chainsaws. One-end log suspension would be required during inhaul for the skyline cable system. Marbled murrelet seasonal restrictions and daily timing restrictions for timber harvesting would be in place on all or portions of units 4, 5B, 6, 7, 9 10A, 11, 14, 16, 19, 20, 20S, 24, 25, 26 due to their proximity to occupied murrelet habitat. A daily timing restriction would be in place for portions of 1A, 1B, 1C, 1D, 1M, 3, 4, 8, 12, 13, and 14 until fire closure, at which time the timing restriction would be removed. See Map A2 in Appendix 2 for marbled murrelet seasonal restrictions.

2.2.6 Road Construction and Decommissioning

Approximately 2.2 miles of new road would be constructed. Roads would be natural surface and have minimal clearing widths. All new road construction would occur on stable ridge top or bench locations and would be decommissioned after use (See Appendix 4). These temporary roads (semi-permanent roads as defined by NMFS, 1997) are expected to be open for up to 3-4 years, but seeded, mulched, properly drained and blocked prior to each wet season (i.e., winterized). Seven (7) helicopter landings would be newly constructed or improved from existing clearings and decommissioned after use. Up to 4.3 miles of existing road would need renovation. Renovations could include blading and brushing and at times a layer of rock. Some roads that are currently closed would be renovated. This alternative would require 0.9 miles of road to be improved by applying rock to the unimproved surfaces and improving drainage. Most of these renovated and improved roads would be closed or decommissioned after use (see Table 4-1). In total, 11.5 miles of existing road would be closed or decommissioned. Approximately 9.6 miles of these could be accomplished through the timber sale actions. The remaining would have to be accomplished through separate restoration efforts.

Decommissioning would occur on 8.6 miles of road within Riparian Reserve allocation. Please see Table 4-1 in Appendix 4 and Map A4 for more details on planned road closure or decommissioning actions.

2.2.7 Riparian Reserves

All intermittent and perennial, non fish-bearing streams would retain the interim Riparian Reserve widths of 220 feet (one site potential tree height (USDI 1999) on each side of stream channels. All fish-bearing streams would retain the interim Riparian Reserve widths of 440 feet on each side of stream channels. Alternative A would include density management treatment within designated Riparian Reserves.

No treatment areas would occur adjacent to the majority of perennial streams. The widths of these no treatment areas would be varied by site based on geomorphology and site conditions, and would be designed to maintain stream temperature, bank stability, and prevent sediment delivery during and after treatment. Within the analysis area, six miles of stream channels would have designated no treatment areas.

Alternative A would also include ‘thin through’ treatments on five miles of intermittent and ephemeral stream channels where thinning would occur up to the stream channel. Stream bank trees (any tree within three feet of a channel with annual scour and deposition) would not be removed. The remainder of the Riparian Reserve would receive the same treatment as surrounding upland areas. Prescriptions would generally result in removal of much of the smaller red alder and conifer, and would retain larger conifers. See Map A1 in Appendix 2 for locations of no treatment areas and thin through streams.

2.2.8 Site Preparation

The 55 acres of hardwood conversion would be prepared for planting by hand piling and burning of slash during the wet season and would comply with Oregon smoke management guidelines. Slash loading in these sites is expected to be around 4 tons per acre resulting in approximately 220 tons of fuel being burned.

2.2.9 Restoration Activities

Several aquatic and riparian habitat restoration projects would be implemented under this alternative. Three culverts would be replaced on Cox Creek, and one culvert would be replaced on a tributary to Coal Creek, to improve fish passage. An additional 1.9 miles of the -7.0 road would be decommissioned (beyond what would be covered under sale activities). Additionally, two private roads (6.4 and 6.5) would be decommissioned depending on landowner permission.

2.3 Alternative B – Minimize Short Term Impacts to Late Successional Ecosystem

2.3.1 Overview

Alternative B reduces short-term impacts to late-successional habitat adjacent to and downstream from the treatment units, as well as minimizing impacts to late-successional structures in the treatment units.

Under this alternative, approximately 886 acres would be thinned and 22 acres of hardwood stands would be converted to conifer stands. Approximately 442 acres would occur within the Riparian Reserve. Approximately 21 acres of commercial thinning would occur in the Matrix land use allocation; 0.1 miles of new road would be constructed in the matrix land use allocation; 4.8 miles of road would be renovated or improved. Approximately 1565 snags would be created and 2652 trees would be cut for down wood debris. The key components of Alternative B that make it distinct from Alternative A include:

i. Use of helicopter on 275 acres and ground-based equipment on 14 acres instead of constructing new roads would decrease the potential disturbance of marbled murrelet habitat on 39 acres and avoid creating 2.1 on new road.
ii. Additional implementation cost of helicopter yarding
iii. Adds buffers around snags patches of high ecological value.
iv. Replacement of all culverts identified in Alternative A except for three on perennial streams.
v. Restoration activities not associated with timber sale activities are not considered.

These key components are described below, followed by a more detailed description of Alternative B.

2.3.2 Key components

The use of newly constructed temporary dirt roads considered in Alternative A could potentially disrupt marbled murrelet nesting in potential habitat within and adjacent to treatment areas. By helicopter yarding those areas accessed by the new roads proposed in Alternative A, activity would primarily occur in the winter months outside of the nesting season. This alternative eliminates 2.1 miles of new road construction and shifts 275 treatment acres from skyline cable to helicopter yarding. Twelve (12) helicopter landings would need to be constructed or improved requiring 3.1 acres of ground disturbance. Approximately 14 acres would be shifted from skyline to ground based systems on flat areas adjacent to existing roads. See Map B1 in Appendix 2 for harvest systems and landing construction.

The Northwest Forest Plan (1994, p19) and Coos Bay RMP (1995, p20) recommend that alternative methods, such as aerial logging, be considered to provide access in the LSR. The estimated additional implementation cost of Alternative B would be approximately $969,000. This estimate reflects the net increased cost associated with helicopter yarding including yarding and landing-construction costs and the cost reduction associated with the elimination of 2.1 miles of temporary road construction. See Appendix 1 for a more detailed discussion of the cost estimates.

Two high value snag patches have been identified within the proposed treatment areas that may be a potential risk to those working in the project area and would receive a two-snag-height safety buffer under Alternative B. The two snag height buffer should be adequate given slope and position to provide a safe working area. A two snag height buffer is considered safe by Federal OSHA standards (1995). The snag buffers would reduce the treatment area by approximately 8.6 acres.

Total treatment acres would slightly decrease as a result of the reduced new road construction. An additional 6.2 acres in unit 14 would become feasible to treat by helicopter; however, 7.2 acres elsewhere would become unfeasible based on tree size and proximity to a suitable landing. Hardwood conversion acres would be reduced from 55 acres to 22 acres due to the increased cost associated with helicopter yarding and lower value of hardwood species.

The three culverts identified that occur on or near perennial fish-bearing streams would not be replaced under this alternative. Replacing these culverts could create short-term sediment delivery to fish bearing streams.

Restoration activities not associated with timber sale activities are not included under this alternative because they have the potential to create short-term increases in sediment delivery to salmonid habitat.

2.3.3 Density management thinning (DMT) prescriptions

Silvicultural prescriptions for the units in Alternative B would be the same as those for Alternative A. The boundaries would be adjusted slightly to accommodate the specifics of the harvesting system or protection areas as described earlier. Please see map B3 in Appendix 2 for alternative B prescriptions

2.3.4 Commercial thinning (CT) prescriptions

The prescription for commercial thinning in 1M is identical to the prescription in Alternative A (2.2.4).

2.3.5 Harvesting Systems

EA units 5B, 9 and portions of 1A, 1B, 1C, 1D, 3, 4, 6N, 7, 12, 14, would be harvested using a helicopter that would allow the logs to be transported free and clear of the ground. Portions of 1C, 1D, and 11 would be harvested using ground based machinery. The remaining areas would be harvested using skyline cable systems. See Map B1 for logging systems description in Appendix 2. Cutting of trees will be done manually with chainsaws or the use of a cut-to-length mechanical system in the ground based areas. One-end log suspension would be required during inhaul for the skyline cable system. Marbled murrelet seasonal restrictions and daily timing restrictions for timber harvesting would be in place on all or portions of EA units 5B, 6, 7, 9 10A, 11, 14, 16, 19, 20, 20S, 24, 25, 26 due to their proximity to occupied murrelet habitat. A daily timing restriction would be in place for portions of1A, 1B, 1C, 1D, 1M, 3, 4, 8, 12, 13, and 14 until fire closure at which time the timing restriction would be removed. See Map B2 in Appendix 2 for marbled murrelet seasonal restrictions.

2.3.6 Road Construction and Decommissioning

Less road construction and improvement would occur under this alternative. There would be 0.1 miles of new road constructed. The number of miles of road renovation would be similar to Alternative A. Twelve (12) helicopter landings would need to be constructed or improved requiring 3.1 acres of ground disturbance Approximately 4.4 miles of existing road would be renovated, and 0.9 miles would be improved. Road closures and decommissioning would be slightly less than Alternative A; only the 9.6 miles of timber sale associated roads would be accomplished (see Table 4-1 in Appendix 4). Replacement of three dysfunctional culverts expected to deliver short-term sediment to the stream network will not be part of this action.

2.3.7 Riparian Reserves

Treatments around streams and within Riparian Reserves would be identical to Alternative A (2.2.7). Alternative B would include 14 acres of ground based harvesting within Riparian Reserves. Additionally, winter haul would increase as a result of winter season helicopter yarding.

2.3.8 Site Preparation

The 22 acres of hardwood conversion would be prepared for planting by hand piling and burning of slash during the wet season and comply with Oregon smoke management guidelines. Slash loading in these sites is expected to be around 4 tons per acre resulting in approximately 88 tons fuel being burned.

2.4 Alternative Comparison and Summary

Table 2-2 Summary of key elements of the Alternatives

	No Action	Alternative A	Alternative B
Miles of temporary new road construction	0 mi	2.2 mi	0.1 mi
Density Management Thinning acres	0 ac	870 ac	865 ac
CT acres	0 ac	21ac	21 ac
Hardwood conversion acres	0 ac	55 ac	22 ac
Low-quality murrelet habitat disturbed	0 ac	27 ac	27 ac
Acres of treatment with the potential to affect marbled murrelet habitat	0 ac	138 ac	99 ac
High-value snags at risk	0	18	1
Snags created (approximation)	0	1565	1565
Down wood pieces created (approx)	0	2667	2652
Implementation cost (relative)	(opportunity cost)	$0	$969,000
Miles of intermittent channels thinned through	0	5.1	5.0
Miles of stream channels with no treatment zones	0	6.0	6.0
Open road density	3.87 mi/mi2	2.53 mi/mi2	2.53 mi/mi2
Improves transportation network by replacing culverts in poor and unsatisfactory condition	No	Yes	Only those on intermittent channels
Implements restoration opportunities	No	Yes	No

2.5 Design Features common to Alternatives A and B

The best management practices described in the RMP appendix D describe many of the design features common to both action alternatives and are incorporated into their design. Additional design features as well and some highlighted best management practices are described below. Design features apply to both alternatives unless specifically noted.

2.5.1 Harvest Methods and Prescriptions

- All remnant overstory trees > 20" will be reserved from harvest. These large trees will add significantly to the structural diversity of the modified treatment units. Unit boundaries, spur roads, landings, and yarding corridors will be designed to avoid and protect large residual trees wherever possible.

- Yarding activities to helicopter landings adjacent to unit 8 and 9 are prohibited form April 1st to August 5th with an additional daily timing restriction from August 6th to September 15th which prohibits yarding activities from 2 hours prior to sunset to 2 hours after sunrise. Additionally, yarding activities to helicopter landings adjacent to unit 1A, 4, and 7 have a daily timing restriction from April 1st until Sept 15th or the start of fire closure.
- Cutting and yarding activities are restricted as described on maps A2 and B2 according the following guidelines.
    - *Full MMR plus NSO* prohibits harvest activities from March 1st to August 5th with an additional daily timing restriction from August 6th to September 15th.
    - *Full MMR* prohibits harvest activities from April 1st to August 5th with an additional daily timing restriction from August 6th to September 15th.
    - *DTR only* prohibits harvest activities from 2 hours before sunset to 2 hours after sunrise from April 1st to September 15th or the start of fire season closure.
- At least 10% of each contiguous young stand would remain unthinned (range approximately 11-60%) pursuant to the LSRA.
- In south-facing and ridgeline units with high densities of fire-intolerant species such as western hemlock and western red-cedar (Units 16, 24, 25), prescriptions will favor removal of these fire-intolerant trees and retention of fire-tolerant or fire-related species (i.e. Douglas-fir). In all other treatment units, shade-tolerant species (e.g., western red cedar, western hemlock) will be maintained.
- All red alder will be retained in units 11, 24, 25 and 26, where cover by red alder is extremely low and representative of historic conditions. Retention of this red alder will maintain structural and species diversity, and lead to eventual canopy gaps as red alder senesces. In all other treatment units, red alder will only be maintained where it meets design criteria (MDL or RD requirements), or where it occurs within 3' of active channel margins.
- In all treatment units, minor species, and hardwood species other than red alder (e.g., Oregon myrtle, bigleaf maple) will be maintained.
- In thinnings based on existing tree densities (i.e. RD thinnings), where choice exists in prescription, deformed trees (e.g., trees with multiple tops, damaged tops, cavities), and wolf trees will be chosen for retention.
- Retain several trees/acre (generally < 3/ac.) with defect (e.g. broken or forked tops, damaged trees, wolf trees, etc.), if present.
- Within alder conversion /conifer restoration units, releasable conifers will be reserved from cutting. In these units, individual large bigleaf maple and myrtle will be reserved for habitat diversity. Stump sprouted maples and myrtles will be cultivated to encourage large single stem trees.
- Prescriptions will be modified to maintain biotic communities associated with potential "hotspot" habitats, including a rock outcrop (Unit 9) and several sag ponds (Unit 1C).
- Conventional falling with chain saws and cable yarding may be permitted only from July 1 to March 31 of the following year to reduce bark damage during high sap flow.

- The location, number, and width (maximum of 12') of cable yarding corridors will be specified prior to yarding.
- In addition to BMPs for ground based harvest activities found in RMP all forwarder/harvester operations should place 4 to 6 inches of green slash materials in the skid trail prior to transporting logs from the thinned units. All designated trails should be pre-approved by the Authorized Officer and use the existing network to the extent possible. Operate during dry season of the year when soil moisture content is less than 25% at a depth of 2 to 4 inches below the organic layer. Block all access trails upon completion of projects to discourage OHV use in the future.
- Retain 1-2 large slash piles in unit 1M.
- Keep litter cleaned up to reduce attraction to corvids (i.e. crows, ravens, jays).

2.5.2 Snags

- All existing snags will be retained and protected during logging operations to extent possible. Snags will be reserved from cutting except those that must be felled to meet safety standards.
- Any snags felled or accidentally knocked over will be retained on site.
- In alternative A, for every high value snags that is felled, a large tree (approximately 30+ inches dbh) will be topped to create a snag in the adjacent stand. Trees containing potential murrelet nest platforms or other valuable habitat structures will not be topped.
- In alternative B, high value snags will be buffered using no treatment areas to protect against their removal. These buffer areas of unthinned trees around snags will facilitate retention and reduce safety concerns (USDA-USDI 1998).
- Up to 3 trees per acre will be killed to meet immediate snag needs in treatment units (see Table 2-1). Snags will be created after yarding, and preferably after the unit has over wintered if possible. In units where 2 snags/ac are prescribed, distribute snags such that the units contain approximately 3 snags/ac on north aspects and 1/ac on south aspects.
    - Douglas-fir snags will be recruited from trees 15-19" in 1950's stands and 12-14" in 1970's stands. Selecting trees from this range will provide some near term habitat benefit without delaying attainment of snags greater than 24" dbh in the future. Killing the largest trees in the stand would have the deleterious effect of eliminating the trees best adapted to the site.
    - Snags will be created by cutting or girdling selected trees above the 2nd live branch and at least 30' tall.
    - Where applicable, created snags will be clustered in north-facing units to create or enlarge canopy gaps. Created snags will generally be evenly-distributed in south-facing units. However, recruiting snags in clusters on south facing ridgelines will also be employed, to emulate the effects of small burns.

2.5.3 Down wood

- All existing down logs will be reserved from cutting and removal during logging operations.

- In all density management units (not hardwood conversions), create 3 down logs/ac. Down logs will be created after yarding, and preferably after the unit has over wintered.
- Down wood will be recruited from trees 15-19" in 1950's stands and 12-14" in 1970's stands.
- Fresh blowdown inside treatment units will be counted toward meeting the down wood recruitment targets if they meet or exceed the size requirements.
- Generally, down wood creation will be clustered in north-facing units. Created down wood will generally be evenly-distributed in south-facing units. However, recruiting down wood in clusters on south facing ridge lines will also be employed, to emulate the effects of small burns.

2.5.4 Culverts / Haul

- Hauling on the Coal Creek Mainline Road will be restricted to the dry season (generally May 15-October 15).
- Culverts will be replaced during the in-stream operating period (July 01 - Sept 15).
- Culvert replacements on intermittent streams will occur after cessation of flow.
- When replacing stream-crossing culverts on perennial streams, divert stream flow around work area, contain sediment (using straw bales and/or filter fabric), and [as needed] pump turbid water from containment area onto vegetated terrace or hill slope as directed by contract administrator.
- For winter haul and landing activities on gravel surfaces, the following best management practices should be implemented to prevent sediment delivery at or near stream crossings along the haul route. The sediment prevention measures must be in place, before winter haul begins. They include:

  *Apply an additional lift of rock to the area of road that can influence the stream if rill erosion is evident in the road tread near live stream crossings.

  *Contain any offsite movement of sediment from the road or ditchflow near streams with silt fence or sediment entrapping blankets as needed. Such control measures must allow for the free passage of water without detention or plugging. These control structures and applications should receive frequent maintenance. At the completion of haul, sediment retained in the traps and the traps themselves will be removed.

  *If the ground is already saturated from winter rains and more than 1 inch of precipitation is predicted in the project area over the next 24 hours, then winter haul should be suspended. Operations may resume after the 24 hour suspension, except when another storm (exceeding 1 inch) is forecasted. Currently, precipitation predictions are based on the Quantitative Precipitation Forecast (QPF) maps from **The HydroMeterological Predication Center internet site:** http://www.hpc.ncep.noaa.gov/html/fcst2.html A similar predictive model internet site may be used if this site should be unavailable in the future.

2.5.5 Roads

- Minimize road corridor clearing width for all road renovation and new construction.

- For roads to be closed or less than fully decommissioned, install water bars to route surface runoff to vegetated areas and block road to traffic by use of earthen berm, rock or gate barriers. Install waterbars as back up drainage feature near culverts to prevent diversions.
- For roads to be fully decommissioned: Remove fills and culverts on stream crossings, restore banks and channel bottoms to stable grades, de-compact road surfaces to regain normal infiltration rates, mulch tilled surface using surrounding forest slash if possible or straw and seed (see District native seed policy), and close all de-compacted surfaces to traffic.

2.5.6 Site Preparation

- Post harvest treatments for hazard reduction and site preparation may include: 1) the slashing of undesired and/or competitive vegetation, 2) machine and/or hand pile of slashed vegetation, logging residue, and landing pullback. Machine and/or hand piled all slash ½ inch to 4 inches in diameter, including landings. Piles would be covered with black plastic (6 mil) and burned in the following late fall/early winter when fire danger is low. Material pushed off the landing during the operation will be pulled back to the landing and stacked in manner to promote best burn results.
- Slash piles will be located at least 25 feet from stream channels.
- All harvest and post-harvest activities will comply with applicable Oregon State Fire Regulations. Disposal of slash will be conducted under the direct oversight of Bureau of Land Management personnel and will comply with the State of Oregon Smoke Management Guidelines.
- Burn piles, either hand or machine will be located away from existing snags and down wood to prevent fire charring. Where tree retention is located piles will be placed at a distance from leave trees to minimize scorching when burning.
- As an alternative to pile burning, landing piles and concentrations from ground-based processor and cable operations located within the interior of the project areas and along roads designated for post-harvest closure or decommissioning would be broken up and scattered before equipment is removed from the site. On roads scheduled for decommissioning, woody material could be scattered across road surface to further the decommissioning process.
- Other site preparation activities could include slashing, swamper burning, and chainsaw scalping.
- Hand or machine pile to within 20 feet each side of those roads within harvest areas not identified for closure or decommissioning after harvest.
- Except along existing roads, machine piling would be limited to those units with slopes less than 35% and to periods when soil moisture content is measured below 25%. Roadside machine piling will be limited to dry weather periods.
- Post harvest site preparation treatment would also include the slashing of undesired competitive brush species and the hand piling of slashed brush and logging residue from ½ inch small end to 4 inches on the large end. Handpiled brush would then be covered with black plastic and burned in the following late fall/early winter prior to planting season. Piles could be distributed throughout the stand to provide the best

opportunity for achieving desired micro-site planting and spacing of planted understory trees.

2.5.7 Noxious Weeds

- Equipment will be washed at an approved wash site that minimizes risk of noxious weed introduction and spread.
- Minimize soil disturbance and seed all bare soil with an approved weed free seed mix.
- Treatment by brushing or pulling of weeds on the BLM managed haul route will be completed prior to the start of hauling.

3 Affected Environment

This chapter describes the current (baseline) condition, organized by resources, of the environmental components that could be affected by any of the alternatives if implemented. Additional information can be found in the Watershed Analyses.

3.1 Stand Development and Desired Future Conditions (Issue 1)

3.1.1 Unit-level forest conditions

Individual tree growth rates

Proposed treatment units in the analysis area fall into two broad cohorts; one group of stands initiated between 1948 and 1961 (1950's stands, hereafter); a second group initiated between 1965 and 1976 (1970's stands, hereafter). Both cohorts were initiated by timber harvest. Timber harvest in 1950's units involved clear cut and seed tree regeneration with retention of some overstory dominant trees (on ridges and other features), using tractor logging and extensive downhill yarding. Harvest in 1970's units involved principally high lead cable yarding. The 1950's units were regenerated using natural seeding (seed trees); 1970's units were planted with Douglas-fir. Both techniques sometimes led to dense stands and sometimes led to hardwood-dominated stands. Following 30-50 years of succession, seven of the potential treatment units (18% of the treated acres) are best-described by the canopy closure stage; 18 units (54% of treatment area) approximate conditions in the biomass accumulation/competitive exclusion stage of natural stand development, and two units (28%) are best-described as just entering the maturation stage of development (Franklin et al. 2002).

All potential treatment units and most previously managed stands in the analysis area, show strong signs of tree competition, including high tree densities, low growth, smaller tree diameters, lower crown ratios, and higher height/diameter ratios. Most Coast Range stands which developed late-successional characteristics had low and variable densities at ages comparable to the proposed treatment units (Tappeiner et al. 1997, but see Winter et al. 2002). The relative densities[3] (RD) of these late-successional stands were generally below self-thinning levels (< 55), and the densities of large overstory trees/ac. ranged between 20 and 50. Proposed 1950's treatment units currently have relative densities between 58 and 100 (not including hardwood conversion areas), and relative densities in 1970's units range between 34 and 100, with only 3 treatment units < 55. Tree densities in treatment units range between 160 and 727 trees/ac.

Dominant trees in the proposed treatment units have a mean radial growth of 0.3 - 0.7 cm/year (last 10 years). These values are comparable to young unthinned plantations, and approximately ½ of the growth rates of dominant trees in late-successional stands at 50 years of age (1.19-1.35 cm/year) (Tappeiner et al. 1997). Basal area increment, a measure

[3] Relative density (RD) expresses the actual density of trees in a stand relative to the theoretical maximum density (RD100) possible for trees of that size; for Douglas fir, self-thinning occurs at densities > 55 (Hayes et al. 1997)

of total tree growth and biomass accumulation (Poage and Tappeiner 2002), was estimated for both dominant and codominant trees in 1950's and 1970's treatment units (Table 5-4: Appendix 5). Basal area increment for dominant trees in treatment units were below predicted values for trees that became old growth (Figure 3-1). Codominant trees in treatment units appeared to be roughly on a trajectory to become small diameter old-growth trees (Figure 3-1).

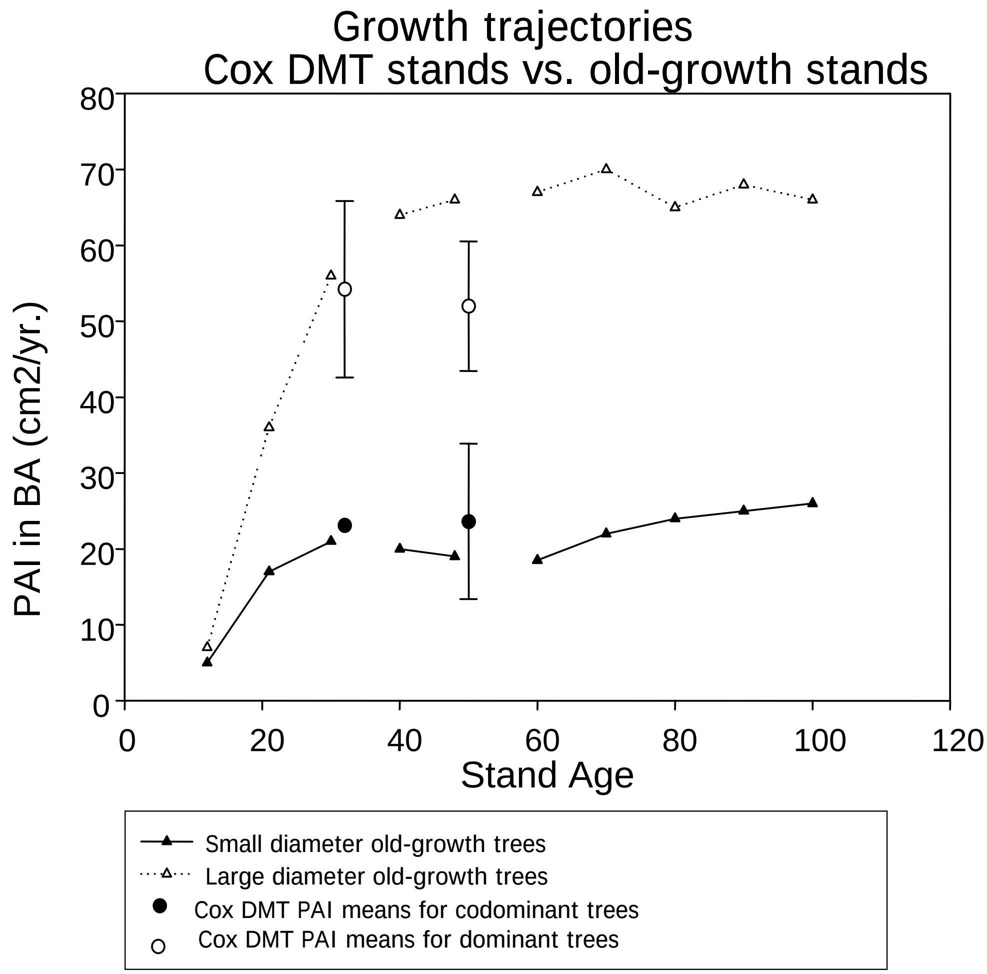

Figure 3-1 Comparison of tree growth in proposed treatment units to growth of trees which became old-growth, at similar ages (with 95% confidence intervals). Growth lines are from Poage and Tappeiner (2002) for large-diameter (···) and small-diameter (—) old-growth trees. Means for dominant (º) and codominant (•) trees measured in the potential treatment units are presented, with 95% confidence intervals. Sample sizes were 1 and 39 for 1970's codominant and dominant trees, and 6 and 87 for 1950's codominant and dominant trees.

Individual tree diameters and crown ratios are low, particularly in the older cohort. Coast Range trees that survive to become old-growth trees generally average > 20" dbh by age 50 (USDI 1999). The only trees > 20" in 1950's treatment units are residual trees that originated in periods prior to stand-initiating disturbance. Crown ratios averaged < 40% in 1950's stands, with codominant trees averaging < 29%. Crown ratios < 30% are associated with reduced vigor, low diameter growth, poor recovery after thinning, and suppression mortality (Smith et al. 1986). Mean height/ diameter ratios in both cohorts are almost 90%, suggesting that some units are unstable and that trees near ridge areas are susceptible to blowdown.

Forest structure

Structural diversity (including horizontal, vertical, species, and physical legacy components) is low in both 1950's and 1970's units, due to their similar and evenly-applied disturbance history; units have few late-successional characteristics. Horizontal diversity includes within-stand variation in tree densities, canopy gaps and large limb structures. Within treatment units, variation in tree densities is moderate, but units lack areas of low tree density (Appendix 5 Table 5-4). Canopy gaps in the treatment units are below minima set for silvicultural restoration treatments in the LSRA (USDA-USDI 1998). Gaps[4] averaged < 1/ha in 1950's stands, accounting for 3% of treatment units. (1950's stands support some trees > 20" but few have large limbs).

Vertical diversity includes canopy differentiation, densities of residual overstory trees, and sapling densities. Vertical diversity in 1950's stands includes between 1 and 2 canopy layers, with > 70% of the trees either suppressed or codominant. The 1970's stands support only a single canopy layer, with primarily codominant trees. Densities of residual overstory trees ranged from 0.05-0.3 TPA in the seven 1950's treatment units in which residual trees were observed and measured. Residual overstory trees were only observed in one 1970's unit (unit 11).

Units in the analysis area have relatively low tree, shrub and herb diversity. Proposed treatment units support principally Douglas-fir and western hemlock in tree layers, with mean tree richness between 1.4 and 2.1. This richness is lower than natural stands in these associations (McCain and Diaz 2002), due to regeneration techniques used in the units. Western red cedar and bigleaf maple densities in units are far lower than in natural stands. Red alder is present principally in disturbed areas such as road prisms and riparian areas. Saplings average over 90/ac. in 1950's stands, and > 190/ac. in 1970's stands. These saplings are principally western hemlock; few shade-intolerant saplings (Douglas-fir) are present, consistent with the low number of canopy gaps. Shrub and herb richness in both cohorts is moderately low; forest floors in the analysis area are dominated by shrubs and by sword fern (*Polystichium munitum*). The primary shrub species include rhododendron (*Rhododendron macrophyllum*), vine maple (*Acer circinatum*), and evergreen huckleberry (*Vaccinium ovatum*), with salmonberry (*Rubus spectabilis*) locally abundant in drainage bottoms and other wet areas. Few herbaceous species other than sword fern have covers > 5%. Lichen and bryophyte diversity tends to be low due to limited light conditions resulting from the densely stocked conifer-dominated overstory. Lichens are generally more abundant along stand edges and in canopy gaps, or in association with residual overstory trees or hardwoods. Bryophytes were more abundant where class 3, 4, and 5

[4] Gaps are operationally defined here as holes in the principle canopy wider than 1 overstory tree canopy width.

down logs were present, in or adjacent to streams, and on hardwood trees and older hardwood shrubs.

Structural legacies in treatment units include moderate levels of low quality down wood and few snags (Table 5-4: Appendix 5). Although over half of the down wood in 1950's units is > 15" diameter, it is dominated by highly decayed (DC 5) logs. Down wood volumes in 1950's units are far below levels in comparable young/ mature stands or in old-growth stands (Spies and Franklin 1991), and far below recommended retention ranges for riparian reserve areas (USDA-USDI 1998, pg. 90). Although 1970's units have a much higher mean down wood volume, this mean is driven by a single unit with exceptionally high volumes (unit 9); the rest of the 1970's units have equal or lower volumes of down wood. Snag populations in both cohorts are dominated by small diameter, suppression mortality trees; larger diameter snags are frequently short and in advanced decay stages. Total snag densities in the treatment units are far below levels in comparable young/ mature stands or in old-growth stands (Spies and Franklin 1991); hard snags > 20" diameter are almost absent from units (Table 5-4).

3.1.2 Analysis area and landscape-level characteristics

Current vegetation patterns in the analysis area as a whole are a result of differences in geomorphology (aspect and topographic position), as well as natural and human-caused disturbance processes and natural succession. Treatment units encompass a range of aspects, including 15 south-through-west-facing units and 11 north-through-east-facing units; 4 units have mixed aspects. Most of the treatment units are in middle and upper topographic positions, but areas adjacent to large riparian draws and ridge areas are also included. Although Riparian Reserves make up a sizeable portion of the treatment units, drainages in the treatment units are mostly 1st and 2nd-order. Detectable riparian influences on overstory composition in these systems do not extend far from active channel margins (< 1 tree height). Minor increases in overstory tree size (diameter, height) and structural diversity (density, gaps) may occur in Riparian Reserves, associated with increases in available water and increased fluvial and hillslope disturbance.

Primary disturbance history for the analysis area includes both fire and human stand replacements. Unmanaged areas in the analysis area are estimated to be 300 years old, probably initiating during a period of intense fire activity in the analysis area from 1735-1780 (USDA-USDI 1998). All other stands in the analysis area originated after 1910, and the majority of these (including the proposed treatment units) were initiated after 1940 by anthropogenic stand replacements. Succession continues to modify forest structure and composition in periods between disturbances.

Succession and disturbance in the analysis area have produced forest types at the low end of the historic range of variability in late-successional forest cover. Analysis of BLM forest inventory data and remote sensing data (Nighbert et al. 1998) suggest that cover by large sawtimber and old-growth size classes in the analysis area is roughly 30% (Table 5-2: Appendix 5), compared with over 59% in studies of pre-logging Coast Range landscapes (Ripple et al. 2000). The proportion of large sawtimber and old-growth size classes in the analysis area is slightly greater than that associated with the 25% percentile for models predicting the historic range of variability in old-growth covers at the LSR-scale

(Wimberly et al. 1999). The analysis area has > 60% cover by pole- and small sawtimber, compared with only 26% in pre-logging landscapes. Thus, much of the analysis area is either late-successional habitat (horizontal diversification stage) or young forest (canopy closure stage). Treatment units in the biomass accumulation/ competitive exclusion or maturation stages of development covered < 20% of the analysis area.

The analysis area is part of LSR # 261, described in the South Coast-Northern Klamath Late-Successional Reserve Assessment (USDA-USDI 1998). LSR # 261 includes > 40% mature and late successional habitat (USDA-USDI 1998). These levels are closer to the historic ranges of old-growth cover than covers in the analysis area, but are still below estimated mean historic old-growth cover (Wimberley et al. 2000). Cover by young (sapling) forest types in LSR #261 is twice as high as in historic landscapes (Ripple et al. 2000). Late-successional forest types in LSR #261 have little interior habitat (14% of total), and include degraded private land in (approximately) every third section (USDA-USDI 1998). These private forest types cover 16,786 ac., almost 20% of the LSR.

LSR # 261 enhances reserve connectivity by providing a crucial provincial link between the Southern Oregon Coast Range and Northern Klamath Provinces. It is the second largest reserve, and the most isolated LSR block in the two provinces; loss of LSR # 261 would lead to a gap > 12 miles between late-successional habitat blocks (USDA-USDI 1998). LSR # 261 has a moderately high potential to develop large, contiguous late seral stands with proper management. Activities which enlarge or create late-successional habitat or enhance habitat between existing late-successional habitat blocks would thus enhance continuity of the entire LSR system in Southwestern Oregon, making LSR # 261 a high priority for management action.

3.2 Short Term Impacts to Late-Successional Ecosystems (Issue 2)

The following subheadings (3.2.1-4) are a description of affected environment specific to Issue 2. The alternatives contrast potential effects to nesting marbled murrelets, wildlife movements from road corridors, snags that provide high habitat value to wildlife, and to culverts that could deliver sediment to the stream network. The baseline conditions for these specific concerns are presented below.

3.2.1 Marbled Murrelet Nesting

The analysis area contains approximately 2,176 acres of suitable habitat and one known occupied murrelet site. Few surveys for murrelets have been done within the analysis area. Most of the suitable habitat is in the south and southeast portion of the analysis area and is of high quality (contiguous stands > 10 acres in size, numerous large platforms). There are other occupied sites along the Coos River. Based on the quality of available habitat, the short distance to the coast (< 25 miles), and the presence of known occupied sites in the vicinity, there is a high probability that the unsurveyed high-quality habitat is occupied by murrelets.

The western portion of the analysis area contains unsurveyed low-quality habitat. This area was originally harvested in the 1940s and 50s, and many trees > 15 inches dbh were left. Today this area is dominated by 50-year-old stands of dense conifer and mixed hardwood/conifers, punctuated by occasional individual or small clumps of remnant trees. Most of these remnant trees were young trees at the original harvest and are now mature trees that have been open grown for 50 years. While these trees are beginning to develop occasional small (4-6 inch) platforms (primarily limbs and mistletoe deformities), they do not function as suitable murrelet habitat because the platforms occur at a low density (< 4/tree), the trees are hidden within the surrounding trees, and the stands are so dense that they preclude access by murrelets. Some of the remnant trees, however, are large old growth trees that occur either singly or in small groups (up to 18 trees in a 2 acre area in unit 4). These larger remnant trees contain larger platforms and have ample access for murrelets, and do function as suitable habitat. There are approximately 27 acres plus 16 scattered individual trees of this kind of habitat within the units or within 100 yards of the units. This habitat is low quality because the density of nest trees, density of platforms, and size of platforms is all low. Murrelets focus on areas with high levels of platform trees, total platforms, and large platforms when selecting nest sites (Nelson and Wilson 2002). High-quality habitat is commonly available a mile or two further up the Cox Creek drainage.

Murrelets nest from late April through mid September (Hamer and Nelson 1995b). Human disturbances can distract wildlife from essential life functions such as feeding and reproduction and thereby reduce fitness or reproductive success (Frid and Dill, 2002). It is unclear how susceptible marbled murrelets might be to the kinds of disturbances associated with the action alternatives (e.g. vehicles, mechanical noises, people working near nests), and there have been virtually no studies upon which to base a conclusion. While most incidental observations of nesting murrelets suggest that murrelets generally appear undisturbed by most noises, vehicles, and people, they have shown some response to human disturbance.

3.2.2 Roads and Wildlife

Roads can affect wildlife by creating a physical or perceived barrier to movement, acting as avenues for edge species to utilize interior habitats, and by encouraging harassment via vehicle traffic and hunting. Currently there are approximately 33.3 miles of open roads in the analysis area on BLM. This equates to an open road density of 3.9 miles/sq. mile (see Table 3-1). Roads that have grown over with vegetation to become impassable by vehicles are less likely to restrict movements of wildlife species and do not allow the harassment associated with vehicular traffic. The analysis area is within the Tioga big game management unit where the open road density objective is 1.1 to 2.9 miles/mi^2 (BLM 1995). This target density is less than other areas on the District because of concerns over harassment to big game animals.

Table 3-1 Open Road Densities

Road Status	BLM Lands		Non-BLM Lands		Action Area Totals	
	Area (ac) =	5,506	Area (ac) =	2,530	Area (ac) =	8,036
	Area (sq. mi.) =	8.6	Area (sq. mi.) =	4.0	Area (sq. mi.) =	12.6
	Miles	Density	Miles	Density	Miles	Density
Open	33.3	3.9	14.9	3.8	48.2	3.8
Closed	3.0	0.3	7.8	2.0	10.7	0.9
Overall	**36.3**	**4.2**	**22.7**	**5.7**	**59.0**	**4.7**

3.2.3 Snags

Snags provide breeding habitat for 76 species and feeding habitat for 19 species (Brown 1985, Appendix 13). Special status species that utilize snags include bald eagle, northern pygmy owl, pileated woodpecker, purple martin, western bluebird, silver-haired bat, fringed myotis, long-eared bat, long-legged bat, American martin, and Pacific fisher (FRMP, Appendix T). Competition between trees in most of the units is causing the smaller, suppressed trees to die and become small snags. Snag inventories in proposed units and in other parts of the District have shown that many areas are deficient in snags compared to management goals. Past management practices such as snag falling contracts, felling of hazard trees together with lower snag retention goals from previous management plans have worked to reduce snag availability across BLM lands. Even fewer snags are left on private lands making snags even more limiting across the landscape. Snags are presumably far more common and less limiting in the old growth stands which occupy approximately half of the southeastern part of the analysis area; however, most of the western half was harvested in the 1940s and 1950s, and snags are far less common there. Large, tall (> approximately 100 feet) snags in the early stages of decay which still have many of their limbs and bark are particularly rare in the western part of the analysis area. These snags have an especially high value to wildlife because of their relative scarcity on the landscape, their importance as habitat for bats and cavity-nesting wildlife, and their long “life” as a dead tree. These snags are classified as Type 4 reserve trees under the *Oregon Guidelines for Selecting Reserve Trees* (OR-OSHA *et. al*., 1995) guide.

3.2.4 Culvert inventory

Within the analysis area and road network, 97 culverts were identified in a recent transportation inventory as being undersized, improperly aligned, or failing. Please refer to section 3.8 for the description of the culvert infrastructure within the analysis area.

3.3 Wildlife Resources

3.3.1 Threatened and Endangered and Special Status species

The Analysis Area is within the range of three federally listed threatened species: the northern spotted owl, marbled murrelet, and bald eagle. The area contains suitable nesting habitat for all three species. No threatened or endangered species nest sites or activity centers are within the proposed EA units. Four nests from one bald eagle territory exist downstream along the Coos River, although none occur in the analysis area. Five spotted owl nest sites exist within the average spotted owl home range radius (1.5 miles) of proposed units. There are two occupied murrelet sites within or adjacent to the Analysis Area. Several proposed units are near owl or murrelet sites and have been designed to reduce risks to existing sites. In addition, critical habitat for northern spotted owl and the marbled murrelet has been designated in the Analysis Area. The only other special status species known to exist in the analysis area is the American marten. Other special status species may exist in the analysis area, but no surveys have been conducted to document their presence.

3.3.2 Survey and Manage species

There are no known S&M wildlife species within or near (within 0.2 mile) the proposed units. According to the latest status review (BLM Instruction Memorandum OR-2003-050), there are no S&M wildlife species potentially present in the analysis area which require pre-project surveys.

3.3.3 Down Wood

Down wood levels in the project area are low compared to management goals, primarily consisting of decay class 3 and 4 logs. The main source of down wood is cull logs left behind after the original harvest. In addition, small pockets of root rot have resulted in a few widely scattered pockets of down logs. Like snags, down wood provides habitat for a myriad of species (Brown, 1985, Appendix 13). For a discussion on snags, see Section 3.2.3.

3.3.4 Special or Unique Habitats

Special or unique habitats in the Coos Bay District include meadows, ponds, and rocky outcrops. A small rocky area exists in unit 9 and 1M, and unit 1C contains some small sink ponds. No other unique habitats occur within or adjacent to proposed units.

3.4 Soils Resources

3.4.1 Geology

The analysis area is located in the Tyee sedimentary basin. Three major members of the Tyee Formation and one of the Elkton Formation underlie the area of the proposed action. All of the members are sedimentary sandstone, siltstone, and mudstone, exhibiting characteristics attributed to the Tyee Formations.

Associated hazards of the Tyee Formations, and those similar in lithology, include: rapid erosion, flash flooding, rapid mass movement, and stream bank erosion. The type of failure is determined by the steepness of slope, angle of stratigraphy dip, a combination of stratigraphy type, moisture, and past disturbance activities and intensities. Stratigraphy dips have been mapped on some areas within the analysis area with angles of dip ranging from 3° to 8°. The analysis area appears to be stable, has a low number of landslide and road construction failures.

The analysis area has one area of Quaternary aged deposits near the mouth of Cox Creek and several slides are evident from last year's rainfalls. No harvesting is proposed from these lands under this action.

The Cox Creek and Coal Creek tributaries are tributary to the South Fork of the Coos River. Within the Erosional Processes section of the South Fork Coos River Watershed Analysis, the underlying geology is outlined as follows.

> The South Fork Coos River gorge is the result of the river cutting down as the land is uplifted. Rock falls, from the cliffs in the gorge reaches, deposited large boulders at the toe of the slopes and in the channel. Some of these boulders were 15 to 30 feet tall (Farnell 1979).
>
> The Tyee Formation is characterized by very steep and extremely steep slopes with sharp ridges. Many slopes have a uniform gradient from ridge top to slope toe. Headwalls (fan-shaped concave features) are high in the drainage, have high dissection density. Soils are very shallow to moderately deep, skeletal soils. Headwall gradients are typically 80% or greater. Typical headwall soils are Umpcoos, Digger, Jason and Rockland, ridge top soils are Preacher and Blachly and Bohannan is a typical steep sideslope soil.

The northern portions of the Cox and Coal Creek subwatersheds (near the main Coos River) are steep and show some evidence of bedrock exposure, high falls and rockfall. In addition, several headwalls of some drainages where Upper Cox and Coal Creek adjoin exhibit bedrock exposures and rockfall (Sections 4 and 9). None of the units proposed under this action are located on exposed bedrock slopes but some units are on moderate to steep slopes (65-90%) on the upper ridges that make up the geological formation.

3.4.2 Sediment and Debris Routing

For the Analysis Area, the disruption to the sediment routing process began with the harvest methods of the early 1940's to the point where little to no routing currently occurs from the first or second order draws. The lower portions of Cox Creek and the west portions of unit 1M were affected by the downhill and spar tree harvest operations of the time. Many times the harvest corridor followed the stream channel. By the 1950's, most of the timber in the western portion of the analysis area had been removed where landing areas, or roads could be built. This allowed for the extraction of some to most of the large diameter trees even across ridge tops. Subsequent road building in the 1960's and 70's on mid-slope ridges and ridgelines allowed for the further removal of timber, at times from the same area harvested in the 1950's in a more conventional uphill direction. Suspension of the large diameter logs was not prevalent and yarding corridors were evident on aerial photos.

Actions during the harvests changed the overall sediment routing processes and that is reflected in the current state of the analysis area. Removing large diameter trees from the landscape in a manner that caused much of the soil to be scraped or loosened from the hillslope surface is evident. Large quantities of sediment were accumulated in the steep V shaped valleys, enough to produce more of a U-shaped channel today. Initially vast quantities of large wood and debris were accumulated and buried in these stream channels from harvest activities in the 1950's. By the end of the 1970's most of the damage was complete and some recovery has occurred since then.

Early road building efforts were concentrated in and adjacent to North Fork Coquille River, Cox and Coal Creeks disturbing the very stream itself. Construction activities placed many large boulders in the creeks and constrained the channel with small diameter culverts in several places. Woody materials were added to or removed from the creek depending on need or yarding operations. Sediment routing processes have been highly altered from the normal; areas of bedrock are distributed among the pools and gravel bars in the creek in a higher proportion than normal.

Water routing processes have also changed. Intermittent first and second order draws that may have had stored water in the soil on the hillslopes above the channel are now draws that may store less water in the bottom of the channel itself. These channels produce subsurface flow even through most of the winter. All fine sediment that is derived from runoff conditions is filtered out by this subsurface capture mechanism. Upper and mid-portions of the streams develop a dry surface readily in late winter and spring although lower portions of the watershed produce cold flows in both Cox and Coal creeks into the late summer.

3.4.3 Sediment Delivery to Streams

The South Fork Coos River and the North Fork Coquille River are "flashy" stream systems that respond rapidly to rainfall events. The rivers are typically turbid during winter precipitation events from background channel derived sediment. After storm events the rivers return to a clear condition.

There is a low risk of storm events triggering overland flow on the forest floor. Within the analysis area, soil/water infiltration rates range from 0.6 -6.0 inches per hour for bare soil, with the majority of the units (and soils) falling into the 2.0-6.0 inches/hour range. The most intense storms recorded in the Oregon coast range have rainfall rates of around 2.0 inches per hour. Therefore, there is a very low risk of large storm events triggering overland flow, and consequent sediment mobilization and delivery.

Older logging roads on BLM lands within the analysis area are in fairly stable condition; vegetation canopy is closed, herbaceous vegetation and detritus cover most of the road surfaces, and most are not currently impacted by vehicular traffic (OHV's). However, the -7.0 road in Unit 14, and the -6.6 road in Unit 3 are contributing sediment to stream channels. The -7.0 road is a natural surfaced road that parallels and crosses the North Fork Coquille River up to five times. Risk of sediment delivery from the -7.0 road surface has been partially addressed with closure techniques in the winter of 2003. The road was blocked at the upper end, but is currently being impacted by vehicular traffic from the lower or west end. As it exists, the road is contributing minor amounts of sediment to the stream channel when vehicles cross the river. The -6.6 road is an old rock surface road adjacent to a tributary stream of Cox Creek. The stream was diverted to the side of the road at the time of construction, and is currently contributing minor amounts of sediment from down cutting of the diverted stream channel.

Stream crossings on the 26-10-6.4 and -6.6 roads have been identified by the IDT as not functioning properly. One culvert, on a third order draw, that crosses the 6.4 road is effectively blocked by a past debris torrent and is producing a 700-foot diversion down the road. This diversion has carved a new channel from 1 to 6 feet deep in the original road. This situation is occurring on a privately controlled road on private land. It is the single largest sediment source delivering to Cox Creek discovered during analysis. Other road grades are not contributing fine sediment due to the vegetative buffer between roads and streams.

Newer roads on BLM land are in stable condition. Haul routes that will be used for the proposed action have various running surfaces ranging from native-surface soils to asphalt pavement. Roads with native surfaced soils are located on ridge tops and do not have stream crossings. Haul routes on gravel surfaced roads generally occur along ridge tops and stable bench areas but would include 7 intermittent stream crossings. The remainder of the haul route occurs primarily on paved roads.

Approximately seven miles of the Coos River mainline road will be utilized for hauling. The Coos River mainline road is a streamside road adjacent to the main stem South Fork Coos River, and is located on private land. Weyerhaeuser Company controls and operates the road. This road system is used by both public and private entities, and is used frequently for timber hauling. In 1998, Weyerhaeuser characterized sediment delivery to streams from roads within the South Fork Coos Watershed Analysis. With moderate haul, the sediment yield to the South Fork was below background levels within the stream channel. Four stream crossings along this road were identified as having delivery potential to a stream channel from moderate haul during the winter. One crossing is a bridge over the main river. The other crossings are located on non-fish bearing stream channels. Some gravel roads on the upper third of ridgetops and the main road adjacent to S.F. Coos River were observed during private timber hauling in the winter of 2003. They showed some minor amount of fine sediment delivery to ditchlines. These fine materials were not visually evident at lower reaches (third order streams) of the watershed. The main S.F. Coos River ran slightly cloudy for several days after two major rainfall events in January and February, 2003 but cleared within a day or two after runoff receded. Fine sediment delivery from haul along S.F. Coos River also was not evident during the winter and spring of 2003. During this same timeframe, haul and maintenance activities (new surface rock applied and graded during rain events) washed fines to the road surface but, delivery to the main river could not be detected as plumes or cloudy creeks running into the main river. Maintenance activities by the private timber company (Weyerhaeuser) apparently corrected this problem after their watershed analysis pointed it out to be a sediment source.

3.4.4 Surface Soils

Physical properties

The soils within the project are derived from the Tyee and Elkton formations. These are listed on the following table. Additional soil information can be found in the Coos County Soil Survey of 1998.

Table 3-2 Summary of Soils within the Analysis Area

Name of Soil Map Unit	Map Symbol	# of Acres affected	Limitations For the Management of Timber (from County Soil Survey)
Milbury-Bohannon-Umpcoos assn. 50-80% slopes	38 F	306	Steep slopes, hazard of erosion, windthrow, poor water holding capacity, plant competition.
Preacher-Blachly assn. 12-30, 30-60% slopes	44 D, E	102	Steep slopes, susceptibility to compaction, hazard of erosion is moderate to high, plant competition
Preacher-Bohannon loams 3-30, 30-60, 60-90% slopes	46 D, E, F	943	Steep slopes, susceptibility to compaction, hazard of erosion is moderate to high, plant competition.
Blachly silty clay loam 0-30% slope	4 D	7	Permeability is moderately slow, runoff is medium, and erosion hazard is moderate. Susceptible to compaction and plant competition
Umpcoos-Rock assn. 70-99% slopes	58 F	28	Steep slopes, shallow soil over bedrock, runoff is rapid; water erosion hazard is high, poor water holding capacity potential windthrow, plant competition.
		1386	

Common associated limitations to management of soils in the proposed units are steep slopes, susceptibility to compaction, erosion hazard, windthrow, and plant competition.

Soil depths range from 10-20 inches on the Umpcoos series to 60+ inches for the Blachly series. The rooting depth for most soils is from 20-60 inches. These soils are for the most part loams, gravelly loams or silty clay texture classes. They were formed in colluvium and/or residuum, derived from sedimentary rock or sandstone. Infiltration rates are moderately rapid (2.0 - 6.0 in. /hr.) for the Bohannon, Milbury and Umpcoos series soils. Infiltration is moderate (0.6 – 6.0 in/hr) on the Preacher series and moderately slow (0.2 - 2.0 in/hr) for the Blachly series. Water storage is moderate to high (7.0-12.5 in.) on the Blachly and Preacher series with low to very low (5.0 -0.5 in.) on the Milbury and Umpcoos series where it is limited by high rock content. Productivity is generally moderate to very high on these soils. The most common soil series encountered is the Preacher loam followed by the Bohannon gravelly loam.

For these soils to express the limitations listed within Table 3.1 the sidehill slope needs to exceed 45% and the soil must be exposed by removing most to all of the vegetative cover. Within the analysis area, approximately 36% of all soil map units are at or above the threshold of concern. However, due to the nature of the proposed action (thinning), the exposure of existing lands will not occur except on the areas adjacent to newly constructed roads and exposure will be temporary in nature.

Timber Productivity Capability Classification (TPCC), with the appropriate management directives, has been applied to this project. Withdrawal of portions of units 1b, 2a, 9, and 24 due to overlap of proposed units on TPCC withdrawn ground was considered. An adjustment to unit boundaries and or design of protection buffers to protect unstable areas was employed during the field review portion of the EA. Establishment of no treatment areas are based on field conditions of the stream channel, the adjacent tree density and the potential overlap of root areas sufficient to hold the soil in place after thinning was accomplished. Past management activities have altered the slope stability in some areas and conversion of the hardwoods to conifer was avoided where that situation existed.

The maximum allowable soil moisture content for any ground-based operations is 25 percent based on the plastic limits of individual soil series. Tree stands within the analysis area have crown ratios that appear to be able to provide adequate levels of slash on the ground to minimize disturbance from a ground based operation. Forwarder roads or skid trails generally need to be covered with at least 6 inches of slash prior to hauling to prevent compaction of soil.

Compaction

A minor amount of compaction has occurred from past road construction across the landscape but, the level is well below the RMP threshold of 12%. Some uphill logging activities in the 1970's produced traditional yarding corridors on 1976 aerial photos. The level of disturbance and impact appears to be consistent with expected amounts of compaction for hi-lead logging of large sized timber, 3 to 7 % of the harvest unit area.

3.5 Water Resources

3.5.1 Physiography and Morphology

The majority of the treatment units are within the Coos 5th field watershed. Cox Creek and Coal creek are small frontal drainages to the South Fork Coos River, having drainage areas of 1809 acres (2.83 mi2) and 2633 acres (4.11mi2). Several units are within the upper North Fork Coquille 5th field watershed. The drainage area is 6140 acres (9.59 mi^2) to the point of Little Fruin Creek, which is just below the analysis area.

The analysis area is characterized by a high drainage density in conjunction with limited soil water storage capacity causing rapid inputs to the channel network. Stream channels are generally headwater, steep cascading, and step-pool channels confined by hill slopes. The analysis area has a drainage density of approximately 8.0 mi/mi2. About 80% of the total drainage density consists of 1st and 2nd order intermittent upland tributaries. In contrast to these streams, the South Fork Coos River is a relatively large, low gradient and low energy depositional river with a floodplain.

Forest trees on the banks of analysis area stream channels are not being undercut by the channel to the point of tree-fall and are providing stability against lateral channel migration. Conifers adjacent to the streambanks in the units are typically dense, smaller trees with inter-mixed larger trees similar to the upland areas. These closely spaced trees have small crowns and correspondingly small root mass. The small root mass makes these trees vulnerable to blowdown. Adequate understory shrubs and vegetation also exist in these areas that provide additional streambank stability. Root strength stability results in fairly straight channels (low sinuousity). Studies in western Oregon indicate factors causing large woody debris accumulation in streams to be primarily due to wind, aided by mortality, to topple trees further away from the stream channel (Lienkaemper and Swanson 1986).

3.5.2 Water Yield

The forested watersheds of the Coos Bay District yield large volumes of water, as stormflow, from precipitation during the winter months. High drainage density (8.0 mi/mi2), shallow porous soils and low transmissivity of the underlying bedrock are physical properties of the watershed that indicate a lack of storage and greatly influence runoff efficiency.

Evapotranspiration is the water lost to evaporation and water transpired into the atmosphere by plants. It is common for annual evapotranspiration in coniferous forests of western Oregon to reach 25 inches (Beschta 1995). Water yields in western Oregon have been found to return to that of a mature forest stand in about 30-40 years after clearcut harvest (Beschta, 1995; Harr and Cundy, 1990; Stednick and Kern, 1992). All planned thinning units within the analysis area consist of forest plantations of the 30-55 year age class re-established following previous harvest. These stands have reached an age where the losses from evapotranspiration on the annual water budget can no longer be attributed to past harvest and are within the historic range of natural variability.

3.5.3 Peak Flow/Flow Regime

By definition, a peak flow is the instantaneous maximum discharge that is generated by an individual storm event. The Cox Creek analysis area is entirely below the transient snow zone and peak flows correspond directly to rainfall events. Because of the shallow soils and underlying bedrock, the time to peak flow is swift from the onset of precipitation. Streams normally have steep rises and fairly uniform recession as the storm passes. Flows that are high enough to mobilize appreciable amounts of sediment from channel sources, or change the shape of the bed or banks, occur only a few times each year.

3.5.4 Water quality

The two components of water quality that are pertinent to the analysis are sediment and water temperature. Natural processes have always contributed sediment to the stream channels. This includes landsliding, channel erosion and effects of fire and floods. However, there are several factors, since the last harvest in the analysis area watersheds that may be contributing slightly more sediment to the channels than normal. They may include: 1) lack of sufficient volumes and pieces of large woody debris in some steep stream channels to break flows, dissipate energy and store sediment (much of this material was salvaged when the area was previously logged), 2) old access or “legacy” roads that are not part of the current road network and are not hydrologically maintained, and 3) existing roads that are maintained on too light of a maintenance schedule.

The South Fork of the Coos River directly north of the analysis area is not listed on the Oregon Department of Environmental Quality’s (ODEQ) 2002 303(d) list of water quality limited streams. The majority of the stream channels in the project area are generally intermittent during the summer and therefore do not contribute to the summer water temperatures of Cox and Coal creeks or the South Fork Coos River.

For a more in-depth discussion of area hydrology the reader is referred to the South Fork Coos Watershed Analysis (1998).

3.6 Aquatic Resources

3.6.1 Aquatic Habitat and Fish Species, Including T&E Species

Aquatic Habitat

The majority of the timber sale units are within the South Fork Coos River watershed (5th field); specifically within the Cox Creek and Coal Creek sub-watersheds (6th fields). Eight harvest units occur within the North Fork Coquille (5th field) watershed. Aquatic habitat has been altered within the lower South Fork Coos and the North Fork Coquille watersheds as a result of past splash dam operations, road construction, timber harvest, and other activities (USDI, 1999 and 2001). Within the analysis area, these actions have simplified aquatic and riparian habitats. Portions of the Riparian Reserve have been converted from large conifer stands to hardwood dominated stands from previous logging and disturbance. Road construction has altered the sediment regime and wood routing within the stream channels. The majority of small first and second order tributary streams have large amounts of downed wood and duff within the channel and riparian area, due to past logging. With the exception of downed wood and stream temperature, streams within the analysis area are not likely functioning within the range of natural variability because past management practices (Sections 3.4, 3.5).

Cox Creek

Aquatic habitat conditions within the Cox Creek sub-watershed are rated as "good"[5]. Large wood is abundant in the lower reaches of the stream, with "fair" to "poor" amounts in the upper reach. Several density management units are adjacent to Cox Creek.

The remaining stream channels within or adjacent to harvest units in Cox Creek are mostly first and second order, non-fish bearing, and intermittent streams. Riparian areas along Cox Creek are dominated by hardwoods (red alder, myrtle, and maple). One perennial stream in Unit #6 contains cutthroat trout and sculpin sp. These small tributary streams have large amounts of buried downed wood within the channel and the riparian area, due to past downhill logging.

Coal Creek

Large wood is less abundant in Coal Creek in the lower reaches and "good" in the upper reach. There is one density management unit adjacent to Coal Creek. All of the units contain within them or are adjacent to small, intermittent and/or perennial non-fish bearing streams. These small tributary streams have low to moderate amounts of downed wood within the channels and riparian area. Unlike Cox Creek, Coal Creek was harvested in the 1970's with a lesser degree of downhill logging. Riparian areas along Cox Creek and Coal Creek are dominated by hardwoods (red alder, myrtle, and maple).

[5] Ratings based on ODFW habitat inventory data and benchmarks.

Fish Species Present

The South Fork Coos River and the North Fork Coquille River contain populations of chinook salmon, coho salmon, steelhead trout, cutthroat trout (migratory and resident), reticulate sculpin, stickleback, speckled dace, pacific lamprey, and western brook lamprey. Populations of chum salmon, and longnose dace have been documented in the North Fork Coquille watershed. Non-native fish species also occur within the two watersheds.

Cox Creek is a fifth order stream that contains cutthroat trout and other non-salmonid fish species. A falls at the mouth of Cox Creek is a barrier to anadromous fish. Coal Creek is a high gradient, fifth order stream typically utilized by steelhead and cutthroat because of the steep gradient and habitat type. The lower portion of the South Fork Coos River is utilized by coho salmon, chinook salmon, steelhead trout, and other anadromous and resident fish as a migratory corridor. Spawning and rearing habitat generally occurs within the upper portion of the mainstem South Fork, above the analysis area. Coho salmon, chinook salmon, steelhead and other resident fish utilize the portion of the North Fork Coquille River within the analysis area as spawning and rearing habitat.

Proposed thinning unit 14 is adjacent to the North Fork Coquille River where anadromous fish are present. Units 1B, 5B, 6, and 6B contain within them, or are adjacent to, fish-bearing streams containing resident cutthroat trout. All other streams within and adjacent to thinning units are non-fish bearing streams.

Threatened and Endangered Fish Species

The analysis area is within Oregon Coast Evolutionary Significant Units (ESU) for coho salmon and steelhead trout. Oregon Coast coho salmon (*Oncorhynchus kisutch*) are listed by the National Marine Fisheries Service as a threatened species. Steelhead trout (*O. mykiss*) is considered a “candidate” for federal listing under the Endangered Species Act (ESA). Stock status reviews are ongoing to determine if a future listing may be warranted. On January 23, 2003 the U.S. Fish and Wildlife Service was petioned to list four lamprey species. Three of the lamprey species may be found within the South Fork Coos River and the North Fork Coquille; Pacific lamprey (*Lampetra tridentata*), and Western Brook lamprey (*L. richardsoni*). River lamprey (*L. ayresi*) may exist, but have not been documented. The distribution of these species within these watersheds is unknown. Additional information on fish stocks can be found in the North Fork Coquille Watershed Analysis (Chapter 8 – page 1).

3.6.2 Sediment

Sediment sources and levels are discussed in Soils sections 3.4.2, and 3.4.3 and Water section 3.5.3.

3.6.3 Riparian Reserve Condition and Function

The South Fork Coos River watershed contains about 21,259 acres of interim Riparian Reserves on BLM-managed lands. The age-class distribution within the Riparian Reserve network is as follows: 1-29 yrs (33%), 30-59 yrs (20%), 60-79 yrs (6%), and 80+ (41%). The North Fork Coquille watershed contains about 19,275 acres of interim Riparian Reserves on BLM-managed land. Twenty-nine percent of these stands are 80+ years old.

See Section 3.1.1 for information on stand characteristics and development.

While the majority of the Riparian Reserves contain moderate to high amounts of soft, embedded, down logs from previous harvest (decay class 3+); "hard" (class 1 and 2) down logs are limited or absent. Riparian Reserves in the proposed units contain minimal remnant trees greater than 160 years old (tree size that contributes appreciably to large wood recruitment to streams). Over the next forty years, self-thinning in riparian stands 120-160 years old should begin to provide class 1 logs to riparian forests and streams. However, because a large percentage of stands in the watershed are <40 years old, it will take up to 80 years to reach optimal wood recruitment levels in the Riparian Reserve to replace the existing wood in the stream channel. Additional information on the condition of Riparian Reserves can be found in the South Fork Coos River Watershed Analysis (Chapter 13, page 9).

3.7 Air Quality

The Oregon Smoke Management Plan, (OAR 629-43-043) manages the levels of particulate emissions from fire activities for private and public lands. The analysis area is located in a remote portion of the coast range away from population centers. The nearest designated population area is Coos Bay approximately 12 miles to the west; opposite of the prevailing wind direction. The Eugene designated area is in the prevailing wind direction and is approximately 56 miles down wind from the analysis area. The fuel loading in the hardwood conversion areas is expected to be approximately 4 tons per acre. Prescribed fire activities in the Coos Forest Protective Association (Coos FPA) district consume approximately 250,000 tons annually or about 330 tons per acre (ODF 2001).The RMP anticipated 21,200 tons of fuel would be burned annually on the Coos Bay District (USDI-BLM 1995, p ROD13). In 2001, prescribed fire activity on all federal lands in the Coos FPA district consumed approximately 6,700 tons (ODF 2001).

3.8 Road Network

Most of the roads are constructed on stable terrain, not delivering sediment from fills or slides but have degraded culverts within the system. Hauling of timber occurs both in the winter and summer months with minimal sediment delivery from dust and erosion processes.

The current transportation network is comprised of private and BLM maintained all-season paved and gravel roads, seldom-used gravel and dirt roads. Roads are controlled both privately and publicly. Nearly 48 of the total 59 miles (81%) are currently open to traffic leaving 10.8 miles (19%) closed within the analysis area. Of that total 10.5 miles are paved, 30.7 miles are gravel surfaces and the remaining 7.8 miles are either natural or unknown surfaces. A small percentage of the roads are closed either through active management or because of past inaction and in-growth of vegetation

Table 3-3 **Description of Roads within the Analysis Area**

Control	Surface Type	BLM Lands: Area (ac) = 5,506; Area (sq. mi.) = 8.6		Non-BLM Lands: Area (ac) = 2,530; Area (sq. mi.) = 4.0		Action Area Totals: Area (ac) = 8,036; Area (sq. mi.) = 12.6	
		Miles	Density	Miles	Density	Miles	Density
BLM	Paved	8.3	1.0	2.2	0.6	10.5	0.8
	Rock	20.4	2.4	7.4	1.9	27.8	2.2
	Natural	1.9	0.2	0.7	0.2	2.6	0.2
	Unknown	0.2	0.0			0.2	0.0
Private	Paved					0.0	0.0
	Rock	0.8	0.1	1.0	0.3	1.8	0.1
	Natural	3.7	0.4	3.4	0.9	7.1	0.6
	Unknown	0.0	0.0	7.9	2.0	7.9	0.6
Shared or Other	Paved					0.0	0.0
	Rock	1.1	0.1			1.1	0.1
	Natural					0.0	0.0
	Unknown	0.0	0.0	0.1	0.0	0.1	0.0
Overall		**36.3**	**4.2**	**22.7**	**5.7**	**59.0**	**4.7**

Several short spur roads have been closed by Jobs in the Woods efforts in 1999. Any of these spurs used for access under this action will be closed again upon completion of the project activities to a standard described in Appendix 4. All roads to be closed are from TMO recommendations within the South Fork Coos River or North Fork Coquille River Watershed analysis.

Noxious weed locations are closely linked to the road system. Those weeds which are known to occur within the analysis area are: French broom, Scotch broom, Himalayan blackberry, Canadian and bull thistles, and tansy ragwort. Noxious weeds have been identified and treated within the analysis area by both private and government parties. Most occurrences are on the mainline road system but some isolated areas are evident. The total number of sites within the analysis area is less than twenty. See Section 4.9.7

For more information concerning the roads and the treatments planned under the proposed action see Appendix 4. Current road densities are previously discussed in Section 3.2.2.

4 Environmental consequences

This chapter provides the analytical basis for the comparisons of the alternatives. The direct, indirect, and cumulative impacts are discussed according to the issues and organized by resources. The main activities considered in the cumulative effects analyses are described in detail in Section 4.0.1 and then summarized in subsequent cumulative effects discussions.

4.0.1 Cumulative Actions

Two other similar density management and hardwood treatment projects are being actively planned or implemented on BLM lands in LSR #261. The North Coquille DM/CT project would affect about 1,054 acres within and adjacent to the analysis area. Approximately 2,447 acres of the Tioga DM project are in the South Fork Coos fifth field watershed. Both these projects propose to thin dense, young stands, reestablish conifers in hardwood-dominated stands, and manage the transportation network.

Private holdings in the analysis area include all of section 32 as well as portions of sections 30, 34, 35 (township 25 range 10), and sections 2, 6, 8, and 10 (township 26 range 10). The private landowner has begun harvesting in section 10, and field observations suggest that the harvest will extend to much of the section. The harvest prescription will likely be thinning base on previous activities near the area.

4.1 Stand Development and Desired Future Conditions (Issue 1)

4.1.1 Issue 1 - No Action

Direct and Indirect Effects

Stand level

At the scale of the units proposed for treatment, effects of the no action alternative on stand characteristics have been modeled using SPS. Generally, the treatment units would remain dense and become denser, with lower diameters and crown ratios (Table 5-4 : Appendix 5). Mean DBH for these units with no treatment would be 22” (95% CI: 20.6-23.4) at age 80, as opposed to almost 29” with treatment. Crown ratios at age 80 would average < 50%, suggesting few trees would develop dominant size and structures (e.g., large limbs). Mean relative density (RD) at age 80 for untreated units would be almost 80, suggesting intense competition, mortality and stagnation of tree growth. SPS model results suggest that without treatment, these units would remain in the biomass accumulation/ competitive exclusion stage of stand development, producing moderately high amounts of pole- and young-stage conifer snags, but few large trees and few large snags or large down wood.

Development of forest structure would also stagnate in potential treatment units under the no action alternative. In the absence of disturbances such as wind or fire, variability in tree densities would be low and canopy gaps would be limited. Uniform competition would limit the development of large individual trees and large tree limbs. Competitive exclusion in these units would take considerable time since trees in the units started contemporaneously; codominants comprise > 50% of tree densities. Canopy differentiation would therefore be slower than in naturally-regenerating stands. In the absence of disturbance and with continued succession, minimal changes would be anticipated in tree, shrub, or herb diversities in the units until they entered the maturation phase.

Under the no action alternative, by a stand age of 80, approximately 100 TPA would die as a result of suppression mortality. These trees would enter snag and eventually down wood pools. These snags would in general be the smaller trees in the stand (< 15" DBH in 1950's stands, < 12" in 1970's stands), with somewhat limited wildlife utility (e.g., lacking deep, fissured bark). Senescing residual overstory trees left in the untreated units (mostly 1950's stands) would increase high quality snags in the analysis area. As these snags fell, very few large overstory trees would senesce to create new snags, leading to quality snag and down wood shortages in the next 100 years.

Landscape-level

The no action alternative would lead to increased cover by dense and very dense stands in the analysis area. Many of these stands with height/diameter ratios > 80 and RD > 60 would be susceptible to catastrophic blowdown or disease. Other than these disturbances, within-stand gaps would be limited in untreated units.

The dense stands which would develop without treatment would enhance some forms of contiguity between late-successional patches, through reduction in wind, maintenance of shading and humidity, and provision of dense hiding cover (USDA-USDI 1998). These untreated units would provide habitat for species associated with dense stands and down wood and snags from small suppressed trees (Muir et al. 2002). This habitat type is not limited in the analysis area. Untreated units would not provide habitat for species associated with small and medium sized forest openings (gaps), large trees, multiple canopy layers or other mature and late-successional habitat features.

LSR # 261 includes > 40% mature and late-successional habitat, closer to historic ranges than the analysis area but still below estimated historic mean old-growth cover (Wimberley et al. 2000), and with cover by young forest stages (sapling size classes) twice as high as historic landscapes (Ripple et al. 2000). Without treatment, much of the analysis area will remain in the biomass accumulation/ competitive exclusion stand-development stage for an extended period (perhaps > 100 years). Relatively few existing stems will develop to large sizes, due to competition. Secondary disturbances such as wind or fire may be necessary to create gaps and growing space necessary for development of large individual trees. Little of the analysis area is currently in a maturation development stage. Without treatment, contrast between existing old growth and stands in competitive exclusion stages will continue for some time. The rest of LSR # 261 is similar to the analysis area, with cover by young stands roughly twice as high as historic conditions.

Cumulative Effects

See cumulative actions described in 4.0.1. Other private holdings within the analysis area will presumably be harvested on an approximately 40 year rotation, maintaining stands in biomass accumulation development stages. Private land accounts for almost 20% of LSR

#261, including a sizeable portion of the interior of the LSR block. Private land use puts a ceiling on late-successional stand contiguity and development of some interior conditions, at the landscape level.

4.1.2 Issue 1 - Alternative A – Preferred Harvesting System

Direct and Indirect Effects

Stand-level

SPS models suggest that trees in treated stands in the analysis area would increase in size, and stand density would decrease. Modeling suggests that at stand age 80, mean unit dbh would be almost 29" with treatment, 7 inches (95% CI: 6.2, 7.8) greater than if units remained untreated. Crown ratios at age 80 would be 58%, still at crown depths required for development of large boles and 12% (95% CI: 9.7, 14.5) higher than if untreated. Thinnings would employ wide to moderate spacing (50- 122 TPA); adjacent 300-year-old stands averaged 30-35 dominant Douglas-fir /ac., with an average dbh of 38 in. (USDI 1976). Stand mean relative densities would be below self-thinning levels, although competition would occur in portions of the treated units.

Forest structure would become more complex in treated units. Heavy thinning of dense young-growth stands in treatment units would lead to development of trees with big stems, crowns, and branches, and would facilitate development of multiple tree canopy layers (Poage and Tappeiner 2002). Gap creation and MDL thinnings in areas without large trees would increase gaps in the treated units and possibly facilitate development of suppressed (tolerant) saplings into a canopy layer. Design features to retain shade-tolerant species (e.g., western red cedar, western hemlock) would enhance structural (not only species) diversity (Zenner 2000). Retention of hardwoods (including red alder in units 11, 24, 25 and 26), coupled with removal of many Douglas-fir stems, would maintain tree structural and species diversity, and lead to eventual canopy gaps as red alder senesced. Removal of fire-intolerant tree species in south-facing ridgeline areas would lead to a small decrease in diversity (USDA-USDI 1998, USDI 1999) at the treatment unit level in 3 units. Changes in diversity associated with this manipulation would be negligible at larger scales, and would more closely emulate the slightly lower diversity associated with these south-facing aspects historically.

Effects of the action on upslope portions of Riparian Reserves around 1st and 2nd-order streams with minimal riparian influences would be similar to the effects of the action on surrounding upland areas. Adjacent to active channel margins, Alternative A would lead to a decrease in small diameter red alder and retention of large conifers, moving some of these systems closer to the overstory compositions in small, unmanaged riparian systems (Pabst and Spies 1999).

Density management thinning would not, in itself, enhance all facets of late-successional habitat. For example, the LSRA constrains maximum gap size and coverage (USDA-USDI 1998, pg. 82) to sizes too small to mimic larger natural gaps or establish shade-intolerant trees (Gray and Spies 1996). The wider spacing in the proposed action may facilitate development of large limbs (Maguire 1991), and survival and growth rates of lower limbs for marbled murrelet nesting and for epiphytes (USDA-USDI 1998).

However, silvicultural approaches have not been developed to create late-successional characteristics like deep, furrowed bark (Hayes et al. 1997) and deep organic soil (Hunter 2001). It should be noted that treated (accelerated) stands would have more late-successional characteristics than untreated stands.

Thinning associated with the proposed action would lead to changes in vegetation in the treated units, including minimal changes in lichen and bryophyte assemblages in the treatment units, and indeterminate changes in fungal assemblages. In previous studies, thinning of young stands led to a slightly higher abundance of forage lichens (Peterson 2002). Thinning young stands may have negligible effect on bryophyte species richness (Rosso 2002), but may decrease bryophyte abundance due to removal of older shrubs (Rosso 2002, Muir et al. 2002). Retention of hardwood species, remnant mature overstory conifers, and retention and creation of down wood during thinning could maintain or enhance bryophyte diversity and abundance (Rambo and Muir 1998). There is limited data available on the effects of forest management as related to fungi richness and abundance. For one common species of ectomycorrhizal fungi, chanterelle (*Cantharellus cibarius*), a negative correlation was found between fruiting numbers and thinning intensity (Pilz et al. 2002). It is possible that as forest canopies close, this species would produce fruit at the same levels it did prior to the thinning, but further studies would be required to verify this (Pilz et al. 2002).

Richness, frequency, and cover of some herbaceous species and most species groups would also increase in thinned stands (Bailey et al. 1998). Thinning would increase cover by exotic plants. Thinned stands have a greater number of exotic plants than do unthinned or old-growth stands (Bailey and Tappeiner 2002), however total exotic plant covers are relatively low in forested systems.

The proposed action would include removal of red alder from some portions of the analysis area, and retention of and invasion by red alder in other areas. Red alder would be removed from 55 ac. under the proposed action. This removal would transform floral and faunal communities in these units, including causing decreases in bryophyte diversity (Muir et al. 2002). However, abundance of red alder has increased 20-fold since the 1920's (Niemiec et al. 1995); this removal would cause a negligible change in red alder abundance at the landscape-level. Proposed hardwood conversion sites do not meet definitions of special habitats (e.g., meadows, wetlands) suggested in the LSRA (USDA-USDI 1998). Thinning in young conifer stands could lead to red alder increase in canopy gaps (Price, pers. comm.), which would maintain red alder in upslope conifer communities. Prescriptions would also maintain red alder in treatment units where red alder is currently at low levels (similar to historic conditions). The totality of the proposed treatments would ensure that hardwoods (including red alder) in conifer-dominated stands, identified as hotspots for diversity (Muir et al. 2002), would be maintained in the analysis area.

The proposed action could lead to several short-term changes in stand structure not consistent with late-successional habitat including increased short term risk of blowdown, shrub and hardwood increases, loss of some hardwood diversity, decrease in some forms of structural legacies, removal of some tall snags, and logging corridor development. Thinning stands, especially in areas with height/diameter ratios > 80, could increase short-term risks of blowdown. The risk of a major blowdown event has been identified in the western portions of LSR # 261 (USDA-USDI 1998). Removal of thinner stems, coupled with increased vigor in remaining trees, would somewhat decrease blowdown risk in decades following treatment (Wilson and Oliver 2000). The loss due to blow down is expected to be < 10 %, based on comparable thinning regimes (Larson, pers. comm.).

Alternative A would also decrease some types of forest structural legacies in portions of the treatment units. Alternative A would remove suppressed, competing stems from portions of treatment units and remove some tall snags which posed safety risks. As a result, an average of only 13 TPA total would die by stand age 80. This would result in far fewer small-sized snags in treated units during the competitive exclusion stand development stage, and less down wood as these snags fell. Additionally, safety requirements could require felling of up to 18 high-value snags in the analysis area. Other snags are either in advanced stages of decay and short enough that they pose little threat to workers in the area, or they are small and provide only limited habitat value. Mitigation associated with the proposed action would include creation of 1-3 snags/ac. and 3 down logs/ac. initially, plus the one-for-one creation of any high-value snags felled for safety reasons. Subsequent snag and down wood creation (in the following decade) using trees which grew in place at lower densities would generate larger snags and down wood than without treatment. Overall, the proposed action would lead to an 8-fold decrease in small diameter suppression mortality snags over the next 30-50 years, and a small increase in larger diameter (> 15 in.) snags, and larger diameter down wood over the long-term.

Alternative A would include logging corridor development associated with skyline cable logging, especially near landings. These corridors would have minimal effects on stand structure or growth at the unit level because corridor width would be less than the expected residual tree spacing.

Landscape-level

The proposed action would decrease the cover by dense stands and increase cover by open stands with larger average diameters and crown ratios within LSR # 261. Dense, smaller stands are currently far above historic levels in the analysis area; cover by mature, open stands (RD < 35) is very low in the analysis area, although these stand types may have been common historically (Tappeiner et al. 1997).

In the most comprehensive study of the effects of thinning on young stand development (Muir et al. 2002), thinning did not produce species abundance or richness more similar to old-growth stands. However, analysis of communities, as opposed to summary measures (e.g., richness, abundance) did reveal differences between thinned and unthinned areas. Effects of thinning young stands included increased total species richness and cover of herbaceous plants, higher frequency and density of conifer seedlings, higher densities of understory trees, and higher shrub densities, compared to unthinned stands. Richness of macrolichens associated with old-growth and hardwoods was higher in thinned stands, but only where these stands had variable-density thinning (leaving remnant trees, gaps, and islands of unthinned vegetation). Thinning reduced bryophyte richness and shrub epiphytes, due to shrub removal/loss during thinnings.

Current structural diversity is moderately low both within stands (TPA CV of 44 and 53 for 1950's and 1970's stands, respectively) and between stands (TPA CV range of 15.2-65.1 and 26-80, respectively). The proposed action includes variable-density thinning practices in 571 ac., or 40% of the treated area. Variable-density thinning would increase horizontal diversity within stands. In contrast, thinning to set relative densities would decrease within-stand horizontal diversity. Both treatments would tend to decrease structural diversity across treated stands, with most treated stands having similar moderate densities (RD range 20-48; 95% CI at age 80: 41-49). However, development of these more open stands would increase structural diversity at the analysis area and landscape scales.

Not all old-growth Douglas-fir stands developed at low densities with long stand initiation stages of development. Winter et al. (2002), studying a single stand, found old-growth Douglas-fir with hypothesized initial spacing of 3-4 m, and similar birth dates (range: 1500-1521). The authors suggest that stands that are not overly dense and are developing strong differentiation in tree sizes may not require manipulation to develop into old growth. The minimal canopy differentiation, moderately low crown ratios, and low growth of the treatment stands (Appendix 5) suggest that at least portions of these stands could benefit from competitive release. Additionally, to ensure that dense stand developmental pathways were not lost in the treatment units, approximately 22% (range 12%-60%) of the initially identified treatment units would remain unthinned. Unthinned and lightly thinned areas would maintain a level of suppression mortality to provide for short-term snag and down wood recruitment in the units (USDA-USDI 1998).

Cumulative Effects

The activities discussed in the cumulative actions section (section 4.0.1) would result in thinning of dense federal stands in approximately 17 % of the analysis area, and private regeneration harvest in 31% of the analysis area on a 40-year rotation. Almost 16% of the analysis area would remain unthinned and in the biomass accumulation/competitive exclusion or maturation stage, with slow succession towards mature forest. Approximately 28% of the area would remain in vertical/ horizontal diversification (old-growth) stages; an additional 7% of the analysis area currently in the cohort establishment and canopy closure stages would continue succession towards biomass accumulation stages. The addition of the proposed treatments to the other reasonably foreseeable planned actions in LSR # 261 would increase planned actions from 7.1% to 9% of the LSR. Cover by dense young timber stands in LSR # 261 would remain far higher than hypothesized historical forest patterns.

4.1.3 Issue 1 - Alternative B – Minimize Short Term Impacts

Direct and Indirect Effects

Stand-level

Alternative B contains several design elements which would lead to somewhat different effects on forest ecology resources in the analysis area and the surrounding landscape. Selection of Alternative B would lead to retention of more stand legacies (snags), and differences in forest structure modifications attributable to different harvest method.

Under Alternative B, no high-value snags would be removed. This alternative avoids large patches of high-value snags in unit 1B (4.7 ac. untreated) and in unit 9 (3.9 ac. untreated). This alternative would lead to retention of approximately 18 large snags (DC 2-4) which could be removed under Alternative A.

Due principally to harvest system differences, treatment acres would increase in the western portion of unit 14 (6.2 ac.). In contrast to Alternative A, areas would be left untreated in the eastern portion of unit 14 (-1.6 ac.) and western portion of unit 12 (5.7 ac.). These modifications in treatment would not lead to different successional pathways in these units. These modifications would lead to minimal increases in stand-level diversity due to inclusion of treated or untreated areas in larger homogenous treatment types.

The use of helicopter yarding for some units under Alternative B, as opposed to cable yarding in Alternative A, would lead to slightly different tree and unit-level disturbance patterns. Helicopter yarding techniques would lead to standing tree damage higher on tree boles, and would include damage to tree canopies (Han and Kellogg 2000). The number of trees damaged with helicopter logging would be fewer; Han and Kellogg (2000) found a range of 14-37% of trees damaged by skyline logging, as opposed to 11% of trees damaged by helicopter systems. If some of these damaged trees became snags, Alternative B would produce fewer harvest-related snags, some of which would include trees with missing tops. Alternative B would also have less corridor development compared to skyline systems under Alternative A.

Landscape-level

The differences between Alternatives A and B include retention of approximately 18 high quality snags, minimal increases in within-stand structural diversity in four stands, and small changes in types and amounts of residual tree damage and corridors. At a landscape scale, these changes in forest structure would be undetectable.

Cumulative Effects

The effects of Alternative B on forest structure, considering all other federal and non-federal activities, are not distinguishably different than the effects of Alternative A, both within the analysis area and within LSR #261 as a whole.

4.2 Short Term Impacts to Late Successional Ecosystems (Issue 2)

4.2.1 Issue 2 - No Action

Direct/Indirect Effects

There would be no direct or indirect effects to species associated with late seral forests. Marbled murrelets potentially nesting in the analysis area would not be subject to any human-caused disturbances which may disrupt nesting activities. There would be no new road corridor constructed or reopened. No high-value snags would be threatened by management actions under the No Action alternative.

Cumulative Effects
The activities discussed in the cumulative actions section (section 4.0.1) could have some short-term impacts to late seral species. Because of the design features in the BLM projects described earlier, the only potential disturbance to nesting murrelets would be that associated with 415 acres which could be harvested during the summer. Some of the anticipated harvest on private land in section 10 is near high-quality murrelet habitat. Since the harvest on private land could occur during the summer nesting season, some disturbance to nesting murrelets is possible.

New road corridors could also be created as part of the other BLM and private timber harvest. Approximately 3.5 miles of new road could be constructed within or near the anlaysis area as part of the North Coquille DM/CT and Tioga DM projects (1 mile North Coquille DM/CT [NF Coq] and 2.5 miles Tioga DM [SF Coos]); additional existing roads could be reopend. It appears most of the preparatory work for the private harvest in section 10 has been completed, so presumably no additional road corridor would be constructed.

Although we do not know the number, high-value snags almost certainly exist near some of these other harvest units and haul routes. OSHA safety regulations may require some unknown number of these snags to be cut.

4.2.2 Issue 2 - Alternative A – Preferred Harvesting System

Direct/Indirect Effects

Marbled Murrelet Disturbance
It is uncertain how sensitive murrelets are to human disturbance. The only information available concerning disturbance of murrelets is from observations incidental to other surveys and research. Long and Ralph (1998), in their summary of all available information concerning disturbance of murrelets, reported that murrelets appeared generally undisturbed by noises and that murrelets were not easily disrupted from nesting attempts by human disturbance except when confronted at or very near the nest itself. Murrelets, however, are not oblivious to human disturbance. It is a widely accepted general principle that human disturbances can distract wildlife from essential life functions such as feeding and reproduction and thereby reduce fitness or reproductive success (Frid and Dill, 2002).

Under Alternative A, operations in most units near potential marbled murrelet habitat would be confined to the non-nesting season to reduce the risk of disrupting nesting. However, approximately 27 acres and 16 scattered individual trees of marbled murrelet habitat would be subject to logging-related disturbances on 138 acres during the summer nesting season. All of this habitat, though, is low quality, because there are relatively few platforms trees and/or few (generally < 4) platforms per tree. Nelson and Wilson (2002) found that murrelets selected nest sites with lots of potential nest trees and lots of potential nest platforms compared with non-nest sites and that murrelets selected the largest available platforms for nesting. All of the nest trees in Nelson and Wilson's (2002) study had at least 4 potential platforms. Nelson and Wilson's (2002) findings suggest that the habitat in Cox Creek subject to summer logging disturbance is low-quality and is unlikely to be occupied. During most of the nesting season, harvest activities in these units would not occur during the early morning or late evening (except during periods of fire closure) in order to avoid the daily high-activity periods for murrelets; this could reduce the risk of disturbances to murrelets.

Barrier Effects of Roads

Alternative A would create 2.8 miles of new road corridors in otherwise contiguous forest through both new road construction and reopening of currently closed roads. Numerous studies suggest that some wildlife species, particularly small mammals and invertebrates, seldom cross roads, including roads that are closed to vehicles (Noss and Cooperrider 1994). Roads can block movements of wildlife by creating a continuous strip devoid of cover. Without cover, animals may be reluctant to cross roads because they would be exposed to predation. Conversely, road corridors could benefit some predator species such as coyote and owls which are often found along roads. Roads can also affect wildlife by encouraging harassment via vehicle traffic and legal and illegal hunting. These effects have been particularly well documented for large mammals such as elk (Wisdom et al. 1986). In a telemetry study of elk in the Coos Bay District BLM, Pope (1994) found that elk avoided areas within 164 feet of roads, and that poaching accounted for 50% of the elk mortality, although the mortality sample size was small.

All of the new road corridors created under this alternative would be decommissioned after the harvest is complete, but the corridor effect of these roads could remain for at least the period during which the road is open (1-3 years). With the application of design features for road decommissioning, the barrier effect of the new road corridors should almost disappear within a few years of decommissioning because: 1) the road corridor width is less than the spacing for most density management units (road corridor width = approximately 12 feet verses an average spacing of 23 feet for most density management units), 2) grass seeding and the pulling of slash and other debris onto the road surface during decommissioning would establish cover over the road surface, and 3) roads would be closed to vehicle traffic. By reestablishing cover over roads and closing them to traffic, the design features confine the main effects that roads have on wildlife to the 1-3 year period when the roads are being actively used.

The open road density goal for the analysis area from the Coos Bay District RMP is 1.1 mi/mi^2 with a maximum density of 2.9 mi/mi^2. Under this alternative, 11.5 miles of existing roads would be decommissioned. Open road densities would decrease from 3.9 mi/mi^2 to 2.5 mi/mi^2 on BLM lands in the analysis area. The overall open road density (includes all private and BLM roads) in the analysis area would decrease from 3.8 mi/mi^2 to 3.5 mi/mi^2 (see Table 4-1). The resultant road density would still exceed the goal for the area, but the alternative would move road densities closer to the desired level.

Table 4-1 Open Road Densities by Alternative

Road Status	BLM Lands		Non-BLM Lands		Action Area Totals	
	Area (ac) =	5,506	Area (ac) =	2,530	Area (ac) =	8,036
	Area (sq. mi.) =	8.6	Area (sq. mi.) =	4.0	Area (sq. mi.) =	12.6
	Miles	Density	Miles	Density	Miles	Density
Open alt A	21.8	2.5	22.7	5.7	44.4	3.5

Threat to High-value Snags

Under Alternative A, approximately 18 high-value snags could be cut in order to reduce the risk to loggers working to implement the alternative. These snags are uniquely valuable as habitat for bats and cavity nesting animals but are scarce in the western part of the analysis area. Their value as habitat is driven by their role as roosts, hibernacula, and maternity sites for bats and by their suitability for foraging and nesting by woodpeckers and cavity associated wildlife such as marten, flying squirrels, owls, and other birds. The value is further augmented by their relative scarcity on the landscape; the fact that they still have a long, fruitful "life" ahead of them as snags; and our inability to fully mitigate their loss (i.e. it takes 20+ years for decay processes to produce a high-value snag). The snags are classified as Type 4 reserve trees under the *Oregon Guidelines for Selecting Reserve Trees* (OR-OSHA *et. al*., 1995) guide. Federal OSHA guidelines do not prohibit activities within two trees heights of hazard trees but could require these snags to be felled in order to reduce hazards to workers. Although we have field checked the 18 snags and determined that they would likely not pose a hazard, the ultimate decision as to their hazard lies with the employer, so there is a chance that up to 18 could be felled. In addition, there may be more high-value snags within or adjacent to units that we are not aware of that could be felled as safety hazards as well. Other high-value snags exist adjacent to units 8 and 19 but were judged to be much less of a safety hazard or are in areas with lots of old-growth habitat where presumably, snags are much more abundant. Any loss of high-value snags would be offset by the concurrent creation of large snags required by the design features, although the replacement snags would take 20+ years to reach the decay condition of their predecessors.

Cumulative Effects

The activities discussed in the cumulative actions section (section 4.0.1), together with Alternative A could disturb murrelets nesting in 589 or more acres of suitable habitat. These disturbances would be spread throughout several years, and a given stand of murrelet habitat could be disturbed by harvest activities on more than one unit. Since the effects of disturbance are short-term and marbled murrelets have generally shown an indifference to the kinds of disturbances associated with timber harvest, any disturbances are not expected to compromise conservation of the species. At the most, harvest-related disturbances could cause the abandonment of some subset of murrelet nests in 589 or more acres of suitable habitat. We do not expect any direct mortality of adult murrelets.

Other BLM and private actions occurring in and near the analysis area described in section 4.0.1 would create additional new road corridors. Ultimately, though, the North Coquille DM/CT and Tioga DM projects would further reduce open road densities on BLM administered land in and near the analysis area. This reduction in road density would be offset to some extent by additional road construction on private lands. Most non-BLM land in the analysis area is managed intensively for timber; therefore, road density and road-related impacts to wildlife would probably continue to remain relatively high on non-BLM lands.

Although we do not know the number, high-value snags almost certainly exist near some of these other harvest units and haul routes. OSHA safety regulations may require some unknown number of these snags to be cut which would further exacerbate their scarcity on the landscape. Additional habitat trees may also be created by mid-crown topping and fungal inoculation in proposed Cox Creek units and no treatment areas through separate restoration contracts.

4.2.3 Issue 2 - Alternative B – Minimize Short Term Impacts

Direct/Indirect Effects

Marbled Murrelet Disturbance

Under Alternative B, a greater use of helicopter yarding would allow operations on more units near potential marbled murrelet habitat to be confined to the non-nesting season for murrelets. However, approximately 27 acres and 16 scattered individual trees of marbled murrelet habitat would be subject to logging-related disturbances on 99 acres during the summer nesting season. All of this habitat, though, is low quality, because there are relatively few platforms trees and/or few (generally < 4) platforms per tree.

Barrier Effects of Roads

Alternative B would create less new road corridors in otherwise contiguous forest (0.84 miles compared to 2.8 miles in Alternative A). The 0.1 miles of the new road corridors created under this alternative would be decommissioned after the harvest is complete, but the corridor effect of these roads could remain for at least the period during which the road is open (1-3 years). With the application of design features for road closures and decommissioning, the barrier effect of the new road corridors should almost disappear within a few years of decommissioning because: 1) the road corridor width is less than the spacing for most density management units (road corridor width = approximately 12 feet verses an average spacing of 23 feet for most density management units), 2) grass seeding and the pulling of slash and other debris onto the road surface during decommissioning would establish cover over the road surface, and 3) roads would be closed to vehicle traffic. By reestablishing cover over roads and closing them to traffic, the design features confine the main effects that roads have on wildlife to the 1-3 year period when the roads are being actively used.

Open Road Density

The effects on open road density would be the same as Alternative A.

Threat to High-value Snags

Under Alternative B, units 1b and 9 would be modified to provide a two snag-height buffer of approximately 8 acres (the OSHA recommendation) around the patches of high-value snags which should eliminate the risk that they would be felled to reduce the risk to loggers working in the units. As a result, only one known high-value snag in Unit 8 near roadside would be at risk for felling due to safety concerns.

Cumulative effects
The cumulative effects of Alternative B would be similar to Alternative A.

4.3 Effects on Wildlife Resources

4.3.1 Wildlife – No Action

Direct/Indirect Effects

Down wood

Most units are deficient in down wood habitat and what down wood is available is mostly in decay classes 3-5. Down wood levels would remain deficient under the No Action alternative. Small diameter down wood would continue to be available as suppression mortality trees fall; though these small logs last but a short time before they decay. Recruitment of large down logs would be limited since few large trees are available now in the units and large trees won't develop for many decades (see numbers from Chris).

Threatened and Endangered, special status, and Survey and Manage species and snags
See the sections 4.2 and 4.9.5 for discussion of effects to Threatened and Endangered, special status, and Survey and Manage species and snags.

Special Habitats

The small rocky area in unit 9 and the sink ponds in unit 1c would remain unchanged.

Cumulative Effects
With the No Action alternative, there would still be thinning projects within or immediately adjacent to the analysis area which would facilitate the future development of larger down wood at the expense of small-diameter down wood in the short-term (see sections 4.0.1). Small-diameter logs, however, offer less habitat value for wildlife since more species are associated with large logs and the small logs decay quickly (Marcot et al. in press). Private timber harvest would follow Oregon forest practices for down wood requirements.

4.3.2 Wildlife - Alternative A – Preferred Harvesting System

Direct/Indirect Effects

Down wood

Most units are deficient in down wood habitat and what down wood is available is mostly in decay classes 3-5. The short-term availability of large down logs would remain about the same under Alternative A; large down logs would be retained in all units, although logs in yarding corridors may be damaged (bark knocked loose or broken apart). Since

Alternative A would hasten the development of large trees, the long-term availability of large-diameter down wood would increase compared to the No Action alternative. Small diameter down wood would be less available since most small trees that otherwise would have died due to suppression mortality would be removed. Small-diameter down logs, however, are not nearly as long-lived nor as valuable for habitat as are large-diameter logs (Marcot et al. in press).

Threatened and Endangered, special status, and Survey and Manage species and snags
See the sections 4.2 and 4.9.5 for discussion of effects to Threatened and Endangered, special status, and Survey and Manage species and snags.

Special Habitats

Some trees would be removed from near the small rocky area in unit 9 and the sink ponds in unit 1c. In the field, prescriptions around these two small special habitats would be customized to maintain or improve any special habitat value at these sites; therefore, the value of these sites as unique habitats would be maintained.

Cumulative Effects

The activities discussed in the cumulative actions section (section 4.0.1), together with Alternative A, would treat about 4,500 acres on BLM-administered land plus additional private harvest in and near the analysis area. The BLM projects would facilitate the future development of larger down wood at the expense of small-diameter down wood in the short-term. Small-diameter logs, however, offer less habitat value for wildlife since more species are associated with large logs and the small logs decay quickly (Marcot et al. in press). Private timber harvest would follow Oregon forest practices for down wood requirements.

4.3.3 Wildlife - Alternative B – Minimize Short Term Impacts

Direct/Indirect Effects

Down wood

The effects to down wood habitat would be similar to Alternative A except that more extensive use of helicopter logging would result in slightly less damage to existing decay class 3-5 logs.

Threatened and Endangered, special status, and Survey and Manage species and snags
See the sections 4.2 and 4.9.5 for discussion of effects to Threatened and Endangered, special status, and Survey and Manage species and snags.

Special Habitats

Same as Alternative A.

Cumulative Effects

Similar to Alternative A except for the acres treated and the exact numbers of down wood and snags created.

4.4 Effects on Soil Resources

4.4.1 Soils - No Action

Direct/Indirect Effects

There will be changes to the physical environment under this alternative. Stream channels and sediment delivery mechanisms altered by past management actions will continue to adjust to the climatic events each year. Some sediment delivery (both fine and coarse materials) can be expected to move through the stream network. Sediment delivery from roads would be limited to situations like the 26-10-6.4 or 7.0 roads.

The nutrient status within the analysis area will not change appreciably. Alder stands will not convert to conifer without some kind of intervention. Small areas of hardwoods will remain and a separate action would need to be planned to remove them. These areas will continue to fix nitrogen until stands become decadent, die, and blow over.

Road closures would have to occur under a different action in order to return sub-grades to near forest conditions with regards to infiltration and nutrient cycling processes. The level of compaction within the analysis area should remain the same as most of the analysis area has prior access or old roads that could be reopened for management activities. Culverts that are presently at the end of their usefulness or are failing would continue to degrade and potentially deliver sediment to the streams. These culverts would have to be replaced under a separate action and funding mechanism.

Cumulative Effects

Other timber harvest activities are likely occurring in and near the analysis area (see section 4.0.1). The North Coquille DM/CT project planned for BLM-administered land should not deliver appreciable sediment into the stream network based on canopy leave levels and location of road building. Private lands will continue to be harvested as demand for timber continues and stands reach their rotation age. Fine sediment delivery can be expected to increase from the road building, regeneration harvesting, and burning activities occurring on private lands within the analysis area. The Forest Practices Act of the state does not require vegetative filter strips on first and second order draws. Without fish presence being verified in the third and fourth order draws, there are minimal leave tree and filter strip requirements under state regulations. Regeneration harvesting and burning without leaving adequate width (25 to 50 feet) of vegetation to filter the fine sediment generated from the disturbance action will lead to some level increased level of sediment delivery compared to the current watershed state. Based on the soil types and slope gradients found in the areas to be harvested soon, the impact could range from minor amounts during large storm events to major contributions from landslide failures

4.4.2 Soils - Alternative A – Preferred Harvesting System

Direct/Indirect Effects

Sediment Delivery

Under this alternative, the removal of cut trees will employ a skyline system capable of providing one-end suspension of the material during in-haul to the designated landings. Transporting logs in this manner generally displaces slash and vegetation along the yarding corridor. When yarding small diameter material, such as those proposed, the disturbance within the yarding corridor is negligible. The total weight of the load is well matched to the equipment and disturbance to the slash and existing vegetation is barely visible. Re-growth is nearly immediate and sediment filtering functions are not interrupted. Harvesting this same sized material has recently been accomplished within the Analysis Area on similar slopes and soil types using the same type of skyline system. There are only minor amounts of exposed soil within the yarding corridors and no sediment delivery from said operations. Thus, it is expected for this proposed action that soil exposure and sediment delivery will be negligible to non-existent.

The placement of variable width buffers by the IDT along stream channels that appeared to have high levels of disturbance in the past or showed some sign of stream bank instability will prevent sediment increases from stream bank instabilities. According to Table DM-1 of the North Fork Coquille WA, a 20-foot buffer is recommended to assure attainment of stable stream banks. However, the existing high level of shrub roots and the expected increase of both canopy diameter and root colonization where trees are removed following the treatment will provide soil stabilization in the wider gaps. There are instances where first and second order streams are presently devoid of canopy or trees. These areas are stable and appear to have been so for at least the last 20 years. It is expected that removal of a portion of the canopy at this time will not lead to stream instability in the next 5 years. By that time, root and canopy mass should increase and provide adequate levels of protection to the stream channels.

The high rate of infiltration of the soil types in the analysis area and the forested environment precludes overland runoff within the treatment areas. The level of slash generated from the thinning operations and the level of vegetation of the understory is adequate to filter any sediment from hillside sources. In addition, the past practices have altered the flow patterns within the streams and most flows are subsurface, allowing sediment to be captured and not routed from the site.

Road construction and improvement actions will produce some fine sediment from disturbed surfaces if erosion control measures fail. Most sediment is produced during the first year from such activities with the amount being reduced by 70 percent in the second year and 90 percent the third year (Luce and Black, 2000). However, the location of the road in proximity to water may preclude delivery into the stream system as there are vegetated buffers and ditch lines with adequate vegetation within them to capture most fine materials. Mean observed sediment travel distance from culvert openings on newly constructed roads has been determined by Brake *et al*., (1997) to be 9.33 meters. Where culvert outflow is filtered by slash or logging debris as in this action, the mean distance was 4.75 meters. Disturbance on old roads will be confined to brushing, minor grading of the road surfaces and opening culvert inlets. Some new rock will be placed on old road grades this BMP will provide an armor layer to the road surface and fine sediment delivery will be abated.

Nutrient Status

Under this proposal, the nutrient status will not change. Thinning actions would not change the overall environment or ecology of the soil. It would be expected that in those areas where conversion from hardwoods to conifer occurs, newly established conifer would take advantage of the nitrogen fixation accumulated by the Red Alder. This would increase the establishment of the conifer if the surrounding fern and other species competition can be controlled.

Road Decommissioning

There are over 11 miles of road proposed for closure under this proposed action. The majority of these closures will block traffic and install waterbars within the road surface to route runoff to vegetation along the roads. The more permanent method of road closure proposed would allow soil infiltration and nutrient cycling processes to return to natural rates. The old road surface will be covered with organic materials that will break up the water drop velocity, and would allow for infiltration. Runoff will not be produced, thus sediment will not leave the sites.

Cumulative Effects

Considering this proposed action with the other combined land treatments within the analysis area (see section 4.0.1), there will be no visible or measurable effect on sediment delivery from this action. The minor amount of road building and decommissioning work will not increase sediment delivery over the expected no action levels. The level of open road density will decrease within the analysis area and some level of restoration will be accomplished on culvert passages and along riparian areas.

4.4.3 Soils - Alternative B – Minimize Short Term Impacts

Direct/Indirect Effects

Sediment Delivery

This proposal seeks to limit the amount of new road construction and reduce the number of large culvert replacements within the analysis area. Treatment area is nearly the same as the proposed action with some acreage being added and others taken away. There is a difference in the number of acres being skyline harvested. Approximately 275 acres will receive full suspension in place of one-end. This will reduce the minimal amount of disturbance and potential erosion sources in comparison to the proposed action. Combined with more helicopter harvest are three to four small areas of ground based harvest. It has been demonstrated on this District that such harvest when confined to pre-approved forwarder trails with at least four to six inches of slash under the tracks or tires will not produce adverse effects when implemented.

Fewer roads (2.1 miles less) are being built under this proposal thus short term sediment delivery should be less from these areas. However, in order to accommodate the increased level of helicopter activity there will need to be more landings constructed. These areas would generate some minor amount of fine sediment from the construction activities much like a new road. Thus the two proposals are equal with respect to fine sediment delivery from newly constructed roads or landings. Due to the activity level at helicopter landings more fine sediment and oils may be generated compared to the proposed action. The location along Cox Creek of one helicopter landing could potentially deliver these materials to the stream if control measures fail. Constant monitoring on a daily basis would be necessary to ensure no delivery takes place.

Nutrient Status

There would be no difference between the proposed alternative and this action on the analysis area nutrient status.

Road Decommissioning

Road decommissioning efforts will remain the same for all roads used under this proposal but overall the total number of miles treated will be less. The major road of concern, 26-10-7.0 will remain open on the west end of the analysis area. Traffic will still be able to cross the North Fork Coquille River (in 5 places) and individuals will have to turn back and cross again (up to 10 in total) in order to leave the area. The road will be blocked on the east end following this proposed alternative.

Cumulative Effects

Under this alternative, 6 fewer acres of Density Management thinning would occur and approximately 22 fewer acres of hardwood conversion areas would be treated. Neither of these actions would have substantially contributed sediment to the stream network had they taken place. When this alternative is considered in context with the rest of the actions expected within the analysis area in the near and foreseeable future, no additional adverse impacts are expected.

4.5 Effects on Water Resources

4.5.1 Water - No Action

Direct/Indirect Effects

Peak flow, annual yield and low flow are expected to be within the range of natural variability. The majority of the watersheds are fully forested with an average of 40 years or greater stand ages. The perennial streams are fully shaded and summer temperatures are expected to be within the range of natural variability.

Cumulative Effects

Channel morphology in up to 10% of the first and second order streams is likely still outside the range of natural variability. Downhill logging was part of the previous harvest plan and some of the small intermittent streams were moved or impacted for easier access up the bottom of the narrow valleys. Some of these streams are still adjusting their bed and banks to the available discharge.

Accumulation of large woody debris (LWD) may be at risk in the analysis area in headwater and larger stream channels. Timber stands in the Riparian Reserves would be stagnated and may be prone to windthrow. This mortality would provide short to long term small to medium diameter large woody debris (LWD) to stream channels. However, smaller diameter material would decay faster and may not maintain desired structural wood components in and along the stream channels

4.5.2 Water - Alternative A – Preferred Harvest System

Direct/Indirect Effects

Peak Streamflows

The various selection prescriptions being proposed should not affect runoff from peak flows. Selective logging studies where 59%-65% of the stand volume was selectively cut show that the larger storms of the year did not significantly affect peak streamflows (Ziemer 1998). These storms return about 8 times each winter season or about 10% of the time, and carry about 99% of the suspended sediment load. Furthermore, the analysis area density management thinning prescriptions, either selectively cutting single trees or small groups, will remove substantially less total volume (40-60%). Therefore peak flows should remain within the range of natural variability.

Annual Yield

There may be some increases in annual yield because of less tree canopy interception and evapotranspiration. Selection logging, using skyline cable systems with similar stand types as in the analysis area indicate that there may be an average increase of up to 15% in annual yield (Keppeler 1998). However, this effect is short lived and decreases rapidly with growth of existing trees or replacement vegetation. Furthermore in the analysis area, riparian vegetation will be mostly retained along intermittent streams and fully retained along perennial streams. Riparian trees and vegetation use more water than the upland forested slopes. This effect would tend to reduce annual yield increases due to less interception and evapotranspiration. Increases in yield would not change flows enough to shape or rearrange the morphological characteristics of stream channels.

Low Flow

Low flows may be temporarily increased due to density management thinning. A selection cutting study without riparian buffers showed that low flows were increased an average of 38% in normal precipitation years, while they were not changed in drought years (Keppeler 1998). Intervening riparian reserves are likely to substantially reduce this effect. Riparian reserves are efficient in uptaking and transpiring available water, thus intercepting downslope movement and entry to stream channels. Because the analysis area streams have very low flows (0.08 cfs mi/mi^2) a temporary increase would be beneficial. Any changes in low flows are likely to rapidly diminish within 5-15 years as trees grow toward crown closure.

Temperature

Reduced shade by decreased vegetative canopy cover can lead to elevated summertime water temperatures (Brown 1972). Various density management prescriptions will be applied throughout the analysis area including a mix of treatments within Riparian Reserves. All of these areas are along intermittent streams and substantial canopy cover would be retained. Furthermore, because intermittent streams are above the water table, they dry by early summer, and do not support base flow. No density management thinning would occur adjacent to perennial streams in the analysis area. Variable width no treatment zones were established along perennial streams based on topography, aspect, existing vegetation cover in order to maintain stream temperature.

Sediment

The density management prescriptions should not appreciably change the natural onsite sediment loss and delivery processes and would likely remain within the range of natural variability. Stream channels with thin through prescriptions, where thinning would occur up to the stream channel, would only occur on intermittent stream channels. Thinning these areas may result in a small number of trees near the streambank being removed (trees within three feet of the channel will not be removed). However, streambank disturbance is expected to be minimal. Closely spaced trees have small crowns and correspondingly small root mass. The small root mass makes these trees vulnerable to blowdown. Thinning will increase crown size that results in a corresponding increase in root mass and bole thickness. An occasional tree being felled may topple into a stream channel. This would lead to only minor and insignificant bank disturbance. Full suspension or one end suspension is planned for the logging systems plans, with some corridors over channels. There may be minor dragging, but the duff and herbaceous vegetation is dense enough to prevent erosion paths from forming.

Additionally, the root systems of severed trees will be sufficiently connected to live green trees through root grafts, which will provide soil stability within the short term. The amount of live root mass, following a thinning, is greater than would be suggested by the number of live trees left. This is due to root grafts and the distribution of root mass in the ground. Eis (1972) found that 45% of selectively cut Douglas-firs were root grafted and half those sumps were still alive 22 years later. The roots of residual trees will expand as tree crowns increase, replacing the root strength lost from severed trees. Understory shrubs and vegetation will also increase following a thinning, which will provide additional stability along the streambank.

Roads/Landings-Sediment

The alternative would involve building 2.1 miles of new road construction, mostly as short spurs on ridgetops or gentle sideslopes, well removed from stream channels. Operators following design features as listed under roads in Chapter 2 would prevent road construction activities from delivering sediment to a stream channel.

Alternative A would replace poor or unsatisfactory stream crossing culverts as indicated on BLM FIMS inventory. There may be some short-term turbidity contained during construction and a possibility of some minor amount of sediment delivery during the first succeeding storm.

Approximately 5.2 miles of road would be renovated or improved by rocking dirt surfaces to prevent erosion, clearing ditch lines or plugged culverts, replacing or increasing the frequency of ditch relief culverts, and outsloping of some road segments so that water will runoff to natural ground and not accumulate in the ditch line. These actions would all be beneficial and would lower sediment delivery to stream channels.

With the application of the design features pertaining to transportation systems and winter haul, negligible sediment delivery to stream channels would be expected.

There would be about 11.5 miles of road closure or decommissioning. This may be a mix of short-term (1-5 years) and long-term (>5years) closures depending on management needs as determined through a district Transportation Management Operations (TMO) interdisciplinary process. Road decommissioning would reduce the short and long-term potential for the transportation system to contribute sediment to the stream network. Short-term closure would block vehicular access to the public, ensure that the road is free draining, ensure that ditch relief culverts are not likely to plug, ensure any stream crossing culverts are not likely to plug, and seed and mulch bare ground. Long-term closure would prevent all vehicular access, remove stream crossing culverts and restore natural hydrologic flow paths, prevent stream nickpoints from forming near the road crossing, ensure that the road is free draining and has adequate runoff structures (waterbars), ensure that fills are stable and seed and mulch bare ground.

Cumulative Effects

None identified. Cumulative effects would be the same as the No Action alternative.

4.5.3 Water - Alternative B – Minimize Short Term Impacts

Direct/Indirect Effects

Density Management Thinning

Peakflow, annual yield, and low flow characteristics would be the same as Alternative A. Temperature would be the same as alternative A except for one helicopter landing. This landing would be constructed at a stockpile site on a terrace between Cox Creek Road and Cox Creek near milepost 1.5. The riparian zone is an alder dominated hardwood stand with some maple and minor amounts of Douglas-fir and hemlock in the understory. Some trees may need to be removed along the stream within the Riparian Reserve for safety concerns. However, the residual stand would be left nearly intact and the spreading crowns of the hardwood species should prevent any temperature increase during the summer months.

Roads/Landings-Sediment

Alternative B would involve building 0.1 miles of new road construction on a ridge. No sediment delivery is possible.

Alternative B would not replace poor or unsatisfactory stream crossing culverts as indicated on BLM FIMS inventory. There would not be any short-term turbidity. However, there would be a possibility for future saturated fills, slumping roads or road failures in three locations.

Approximately 5.3 miles of road would be renovated or improved by rocking dirt surfaces to prevent erosion, clearing ditch lines or plugged culverts, replacing or increasing the frequency of ditch relief culverts, and outsloping of some road segments so that water will runoff to natural ground and not accumulate in the ditch line. These actions would all be beneficial and would lower sediment delivery to stream channels

There would be about 9.6 miles of road closure or decommissioning. This may be a mix or short-term (1-5 years) and long-term (>5years) closures depending on management needs as determined through a district Transportation Management Operations (TMO) interdisciplinary process. Road decommissioning would reduce the short and long-term potential for the transportation system to contribute sediment to the stream network.

Alternative B would have a net positive effect in reducing sediment delivery to streams because 5.3 miles of existing road including natural surface roads would be maintained for safe water drainage and erosion proofed and 11.5 miles of road would be closed or decommissioned.

Cumulative Effects
No cumulative effects, above the baseline, have been identified.

4.6 Effects on Aquatic Resources

4.6.1 Aquatic - No Action

Direct and Indirect Effects
An indirect effect of this alternative would be that a large number of younger conifer stands in Riparian Reserves would continue to develop under conditions of high competition and growth suppression. The Douglas-fir old-growth forests, along with its associated aquatic habitats, are disturbance dependent ecosystems (Agee 1981, Reeves *et al*. 1995). Consequently, excluding or avoiding disturbances that mimic natural disturbances can delay attainment of overall late-successional/old growth conditions for decades to a century or more (USDI 1999). This alternative would result in stands that are more susceptible to fire, windstorms, and insect infestations, and also stands that have an overall smaller tree size. As a result, future contributions of woody material to the aquatic ecosystem would likely occur, but the wood would be of a smaller size and would decompose relatively quickly (relative to larger, mature trees). Logging debris and large relic logs that exist within the channel would likely decompose long before being replaced by new large wood. If the No Action alternative is selected, the quality of down wood recruited from densely stocked stands could adversely affect aquatic species that benefit from late-successional forest conditions in the long term (USDI 1999).

If no action is taken, aquatic habitat conditions would likely remain in “good” condition in the short term, but future contributions of larger, mature trees to the stream channel would occur at a slower rate. In stream systems where large wood is not abundant, aquatic habitat conditions would likely remain relatively simple, until larger, mature trees entered the channel. These larger wood pieces are necessary to form the complex habitat conditions, and stair-stepped channel profiles that have been shown to contribute to healthy aquatic habitat conditions.

Under the No-Action Alternative, none of the recommended road decommissioning, culvert replacements, or road surface/drainage improvements would be completed at this time. Indirect effects of potential culvert and road fill failures, debris torrents, and other potential road-related mass failures could increase water turbidity and accelerated sediment deposition in downstream reaches (from first order tributaries to the lower South Fork Coos River and North Fork Coquille River) potentially affecting spawning and rearing habitat. On BLM-managed lands there would be a low to moderate risk of additional mass failures, sediment delivery, and associated impacts to aquatic habitat as a result of the No-Action Alternative.

Cumulative Effects

The No-Action Alternative would not add to the cumulative effects of the activities discussed in the cumulative actions section (section 4.0.1). The No Action alternative would not continue to simplify aquatic habitat in the watersheds, nor would it enhance the recovery of these conditions. Given the present standards for riparian management under the Oregon Forest Practice Rules, appreciable large wood recruitment from private and industrial forests is unlikely in the foreseeable future; Therefore, BLM managed lands within the analysis area would be the likely source of down wood inputs to aquatic systems. Overall, the other BLM projects would reduce open road densities on BLM administered land in and near the analysis area. This reduction in road density would be offset to some extent by additional new road construction on private lands.

4.6.2 Aquatic - Alternative A – Preferred Harvesting System

Direct and Indirect Effects

Aquatic Habitat and Fish Species, Including T&E Species

An effect of this alternative would be a slight short-term reduction in the amount of small woody material available to enter the channel as a result of the commercial thinning. This short-term reduction is likely to have a negligible effect on aquatic habitat due to its quality and its location on the landscape. Additionally, streams within the analysis area have large amounts of existing downed wood within the stream channel due to past logging. Since the proposed density management would only remove small trees (less than 20” dbh), the residual trees and existing down wood would be expected to provide the intermediate small woody material needed between the time the existing downed wood decomposes and riparian trees mature.

Thinning could have the potential to increase solar radiation reaching the water surface. However, within the analysis area stream temperature would not increase as a result of density management. No treatment zones were designated on streams to provide adequate canopy adjacent to the stream to maintain stream shade. Several small, intermittent stream channels within the thinning units have “thin through” prescriptions, where thinning will occur up to the stream channel. Since these channels are dry during summer months, reducing crown cover along these areas would not affect stream temperatures downstream and therefore would not affect the aquatic environment.

Root strength effectiveness stability and the stability of the streambank would not be altered (see 4.5.2). Therefore, activities occurring near the streambank are unlikely to affect aquatic habitat in the short term, while improving riparian and aquatic habitat in the long term.

T&E species

Impacts to listed fish from the proposed density management are not expected to occur since most units occur miles above anadromous fish bearing streams. The proposed action is expected to benefit listed fish in the short and long term. Three Units (14, 24, and 26) occur within ¼ mile of a coho stream. However, these tributary streams are small, intermittent channels that will be dry during the summer. Variable no treatment zones would exist on all coho streams to maintain stream shade and aquatic habitat. All other units are between 0.5 and 3.0 miles above where coho salmon are located.

The proposed action may increase sediment delivery to stream channels from winter haul on the along the Coos River mainline road. Because the road is privately controlled, sediment control devices cannot be installed at these stream crossings, as in the remainder of the analysis area, though all other design criteria for hauling will apply. Four streams along this haul route were determined to have delivery potential from winter haul. However, when these streams were monitored during moderate haul, sediment was not detected above background levels (see effects below for turbidity). Moinau et al. (1997) found that on established logging roads within the Oregon Coast Range, the maximum observed distance sediment traveled below a culvert with vegetation filtering was typically not more than 6.21 meters. Based on site conditions and supporting literature, it is expected that sediment would be filtered through vegetation and would likely settle out in these small stream channels before reaching the Coos River where coho salmon occur and if occurred would be short term and immeasurable. Additionally, this portion of the Coos River is used as a migratory corridor for salmonids, and is not typically used as spawning and rearing habitat.

A small, short-term pulse of sediment may occur within the North Fork Coquille as a result of decommissioning the 7.0 road, when heavy equipment would cross the stream channel but would have little effect on the aquatic system due to the short duration and the exposed bedrock in the river bed where equipment would be required to traverse.

Sediment Delivery to Streams

The North Fork Coquille River is designated as a Tier 1 Key Watershed. The NFP ROD (USDA-USDI 1994) states that "the amount of existing system and non-system roads within Key Watersheds should be reduced through decommissioning of roads…for each mile of new road constructed, at least one mile of road should be decommissioned." No new roads will be constructed in the Key Watershed as part of this action. Additionally, under this action, road miles within the key watershed would be reduced from 5.2 mi/mi2 to 3.8 mi/mi^2, due to road decommissioning.

All new road construction within the Key Watershed would occur outside of Riparian Reserves. Within the South Fork Coos Watershed, 1000 feet of new road construction in unit 1C would occur on a ridge top within the outer boundary of a Riparian Reserve of a small intermittent stream channel where it overlaps the ridge top (approximately 150' from the stream channel). There would be no stream channel crossings where new construction would occur. Therefore, no delivery mechanism exists for sediment from new construction to enter a stream channel so there can be no effect to the aquatic environment.

The majority of road renovation, improvement, and decommissioning occurs outside the Riparian Reserves. Where stream crossings occur, a subsequent short-term (1-2 years) negligible increase in delivery of suspended fine sediments from road surfaces, road cuts, and ditches could occur; however, these streams are small, intermittent channels that are approximately 0.5-3.0 miles above fish bearing habitat. Additionally, these activities would be completed during summer, dry months when these streams would be dry, so sediment delivered to these stream systems would not have a substantial effect on the aquatic environment.

Winter hauling on gravel roads may potentially increase sediment delivery to stream channels at 7 crossings along the haul routes within the analysis area. The effects are expected to be negligible, since sediment would be contained and removed by sediment control structures, which would reduce, and/or eliminate the potential for sediment to be delivered. The crossings are located on small-headwater- intermittent channels a half-mile above fish bearing water and it would be unlikely that any sediment would be delivered to these areas. See T&E Species above for effects of hauling on the Coos River Mainline Road.

Ninety-seven culverts would be replaced under this alternative. Ninety-four of these culverts are either cross drain ditch relief culverts with no connection to a stream channel, or are small culverts located on intermittent and ephemeral channels that would be dry during replacement. Therefore, no delivery mechanism would exist for sediment to reach stream channels from replacing these culverts. Three culverts would be replaced on or near perennial, resident fish bearing streams. These would be replaced during low flow conditions to minimize sediment delivery. However, a short-term sediment pulse from these activities could occur. Project design criteria for culvert replacements would be expected to reduce the chance of sediment delivery to fish bearing water and limit potential effects to the aquatic environment.

Under this alternative, approximately 10.6 miles of existing road would be decommissioned. This would result in a net decrease of open road miles within the analysis area. Thus, this alternative would reduce the long-term sediment delivery potential (from surface erosion, landslides and culvert/fill failures) in the analysis area. Approximately, 8.6 miles of road decommissioning will occur within the Riparian Reserve. However, only one mile will include total decompaction. A small short term pulse of sediment may occur as a result of decommissioning the -7.0 and -6.6 roads, when heavy equipment crosses the stream channel. Sediment delivery from these actions would be expected to be localized and short term and would have minimal affect on the aquatic system.

Harvest-related ground disturbance caused by skyline log yarding or helicopter removal would not likely result in an increased contribution of sediment to the aquatic system. The combination of high amounts of duff and course wood in the riparian area and within stream channels, variable no-treatment areas along streams, directional falling away from streams, high soil/water infiltration rates (see Soils report), and full suspension across stream channels would essentially eliminate any chance for harvest-related sediment to enter stream channels. Therefore, if there were no sediment delivery to the stream network, there would be no effect to the aquatic environment.

Riparian Reserves Condition and Function

Under this Alternative, 443 acres of Riparian Reserves in the analysis area are proposed for density management. Resultant conifer densities in riparian treatment areas (average 60-80 trees per acre outside no treatment zones) will approximate densities in the uplands.

As a result of the thinning, there would be an immediate reduction in the amount of small, woody material available to enter stream channels. While material recruited from stands <40 years old contributes organic matter important in food webs, such wood provides little in terms of in-stream structure and channel stability, due to its small diameter and high decay rate. Therefore, density management thinning in Riparian Reserves would not likely have a substantial effect on down wood in the short term. In the long term (15+ yrs), growth rate of individual trees and the resultant structural diversity of riparian areas is expected to increase in the thinned Riparian Reserves. This would benefit aquatic habitat and channel stability, because larger pieces of woody structure would be available for recruitment in a shorter period than would occur without thinning.

An indirect effect of this alternative would be that a large number of Riparian Reserves currently dominated by dense, suppressed stands of conifer or alder would shift to lower density, faster growing stands of conifer and mixed hardwood. Overall, this would result in stands that are less susceptible to fire, windstorms, and insect infestations, and stands that are developing larger tree sizes in a shorter amount of time. As a result, contributions of large wood to riparian reserves and stream systems would likely to occur over time, but the wood would be of a larger size and would decompose relatively slowly (relative to smaller diameter trees).

The proposed density management treatments are not likely to negatively affect large wood recruitment in the South Fork Coos and North Fork Coquille watersheds. Under this Alternative, Density Management thinning within Riparian Reserves would treat roughly 1% of the total Riparian Reserve acres within the watersheds. An immediate, concentrated source of woody material available to enter the stream channels would remain in the no-treatment zones prescribed along perennial stream channels within or adjacent to individual units. In addition, remaining trees in the thinned portions of the Riparian Reserve are also likely to contribute to short-term woody debris within the stream channel, due to damage-induced tree mortality (following the thinning harvest), and localized areas of wind toppled trees. Over the long term, density management will improve the large wood recruitment potential, connectivity, and structural diversity within the Riparian Reserve network.

Cumulative Effects

On BLM lands, road and harvest design features and best management practices associated with this alternative, together with the effects of other BLM actions described in section 4.0.1, are expected to slightly reduce sediment delivery to maintain water quality, improve aquatic habitat, and support the recovery of fish populations over the long term. No detrimental impacts to fish populations or fish habitat are expected as a result of any of the BLM projects, so no negative short-term cumulative effects are anticipated. However, the cumulative effects to fish populations, in-stream habitat, and riparian dependent species that would eventually occur within the watersheds as a result of thinning and density management treatments would be beneficial. In addition, the potential for long-term sedimentation from eroding road surfaces would be reduced through road decommissioning and closures.

4.6.3 Aquatic - Alternative B – Minimize Short Term Impacts

Direct and Indirect Effects

Aquatic Habitat and Fish Species, Including T&E Species

The effects to aquatic habitat and fish species would essentially be the same as Alternative A. Ground based harvest methods would be utilized within Riparian Reserves of several small, intermittent stream channels, under Alternative B. However, these areas are stable and relatively flat, and would not be expected to impact aquatic habitat or fish species since the nearest stream channels are small, intermittent, non-fish bearing channels that would be dry during the use of ground based equipment.

Sediment Delivery to Streams

Under this Alternative, new road construction within the LSR would not occur. However, winter hauling on existing roads would increase due to different logging methods being used under this alternative. This may increase the potential for sediment delivery to stream channels. However, project design criteria (e.g. sediment control measures) would still reduce and/or eliminate sediment delivery to stream channels. Increasing haul on the Coos Bay mainline road during the winter could increase the potential for sediment delivery to stream channels, but would still likely be undetectable from background levels.

The three culverts on or near perennial streams would not be replaced under this alternative. The effects of replacing the 94 culverts would be the same as Alternative A. Effects from other actions are described in Alternative A.

Riparian Reserve Condition and Function

The effects to Riparian Reserves would essentially be the same as Alternative A

Cumulative Effects

Under this alternative, there would be a slight increase in short term sediment delivery potential. These effects are expected to be localized, and of short duration. Therefore, in the long term, together with those actions described in Section 4.0.1, cumulative effects under this alternative, would be similar to those described for Alternative A

4.7 Effects on Air Quality

4.7.1 Air - No Action

Direct/Indirect Effects
No site-preparation activities would take place. Their would not be any direct or indirect effects to air quality as a result of site preparation activities.

Cumulative Effects
The Oregon Smoke Management Plan, (OAR 629-43-043) would manage the air Quality associated with harvest activities in the area. Approximately 250,000 tons of woody fuels would be burned across all land ownerships in the Coos Forest Protective Association (ODF, 2001)

4.7.2 Air - Alternative A – Preferred Harvest System

Direct/Indirect Effects
All prescribed burning would comply with the guidelines established by the Oregon Smoke Management Plan, (OAR 629-43-043), as addressed in the RMP. Hand pile or machine pile burning would be scheduled during the period starting in November and ending in April. This window of burning during the rainy season, combined with keeping the burning confined to piles would reduce the amount of material actually consumed. In addition, seasonal restrictions reduce the likelihood of ignition of a large-scale wildfire and subsequent smoke emissions. Hardwood conversion from 55 acres would require that 220 tons (4 tons/acre) of fuel be burned for site preparation.

Cumulative Effects
Cumulative effects are managed by the Oregon Smoke Management Plan, (OAR 629-43-043). Smoke from 55 acres of prescribed fire activities would contribute approximately 220 tons of fuel to the approximately 250,000 (0.09%) tons burned annually in the Coos Forest Protective Association district.

4.7.3 Air - Alternative B – Minimize Short Term Impacts

Direct/Indirect Effects
All prescribed burning would comply with the guidelines established by the Oregon Smoke Management Plan, (OAR 629-43-043), as addressed in the RMP. Hand pile and machine pile burning would be scheduled during the period starting in November and ending in April. This window of burning during the rainy season, combined with keeping the burning confined to piles would reduce the amount of material actually consumed. In addition, seasonal restrictions reduce the likelihood of ignition of a large-scale wildfire and subsequent smoke emissions. Hardwood conversion from 35 acres would require that 140 tons (4 tons/acre) of fuel be burned for site preparation.

Cumulative Effects
Cumulative effects are managed by the Oregon Smoke Management Plan, (OAR 629-43-043). Smoke from 35 acres of prescribed fire activities would contribute approximately

140 tons of fuel to the approximately 250,000 (0.06%) tons burned annually in the Coos Forest Protective Association district.

4.8 Effects on the Road Network-Road Density and Closure

4.8.1 Roads - No Action

Direct/Indirect Effects
The current open road density status of 3.8 mi/mi^2 within the analysis area and 5.2 mi/mi^2 within the Key Watershed will remain same under this alternative. Implementation of the road decommissioning or closure recommendations specific to the Analysis Area would be deferred. Future road decommissioning and closures within the Analysis Area would be dependent on availability of funding from other sources. Roads that are currently becoming impassable to vehicle traffic due to encroachment from vegetation would continue to close if left undisturbed. Risk of failure at stream and culvert crossings or potential diversions would not be addressed.

Cumulative Effects
Open road density on private lands may increase as new roads are constructed or old roads are reopened to harvest private lands. Requests from private timber companies to construct roads on BLM lands under reciprocal right of way agreements would be processed. Such non-discretionary requests may lead to a possible increase in open road density on BLM lands. Increases in the open road density would retard attainment of road closure goals. Some closure due to lack of maintenance will continue to close low use roads. This area appears to be one used by hunters in the fall and some continued use of these roads will occur until nearly impassable to vehicle traffic in 6 to 10 years.

4.8.2 Roads - Alternative A – Preferred Harvesting System

Direct/Indirect Effects (see also section 4.2):
Existing roads – The Analysis Area currently has over 48.2 miles of existing open roads (Table 3-1). The proposed action includes renovating and improving approximately 5.2 miles (9 %) of existing roads that are in various levels of use. They range from those that have been recently maintained to those that are either impassable or marginally passable due to vegetation or other physical barriers. Renovation will allow the public to use these roads during that period of operation. Harvest from these roads may occur during the winter with no sediment delivery due to vegetative buffers along ditches and road edges and the distance to live running water.

Approximately 11.5 miles of existing roads will be decommissioned according to the respective Watershed Analysis road-closure recommendations. The roads identified in this action to be decommissioned will be closed on a long-term basis (not expected to be open again) or may be used again in the future (within 10 yrs). Existing roads that are identified in the respective Watershed Analyses for decommissioning or other roads in the Analysis Area that are determined to no longer be needed may be decommissioned through alternative funding sources such as Jobs-in-the-Woods. The design features outlined in Section 2.5 of this EA and the Best Management Practices listed in Appendix D of the RMP-ROD would ensure that the road related activities in the proposed action coincide with the ACS objectives. Open Road Density within the Analysis Area will decrease from 4.70 to 3.50 mi/mi^2 by decommissioning approximately 11.5 miles of roads that are included in the Coos Bay Districts road database. The Open Road Density within the Key Watershed portion of the analysis area will be reduced from 5.2 to 3.8 mi/mi^2.

Decommissioned roads
There has been 1.34 miles of prior road decommissioning within the analysis area. Several of these roads will be reopened under this action and closed at the end of operations. The original closures did not consider the risk from plugged pipes and surface runoff when the road was closed. This action will provide less risk after closure as the roads will be left in a self-maintaining condition. Overall, the open road density will not change for these surfaces.

New roads
All newly constructed roads will be decommissioned for a long-term (greater than 10 yrs.) rotation. The proposed action will create approximately 2.2 miles of new natural surface roads. These roads are strictly intended for use as logging roads to harvest the proposed units and once they are no longer needed for that purpose they will be decommissioned. None of the proposed new road construction is within Riparian Reserves. All new roads are constructed according to the RMP and Best Management Practices (BMP) in the RMP. Newer BLM-controlled roads pose a no to low risk of short-term sediment delivery to streams.

Cumulative Effects
The BLM activities discussed in the cumulative actions section (section 4.0.1), together with Alternative A would result in the decommissioning of 28.5 miles of existing road. The reduction in roads open to travel and the continued maintenance of existing roads will allow the stream networks to restore their developmental processes without undue influence from road related sediment. Maintenance, renovation, construction, and decommissioning of the road system using the RMP-ROD BMPs for the BLM actions would reduce or eliminate the sediment delivery potential generally associated with roads. Road densities and impacts would generally remain higher on private lands due to the different objectives and standards for management.

4.8.3 Roads - Alternative B – Minimize Short Term Impacts

Direct/Indirect Effects
The proposed action includes renovating and improving approximately 4.3 miles (7 %) of existing roads that are in various levels of use as described in the proposed action. However, one exception pertains; stream crossing pipes larger than 36 inches in diameter will not be replaced under this action. All new construction and approximately 9.6 miles of existing roads will be decommissioned according to the road closure recommendations. Appendix 4 The 26-10-7.0 within the Key Watershed will not be decommissioned under this proposal. This action will construct 0.1 miles of new road within the analysis area.

This action is slightly different from that analyzed in the proposed action but will also reduce or eliminate the sediment delivery potential generally associated with roads. Open Road Density within the Analysis Area will decrease from 4.70 to 3.7 mi/mi^2 by decommissioning approximately 9.6 miles of roads that are included in the Coos Bay Districts road database. The Open Road Density within the Key Watershed portion of the analysis area will be reduced from 5.2 to 4.5 mi/mi^2. The reduction in roads open to travel and the continued maintenance of existing roads will allow the stream networks to restore their developmental processes without undue influence from road related sediment.

Cumulative Effects
All effects are similar to Alternative A.

4.9 Effects on Other Resources

4.9.1 Critical elements not pertinent to the Analysis Area

All analyses have shown no effects to the following elements of the human environment:

1. Areas of critical environmental concern
2. Farm lands, prime or unique
3. Flood plains
4. Wild and scenic rivers
5. Wilderness values

4.9.2 Cultural resource values

Neither a records check nor a reconnaissance-level field visit has suggested the presence of prehistoric or historic resources in any of the proposed units. Therefore, it is not expected that any action alternatives will have any effect on cultural resource values.

4.9.3 Native American religious concerns and/or Indian trust resources

This project is in the traditional territory of the Coos, Lower Umpqua and Siuslaw Indians (CLUSI), a federally recognized Indian Tribe. We do not anticcipate Native American religious concerns in the vicinity of any proposed project units. The CLUSI have been notified about this project via the method of their choice (e-mail) and we expect their response if this project is of possible concern. Indian trust resources are not present in any of the proposed units. Therefore, it is not expected that there will be effects of any action alternatives to the Coos, Lower Umpqua and Siuslaw Indians.

4.9.4 Solid/hazardous waste

All Action Alternatives are subject to Federal and State regulatory guidelines for petroleum product use and storage. Spill Prevention, Control and Countermeasure Plans (SPCC) are required under the Oregon Forest Practices Act (Rule OAR 629-57-3600) and by Department of Environmental Quality (Rule OAR 340-108, *Oil and Hazardous Materials Spills and Releases*), which specifies the reporting requirements, cleanup standards and liability that attaches to a spill or release or threatened spill or release involving oil or hazardous substances. In addition, the Coos Bay District Hazardous Materials Contingency Plan and Spill Plan for Riparian Operations apply when applicable to operations where a release threatens to reach surface waters or is in excess of reportable quantities.

4.9.5 Threatened, Endangered, and other Special Status Species, including Survey and Manage Species (plants, animals, and fish)

Threatened and Endangered and Special Status Species
Impacts to spotted owls, marbled murrelets, bald eagles, northern goshawks, pileated woodpecker, fisher, marten, long-eared myotis, long-legged myotis, and silver-haired bat are addressed below. Other special status species are unlikely to be affected because: 1) the species do not occur in the area or are very unlikely to occur, or 2) the proposed units do not contain suitable habitat. The design features for the action alternative also provide for the retention and creation of snags and down logs which are important habitat features for some of the species.

Spotted Owls, Marbled Murrelets, Bald Eagles, Northern Goshawks, Pileated Woodpecker, Fisher, Marten
All these species are associated to some degree with large trees (bald eagles) or late-seral forests (rest of the species). There are no known active sites or nests within any of the proposed units for any of these species. One marten was sighted in a proposed unit, but it's unknown if it was part of a reproducing pair or just passing through. Although some spotted owl dispersal habitat would be modified by the treatments recommended in the action alternatives, no suitable habitat would be removed for any of the special status species. The action alternatives are primarily intended to accelerate development of large trees and late-successional forest characteristics, which should eventually improve habitat conditions for these species. The loss of up to18 large, tall, class 2-3 snags would degrade habitat for pileated woodpeckers, fisher, and marten especially, but the creation of new snags pursuant to the Design Features would partially compensate for this loss; although the compensation would take 20+ years to develop. Marten and fisher may benefit from the creation and retention of a large slash pile in unit 1m. The Design Features protect key habitat features (down logs) and avoid disrupting any nesting activities in nearby prime habitat. Alternative A would have some logging going on during the murrelet nesting season in an around some low-quality habitat (see Section 4.2.2). Standard E-4 timber sale contract stipulations allow the BLM to halt operations if unanticipated impacts to special status species are encountered. Since the action alternatives are designed to promote development of late-successional forest characteristics, these species should benefit overall from the implementation of the action alternatives. Impacts to spotted owls, marbled murrelets, and bald eagles and critical habitat have been addressed in consultation with the U.S. Fish and Wildlife Service. All mandatory terms and conditions from the Biological Opinions have been or will be incorporated/implemented in accordance with the Endangered Species Act.

Pileated Woodpeckers, Long-eared Myotis, Long-legged Myotis, and Silver-haired Bat
These species depend on large snags for foraging, nesting, roosting, and/or hibernating. The potential, though unlikely, loss of up to 18 large, tall, class 2-3 snags would degrade habitat in the short-term for these species, but the creation of new snags pursuant to the Design Features would partially compensate for this loss; although the compensation would take 20+ years to develop. The action alternatives are primarily intended to accelerate development of large trees and late-successional forest characteristics, which should eventually improve habitat conditions for these species.

S&M Species
Species of bryophytes, lichens, and vascular plants are the only S&M or special status species found within the Analysis Area that require pre-disturbance surveys. The survey results for these species are in Appendix 6. Protection of these species as well as other non-vascular botanical species incidentally encountered while surveying would follow the management recommendations in the Applications of Known Site Management Recommendations for Survey and Manage Nonvascular Species on the Coos Bay District. If discovered, vascular plants on the Bureau Sensitive or Bureau Assessment (Special Status) lists will be managed on a case-by-case basis using existing conservation strategies.

Special Status Aquatic Species
The following species are considered special status species under the Northwest Forest Plan: Newcomb's Littorine Snail (*Algamorda subrotundata)*, Oregon Giant Earthworm (*Driloleirus macelfreshi*), Sisters Hesperian Snail (*Hochbergellus hirsutus*), Rotund Lanx Snail (*Lanx subrotundata*), and the Montane Peaclam (*Pisidium ultramontanum*). The Newcomb's Littorine Snail occurs in marine, rocky inter-tidal zones, so would not be found within the analysis area. The Oregon Giant Earthworm occurs in deep, moist, riparian soils. However, these species are considered endemic to the Willamette Valley, have not been sighted outside this area, and are thought to have a small range. The Sisters Hesperian Snail is only thought to occur near Sisters Rock and has not been documented in Coos Bay. The Montane Peaclam occurs in sand and gravel substrate in spring influenced rivers and lakes. If this species did occur within the analysis area, it would be protected by Riparian Reserves. Additionally, the analysis area does not include actions that would disturb substrate within rivers and lakes where this species would likely be found.

4.9.6 Wetlands and riparian zones

No wetland areas will be impacted by the action alternatives. Riparian Reserves will be treated as described in the Chapter 2. The proposed treatments are designed to enhance the long-term function of the Riparian Reserve network by providing important components characteristic of late successional forest areas.

4.9.7 Noxious weed spread

The analysis area is characterized as having a moderate population of Scotch Broom with occasional heavy concentrations in isolated patches located primarily along roads and in disturbed areas. Previous treatments in the analysis area were completed in 2001 along BLM controlled roads and included cutting, pulling, or spraying with an approved herbicide. A current roadside survey results indicate two small patches of Scotch Broom along the Bear Creek Tie road that would be pulled prior to haul. Any disturbance would likely increase the chances of noxious weed spread. The design features and best management practices outlined in Chapter 2 for the action alternatives (i.e., cutting or pulling, washing of vehicles prior to entry, and seeding of disturbed areas) would help to reduce the risk of noxious weed spread. Other district projects specifically address control and monitoring of noxious weeds.

4.9.8 Port Orford cedar management

No known Port Orford cedar exists within any of the sale units or along haul roads that could be impacted by implementing the proposed action. Therefore, this action has no reasonably foreseeable impact to the management of Port Orford cedar or the root disease *Phytophthora lateralis.*

4.9.9 Environmental justice

The proposed areas of activity are not known to be used by, or disproportionately used by, Native Americans and minority or low-income populations for specific cultural activities, or at greater rates than the general population. This includes their relative geographic location and cultural, religious, employment, subsistence, or recreational activities that may bring them to the proposed areas. Also, BLM concludes that no disproportionately high or adverse human health or environmental effects will occur to Native Americans, and minority or low-income populations as a result of the proposed actions.

4.9.10 Aquatic Conservation Strategy Objectives

Appendix 3 contains an analysis of the consistency of the actions analyzed in the EA with the Aquatic Conservation Strategy Objectives (ACS). It details each of the nine ACS objectives and describes why the proposed action is consistent with and will not prevent the attainment of the ACS objectives.

4.9.11 Energy production, transmission, or conservation

This project does not alter existing energy development opportunities or conditions. The proposed action would not have any direct, indirect, or cumulative adverse energy impacts.

4.9.12 Unresolved conflicts concerning alternative uses of available resources

Some irreversible and irretrievable commitment of resources would result from the proposed actions. Crushed rock from quarries would be committed to reconstruction and construction of the road system. Energy used to grow, manage, and harvest trees is generally irretrievable. Irreversible and irretrievable commitments as stated above are discussed in the Coos Bay District RMP.

5 List of Preparers

The following in a list of the Cox Creek Density Management EA Interdisciplinary Team members:

Core ID Team Members

Chris Schumacher	Forester/Team Lead
John Guetterman	Wildlife Biologist
Nikki Moore	Fisheries Biologist
Chris Sheridan	Forest Ecologist

Other Contributors

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Jay Flora	GIS Specialist
Barry Hogge	Fuels Management Specialist
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Reg Pullen	Recreation Planner
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Tim Rodenkirk	Botany Specialist
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Hans Smith	Engineering
Dale Stewart	Soil Scientist
Tim Votaw	Hazardous Materials Specialist

List of Acronyms

ACS	Aquatic Conservation Strategy
BLM	Bureau of Land Management
BMP	Best Management Practices
BO	Biological Opinion
CT	Commercial Thinning
DMT	Density Management Thinning
EA	Environmental Assessment
(F)EIS	Final – Environmental Impact Statement
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FONSI	Finding of No Significant Impact
IDT	Interdisciplinary Team
LSR	Late Successional Reserves
MMBF	Million Board Feet
NEPA	National Environmental Policy Act
NFP	Northwest Forest Plan
NMFS	National Marine Fisheries Service
ODEQ	Oregon Department of Environmental Quality
RMP	Resource Management Plan
ROD	Record of Decision
RR	Riparian Reserve
S&G	Standard and Guides
S&M	Survey and Manage
SPS	Stand Projection System
T&E	Threatened and Endangered
TMO	Transportation Management Objectives
USDA	United States Department of Agriculture
USDI	United States Department of the Interior

Bibliography

Agee, J.K. 1981. Fire Effects on Pacific Northwest Forests: Flora, Fuels, and Fauna. *Conference Proceedings Northwest Fire Council*, Nov. 23-24, 1981. Portland, OR. Pgs 54-66.

Brown, E.R. (tech. ed.). 1985. Management of wildlife and fish habitats in forests of western Oregon and Washington. Pub. No. R6-F&WL-192-1985. U.S.D.A. Forest Service, Pacific Northwest Region, Portland, OR.

Brake, Diana., Moinau, Myron. and King, John G., 1997. Sediment Transport Distances and Culvert Spacings on Logging Roads within the Oregon Coast Mountain Range. An ASAE Meeting Presentation paper no. IM-975018. Minneapolis, MN. August 10-14, 1997. 12 pp.

Carey, A. B. 1995. Sciurids in Pacific Northwest managed and old-growth forests. *Ecological Applications* 5(3): 648-661.

Curtis, R.O. and D.D. Marshall. 1986. Levels-of-growing stock cooperative study in Douglas-fir: Report Number 8-the LOGS study: twenty year results. UDSA Forest Service Report Paper PNW-356.

Eis, S. 1972. Root Grafts and Their Silvicultural Implications. *Can For Res*. 2: 111-120.

Flowers, R.H. 1987. Supplemental feeding of black bear in tree-damaged areas of western Washington. P. 147-148 *Animal damage management in Pacific Northwest forestry*, Baumgartner, D.M., et. al. (symp. co_chairs). Coop. Extension, Wash. State Univ. Press, Pullman.

Franklin, J. F. 1977. Effects of uneven-aged management on species composition. *In* Uneven-aged silviculture and management in the western United States: Proceedings of an in-service workshop; 1976 October 19-21; Redding, CA. Washington, DC: Government Printing Office: 64-70.

Frid, A. and L. M. Dill. 2002. Human-caused disturbance stimuli as a form of predation risk. *Conservation Ecology* 6(1): 11. [online] URL: http://www.consecol.org/vol6/iss1/art11

Forest Ecosystem Management Assessment Team (FEMAT). 1993. *Forest Ecosystem Management: an Ecological, Economic, and Social Assessment.* USDA and USDI. Portland, OR.

Gray, A.N., and T.A. Spies. 1996. Gap size, within-gap position, and canopy structure effects on conifer seedling establishment in forest gaps. Journal of Ecology 84: 635-645.

Hamer, T.E. and S.K. Nelson. 1995b. Nesting chronology of the marbled murrelet. Pages 49-56. I*n* Ralph, C.J., G.L. Hunt Jr., M.G. Raphael, and J.F. Piatt, Technical Editors. *Ecology and conservation of the marbled murrelet*. Gen. Tech. Rep. PSW-GTR-152. Albany, California. Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture. 420 pp

Han, H.S. and L.D. Kellogg. 2000. Damage characteristics in young Douglas-fir stands from commercial thinning with four timber harvesting systems. *Western Journal of Applied Forestry*. 15(1):27-33.

Hayes, J.P., S.S. Chan, W.H. Emmingham, J.C. Tappeiner, L.D. Kellog, and J.D. Bailey. Wildlife response to thinning young forests in the Pacific Northwest. 1997. *Journal of Forestry* 95(8): 27-33.

Hostetler, B.B. and D.W. Ross. Generation of coarse woody debris and guidelines for reducing the risk of adverse impacts by Douglas-fir beetle. April 15, 1996. Unpublished.

Hunter, M. 2001. Management in young stands. Communiqué published by the Cascade Center for Ecosystem Management, Blue River Ranger District, Willamette National Forest. 27 pp.

Kanaskie. A., J. Chetock, G. Irwin, and D. Overhulser. 1990. Black bear damage to forest trees in northwest Oregon 1988-1989. Pest Manage. Rep. 90-1. Oreg. Dept. of For., Salem, OR. 34p.

Larson, D. Research Assistant (Oregon State University). Personal communication to Chris Sheridan, July, 2003.

Long, L., and C.J. Ralph. 1998. *Regulation and observation of human disturbance near nesting marbled murrelets.* U.S.D.A. Forest Service, Pacific Southwest Research Station, Redwood Sciences Laboratory, Arcata, California. Cited in Biological Opinion numbers 1-3-01-F-2371 and 1-3-02-F-0915.

Luce, C.H. and T.A. Black, 2000, *Spatial and Temporal Patterns in Erosion from Forest Roads.* In *The influence of Land Use on the Hydrologic-Geomorphic Responses of Watersheds,* Edited by M.S. Wigmosta and S.J. Burges. Water Resources Monographs, American Geophysical Union , Washington, D.C.

Maguire, D.A., J.A. Kershaw, and D.W. Haan. 1991. Predicting the effects of silvicultural regime on branch size and crown wood core in Douglas-fir. Forest Science 37(5): 1409-1428.

Marcot, B. G., K. Mellen, J. L. Ohmann, K. L. Waddell, E. A. Willhite, B. B. Hostetler, S. A. Livingston, C. Ogden, and T. Dreisbach. In prep. *DecAID* -- work in progress on a decayed wood advisor for Washington and Oregon forests. Research Note PNW-RN-XXX. USDA Forest Service, Pacific Northwest Region, Portland OR.

Mason, A.C., and D.L. Adams. 1989. *Black bear damage to thinned timber stands in north*west Montana. *West. J. Appl*. For. 4:10-13.

McCain, C. and N. Diaz. 2002. Field guide to the forested plant associations of the northern Oregon Coast Range. USDA technical paper R6-NR-ECOL-TP-03-02. Siuslaw National Forest.

Moinau, M., Brake, D. and King, J. 1997. *Sediment Transport Distances and Culvert Spacings on Logging Roads Within the Oregon Coast Mountain Range.* Rocky Mountain Research Station, USDA and University of Idaho.

Molina, R.J., O'Dell, T., Luoma, D. L., Amaranthus, M., Castellano,M., and Russell, K. 1993. *The biology, ecology, and social aspects of edible mushrooms in the Pacific Northwest: A preface to managing commercial harvest.* Gen. Tech. Rep. PNW-GTR-309. USDA Forest Service, Pacific NorthwestResearch Station, Portland, OR. 42 p.

Muir, P.S., R.L. Mattingly, J.C. Tappeiner, J.D. Bailey, W.E. Ellicott, J.C. Hagar, J.C. Miller, E.B. Peterson, and E.E. Starkey. 2002. Managing for biodiversity in young Douglas-fir forests of western Oregon. U.S. Geological Survey, Biological Resources Division, Biological Science Report USGS/BRD/BSR-2002-0006. 76 pp.

National Marine Fisheries Service. 1997. *Biological and Conference Opinion for Implementation of Land and Resource Management Plans (USFS) and Resource Management Plans (BLM).* NMFS, Northwest Region, Seattle, Washington.

Nelson, S.K. and A.K. Wilson. 2002. *Marbled murrelet habitat characteristics on state lands in western Oregon, final report*. Oregon Coop. Fish and Wildlife Research Unit, Oregon State Univ, Dept. of Fish and Wildlife, Corvallis. 151 pp.

Niemiec, S.S., G.R. Ahrens, S. Willits, and D.E. Hibbs. 1995. Hardwoods of the Pacific Northwest. Research Contribution 8. Forest Research Laboratory, Oregon State University, Corvallis, OR.

Nighbert, J., J. O'Neil, and A. Byrd. 1998. Western Oregon Digital Image Project: WODIP Guidebook.

Noss, R.F, and A.Y. Cooperrider. 1994. *Saving nature's legacy*. Island Press, Washington, D.C. 416 pp.

O'Neil, T. A., Johnson D. H., Barrett C., Trevithick M., Bettinger K. A., Kiilsgaard C., Vander Heyden M., Greda E. L., Stinson D., Marcot B. G., Doran, P. J., Tank, S., and Wunder, L., 2001. Matrixes for Wildlife-Habitat Relationship in Oregon and Washington, Northwest Habitat Institute. 2001. In D. H. Johnson and T. A. O'Neil

(Manag. Dirs.) *Wildlife-Habitat Relationships in Oregon and Washington*. Oregon State University Press, Corvallis, Oregon.

Oregon Department of Forestry (ODF), 2001. Oregon State Forest Practices Rules., OAR 629.

Oregon Occupational Safety and Health Division (OR-OSHA), Associated Oregon Loggers, Oregon Department of Forestry, Oregon Department of Fish and Wildlife, USDA Forest Service, USDI Bureau of Land Management. 1995 *Oregon Guidelines for Selecting Reserve Trees.*

Pabst, R. J. and T. A. Spies. 1999. Structure and composition of unmanaged riparian forests in the coastal mountains of Oregon. *Canadian Journal of Forest Research* 29:1557-1573.

Poage, N.J. and J.C. Tappeiner. 2002. Long-term patterns of diameter and basal area growth of old-growth Douglas-fir trees in western Oregon. *Canadian Journal of Forest Research* 32:1232-1243.

Pilz, D., J. Mayo, and R. Molina. 2002. Chanterelle Mushroom Productivity Responses to Young Stand Thinning. Presented in poster session, Silvicultural Options for Sustainable Management of Pacific Northwest Forest Symposium, Oregon State University, Corvallis, OR.

Pope, M.D. 1994. *Roosevelt elk habitat use in the Oregon Coa*st Range. M.S. Thesis, Oregon State University, Corvallis. 94 pp.

Price, F. BLM Forest Ecologist. Personal communication to Chris Sheridan, July, 2003.

Reeves, G.H.; Benda, L.E.; Burnett, K.M.; Bisson, P.A.; Sedell, J.R. 1995. 'A Disturbance-Based Ecosystem Approach to Maintaining and Restoring Freshwater Habitats of Evolutionary Significant Units of Anadromous Salmonids in the Pacific Northwest.' *American Fisheries Society Symposium* 17:334-349.

Ripple, W.J., K.T. Hershey, and R. Anthony. 2000. Historical forest patterns of Oregon's central Coast Range. *Biological Conservation* 93(2000): 127-133.

Rosso, A. 2002. Macrolichens and Bryophytes on Shrubs. Pages 29-32 in Muir et al., editors, Managing for biodiversity in young Douglas-fir forests of Western Oregon. Biological Science Report USGS/BRD/BSR-2002-0006, U.S. Geological Survey, Forest and Rangeland Ecosystem Science Center, Corvallis, Oregon.

Smith, D.M., B.C. Larson, M.J. Kelty, and P.M.S. Ashton. 1997. *The practice of silviculture: applied forest ecology*. 9th edition. John Wiley and Sons, Inc., New York.

Spies, T.A.; Franklin, J.F.; Thomas, T.B. 1988. Coarse Woody Debris in Douglas-fir forest of Western Oregon and Washington. *Ecology*, 69(6):1689-1702.

Spies, T.A. and J.F. Franklin. 1991. The structure of natural young, mature, and old-growth forests in Oregon and Washington. p. 91-109 *in* L.F. Ruggiero, K.A. Aubry, A.B. Carey, and M.H. Huff (technical editors.). Wildlife and vegetation of unmanaged Douglas-fir forests. USDA Forest Service, Pacific Northwest Research Station General Technical Report PNW-GTR-285, Portland, OR.

Stewart, W.B., G.W. Witmer, and G.M. Koehler. 1999. Black bear damage to forest stands in western Washington. *West. J. Appl. For*. 14(3):128-131.

Tappeiner, J.C., D. Huffman, D. Marshall, T.A. Spies, and J.D. Bailey. 1997. Density, ages, and growth rates in old-growth and young-growth forests in coastal Oregon. *Canadian Journal of Forest Research.* 27:638-648

USDA Forest Service and USDI Bureau of Land Management. 1994. *Record of Decision* for *Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl* and *Standards and Guidelines* for *Management of Habitat for Late-Successional and Old-growth Forest Related Species within the Rand of the Northern Spotted Owl*. (Northwest Forest Plan).

USDA Forest Service and USDI Bureau of Land Management. 1998. *South Coast-Northern Klamath late-successional reserve assessment*. Coos Bay, Medford and Roseburg, Oregon.

USDI Bureau of Land Management. 1976. Cutting report for Farrin Ridge Timber Sale number 77-17. North Bend, Oregon.

USDI Bureau of Land Management. 1995. *Final - Coos Bay District Resource Management Plan and Environmental Impact Statement* and its *Record of Decision*, North Bend, Oregon.

USDI Bureau of Land Management. 1995b. *Forest survey handbook.* BLM manual supplement 5250-1. Portland, Oregon.

USDI Bureau of Land Management. 1996 Western Oregon Transportation Management Plan. North Bend, OR

USDI Bureau of Land Management. 1999. *South Fork Coos Watershed Analysis*. North Bend, Oregon.

USDI Bureau of Land Management. 2001. *North Fork Coquille Watershed Analysis*. North Bend, Oregon

U.S. Department of Labor, Occupational Safety & Health Administration. 1995. 29 CFR Part 1910.

Weyerhaeuser, 1998. *South Fork Coos River Watershed Analysis*. Coos Bay, OR

Wilson, J.S. and C.D. Oliver. 2000. Stability and density management in Douglas-fir plantations. Canadian Journal of Forest Research 30:910-920.

Wimberly, M.C., T.A. Spies, C.J. Long, and C. Whitlock. 2000. Simulating historical variability in the amount of old forests in the Oregon Coast Range. Conservation Biology 14(1):167-180.

Winter, L.E., L.B. Brubaker, J.F. Franklin, E.A. Miller, and D.Q. DeWitt. 2002. Initiation of an old-growth Douglas-fir stand in the Pacific Northwest: a reconstruction from tree-ring records. *Canadian Journal of Forest Research* 32: 1039-1056.

Wisdom, M.J., L.R. Bright, C.G. Carey, W.W. Hines, R.J. Pedersen, D.A. Smithey, J.W. Thomas, and G.W. Witmer. 1986. 'A model to evaluate elk habitat in western Oregon.' *Publication No. R6-F&WL-216-1986.* USDA Forest Service, Pacific Northwest Region, Portland, OR. 36 pp.

Witmer, G.W. 1981. *Roosevelt elk habitat use in the Oregon Coast Range.* PhD Thesis, Oregon State University, Corvallis. 103 pp.

Zenner, E.K. 2000. Do residual trees increase structural complexity in Pacific Northwest coniferous forests? *Ecological Applications* 10:800-810.

1 Appendix 1 Economic Analysis

The following tables summarize the costs differences associated with implementing the two action alternatives. Units with identical harvesting systems in Alternatives A and B are not included. The cost estimates include the cost of related road and landing construction, renovation or improvement as described. Ground-based acres are not included because of the small area affected. Harvest system maps are included in Appendix 2.

Volumes are a result of SPS stand modeling and are typically overestimated. Any reduction in acres or estimated volume would add additional cost to both systems proportionally. Helicopter costs were derived from the *Helipace* logging cost program and include yarding, loading and landing construction costs on a per thousand board foot basis. Skyline costs were derived from Coos Bay District standard appraisal programs.

Details of the helicopter, skyline, and road cost estimates are available at the Coos Bay district office.

Cox Creek LSR Logging Cost Comparison 7/30/2003

Comparison of logging cost differences for units with a change in logging systems between Alternatives.

		Alternative B Helicopter		Alternative A Skyline				
Unit	Volume Affected by System Change MBF	Helicopter Cost $/MBF	Total Cost	Skyline Cost $/MBF	Road Costs $/MBF	Total Skyline Cost $/MBF	Total Cost	**Cost Difference Helicopter vs. Skyline**
1A	2003	341	$ 683,023.00	180	26	206	$ 412,618.00	$ 270,405.00
1B	2927	306	$ 895,662.00	180	20	200	$ 585,400.00	$ 310,262.00
1C, D	1489	299	$ 445,211.00	180	11	191	$ 284,399.00	$ 160,812.00
3,4	409	293	$ 119,837.00	180	39	219	$ 89,571.00	$ 30,266.00
7	74	275	$ 20,350.00	180	74	254	$ 18,796.00	$ 1,554.00
14	1200	371	$ 445,200.00	180	28	208	$ 249,600.00	$ 195,600.00
							Cost difference between Helicopter and Skyline systems	**$ 968,899.00**

*Unit 7 road cost is high because portion of the volume is being yarded downhill to a lower road in Alternative B, when comparing helicopter costs.

Average Delivered Log price for DF (#2 & #3 Saw grades) = $530/MBF (July 2003, Log Lines)

Average Delivered Log price for Hemlock (#2, #3 & #4 Saw grades) = $360/MBF (July 2003, Log Lines)

Does not include unit costs that have helicopter common to both alternatives.

Stump to Truck Logging Costs:

Helicopter Costs include landing costs, reno costs, and improvement costs, K-MAX Helicopter
Skyline Yarding Cost based on 40'-70' tower, 800' Average Yarding Distance, 12" Ave cut tree, 130 BF/tree, 5 loads/day.
Road Costs include: New construction, renovation, improvement, and decommissioning.

Proposed Helicopter Landings for Alternatives A and B (See Map A1 and B1 in Appendix 2) 9/11/2003

Alternative A Helicopter Landings Landing sizes reduced for reduced volumes

Landing #	Location	Size (L) (W)	Area sq. ft.	Sub grade Cost	Rock Yds	Rock Cost (yd)	Rock Cost	Total Cost	
Service Landings									
Service 1	25-10-30	90 x 75	7000	250	193	18	3467	3717	Addition for spot rocking, minus rocked road, Weyerhaeuser
Service 2	26-10-5	135 x 70	9500	0	100	18	1800	1800	Addition for spot rocking
Log Landings									
2	26-10-6	300 x 80	24000	0	100	18	1800	1800	Existing landing on Cox Crk mainline, spot rock
2A	26-10-5	160 x 80	12900	500	478	18	8600	9100	Rock 80% of landing
3	26-10-5	150 x 80	12000	2500	444	18	8000	10500	Adj. to 25-10-30.0 Seg. C, has knob to be graded
5	26-10-4	150 x 120	18000	0	667	18	12000	12000	Includes Pavement Protection
8	26-11-1	140 x 80	11000	500	256	18	4615	5115	Rd jct on private, partial landing existing, deduction for rock
Total			94400		2238			$ 44,032	
	Acres of new disturbance		1						Does not include landings 2 & 5 , compacted area

Alternative B

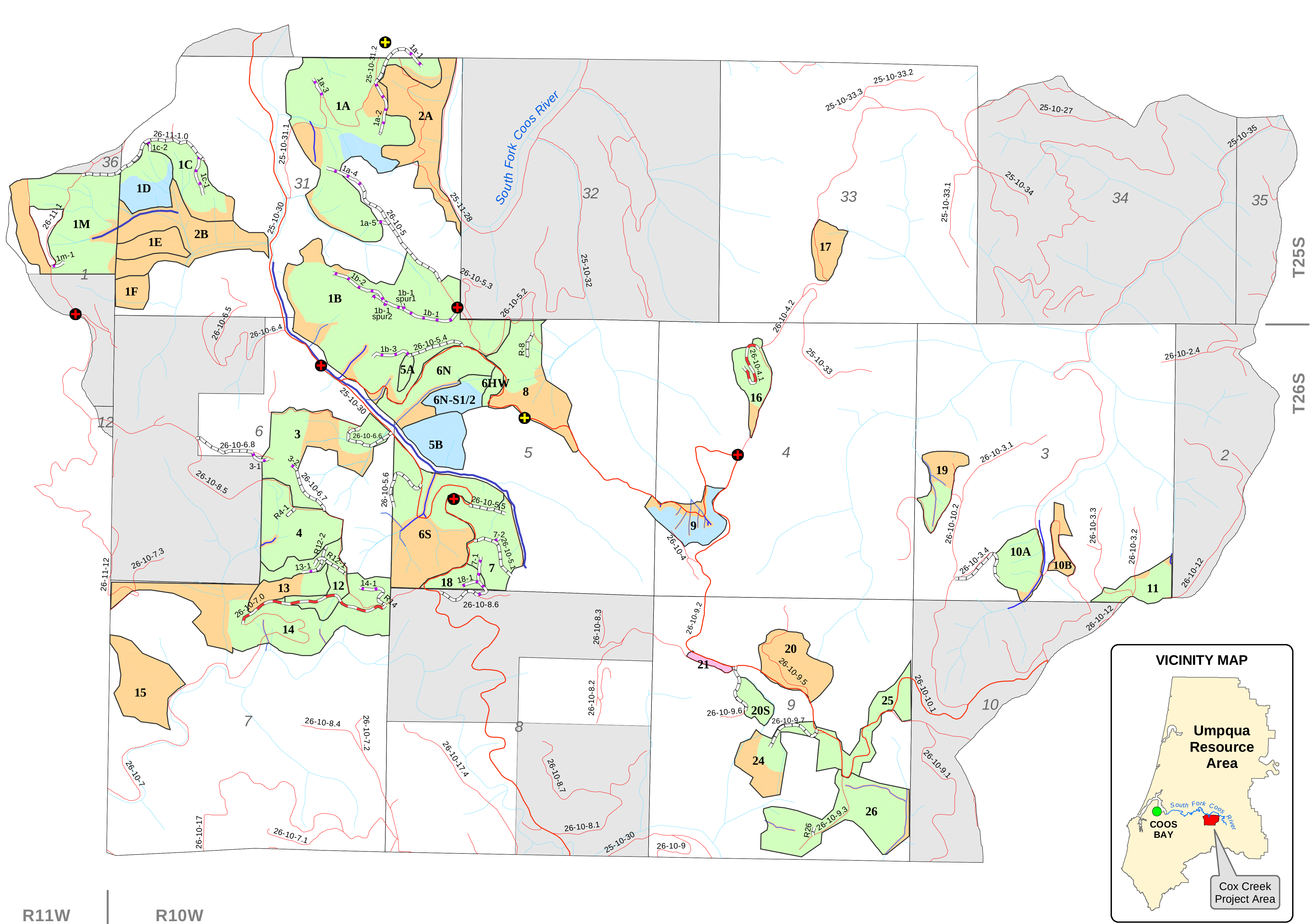
Landing #	Location	Size (L) (W)	Area sq. ft.	Sub grade Cost	Rock Yds	Rock Cost (yd)	Rock Cost	Total Cost	
Service Landings									
Service 1	25-10-30	90 x 75	7000	250	193	18	3467	3717	Addition for spot rocking, minus rocked road, Weyerhaeuser
Service 2	26-10-5	135 x 70	9500	0	100	18	1800	1800	Addition for spot rocking
Service 3	26-10-6	80 x 80	6400	0	100	18	1800	1800	Addition for spot rocking, existing landing on Menasha
Log Landings									
1Weyco	25-10-30	160x 100	16000	1000	593	18	10667	11667	40% of landing on BLM
2	26-10-6	300 x 80	24000	0	100	18	1800	1800	Existing landing on Cox Crk mainline, spot rock
2A	26-10-5	160 x120	19200	500	556	18	10000	10500	Rock 80% of landing 15000 sq.ft.
3	26-10-5	150 x 120	18000	2500	667	18	12000	14500	Reduce landing cost by 20% for K-Max
5	26-10-4	150 x 120	18000	0	667	18	12000	12000	Includes Pavement Protection
6	25-10-31	150 x 100	15000	500	556	18	10000	10500	old landing with additional clearing
6.5	25-10-31	100 x 100	5000	250	100	18	1800	2050	overflow landing, triangular shaped
7	25-10-31	160 x 120	19200	500	551	18	9920	10420	Deduction for rocked area
9	26-10-6	150 x 80	12000	500	484	18	8720	9220	
Total			169300		4665			$ 89,973	
	Acres of new disturbance		3.1			Acreage does not include Service landing 3, Log Landings 2 and 6.5			

2 Appendix 2 Maps

2.1 Index of Maps

Map A1: Cox Creek DMT - Alternative A

Logging Systems and Road Construction



United States Department of the Interior
Bureau of Land Management

Coos Bay District Office
1300 Airport Lane
North Bend, Oregon 97459

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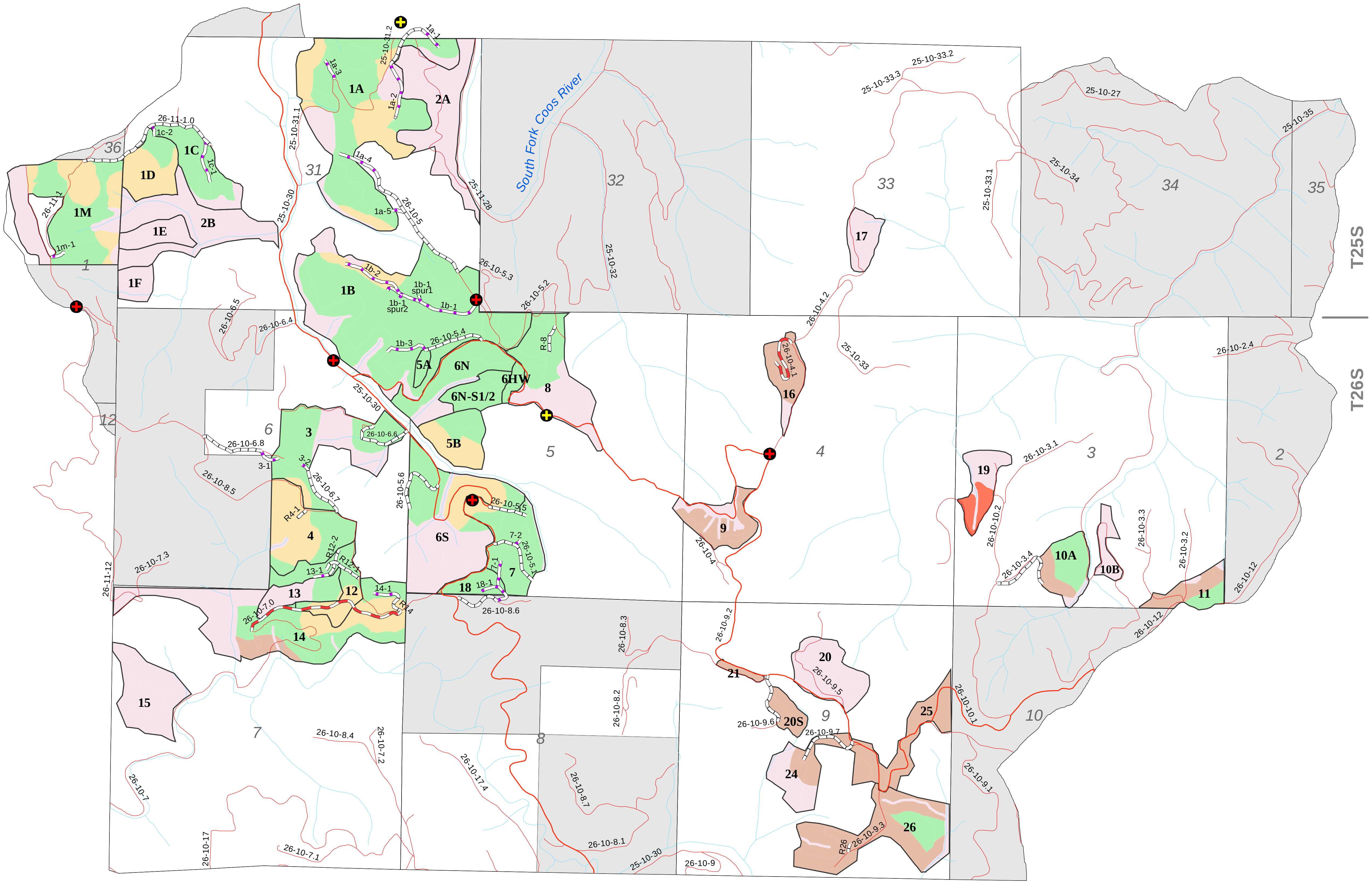
Alt_A_logging_systems.mxd

Map A2: Cox Creek DMT - Alternative A

Seasonal Restrictions



Map Features

Road Construction

New Construction

Renovation

Improvement

Other Existing Roads

Paved Roads (BST)

Unpaved Roads

Ownership

BLM

Private

Helicopter Landings

Service Landings

Log Landings

Seasonal Restrictions

Daily Time Restrictions (DTR)

Full MMR Plus DTR

Full MMR & NSO Plus DTR

None

Not Applicable

1:24,000

0 0.25 0.5 Miles

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Bureau of Land Management

Coos Bay District Office
1300 Airport Lane
North Bend, Oregon 97459

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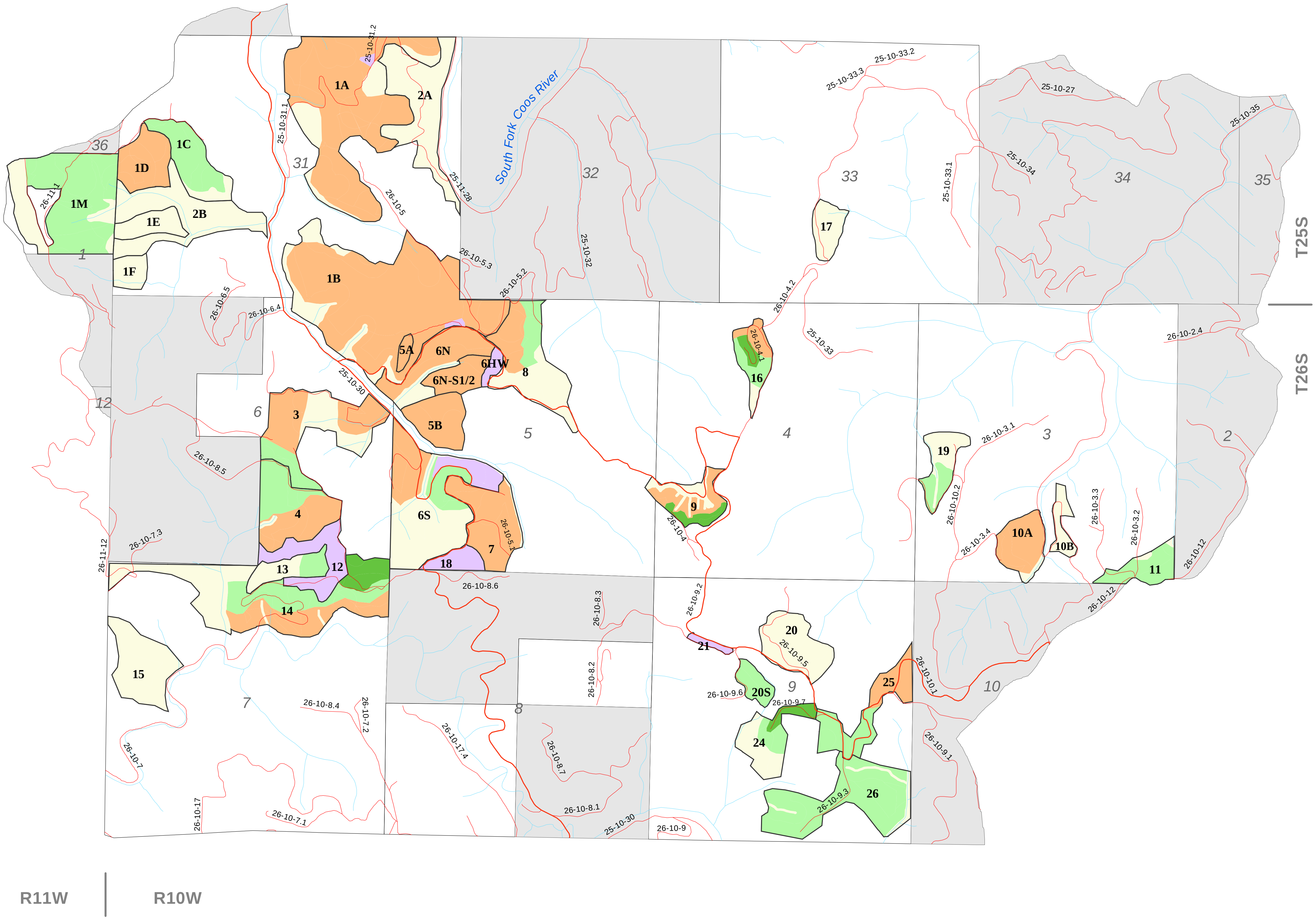
Alt_A_seasonal_restrict.mxd

Map A3: Cox Creek DMT - Alternative A

Unit Prescriptions



Map Features

Existing Roads

- Paved Roads (BST)
- Unpaved Roads

Ownership

- BLM
- Private

Prescription

- Dominant Tree Retention
- Maximum Diameter Limit
- Relative Density
- Hardwood Conversion
- No Treatment

N

1:24,000

0 0.25 0.5
Miles

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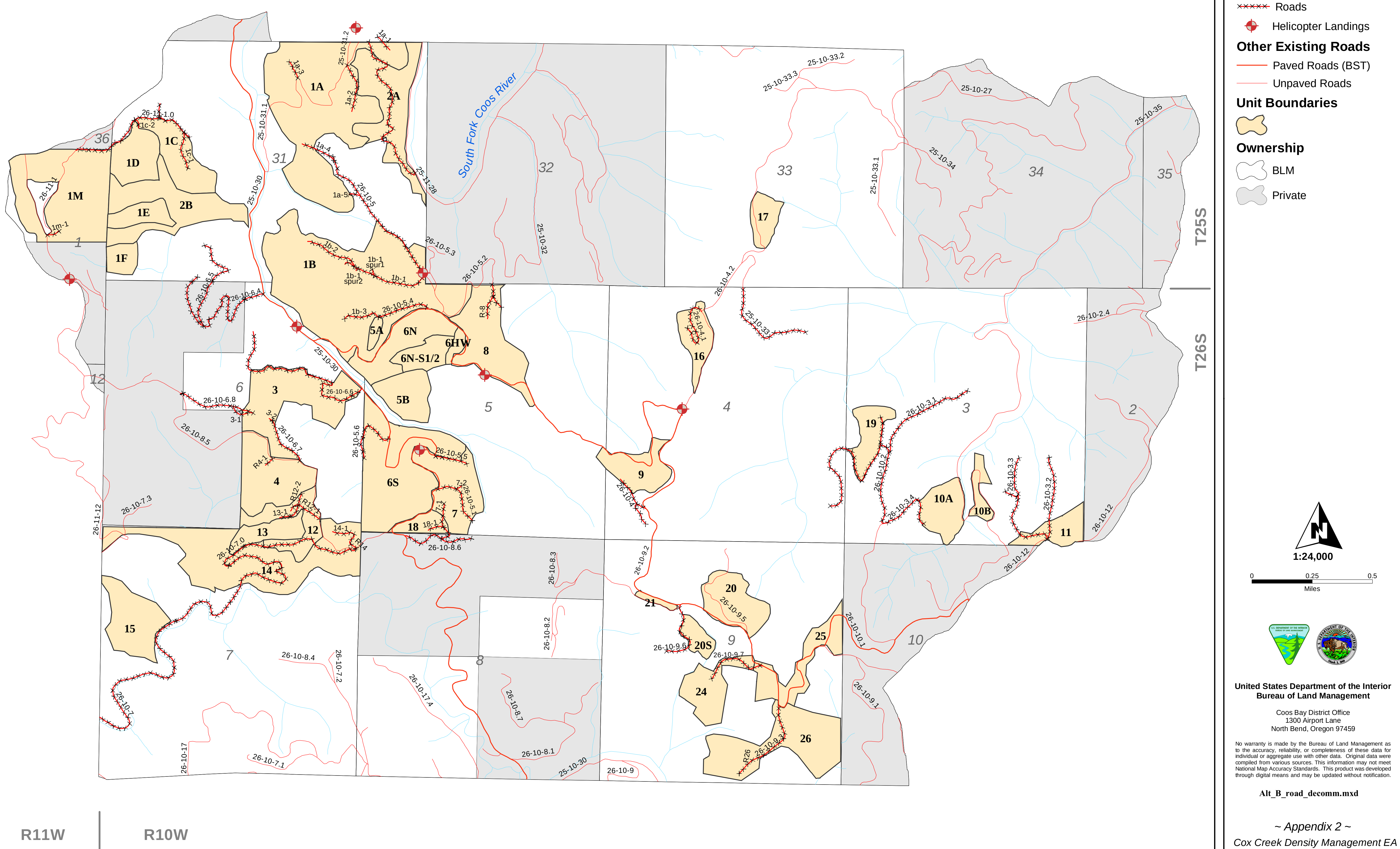
Alt_A_prescriptions.mxd

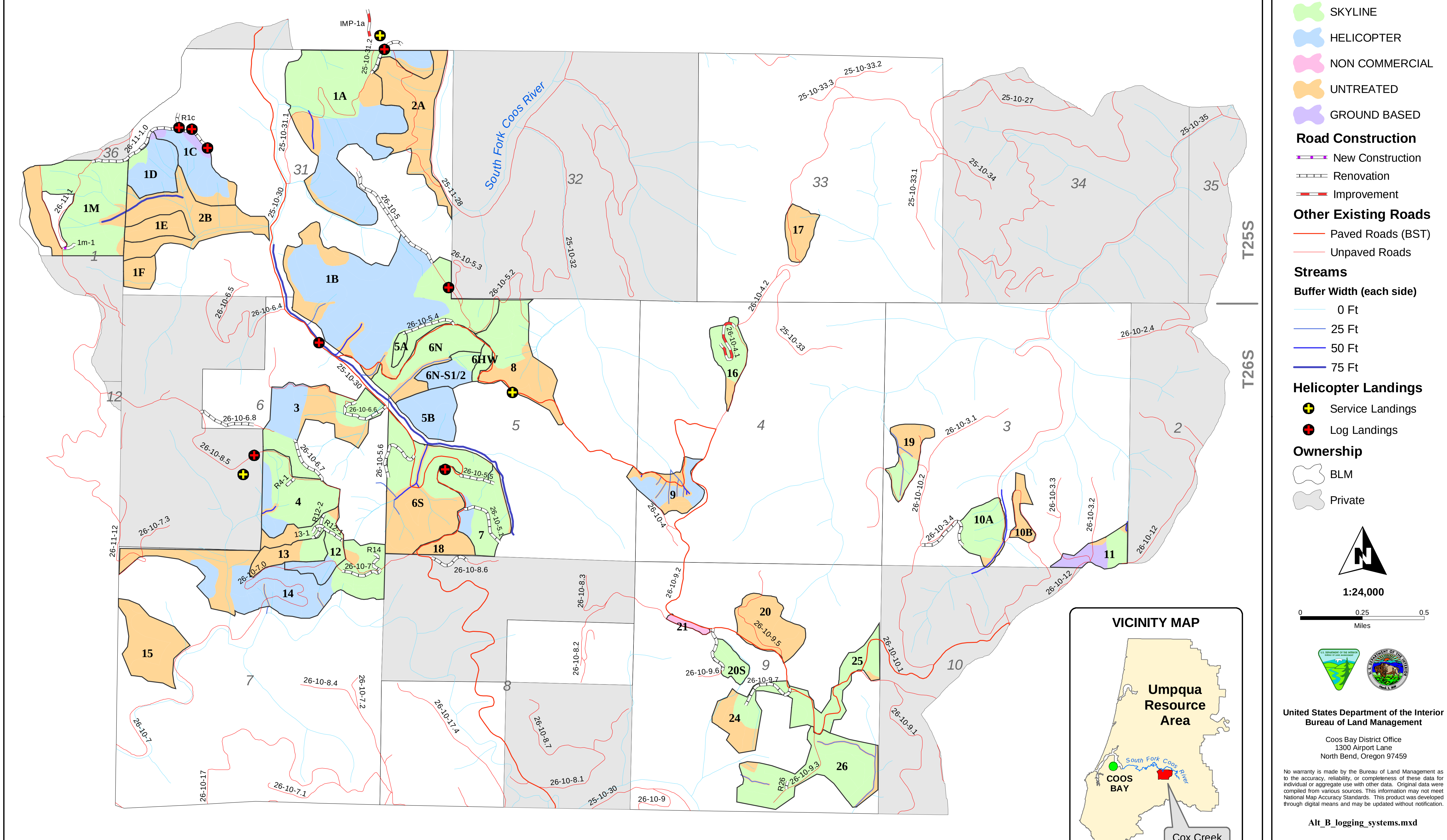
Map A4: Cox Creek DMT - Alternative A

Road and Landing Decommissioning



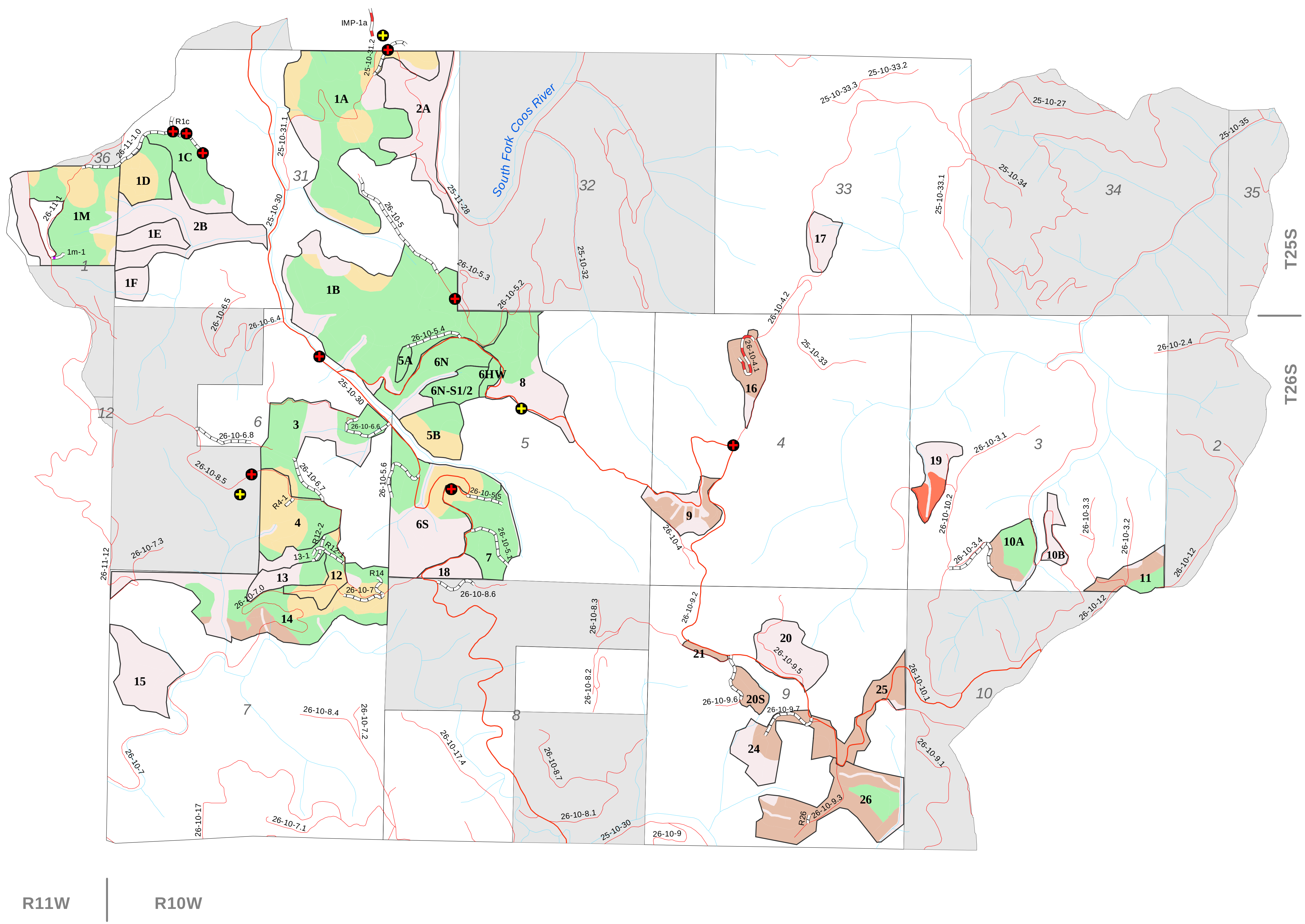
Map B1: Cox Creek DMT - Alternative B

Logging Systems and Road Construction



Map B2: Cox Creek DMT - Alternative B

Seasonal Restrictions



Map Features

Road Construction

- New Construction
- Renovation
- Improvement

Other Existing Roads

- Paved Roads (BST)
- Unpaved Roads

Ownership

- BLM
- Private

Helicopter Landings

- Service Landings
- Log Landings

Seasonal Restrictions

- Daily Time Restrictions (DTR)
- Full MMR Plus DTR
- Full MMR & NSO Plus DTR
- None
- Not Applicable

1:24,000

0 0.25 0.5
Miles

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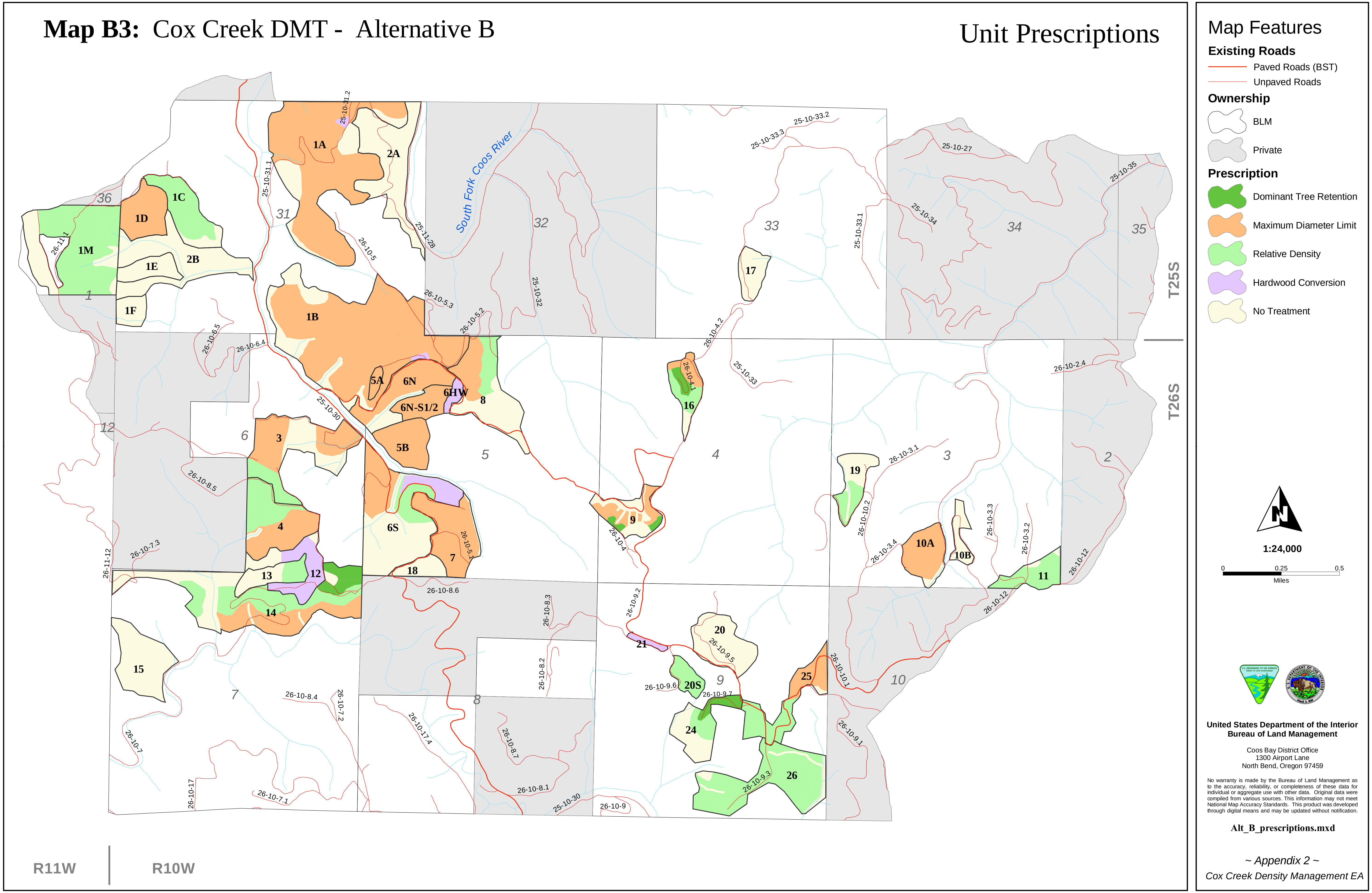
Alt_B_seasonal_restrict.mxd

Map B3: Cox Creek DMT - Alternative B

Unit Prescriptions

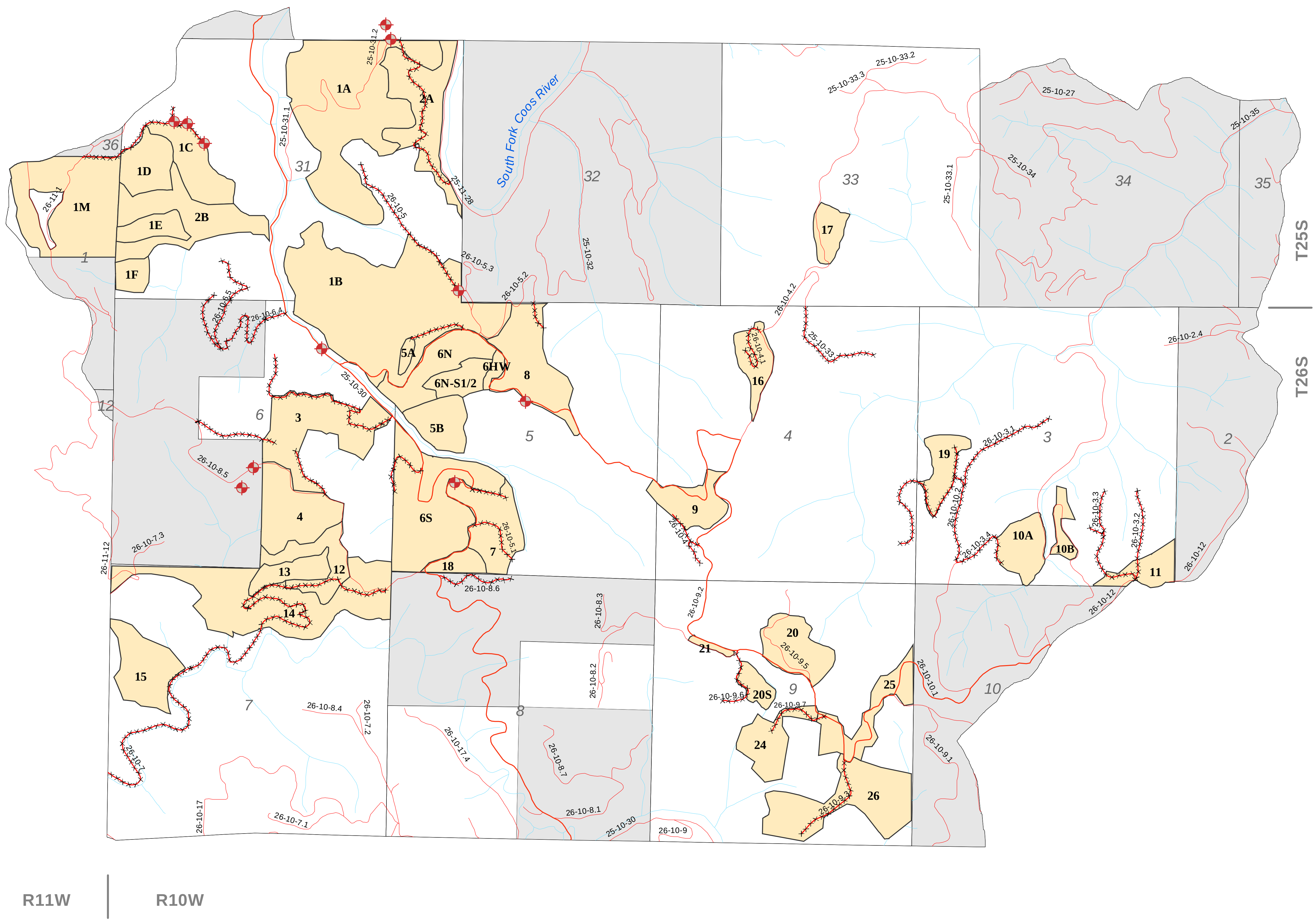


~ Appendix 2 ~

Cox Creek Density Management EA

Map B4: Cox Creek DMT - Alternative B

Road and Landing Decommissioning



Map Features

Decommissioning

Roads

Helicopter Landings

Other Existing Roads

Paved Roads (BST)

Unpaved Roads

Unit Boundaries

Ownership

BLM

Private

1:24,000

0 0.25 0.5

Miles

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Alt_B_road_decomm.mxd

~ Appendix 2 ~

Cox Creek Density Management EA

3 Appendix 3 Consistency with Aquatic Conservation Strategy

Consistency with Aquatic Conservation Strategy Objectives

The four components of the Aquatic Conservation Strategy are 1) Riparian Reserves, 2) Key Watersheds, 3) Watershed Analysis, and 4) Watershed Restoration.

1) Interim Riparian Reserve widths would be maintained under all alternatives. The effectiveness of the interim Riparian Reserve widths was analyzed in the FEMAT Report. Silvicultural treatments within Riparian Reserves were designed to improve the growth and structural diversity of riparian areas over the long term, as needed to attain the ACS objectives.
2) The North Fork Coquille River is designated as a Tier 1 Key Watershed. Management within a key watershed requires watershed analysis prior to activity. Additionally, the NFP ROD states "the amount of existing system and non-system roads within Key Watersheds should be reduced through decommissioning of roads…for each mile of new road constructed, at least one mile of road should be decommissioned." The North Fork Coquille Watershed Analysis was completed in June 2001. Additionally, under this action road miles within the key watershed will be reduced from 5.2 mi/mi^2 to 3.8 mi/mi^2. No new roads will be constructed in the Key Watershed as part of this action.

3) The South Fork Coos River watershed analysis was completed in 1999. The North Fork Coquille Watershed Analysis was completed in 2001.

4) During the interdisciplinary team process for this EA, some of these watershed restoration opportunities, such as road decommissioning and culvert replacements were incorporated into the action alternatives. Road decommissioning would reduce the road density on BLM lands within the analysis area.

The South Fork Coos Watershed Analysis and the North Fork Coquille Watershed Analysis contain Riparian Reserve evaluations, and include recommendations for the management of the Riparian Reserves within the analysis area. Six miles of stream channels within the Cox Creek Density Management Analysis Area have variable no treatment zones (25-100 feet in width). This design feature and all other design features for Riparian Reserves are consistent with these recommendations. Five miles of intermittent and ephemeral channels have thin through prescriptions within the Riparian Reserves. This design feature is not consistent with recommendations from the two watershed analyses. However, as described in each watershed analysis, these recommendations are based on a watershed perspective, and that ID teams may find some recommendations are not suitable for some projects based on site-specific conditions.

The Cox Creek DM IDT felt the project designs, although different than the WA recommendations, were more appropriate based on site-specific conditions within these areas. The following site-specific conditions warranted these changes: 1) Thinning closer to these stream channels would provide increased long term benefits to aquatic and riparian habitat; 2) No short term impacts are expected since these treatments would occur on small, intermittent and ephemeral non-fish bearing streams that would be dry during summer months, large amounts of downed wood and material was present in and adjacent to the channel; 3) Streambank trees (within three feet) would not be removed; 4) Riparian areas consisted of dense, young stands vulnerable to blowdown and bank instability within the long term if left untreated; 4) Adequate large conifers existed to provide intermediate root strength.

All activities within the Riparian Reserves are consistent with Standards and Guidelines (ROD, C-30 - C-33). These "Standards and guidelines prohibit and regulate activities in Riparian Reserves that retard or prevent attainment of the Aquatic Conservation Strategy objectives" (ROD, page B-12). If the proposed density management treatment was not applied, younger conifer stands in Riparian Reserves would continue to develop under conditions of high competition and growth suppression. Excluding or avoiding disturbances that mimic natural disturbances can delay attainment of overall late-successional/old growth conditions for decades to a century or more (USDI, 1999). This would result in stands that are more susceptible to fire, windstorms, and insect infestations, and also stands that have an overall smaller tree size. As a result, future contributions of woody material to the aquatic ecosystem would likely occur, but the wood would be of a smaller size and would decompose relatively quickly (relative to larger, mature trees). Logging debris and large relic logs that exist within the channel will likely decompose long before being replaced by new large wood. Foregoing treatment for a densely stocked stand could adversely affect species in the long term that benefit from late-successional forest conditions, and would not be consistent with ACS objectives.

The following table shows the relationship between the nine Aquatic Conservation Strategy (ACS) objectives, aquatic and riparian habitat indicators, and any effects from the proposed actions within the Cox Creek Density Management EA. The table demonstrates that the actions proposed would meet Aquatic Conservation Strategy objectives within each watershed. The proposed action occurs within two watersheds; the South Fork Coos River watershed and the North Fork Coquille River watershed. The table combines rational for ACS consistency into one table, since the design features and watershed-scale effects are the same within both watersheds.

Table 3-1 Summary of Cox Creek Density Management EA design features, effects of actions on aquatic and riparian habitat indicators within the Southwest Province Tyee Sandstone Physiographic Area, and assessment of consistency with the ACS objectives

ACS Objectives Northwest Forest Plan	Habitat Indicators	Cox Creek Density Management EA Design Features and Rational for Consistency with ACS Objectives
2,4,8,9 Design features will maintain spacial and temporal connectivity within the drainage network (ACS#2) with regard to shade and water temperature, maintain water quality (ACS#4), maintain vegetation for adequate summer/winter thermal regulation for aquatic species (ACS#8), and therefore maintain habitat for well-distributed riparian-dependent populations (ACS#9).	Water Quality / Temperature	Interim Riparian Reserve (RR) widths would be maintained on all streams within and adjacent to proposed commercial thinning units; this is of sufficient width to maintain water temperature. Where Density Management Thinning occurs within RRs, a variable no treatment zone (25-100 feet) would be designated adjacent to stream channels where needed to maintain shade and streambank stability. Widths vary depending on slope and aspect, as needed to prevent increased direct solar radiation to streams and maintain water temperature. Five miles of small, intermittent and ephemeral stream channels have thin through prescriptions where thinning will occur up to the stream channel. Thinning in RRs along intermittent stream segments will not contribute to the warming of downstream waters, because intermittent streams are typically dry during the critical thermal period. Additionally, trees within three feet of any channel will not be removed to maintain bank stability. Therefore, the proposed actions will maintain stream temperature within the watersheds in the short term, while improving tree growth and size in the Riparian Reserve in the long term. The proposed actions do not include any new road construction or road renovation that would remove trees that provide stream shade. The indicators described would not be degraded at the watershed scale or in the short or long term as a result of the proposed action. Therefore, the proposed action is consistent with ACS Objectives 2,4,8, and 9.

ACS Objectives Northwest Forest Plan	Habitat Indicators	Cox Creek Density Management EA Design Features and Rational for Consistency with ACS Objectives
4,5,6,8,9 Design features will maintain water quality (ACS#4) in the long term, maintain the sediment regime in the long term (ACS#5), maintain instream flows to retain patterns of sediment routing (ACS#6), maintain vegetation to provide adequate rates of erosion (ACS#8), and therefore maintain habitat for well-distributed riparian-dependent populations (ACS#9).	Water Quality / Sediment / Turbidity	Interim Riparian Reserve (RR) widths would be maintained on all streams within and adjacent to the proposed thinning units. RR's encompass unstable and potentially unstable slopes where there is a potential for sediment delivery from mass wasting. No-treatment zones would be applied to protect steep/sensitive headwalls and side-slopes, or where there was a chance that thinning operations may have increased landslide or sediment delivery potential. RRs will be sufficient to filter sediments from adjacent harvest units, prevent delivery to stream channels, and avoid downstream effects (FEMAT, pp. V-38). Density Management Thinning within RRs include 25-100' wide no-treatment zones on streams with steep or otherwise sensitive side-slopes. No treatment will occur where there is a chance for thinning operations to increase landslide or sediment delivery potential. Stream channels that have thin through prescriptions are located on stable areas. Additionally, trees within three feet of the stream channel will not be removed on all streams to minimize disturbance and protect streambank stability. Trees thinned within RRs will be felled and yarded away from streams. In instances where yarding across streams may be necessary, logs will be fully suspended above the channel (where feasible). Roads: The chance of sediment delivery during road renovation and improvement activities is negligible, due to the season of construction (June-Sept.) and the erosion control measures outlined in the EA design features. All new road construction is located on ridgetops or stable bench locations and will be performed during the dry season incorporating the erosion control measures outlined in the design features. All new road construction is located outside the RR's (one segment in Unit * is within the RR, but located on the ridgetop). Sediment and turbidity from road decommissioning and culvert replacements on perennial streams (if any) will be short term (occurring during the first subsequent freshet) and localized. Short-term sedimentation would be minimized by best management practices (BMPs) (erosion control, water barring, seeding and mulching, and seasonal restrictions). Additionally, the potential for long-term sedimentation from eroding road surfaces and culvert failures would be reduced through road decommissioning and closures. Sediment delivery to stream channels could occur from winter hauling. However, project design criteria are expected to minimize or eliminate the potential for this to occur. If sediment did enter the stream channel, it would be localized and of short duration and would not be measurable above background levels. The indicators described would not be degraded at the watershed scale or in the long term. The proposed action is expected to reduce sediment delivery to stream channels within the watersheds over time. Therefore, the proposed action is consistent with ACS Objectives 4,5,6,8, and 9.

ACS Objectives Northwest Forest Plan	Habitat Indicators	Cox Creek Density Management EA Design Features and Rational for Consistency with ACS Objectives
4,6,8,9 Design features will maintain water quality with regard to chemical concentration/ nutrients (ACS#4), maintain instream flows to retain patterns of nutrient routing (ACS#6), maintain vegetation to provide adequate nutrient filtering (ACS#8), and therefore maintain habitat for well-distributed riparian-dependent populations (ACS#9).	Water Quality / Chemical Concentration / Nutrients	Interim Riparian Reserve (RR) widths would be maintained on all streams within and adjacent to the proposed treatment units; this is sufficient to maintain the natural input of organic material into streams by riparian vegetation (FEMAT, pp. V-26). Roads: Where road work will occur, water quality will be maintained through implementation of the Conservation Practices for Streams and Riparian Reserves #13 (Coos Bay District ROD, BMPs p. D-3). Furthermore, the contract will have requirements pertaining to water quality in connection with all construction (Contract Provisions Sec. 25), disposition of waste materials (Sec. 26), and handling of hazardous materials (Sec. 27) to prevent chemical entry into any surface waters. Compliance with the Oregon State Forest Practice Rules regarding spill prevention and containment (OAR 629-620-100 Sections 2, 3 & 4) should reduce the possibility of release of hazardous materials to surface waters. The indicators described would not be degraded at the watershed scale or in the short or long term as a result of the proposed action. Therefore, the proposed action is consistent with ACS Objectives 4,6, 8, and 9.
2,9 These design features will help restore spatial and temporal connectivity within the drainage network (ACS#2) and therefore help restore habitat for well-distributed riparian-dependent populations (ACS#9).	Habitat Access / Physical Barriers	There will be no thinning or road-related activities that create physical barriers or otherwise degrade access to aquatic habitat. Therefore, the project is consistent with ACS Objectives 2 and 9.
3,5,6,8,9 Design features will maintain and restore the shorelines, banks and bottom configurations of the aquatic system (ACS#3), maintain the sediment regime in the long term (ACS#5), maintain instream flows to retain patterns of sediment routing (ACS#6), maintain vegetation to provide adequate rates of erosion, and to supply coarse woody debris sufficient to sustain physical complexity and stability (ACS#8), and therefore maintain habitat for well-distributed riparian-dependent populations (ACS#9).	Habitat Elements / Sediment	Design features and analysis are the same as described for the Water Quality / Sediment / Turbidity factor/indicator.

ACS Objectives Northwest Forest Plan	Habitat Indicators	Cox Creek Density Management EA Design Features and Rational for Consistency with ACS Objectives
6,8,9 These design features will maintain instream flows to retain patterns of sediment and wood routing (ACS#6), maintain vegetation to provide adequate rates of erosion, and to supply coarse woody debris sufficient to sustain physical complexity and stability (ACS#8), and therefore maintain habitat for well-distributed riparian-dependent populations (ACS#9).	Habitat Elements / Large Woody Debris	Riparian Reserves (RR) and 25-100' wide no-treatment zones were designed to incorporate headwalls, and steep or otherwise sensitive side-slopes. No treatment will occur where there is a chance for thinning operations to accelerate mass wasting. Therefore, the potential recruitment of large wood from debris torrents or landsliding will not be adversely affected. Density Management Thinning within RRs is designed to accelerate tree growth within Riparian Reserves, thereby enhancing the quality and rate of future LWD recruitment. Trees thinned within RRs will be felled and yarded away from streams. In instances where yarding across streams may be necessary, logs would be fully suspended above the channel (where feasible). This would minimize disturbance to existing woody material. New road construction and road renovation will not remove trees that are likely to be recruited to stream channels. The indicator described would not be degraded at the watershed scale, or in the short or long term. The proposed action is expected increase the amount of large wood available over time. Therefore, the proposed action is consistent with ACS Objectives 6,8, and 9.
3,5,6,8,9 Design features will maintain: stream-bottom configurations (ACS#3), the sediment regime (ACS#5), stream flow (ACS#6), and amounts and distributions of CWD sufficient to sustain physical complexity and stability (ACS#8), and therefore maintain habitat for well-distributed riparian-dependent populations (ACS#9).	Habitat Elements / Pool Area (%)	"Primary reasons for the loss of pools are filling by sediments...loss of pool-forming structures such as boulders and large wood...and loss of sinuosity by channelization" (FEMAT, pp. V-22). Sediment delivery as a result of road decommissioning, hauling and/or culvert replacements (if any) would be localized and of short duration, and would not be in amounts that would fill pools or create channelization. As stated above, LWD recruitment would be maintained, and the proposed actions would not accelerate mass wasting or sediment delivery to streams. Therefore, the proposed actions are not likely to affect pool frequency or pool area (%). The indicator described would not be degraded at the watershed scale or in the short or long term. Therefore, the proposed action is consistent with ACS Objectives 3,5,6,8, and 9.
3,5,6,8,9 Design features will maintain: stream-bottom configurations (ACS#3), the sediment regime (ACS#5), stream flow (ACS#6), and amounts and distributions of CWD sufficient to sustain physical complexity and stability (ACS#8), and therefore maintain habitat for well-distributed riparian-dependent populations (ACS#9).	Habitat Elements / Pool Quality	Pool quality primarily refers to depth and cover/complexity. Wood is a major habitat-forming element in streams (FEMAT, pp. V-22). As stated above, LWD recruitment will be maintained. Furthermore, the proposed actions would not accelerate mass wasting or sediment delivery to streams, thus are not likely to contribute to pool filling. Therefore, the proposed actions are not likely to affect pool quality. The indicator described would not be degraded at the watershed scale or in the short or long term as a result of the proposed action. Therefore, the proposed action is consistent with ACS Objectives 3,5,6,8, and 9.

ACS Objectives Northwest Forest Plan	Habitat Indicators	Cox Creek Density Management EA Design Features and Rational for Consistency with ACS Objectives
1,2,3,5,6,7,8,9 Design features will maintain watershed and landscape-scale features (ACS#1), connections with floodplains and wetlands (ACS#2), the physical integrity of the aquatic system (ACS#3), the sediment regime (ACS#5), stream flow (ACS#6), the timing and variability of floodplain inundation (ACS#7), and amounts and distributions of CWD sufficient to sustain physical complexity and stability (ACS#8), and therefore maintain habitat for well-distributed riparian-dependent populations (ACS#9).	Habitat Elements / Off-Channel Habitat	There are no off-channel habitat features associated with the stream segments adjacent to, or within, the proposed thinning units. Where off-channel habitat exists on federally-managed lands within the analysis area [downstream], it would protected by Riparian Reserves 440 feet wide on both sides of the stream. Therefore, no effects to off-channel habitat are expected. The indicator described would not be degraded at the watershed scale or in the short or long term as a result of the proposed action. Therefore, the proposed action is consistent with ACS Objectives 1,2,3,5,6,7,8, and 9.
2,3,5,6,8,9 Design features will maintain stream network connections (ACS#2), the physical integrity of the aquatic system (ACS#3), the sediment regime (ACS#5), stream flow (ACS#6), and amounts and distributions of CWD sufficient to sustain physical complexity and stability (ACS#8), and therefore maintain habitat for well-distributed riparian-dependent populations (ACS#9).	Channel Condition & Dynamics / Width/Depth Ratio	Channel dimensions vary within a given channel type, and are affected by the flow regime, the sediment regime, structural components (boulders and wood), and bank integrity. The proposed actions are not expected to adversely affect in-stream flows (EA Hydrology Report), sediment delivery (as described above), or large wood recruitment (as described above). Furthermore, the Riparian Reserves, and no-treatment zones are adequate to maintain stream bank stability (FEMAT, pp. V-26). Where stream channels have thin through prescriptions trees will still be left within three feet of the channel to protect streambank stability. Large conifers that would be left near the stream are expected to provide adequate root strength in the short term, until roots of the smaller trees increase over time. Therefore, no effects to width/depth ratios are expected. The indicators described would not be degraded at the watershed scale or in the short or long term as a result of the proposed action. Therefore, the proposed action is consistent with ACS Objectives 2,3,4,5,8, and 9.

ACS Objectives Northwest Forest Plan	Habitat Indicators	Cox Creek Density Management EA Design Features and Rational for Consistency with ACS Objectives
3,5,6,8,9 Design features will maintain the physical integrity of the aquatic system (ACS#3), the sediment regime (ACS#5), stream flow (ACS#6), and amounts and distributions of CWD sufficient to sustain physical complexity and stability (ACS#8), and therefore maintain habitat for well-distributed riparian-dependent populations (ACS#9).	Channel Condition & Dynamics / Streambank Condition	Streams within and adjacent to the proposed harvest units are generally steep, cascading and step-pool headwater channels confined by hillslopes. Factors affecting streambank condition include the flow regime, the sediment regime, structural components (boulders and wood), bank integrity (as affected by root strength and soil structure), and disturbance. The proposed actions are not expected to adversely affect in-stream flows (EA, Hydrology Report), sediment delivery (as described above), or large wood recruitment (as described above). In-channel work from the culvert replacements on perennial streams would not alter the existing channel or streambank. Density management units include appropriate no-treatment zones on stream channels, falling and yarding away from stream channels, and full suspension where yarding above stream channels (where feasible), and therefore would not disturb stream banks. As stated above, Riparian Reserves and no-treatment zones are adequate to maintain root strength/streambank stability (FEMAT, pg. V-26). Therefore, the proposed actions are expected to maintain stream channel and streambank condition. The indicators described would not be degraded at the watershed scale or in the short or long term as a result of the proposed action. Therefore, the proposed action is consistent with ACS Objectives 3,5,6,8, and 9.
1,2,3,5,6,7,8,9 Design features will maintain watershed and landscape-scale features (ACS#1), connections with floodplains and wetlands (ACS#2), the physical integrity of the aquatic system (ACS#3), the sediment regime (ACS#5), stream flow (ACS#6), the timing and variability of floodplain inundation (ACS#7), and amounts and distributions of CWD sufficient to sustain physical complexity and stability (ACS#8), and therefore maintain habitat for well-distributed riparian-dependent populations (ACS#9).	Channel Condition & Dynamics / Floodplain Connectivity	There are no floodplains associated with the streams within, or adjacent to, the proposed harvest units. Where floodplains exist on federally-managed lands within the analysis area [downstream], they are incorporated in the Riparian Reserves. Because the actions will not adversely affect in-stream flows, sediment delivery or large wood recruitment (as described above), no effects to floodplain connectivity are expected. The indicators described would not be degraded at the watershed scale or in the short or long term as a result of the proposed action. Therefore, the proposed action is consistent with ACS Objectives 1,2,3,5,6,7,8, and 9.
1,2 Design features will contribute toward long-term restoration of the distribution, diversity and complexity of watershed and landscape-scale features (ACS#1), help restore spacial and temporal connectivity within the drainage network (ACS#2)	Watershed Condition / Road Density & Location	The proposed action includes 2.2 miles of new road construction, all of which is located either on ridgetops or stable bench locations. These new roads would be closed following completion of harvest activities. As a result of the proposed action, 10.6 miles of road will be decommissioned (closed, blocked, and treated as necessary to restore pre-road hydrologic function). These actions will result in a net reduction in open road density on BLM managed lands. The proposed action will reduce road density within the watersheds. Therefore, the proposed action is consistent with ACS Objectives 1 and 2.

ACS Objectives Northwest Forest Plan	Habitat Indicators	Cox Creek Density Management EA Design Features and Rational for Consistency with ACS Objectives
S1,2,5,6,7,8,9 Design features will maintain watershed and landscape-scale features (ACS#1), connections within and between watersheds (ACS#2), the sediment regime (ACS#5), stream flow (ACS#6), the timing and variability of floodplain inundation (ACS#7), and species composition and structural diversity of riparian plant communities (ACS#8), and therefore maintain habitat for well-distributed riparian-dependent populations (ACS#9).	Watershed Condition / Disturbance History	As described above, the proposed actions will not disturb unstable or potentially unstable areas, or adversely impact aquatic refugia. The proposed actions will not reduce the existing acreage of late-successional and old-growth habitat in the watersheds. Therefore, the proposed action is consistent with ACS Objectives 1,2,5,6,7,8 and 9. The indicator described would not be degraded at the watershed scale as a result of the proposed action. Therefore, the proposed action is consistent with ACS Objectives 1,2,5,6,7,8, and 9.
1,3,5,8 Design features will maintain watershed and landscape-scale features (ACS#1), the integrity of the aquatic system (ACS#3), the sediment regime (ACS#5), and species composition and structural diversity of riparian plant communities (ACS#8).	Watershed Condition / Landslide and Erosion Rates	Riparian Reserves and no-treatment zones were designed to incorporate headwalls, and steep or otherwise sensitive side-slopes. The proposed thinning and road renovation/decommissioning are not likely to result in accelerated mass wasting or substantially increase erosion (EA, Soils Report). Also see discussion for the Water Quality / Sediment / Turbidity factor/indicator. The indicator described would not be degraded at the watershed scale as a result of the proposed action. Therefore, the proposed action is consistent with ACS Objectives 1,3,5, and,8.

ACS Objectives Northwest Forest Plan	Habitat Indicators	Cox Creek Density Management EA Design Features and Rational for Consistency with ACS Objectives
1,2,4,8,9 Design features will maintain watershed and landscape-scale features (ACS#1), connections within and between watersheds (ACS#2), and species composition and structural diversity of riparian plant communities (ACS#8), and therefore maintain water quality (ACS#4) and habitat for well-distributed riparian-dependent populations (ACS#9).	Watershed Condition / Riparian Reserves	Interim Riparian Reserve (RR) widths would be maintained on all streams within and adjacent to the proposed treatment units. The RR network will maintain shade, large wood recruitment, habitat protection and connectivity in the analysis area, and include all known refugia for sensitive aquatic and riparian-dependent species. Density Management Thinning may reduce the amount of small woody material within the short term. However, the majority of the streams within the analysis area have adequate wood and material within the stream channels (due to past downhill logging). Additionally, the long-term benefits to development of late-successional characteristics outweigh short-term reductions in small woody material. If the proposed density management treatment was not applied, younger conifer stands in Riparian Reserves would continue to develop under conditions of high competition and growth suppression. Excluding or avoiding disturbances that mimic natural disturbances can delay attainment of overall late-successional/old growth conditions for decades to a century or more (USDI, 1999). This would result in stands that are more susceptible to fire, windstorms, and insect infestations, and also stands that have an overall smaller tree size. As a result, future contributions of woody material to the aquatic ecosystem would be likely to occur, but the wood would be of a smaller size and would decompose relatively quickly (relative to larger, mature trees). Logging debris and large relic logs that exist within the channel will likely decompose long before being replaced by new large wood. Foregoing treatment for a densely stocked stand could adversely affect species in the long term that benefit from late-successional forest conditions, and would not be consistent with ACS objectives. The indicator described would not be degraded at the watershed scale. The proposed action is expected to improve the condition of Riparian Reserves within the analysis area in the long term. Therefore, the proposed action is consistent with ACS Objectives 1,2,4,8 and 9.

4 Appendix 4 Road Decommissioning Methods

A more comprehensive description of road decommissioning methods and the types of roads they will be applied to is provided below.

Existing roads

These fall into several categories of use and current standard of maintenance or construction. Mainline roads used for timber management activities are well maintained paved or gravel surface roads. Other spurs or landings are either gravel of dirt surfaces. Some old roads are a combination of large rock where roads needed maintenance during hauling or dirt and grass covered rock surfaces. Road improvement activities generally are confined to grading, brushing, and ditchline cleaning. At times, a lift of rock will be placed on the dirt surfaces to make them all weather roads or reduce sediment delivery potential during rainy weather.

Decommissioned roads

The South Fork Coos River and North Fork Coquille Watershed Analyzes identified roads to be decommissioned as opportunities and funding allow. The roads identified in this action to be decommissioned either will be closed on a short to long-term basis (5-20 years) and may be used again in the future or closed with the intent of not needing them for future management actions.

Decommissioning ranges from either full removal or temporary closure. Closure would consist of blocking the road to vehicular traffic, installing water bars to route water from ditches and road surfaces, and leaving the gravel road portion in a condition to self maintain. This would allow for reduced maintenance, lower risk, and easier renovation or improvement in the years to come.

If road decommissioning involves the removal of stream crossing pipes, the banks and bed of the channel would be returned to original grade unless the past installation has changed the local environment in a drastic manner. At which time a step down channel or gulley plug may be designed into the stream crossing removal implementation. Full decommissioning involves the most complete removal of the road grade and all associated pipes, fills or overburdened materials likely to cause sediment delivery to a stream.

For this action, those roads that are within the older aged stands of timber, and no longer necessary to manage the stands, would have the road grade tilled to increase the infiltration rates to near forest like conditions. It would not be necessary to use a sub-soiler to accomplish this goal. Old rock roads with sandstone surfaces can be turned over with an excavator or ripper. Scraping off the surface rock in order to recover the investment may not be feasible and does not ensure plant establishment. These tilled surfaces would have organic debris and vegetation, dragged, or placed on the worked road grade when it is available. The intent would be to re-establish some of the nutrient cycling and forest floor processes on the old road surface.

In this action, one road has been identified as a high priority to decommission in the Watershed Analysis. That road is adjacent to the North Fork Coquille River. The road is very old road that had 5 different log stringer bridges across the river until recently. Now none of the bridges are functional and only two remnants are present. The difficulty in decommissioning this road is two fold; access across the river and old planking buried within the sub-grade. Since little sediment is actually being delivered to the river from this road in the absence of traffic, it would be best to concentrate on blocking the two ends of the system. The compacted road surface is producing runoff within the road but the runoff is not reaching the river. If tillage were implemented on this road, it would have to be accomplished where the planking would not be disturbed. A concentrated effort would be made on the areas where cuts were made into the hillslope to provide infiltration in those areas. If planking is encountered that road section should be skipped since planked sections are generally the wet. Crossing the N.F. Coquille River would take a slowly moving excavator walking on the bedrock channel. Re-contouring the approaches to and from the river would be all that is necessary to complete the restoration of the road.

Newly constructed roads

New road construction on BLM lands within the Analysis Area is limited to roads analyzed through the NEPA process to facilitate BLM timber sales and by private timber companies constructing new roads across BLM lands under existing reciprocal right of way agreements. All new roads are constructed according to the Best Management Practices in the RMP that reduce impacts during construction and provide stability over a long period. Severe erosion or instability, cultural or botanical reasons would prevent private road construction across BLM lands. Most new road construction has demonstrated that roads can be built and have smaller impacts than in the past. Under this action, new roads would have dirt surfaces and would be fully decommissioned.

All new constructed dirt spurs will be decommissioned after use. The intent of decommissioning is to return soil infiltration rates, organic matter, and nutrient cycling functions to the temporary road surfaces. The objectives would be accomplished with heavy equipment (excavators or dozers) that would capable of reworking the surface with an implement that reduces the compacted layer. Presently there are several attachments that can de-compact these surfaces; they range from a sub-soiler to a bucket on the excavator. The return of the soil infiltration rate can be accomplished on dirt surfaced roads rather easily. Once these surfaces become covered with rock, it becomes more problematic to restore infiltration rates. Operationally they are less successful and become more expensive to close.

All closures would need to restrict traffic by using a combination of berms, large rock, or a guardrail depending on future access needs. Once the sub-grade is reworked, placement of slash, plants and some amount of organic matter from the neighboring slope should be worked into the surface layer. This addition of nutrients and more importantly fungi and microorganisms will allow the process of colonization to occur. Once established these organisms will process materials both on and in the soil much like that under the forest canopy. Without the aid of the microorganisms, the timeframe to establish them becomes very long, sometimes decades. Some refer to this as “jump-starting” the system.

Table 4-1 Roads Considered for Closure to Reduce Analysis Area Road Density

Road Number	*Close or Decommission*	*Method of Closure*	*Possible Miles*	*Within Key Watershed*	*Closure Recommended in TMO*	*Accomplish w/Timber Sale*	
						Yes	*NO*
25-10-31.1	Decommission	Block w/berm, No pipes to remove, leave surface as is	.77	No	No, Recently opened by Pvt. and access being retained	X	
25-10-33.0	Closed current road failure	Block w/rock after pump chance, waterbar	.15	No	Yes	X	
26-10-3.1	Closed with past action	Block with guard rail north of 3.4 road	0.5	No	Yes		X
26-10-3.2	Close	Block w/rock, waterbar	.36	No	Yes	X	
26-10-3.3	Close	Block w/rock, waterbar	.40	No	Yes	X	
26-10-3.4	Close	Block w/berm, waterbar	.31	No	Yes	X	
26-10-3.5	Closed past action	Block w/berm, waterbar	.15	No	Yes		X
26-10-4.0	Close	Block w/rock, waterbar	.20	No	Yes	X	
26-10-4.1	Close	Block w/rock, waterbar	.24	No	Yes	X	
26-10-4.3	Close	Block w/4.0, waterbar	.11	No	Yes	X	
26-10-5.0	Close	Block w/rock after pvt access point Sec 32	.80	No	No, First portion is mainline road, pvt access being maintained	X	
26-10-5.1	Decommission	Place rock at 30.0 rd restore infiltration to road surface	.24	No	Yes	X	
26-10-5.2	Close	Block w/berm at Sec 32 Property line, waterbar	.11	No	No, Pct complete now	X	
26-10-5.4	Close	Block w/berm, waterbar	.22	No	No, not on data base at the time	X	
26-10-5.5	Decommission	Block w/berm, restore water routing/ infiltration	.24	No	No, not on data base at the time	X	
26-10-5.6	Decommission	Block w/berm, restore water routing/ infiltration	.27	No	No, not on data base at the time	X	
26-10-6.4	Closed but eroding still	Block w/berm, restore water routing, rebuild subgrade and running surface	0.8	No	No, private road would need to contact land owner		X
26-10-6.5	Closed by road failure on 6.4	Restore water routing with water bars	0.3	No	No, only close BLM portion		X
26-10-6.6	Decommission	Block w/berm, remove 2 stream crossing pipes, restore infiltration	.79	No	No, not on data base at the time	X	
26-10-6.7	Close	Block w/berm, waterbar	.22	No	No, not on data base at the time	X	
26-10-6.8	Close	Block w/berm, waterbar	.30	No	No, not on data base at the time	X	
26-10-7.0	Close part Decomm part	Block w/reconstructed entrance (N) and berm (S), restore infiltration, restore 6 stream crossings	0.6 1.9	Yes, WA directed High Priority road	No, Control now being returned to BLM from Menasha for H2O quality reasons	Seg A	Seg B, C, D
26-10-8.6	Close	Block w/berm, waterbar, pvt rd.	.42	Yes	No, Private road now accessing BLM lands	X	
26-10-9.3	Close	Block w/berm, waterbar	.38	Yes	No, not on data base at the time	X	
26-10-9.6	Close	Block w/berm or rock, waterbar	.29	Yes	No, not on data base at the time	X	
26-10-9.7	Close	Block, w/berm, waterbar	.20	Yes	No, not on data base at the time	X	
26-10-10.2	Close	Block w/Guard rail just north 3.4 road	1.03	No	Yes	X	
26-11-1.0	Close	Block w/berm or rock at 1.1 jct. Allow pvt access	.60	no	Yes	X	
		Total from all roads	**12.9**				

5 Appendix 5 Additional Forest Ecology Data

This appendix includes tables detailing conditions in the affected environment, including forest cover in the analysis area and the landscape (LSR # 261), as well as unit-level forest characteristics.

Table 5-1 Percent of analysis area covered by forests in different structural, tree size and tree cover categories. This data was summarized from Western Oregon Digital Image Project (WODIP) remotely-sensed imagery.

	Single-story canopy				Multiple-story canopy			
	Tree diameter class				Tree diameter			
	< 10"	10-19"	20-29"	> 30"	10-19"	20-29"	> 30"	Total
Overstory cover								
Conifer	12	20	8	6	0	11	10	68
Hardwood	2	13	2	0	0	0	0	18
Mixed	3	3	0	0	2	0	0	7
Other[1]	0	0	0	0	0	0	0	7
Grand Total	*17*	*36*	*10*	*6*	*2*	*11*	*10*	*100*

[1] 7.1% of cells were classified as water or unvegetated.

Table 5-2 Percent of analysis area covered by forests in different age classes and cover types, calculated from BLM forest inventory data. Age classes of private holdings estimated from air photos. Age classes include seedling/sapling (0-5 in. dbh), poletimber (5-11 in. dbh), small sawtimber (11-21 in. dbh), and large sawtimber (21+ in. dbh). Approximately 4.3 ac. (< 0.1%) of the analysis area was classified as water or unvegetated. Total size of analysis area is approximately 10,566, including 2,530 ac. of private lands.

	Forest cover type			
Overstory cover	Seedling/ sapling	Pole timber	Small sawtimber	Large sawtimber
Conifer	9.0	22.0	21	24
Red alder	0.0	3.0	5	0
Conifer/hardwood (mixed)	2.0	9.0	3	3
Grand Total	*11.0*	*34.0*	*29.0*	*27.0*

Note: within the analysis area, the Cox Creek DM Project would thin approximately 900 ac. and the North Coquille DM/CT Project would thin approximately 150 ac.

Table 5-3 Cover by forest types in LSR # 261 (including private holdings), calculated from BLM forest inventory data. Forest types include seedling/sapling/poletimber (BLM age class 1 and 2, 0-11 in. dbh), small sawtimber (BLM age class 3, 11-21 in. dbh), and large sawtimber (BLM age class 4, 21+ in. dbh). 'Private/other' types includes approximately 4.3 ac. (< 0.1%) of the analysis area classified as water or unvegetated. Total cover by LSR # 261 is approximately 86,672 ac.

	Forest type				
Cover variable	Seedling/Saplings /Pole timber	Small sawtimber	Large sawtimber	Hardwoods	Private/ other
Acres	19,670	11,998	34,714	3,503	16,786
% of LSR	22.7	13.8	40.1	4.0	19.4

Table 5-4 Forest ecology variables, calculated for treatment units in the Cox Creek DM project.

		Age Class				
		1950's Stands		1970's Stands		
Variable	Units	Mean (95% CI)	CV	Mean (95% CI)	CV	Notes
Overstory conditions						
Trees per acre (TPA)[1]	n/ac.	227.4 (160.2 - 294.6)	44.0	363.5 (203.9 - 523)	52.5	Range in unit-level CV of 15.2 - 65.1
Diameter at breast height (DBH) [1]	in.	16.7 (15.6 - 18)	14.1	12.7 (0 - 0)	19.8	
Douglas-fir maximum dbh[1]	in.	31.7 (24.8 - 38.6)	30.2	27.1 (14.8 - 39.5)	54.5	Age class average of plot max values.
Basal area (BA) of conifers[1]	ft^2/ac.	217.6 (172.1 - 263.2)	31.1	187.4 (145.5 - 229.3)	26.8	Forest ecology plot estimate=195 ft^2/ac
BA of hardwoods[1]	ft^2/ac.	7.8 (1.1 - 14.6)	20.1	3 (-4.1 - 10.1)	82.8	
Codominant tree density[2]	%	52.9 (42.4 - 63.4)	34.3	66.3 (53.6 - 79.1)	26.9	
Suppressed tree density[2]	%	31.6 (21.8 - 41.4)	53.7	13.5 (0.2 - 26.9)	138.1	
Growth/allometry						
Crown ratio (Dominant trees) [1]	%	37.5 (32.4 - 42.6)	20.3	62.8 (50.6 - 74.9)	23.1	Forest ecology plot estimate =33.8%
Crown ratio (co-dominant trees) [1]	%	28.3 (25.6 - 30.9)	14.1	48.3 (40.7 - 56)	19.0	Forest ecology plot estimate= 32%
Radial growth of dominant trees (10 yr) [3]	cm	0.4 (0.3 - 0.4)	35.9	0.5 (0.4 - 0.7)	33.3	Forest ecology plot estimate= 0.7 cm
PAI_{BA}-Dominants[3]	cm^2/yr.	52 (43.5 - 60.5)	24.4	54.2 (42.6 - 65.9)	25.7	Using 10 year growth data
PAI_{BA}-Codominants[4]	cm^2/yr.	23.6 (13.4 - 33.9)	34.9	23.1	.	Only 1 sample
Height/DBH ratio[1]	ft./ft.	94.1 (86.1 - 102.1)	12.7	89 (78.1 - 99.8)	14.6	Codominants and Intermediates only
Stand structure						
Overstory richness[2]	n	1.9 (1.8 - 2.1)	11.6	1.6 (1.4 - 1.9)	17.4	Richness = number of tree species
Plant richness[2]	n	4.5 (3 - 5.9)	50.7	6.7 (4.9 - 8.5)	37.0	Richness = number of herbs/ shrubs
Shrub cover[2]	%	45.1 (29.5 - 60.7)	54.4	37.9 (22.4 - 53.4)	57.3	
Number of canopy layers[2]	n	1.5 (1.3 - 1.7)	25.1	1.1 (1 - 1.3)	14.1	
Saplings/ac. – total[2]	n/ac.	91.3 (59.5 - 123.1)	57.6	193 (98 - 288)	59.0	
Down wood - total volume[1]	ft^3/ac.	1206 (480 - 1933)	113.0	2765.7 (-283.7 - 5815.1)	228.8	Biased by 1 large log (Unit 9)
Snags - total density[1]	#/ac.	20.7 (8.3 - 33.1)	290.1	4.7 (-1.6 - 11)	477.5	Estimate of snag BA=15.4 ft^2/ac.
Snag density > 11.0" [1]	#/ac.	3.9 (0.9 - 5.3)	350.8	0.2 (-0.2 - 0.6)	714.1	
Snag density > 20.0"[1]	#/ac.	1.1 (0.1 - 2.1)	445.8	0.2 (-0.2 - 0.6)	714.1	

1 Data from stand exam plots, using unit means (n= 14 for 1950's units; n=11 for 1970's units). Within-unit sub-samples were > 1500.
2 Data from forest ecology plots (n= 14 for 1950's units; n=13 for 1970's units). Within-unit sub-samples were 90.
3 Data from measured trees in stand exam plots (n= 87 for 1950's units; n=39 for 1970's units).
4 Data from measured trees in forest ecology plots (n=6 for 1950's units; n=1 for 1970's units).

6 Appendix 6 Survey and Manage and Special Status Species

6.1 Survey Documentation

6.1.1 Fungi

There are no fungi species within the analysis area that require pre-disturbance surveys under the 2002 Annual Species Review (see U.S. Dept. of the Interior 2003).

6.1.2 Bryophytes/Lichens

Bryophyte surveys were conducted in accordance with the Survey Protocol for Survey and Manage Component 2 Bryophytes Version 2 released December 11, 1997. Lichen surveys were conducted in accordance with the Survey Protocol for Component 2 Lichens Version 2 released March 12, 1998. Qualified surveyors experienced with non-vascular plant identification, traversed the proposed units one time and all habitat for the target bryophyte and lichen species was covered using the intuitive controlled survey method as per protocol. Survey routes were represented on maps after each visit as were the locations of any target species found. Known sites for target species were flagged in the field and each site was given a unique collection number. GPS coordinates were also taken at each site and the locations were recorded on a map.

Some surveys completed before March 14, 2003 were conducted prior to release of the 2002 Annual Species Review (see U.S. Dept. of the Interior 2003). Pre-disturbance surveys are not required for some of the bryophytes and lichens previously surveyed in the analysis area under the S & M SEIS. In addition, some species that previously required management of known sites under the S & M SEIS, no longer require management under the 2002 Annual Species Review. Surveys conducted prior to the 2002 Annual Species Review followed the same protocol as stated above.

6.1.3 Vascular Plants

There are no vascular plant species within the analysis area that require pre-disturbance surveys under the 2002 Annual Species (see BLM Memorandum dated March 14, 2003). However, proposed units were surveyed for special status plant species (Bureau Sensitive and Bureau Assessment species) that had habitat or a known range indicating it could be found in the analysis area. Qualified surveyors experienced with vascular plant identification, traversed the proposed units one time inspecting all special status plant species habitat using the intuitive controlled survey method per protocol. Surveys were completed during the June through early October period when the target species were most likely to be found if present. Survey routes were represented on maps after each visit as were the locations of any target species found. Known sites for target species were flagged in the field and each site was given a unique collection number. GPS coordinates were also taken at each site and the locations were recorded on a map.

6.2 S&M Botanical Species Found During Surveys

The following is a complete list of all S & M species found on the Cox Creek analysis area. A list of the survey types and the dates of surveys completed is available in the Analysis File.

Table 6-1 Survey and Manage Botanical Species found in Cox Creek

Species	Taxa Group	Annual Species Review Category (2002)
Ramalina thrausta	Lichen	A
Sparassis crispa	Fungi	D

6.3 Implementation of Management Recommendations for S&M Botany

6.3.1 Fungi

If S & M fungi species requiring protection are encountered incidentally while surveying for bryophytes, lichens, or vascular plants, the known site would be protected using known site management recommendations developed by an interdisciplinary team on the Coos Bay District (see Brian et al. 2002). These recommendations are based on criteria for protection of such sites as required by the Northwest Forest Plan. These recommendations are designed to accomplish the following:

- maintain current habitat and microclimate conditions,
- minimize soil disturbance, and
- prevent damage or removal of potential host trees

Using these management recommendations, it is assumed that these species will have a reasonable likelihood of persisting.

6.3.2 Bryophytes/Lichens

Any S & M bryophyte or lichen species found that requires protection will be managed using known site management recommendations developed by an interdisciplinary team on the Coos Bay District (see Brian et al. 2002). These recommendations are based on criteria for protection of such sites as required by the Northwest Forest Plan. These recommendations are designed to accomplish the following:

- maintain current habitat and microclimate conditions,
- minimize soil disturbance, and
- prevent damage or removal of potential host trees

Using these management recommendations, it is assumed that these species will have a reasonable likelihood of persisting.

6.3.3 Vascular Plants

Any sensitive plant species (Bureau Sensitive or Assessment Species) found would be managed on a case by case basis. Existing conservation strategies and measures would be used for species that currently have them. All sites would be managed to maintain and enhance their viability. This could be done with a variety of management techniques, depending on the species. The purpose of any management technique would be to create and maintain conditions favorable for the species.

6.4 Management Recommendations for Ea Units with S & M Sites

The following contains documentation of the decision process used in implementing management recommendations for S&M species in EA units where S & M species were located:

Unit 1A

Sparassis cripsa- S & M Category "D" fungi species. This species was found incidentally while doing lichen and bryophyte surveys. It is located on the very southeast edge of the unit. This site would be buffered using management recommendations developed by an interdisciplinary team at Coos Bay BLM (see Brian et al. 2002). These recommendations were designed to buffer nonvascular plant sites with a reasonable likelihood that the species would persist.

Unit 8

Ramalina thrausta- S & M Category "A" lichen species. There are two sites of this species on the southwest and southern edge of the proposed unit along a road adjacent to an old-growth Douglas-fir stand. This large site contains multiple conifer and hardwood trees with *Ramalina thrausta* growing on them. The source of the *Ramalina thrausta* is the adjacent old-growth stand, directly across the road from both sites. These sites would not be buffered. Instead, they would be density management thinned (as would the rest of the unit). This would include leaving the largest conifers and hardwoods, with the objective of increasing the habitat available for this species to colonize. Currently, the distribution of this lichen in the unit is limited to the very edge of the stand along the road where light levels are greatest and a seed source is present. A variable-density thinning prescription would create gaps within the interior of the stand providing additional habitat that this species could potentially colonize (Peterson 2002, Muir et al. 2002). Although some trees with this species would be removed during a thinning operation, many others would remain. The adjacent old-growth stand and the larger trees left at the site after the thinning would provide a seed source to potentially disperse this species further within the unit in areas where it currently has not be found growing.

Unit 10A

Ramalina thrausta- S & M Category "A" lichen species. There is one site of this species on the west edge of the proposed unit along a road. This large site contains multiple conifer and hardwood trees with *Ramalina thrausta* growing on them. The source of the *Ramalina thrausta* is the adjacent old-growth stand, directly across the road and uphill from the site. This site would not be buffered. Rationale is identical to Unit 8.

Unit 10B

Ramalina thrausta- S & M Category "A" lichen species. There are two sites of this species: on the southeast and east edge of the proposed unit along a road adjacent to an old-growth stand, and in a red alder patch adjacent to the same old-growth stand. This large site contains multiple conifer and hardwood trees with *Ramalina thrausta* growing on them. The source of the *Ramalina thrausta* is the adjacent old-growth stand, directly across the road and uphill from the southeast site and uphill from the east site. These sites would not be buffered. Rationale is identical to Unit 8.

Unit 11
Ramalina thrausta- S & M Category "A" lichen species. There is one site of this species on the north edge of the proposed unit along a road adjacent to an old-growth stand and contnuing along a ridgeline where the unit is directly adjacent to the old-growth stand. This large site contains multiple conifer and hardwood trees with this species growing on them. The source of the *Ramalina thrausta* is the adjacent old-growth stand. This site would not be buffered. Rationale is identical to Unit 8.

Unit 19
Ramalina thrausta- S & M Category "A" lichen species. There is one large site of this species along a road that bounds the south half of the unit and is adjacent to a stand of old-growth Douglas-fir. This large site contains multiple conifer and hardwood trees with this species growing on them. The source of the *Ramalina thrausta* is the adjacent old-growth stand. This site would not be buffered. Rationale is identical to Unit 8.

Unit 20 South
Ramalina thrausta- S & M Category "A" lichen species. This species is found along the east and south end of this proposed unit where it is seeding in from the adjacent old growth stands. The species was found as far as 300 feet from the east end of the unit but is primarily found within a 100 feet of the edge of the adjacent old growth stands. A variable-density thinning prescription would create gaps within the interior of the stand providing additional habitat that this species could potentially colonize (Peterson 2002, Muir et al. 2002). Although some trees with this species could be removed during a thinning operation, many others would remain. The adjacent old-growth stands and the larger trees left at the site after the thinning would provide a seed source to disperse this species further within the unit in areas where it currently has not be found growing.

Unit 21
Ramalina thrausta- S & M Category "A" lichen species. There is one site of this species along the western half of the northern edge of the unit. This species is restricted to the scattered young Douglas-fir trees growing right along the edge of the stand adjacent to the black-topped road. The source of the *Ramalina thrausta* is the adjacent old-growth stand directly across the black-topped road on the north side of the unit. The management prescription for this stand would remove all the hardwood and replant the unit with Douglas-fir. The existing Douglas-fir currently hosting this species would not be cut. The adjacent old-growth stand and the existing Douglas-fir left at the site after the hardwood removal would provide a seed source to give this species a reasonable likelihood of persistence at this site.

Unit 25

Ramalina thrausta- S & M Category "A" lichen species. There is one small site in the northeast half of the stand which is adjacent to an old-growth Douglas-fir stand. This small site contains several conifer and hardwood trees with this species growing on them. The source of the *Ramalina thrausta* is an adjacent old-growth stand. This site would be buffered in accordance with "Applications of Known Site Management Recommendations for Survey and Manage Nonvascular Species on the Coos Bay District". These management recommendations were developed by an interdisciplinary team at Coos Bay BLM and are designed to buffer nonvascular plant sites with a reasonable likelihood that the species would persist at the site. This site is being treated differently from other units where this species was found because it is a much smaller site involving only a few trees and because there is not an adjacent source available to help "seed" additional *Ramalina thrausta* into the unit after it is thinned.