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2006

Preliminary Assessment
2007 Plantation Thinning

Clackamas River Ranger District, Mt. Hood National Forest
Clackamas County, Oregon

The project is located in T.5S., R.5E.; T.5S., R.6E.; T.6S., R.6E.; T.7S., R.6E.; T.7S., R.5E.; Willamette Meridian.

For Information Contact: James Rice
595 NW Industrial Way, Estacada, OR 97023
503.630.6861
jrrice@fs.fed.us

An example of post harvest plantation thinning

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1.0 SUMMARY

The Mt. Hood National Forest proposes a commercial thinning project in plantations ranging in age from 30 to 61 years old. The project is located in the Clackamas River Ranger District, Mt. Hood National Forest, Oregon.

The purpose of this project is to thin second-growth plantations to achieve multiple objectives. The proposed action is to thin and harvest wood fiber from approximately 4374 acres of matrix land, late-successional reserves and riparian reserves. Refer to s. 3.2 for greater detail.

The Forest Service evaluated the no-action alternative and action alternatives that vary by logging method and road construction.

2.0 INTRODUCTION

2.1 Document Structure

The Forest Service has prepared this document in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This document discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into the following parts:

- *Summary*
- *Introduction:* This section includes the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.
- *Alternatives:* This section provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on issues raised by the public and other agencies. This discussion also includes design criteria and Best Management Practices. Finally, this section provides a comparison of the environmental consequences associated with each alternative.
- *Environmental Consequences:* This section describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by resource. Within each section, the existing situation is described first, followed by the effects of the alternatives. The No-action Alternative provides a baseline for evaluation and comparison of the other alternatives.

  Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at the Estacada Ranger Station in Estacada, Oregon.

2.2 Purpose and Need for Action

2.2.1 The following five purposes of this project are derived from the Mt. Hood Forest Plan as amended. Each purpose statement has page references from various Forest Plan documents and has section references where greater detail can be found elsewhere in this document.

- 2.2.1.1 Riparian Reserves

  One of the purposes of this project is to enhance riparian reserves on 1225 acres in the project area.

  This action is needed because these plantations occur in riparian reserves and because the current vegetation does not meet the needs of associated aquatic and riparian resources (The Mt. Hood Forest Plan describes this need on p. Four-17 to 20, Northwest Forest Plan Standards and Guidelines p. C-32). If no action is taken in these riparian reserves, stands would have reduced capability to produce the size and quantity of coarse woody debris sufficient to sustain physical complexity and stability of the riparian reserves and associated streams. Plantations can be enhanced by thinning to accelerate the development of mature and late-successional stand conditions (s. 3.2.2, 3.2.3, 3.2.4, 4.2.7.6, 4.3.7, 4.3.7.1 & 4.3.7.2).

- 2.2.1.2 Late-Successional Reserves

  One of the purposes of this project is to enhance late-successional reserves on 1237 acres in the project area.

  This action is needed because these plantations occur in late-successional reserves and because the current vegetation does not meet the needs of dependent species (The Mt. Hood Forest Plan describes this need on p. Four-67, Northwest Forest Plan Standards and Guidelines p. C-9-21). If no action is taken in these reserves, stands would be delayed in their acquisition of desired habitat characteristics. Plantations can be enhanced by thinning to accelerate the development of mature and late-successional stand conditions (s. 4.3.6, 4.3.6.1, 4.3.6.2 and 4.5.1).

- 2.2.1.3 Diversity

  One of the purposes of this project is to enhance diversity on 4374 acres in the project area.

  This action is needed because these plantations lack certain elements of diversity (s. 3.2.1, 3.5.2 & 4.4). They do not have the mix of tree species that were present in the original stand and they are relatively uniform in terms of tree size and spacing. There is a need for greater variability of vertical and horizontal stand structure. There is a need for more sunlight on the forest floor to create greater diversity of ground vegetation. (The Mt. Hood Forest Plan describes this need on p. Four-67). If no action is taken,

over time the stands would become increasingly dense resulting in a period of low structural diversity that could last more than 100 years (s. 4.4.3).

- 2.2.1.4 Health and Growth

  One of the purposes of this project is to increase health and growth that results in larger wind-firm trees on 2188 acres of matrix in the project area.

  This action is needed because these second-growth plantations are experiencing a slowing of growth due to overcrowding and some are experiencing suppression caused mortality (The Mt. Hood Forest Plan describes this need on p. Four-91 FW-372 & Four-292). If no action is taken, this overstocked condition would result in stands with reduced vigor and increased mortality. There is a need for forest stands in the matrix that are healthy and vigorous with low levels of mortality. (s. 4.3)

- 2.2.1.5 Forest Products

  One of the purposes of this project is to provide forest products consistent with the Northwest Forest Plan goal of maintaining the stability of local and regional economies.

  This action is needed to supply forest products in a cost effective manner (s. 3.6 & 4.11). There is a need to keep forests healthy and productive to sustainably provide forest products in the matrix in the future. Not only are forest products needed by society, but also the employment created is important to local and regional economies. (Northwest Forest Plan ROD p. 26, Mt. Hood Forest Plan p. Four-26)

2.2.2 **Management Direction –** The proposed action has been designed to meet the goals and objectives of the documents listed below. This assessment is tiered to the Environmental Impact Statements and the listed plans are incorporated by reference.

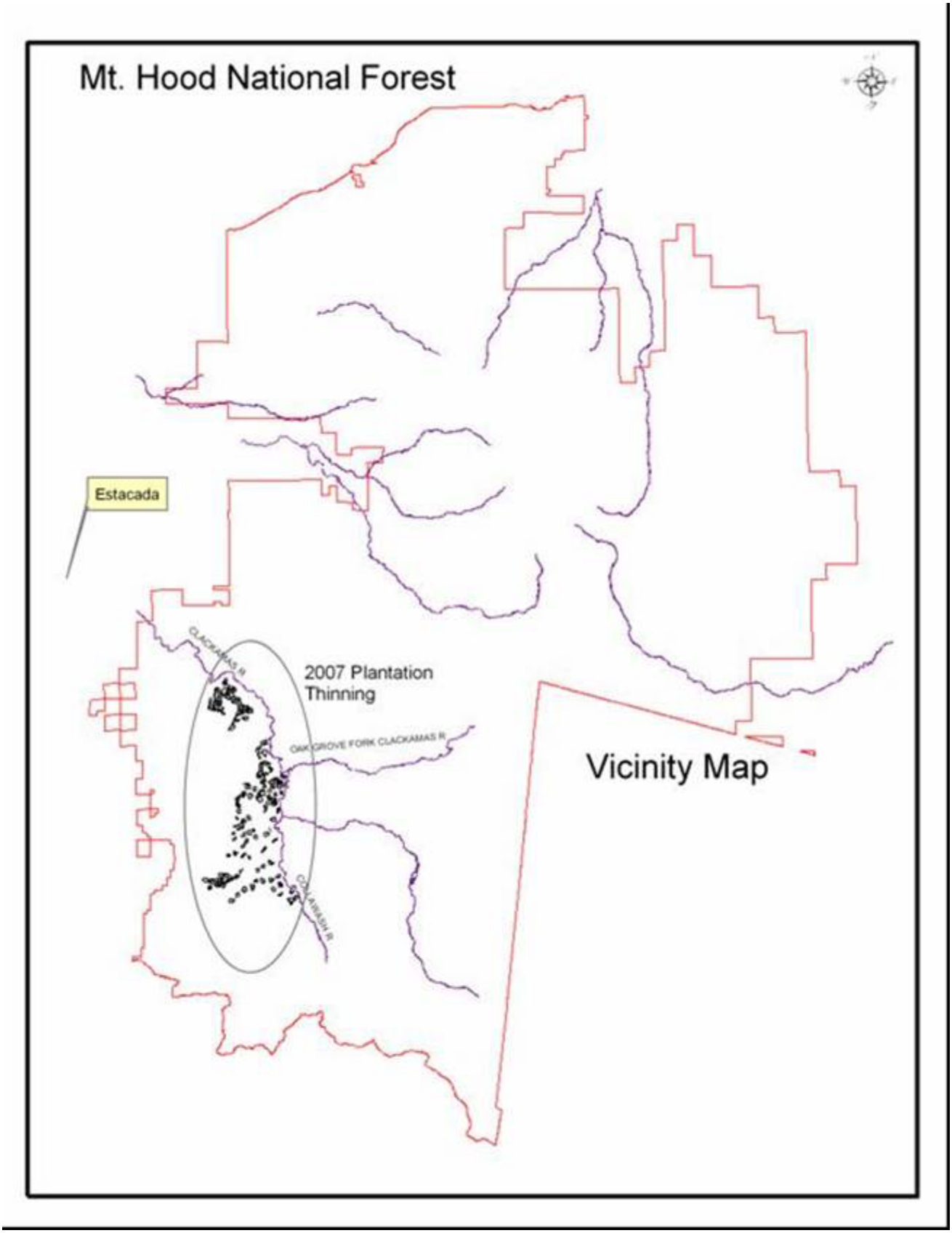
- The Mt. Hood National Forest Land and Resource Management Plan as amended (USDA 1990b) (referred to as the **Forest Plan**). The Forest Plan contains standards and guidelines applicable to this project. Consistency is addressed in each resource section 4.0.
- The Mt. Hood National Forest Land and Resource Management Plan Final Environmental Impact Statement (USDA 1990a). This document discusses environmental effects for Forest-wide programs (including the timber sale program) and sets the stage for project level analysis.
- The Forest Plan was amended by the Record of Decision and Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl. (USDA, USDI 1994b) (hereafter referred to as the **Northwest Forest Plan** or NFP). The NFP contains standards and guidelines for Matrix, Riparian Reserves and Late-Successional Reserves. Consistency is addressed in each resource section (s. 4.0).
- The Northwest Forest Plan Final Supplemental Environmental Impact Statement (USDA, USDI 1994a). This document discusses environmental effects for Region-

wide programs (including the timber sale program) and sets the stage for project level analysis.

- The Forest Plan was amended by the 2004 Record of Decision to Clarify Provisions Relating to the Aquatic Conservation Strategy. (USDA, USDI 2004a). Consistency is addressed in section 4.2.
- The Forest Plan was amended by the 2005 Record of Decision for Preventing and Managing Invasive Plants (USDA 2005). Consistency is addressed in section 4.9.

- The Forest Plan was amended by the 2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines. (USDA, USDI 2001).
- The Forest Plan was amended by the 2004 Record of Decision to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines. Many species were removed from the requirements of the Survey and Manage Standards and Guidelines and placed on sensitive species lists. A subsequent court case set aside parts of the 2004 Record of Decision and reinstated the 2001 Record of Decision except for thinning projects in stands less than 80 years old (October 11, 2006, modified injunction in Northwest Ecosystem Alliance et al. v. Rey et al., Civ. No. 04-844 P (W.D. Wash)). All of the plantations with this project are less than 80 years old (they are plantations 30 to 61 years old). Effects to sensitive species are addressed in s. 4.2.7.10, 4.5.3.3 & 4.8.6.

2.2.3 **Maps** – In addition to the vicinity map below, Appendix F contains close-up maps showing the proposed actions, land allocations and other details. These maps are in color. If you have a paper copy with black and white maps, color versions of the maps are available at the forest web site or can be sent in the mail if requested.


Mt. Hood National Forest
Estacada
2007 Plantation Thinning
CLACKAMAS R
OAK GROVE FORK CLACKAMAS R
COLLAWASH R
Vicinity Map

2.2.4 Land Allocations

The 2007 Plantation Thinning project has many overlapping land allocations. Some units have up to 5 land allocations on the same ground.

Allocation	Approximate Acres	Units, Comments
Late-Successional Reserves	1237*	2-38, 42, 54, 56, 60, 66-72, 78, 80, 84, 86, 100, 106, 121, 146, 161, 164, 177, 178, 210, 214, 216, 220, 322-334, 346, 348 and 350
A7 – Special Old Growth	34	Units 2 and 4. Overlaps LSR and has similar objectives.
Riparian Reserves	1225	Virtually all units contain some riparian reserve.
A9 – Key Site Riparian	18	2 and 178. Objectives are similar to riparian reserves.
A1 – Wild and Scenic Rivers	149	14, 16, 18, 20, 22, 146, 161, 164, 177, 178 and 210. All units in A1 overlap LSR.
B6 – Special Emphasis Watersheds	1800	2-16, 26-44, 48, 50, 212-220, 224-236, 274-350
B2 - Viewsheds	2443	2-22, 26-38, 52-56, 64, 66, 78-86, 100-220, 224, 242, 246, 268-314, 318, 322-350.
B8 - Earthflow	2014	100-104, 112-120, 122-152, 158-180, 202, 204, 212-222, 256-268, 274-304, 310-350.
C1 – Timber Emphasis	645	44, 48-52, 58, 62, 64, 74, 76, 82, 88-98, 238, 240, 244-264, 268. Where units are overlapped by riparian reserves, the riparian reserve standards and guidelines apply.

* Note: In some areas where the LSR boundary follows a road, the actual boundary lines were drawn 100 feet away from the road. One of the reasons for this was to allow management of roadside vegetation and the treatment of hazardous snags that might fall across roads. There are 16 units (42, 54, 56, 60, 66, 69, 70, 72, 78, 80, 84, 86, 100, 102, 178 and 214) that are primarily LSR but the strip of land within 100 feet of the road is matrix. Since it is impractical to thin this 100-foot wide strip differently, these units would be managed using the LSR prescription. Approximately 56 acres of proposed thinning units are in this 100-foot strip.

2.2.5 **Watershed Analysis** – The project is covered by three analyses. Approximately 2365 acres of the project is covered by the Lower Clackamas River Watershed Analysis (1996). Approximately 1414 acres of the project is covered by the Collawash/Hot Springs Fork Watershed Analysis (1995) amended in 2003. Approximately 595 acres of the project is covered by the Fish Creek Watershed Analysis (1994). Since then, fifth-field watersheds have been redrawn. The Collawash River and the Hot Springs Fork have been combined into one fifth-field watershed called Collawash River. Several

watersheds including Lower Clackamas River and Fish Creek have been combined into one fifth-field watershed called Middle Clackamas.

All of these watershed analyses recommend thinning plantations. Collawash/Hot Springs page 4-10, Lower Clackamas page 6-13, Fish Creek page 130.

2.2.6 **LSR Assessment** – Approximately 1237 acres are in late-successional reserves. The North Willamette LSR Assessment (1998) covers these units. This assessment recommends thinning plantations (p. 6-16).

2.2.7 **DESIRED FUTURE CONDITION**

The desired future conditions from the **Mt. Hood Forest Plan (**as amended) that are relevant to this proposal are summarized below.

Health	Forest stands have low levels of disease, damaging insect populations and storm damage. Four-92, FW-382; and Four-292, C1-22.
Growth	Forest stands are healthy and vigorous, and have growth rates commensurate with the sites potential (at a rate at which the mean annual increment has not culminated). Four-5, #44; and Four-86, FW-306; and Four-91, FW-372; and Four-90, FW-361.
Riparian & Aquatic	Riparian reserves contain the level of vegetative and structural diversity associated with mature and late-successional stand conditions. They supply coarse woody debris sufficient to sustain physical complexity and stability. They provide connectivity within and between watersheds. The riparian reserve connections provide unobstructed routes to areas critical to fulfilling life history requirements of aquatic and riparian-dependent species. NFP page B-11.
Late-successional Reserves	Late-successional reserves contain sufficient late-successional and old-growth forest ecosystems to meet the habitat needs for species such as the northern spotted owl. NFP page C-11.
Snags & Down Logs	Snags, down logs, and recruitment trees are well distributed across the landscape in sufficient quantity and quality to support species dependent upon these habitats. NFP page C-40.
Deer & Elk	The forest contains a mix of habitats including forage, thermal cover and optimal cover. Four-72, FW-202 to 207.
Landscape Health	Landscapes are healthy and productive and provide a mix of forest and non-forest habitats to support diverse populations of desired plant and animal species. Watersheds provide long-term sustained production of high quality water for fish and for on-Forest and off-Forest water users. Landscapes are actively managed. Four-2 to 5. The project is not within a wildland-urban interface and is not in a high fire hazard landscape.

Invasive Plants	Healthy native plant communities remain diverse and resilient, and damaged ecosystems are being restored. High quality habitat is provided for native organisms. Invasive plants do not jeopardize the ability of the National Forests to provide goods and services communities expect. The need for invasive plant treatment is reduced due to the effectiveness and habitual nature of preventative actions, and the success of restoration efforts. Appendix 1-1, ROD for Preventing and Managing Invasive Plants.
Timber Harvest Levels	Provide forest products consistent with the Northwest Forest Plan goal of maintaining the stability of local and regional economies now and in the future. Timber outputs come primarily from the Timber Emphasis (C-1) portion of the Matrix lands, with lesser amounts coming from the "B" land allocations of the Matrix. Minor amounts of timber may also come from Riparian Reserves or Late-successional Reserves where harvesting would be used as a tool to enhance resources and move the landscape toward the desired future conditions. Four-86 & Four-289 & NFP ROD pages 2 & 3.

2.3 Proposed Action

The action proposed by the Forest Service to meet the purpose and need is a timber sale that would thin and harvest wood fiber from approximately 4374 acres. Thinning would be designed to enhance diversity by applying variable density prescriptions. (See Alternatives section (3.2) for details.) The proposal would begin as soon as possible.

2.4 Public Involvement

A scoping process to request public input for this project began with a letter that was sent in May 2006 to request comments. The Forest publishes a schedule of proposed actions (SOPA) quarterly. The project first appeared in July 2006. A public meeting was held in Estacada on July 12, 2006 to discuss this project.

2.5 Issues

Three letters were received during the scoping process. Using the comments received the interdisciplinary team developed the following list of issues.

2.5.1 **Key Issue #1: Water Quality and Fisheries - Roads**

Based on the comments received, water quality and fish habitats are concerns for many people.

Issue statement: Temporary road construction may pose a risk to water quality and fish by contributing sediment to streams. Indicators for this issue include the length of new temporary roads and the acres of thinning accessed by each road (3.2.7), sediment from road construction (s. 4.2.4.1), effects to fish stocks of concern (4.2.8.4) and effects to hydrologic stability (4.2.6).

2.5.2 **Key Issue #2: Roads Closures and Decommissioning**

The proposed action does not include the decommissioning or closing of any open roads. (It does include the re-closing of roads used by loggers that are currently closed.) Based on the comments received, the effects of existing roads and open road density are concerns for many people. Comments have also been received from people that do not favor road closures or decommissioning.

Issue statement: Existing roads pose a risk to water quality, fish and many wildlife species by contributing sediment to streams and by allowing vehicles to drive on roads and disturb wildlife. Indicators for this issue include the length of roads closed (s. 3.3.2), the length of roads decommissioned (s. 3.3.2), open road density (s. 4.5.5.17), sediment from roads (s. 4.2.4.1), and effects to fish stocks of concern (s. 4.2.8.4).

Other Issues:

2.5.3 **Protection Buffers on Intermittent Streams**

Comments were received suggesting that protection buffers in intermittent streams should be 50 feet instead of the minimum of 30 feet. This has been included in Alternative C.

3.0 ALTERNATIVES

This chapter describes and compares the alternatives considered for this project. It includes a description of each alternative considered. Maps are in Appendix F. This section also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public.

3.1 Alternative A - No Action

Under the No-action Alternative, current management plans would continue to guide management of the area. No timber harvest or other associated actions would be implemented to accomplish project goals.

3.2 Proposed Action – Alternative B

The action proposed by the Forest Service to meet the purpose and need is a timber sale that would thin and harvest wood fiber. A silvicultural diagnosis has been developed including variable-density thinning designed to enhance diversity.

3.2.1 Variability – Thinning would be conducted to introduce structural diversity through variable spaced thinning. Diversity and variability would be introduced in several ways. This list is a summary of practices that are described below and in the design criteria.

- Leave tree spacing would vary within units and between units.
- Skips and gaps would be created in a variety of sizes. (Skips are areas where no trees would be removed; Gaps are areas where few or no trees would be retained. Gaps may also include areas of heavy thinning where 50 or fewer trees per acre are retained.)
- Leave trees would include minor species.
- Hardwood trees such as red alder and bigleaf maple are present in many stands. Where they are in wet areas they would be retained. In dry upland areas red alder and bigleaf maple would be retained where they are a minor species. In some areas these trees comprise a large component of the dry upland portion of a stand and in these cases some of the hardwoods would be removed to accomplish the desired thinning and some would be retained. There would be a greater emphasis for hardwood retention in LSRs than in matrix.
- Leave trees would include trees with the elements of wood decay.
- Leave trees would include some live trees where their crowns touch certain key snags.
- All non-hazardous snags would be retained.
- All existing down logs would be retained and key concentrations of woody debris in the older decay classes would be protected.
- Some snags and down logs would be created.

3.2.2 Streamside Riparian Reserves - For this project, riparian reserve widths are 180 feet for non-fish-bearing streams and 360 feet for fish-bearing streams (approximately 1225 acres). In riparian reserves the thinning would be designed to create conditions suitable for maximum diameter growth and enhance the potential for large wood recruitment. The intention is to enhance riparian reserves by accelerating the development of mature and late-successional stand conditions. Trees would be thinned to a relative density of 30.

Skips & Gaps - The protection buffers along streams would be considered skips. Gaps would be created within riparian reserves but they would be 100 feet or farther from a stream. Gaps would be 0.1 to 0.25 acre in size and would make up 0-10% of the available riparian component. For units 122 and 124, gaps would have similar size and distribution but would be 180 feet or farther from Big Creek.

3.2.3 Protection Buffers – The width of protection buffers would vary depending on site conditions. Streams adjacent to listed fish habitat would have 100-foot wide buffers (this applies to unit 208 adjacent to Trout Creek, and to unit 122 and 124 adjacent to Big Creek). All other perennial streams and intermittent streams within one mile of listed fish habitat would have 50-foot wide buffers (this applies to units 2-24, 28-36, 42, 46, 52-56, 60, 64, 80, 84, 86, 100-128, 142-224 and 274-350). Intermittent streams farther than one mile of listed fish habitat would have 30-foot wide buffers (this applies to units 26, 38, 40, 44, 48, 50, 58, 62, 66-78, 82, 88-98, 130-140 and 226-272).

Within 50 feet of the stream protection buffers, only low impact harvesting equipment such as, but not limited to, mechanical harvesters or skyline systems, which have minimal ground disturbance would be allowed. Mechanical harvesting equipment would be

required to operate on slash-covered paths. Trees in this zone would be directionally felled away from the protection buffers to minimize the disturbance to the forest floor. These requirements would maintain the indicators for sediment, stream temperature, stream bank condition, and large woody material indicators.

3.2.4 Other Riparian Reserves – There are some small seeps and wet areas that are too small to show on maps. Riparian features that are not perennial or intermittent streams such as seeps, springs, ponds or wetlands would be protected by the establishment of protection buffers that incorporate the riparian vegetation. Certain perennially wet features that are habitat for the aquatic mollusks *Lyogyrus* n. sp. 1 or *Juga (O.)* n. sp. 2 would be protected by the establishment of 50-foot wide protection buffers. The protection buffers along ponds, seeps and wet areas may be considered skips.

3.2.5 Late-Successional Reserve - In late-successional reserves (approximately 1237 acres), the thinning would be designed to accelerate the development of mature and late-successional stand conditions. Trees would be retained at a relative density of 20 to 40. Where riparian reserves overlap late-successional reserves, the design features for riparian reserves would take priority in the riparian reserve component. In late-successional reserves (including where riparian reserves overlap) trees would not be cut if they are greater than 20 inches in diameter (at a height of 4.5 feet). If larger trees need to be cut for skyline corridors, skidtrails, landings or temporary roads they would be left in place. Hardwood trees across a range of size classes would be favored, including large trees that occupy mid-canopy and higher positions.

Skips & Gaps - Skips would be created that would vary in size and would comprise a minimum of 10% of each unit. Skips would be 0.25 to 1.25 acres or larger where appropriate based on site-specific features. Where riparian reserves overlap late-successional reserves, the protection buffers adjacent to streams may be counted as skips. Gaps would be created on 3 to 10% of each unit: Openings would be 0.1 to 0.25 acre in size would have 6 or fewer trees and heavy thinning (25 to 50 trees per acre) would vary in size from 0.25 and 1.25 acres.

3.2.6 Matrix - In the matrix (approximately 2188 acres), thinning would be designed to increase health and growth that results in larger wind-firm trees. Trees would be retained at a relative density of 25 to 35.

Skips & Gaps - Skips would be created that would vary in size and would comprise up to 5% of each unit. Where riparian reserves cross through matrix, the protection buffers adjacent to streams may be counted as skips. Gaps would be created within matrix; they would be 0.1 to 0.25 acre in size and would make up 0-3% of each unit's matrix component.

3.2.7 Roads –

In the following sections, the terms obliteration and decommission are used. For this document, the term obliteration is used for temporary roads to describe the type of closure that is standard practice now. After use, temporary roads would be bermed at the entrance, would be decompacted and roughened with the jaws of a loader or excavator, and would have debris (rootwads, slash, logs or boulders) placed near the entrance and along the first portion of the road. In this document, the term decommission, is used for Forest Service system roads to describe the process of removing them from the system. They would be treated similarly as described for temporary roads above. Decommissioning sometimes includes the removal of culverts where appropriate. For this project, no culverts on live streams would be removed on the roads proposed for decommissioning. Neither term carries any implication about future use of the roadway. It is possible that obliterated or decommissioned roads may be reopened and used again where appropriate or used for trails.

3.2.7.1 Temporary Roads

Temporary roads are roads that are built by timber operators to access landings and are closed upon completion of logging until they are needed again. They are not considered part of the Forest's system of permanent roads. The units proposed for thinning are plantations, many of which were accessed by temporary roads during the original clear cut logging. Existing temporary roads were assessed to determine whether they are needed for the current thinning proposal. These existing temporary roads are closed and in some cases have vegetation, brush and trees growing on them. Even though all of the proposed units were clear cut logged before, there are cases where it is not feasible or desirable to use the same roads, landings or logging method used before. To protect the residual trees and soil and water resources, in some cases new temporary roads are proposed to access the landings where the existing system roads and old temporary roads do not adequately access the ground. The unit tables show the lengths of road for each unit and the unit maps in Appendix F show their location. In some cases a road crosses through one unit to access an adjacent unit. In these cases the road is listed with the unit that requires the road for its logging. If needed for future management, a future EA would address the need for and the impacts of reopening obliterated roads.

Approximately 6.8 miles of old existing temporary roads would be reopened. They would be obliterated upon completion of the harvest units they access.

Approximately 0.7 miles of temporary roads would be constructed on old existing skid trails. They would be obliterated upon completion of the harvest units they access.

Approximately 2.6 miles of new temporary roads would be constructed. They would be obliterated upon completion of the harvest units they access.

Comments were received requesting information about how many acres were accessed by the new temporary roads.

3.2.7.2 **Area Accessed by New Temporary Roads**

Unit	Length (ft.)	Acres Accessed	Unit	Length (ft.)	Acres Accessed	Unit	Length (ft.)	Acres Accessed
44	300	3.3	162	320	4.3	284	240	7.4
52	240	8.8	168	920	13.7	318	580	16.3
58	260	25.3	178	550	3.8	322	780	4.8
80	635	6.5	182	460	9.5	328	210	23.6
126	1000	24.0	218	480	13.3	338	780	3
130	590	17	238	850	22.4	346	1730	3.8
146	630	11	256	110	0.6	348	1250	3.5
160	260	4.5	264	310	4			

3.2.7.3 System Roads

Many system roads are closed with berms or other devices. They would be temporarily reopened and would be reclosed upon completion of the harvest units they access. The following roads (approximately 6 miles) have berms: 4620-011, 4620-013, 4620-016, 4620-025, 4620 (near unit 270), 4620-150, 4620-174, 4620-180, 4621-017, 4621-018, 4621-019, 4621-020, 4621-022, 4621-027, 4621-125, 4621-140, 5410-016, 5412-012, 6320-021, 6320-022.

Road Repair and Stabilization

To facilitate safe use, several roads are in need of repair.

Note: Road 4620 has two unconnected sections due to previous decommissioning in a middle section.

Road 4620 beginning at junction with 6322 - Grind pavement and convert to gravel from mile posts 1.9 to 2.3, 2.5 to 3.1, 3.6, to 6.5. Deep patch repairs are needed at mile posts 4.0, 4.1, 4.15, 4.25, 4.3, 4.35, 5.1, 5.35, 5.4, 5.5, 5.7 to 5.9, 6.2, 6.3, and 6.4.

Road 4620 beginning at Highway 224 – polyfabric and leveling at mile post 5.2. (Repairs needed at mile posts 1.1, 1.5, and 2.6 will be made by operator of Slip Thin timber sale.)

Road 4620340 would have 2 inches of gravel added.

Road 4621 – deep patch repair and fill slope repair at mile post 0.

Road 5400 – deep patch repair at mile posts 0.7 and 1.1.

Road 5410 – Grind pavement and convert to gravel from mile posts 0 to 5.8 except at stream crossings. Stump removal mile posts 1.8, 2.2, 2.4, 2.6 and 3.3. Deep patch repair – mile posts 0.7, 2.9, 3.1, 3.5, 5.37 and 5.7. Spot rocking at mile post 7.3. Install cross drain culvert at mile post 5.3.

Road 5411 – Deep patch repairs at mile posts 2.8, 2.9 and 3.7.

Road 6300 – Overlay with polyfabric at mile posts .05, .1, .5, .9, 1.3, 2.9, 3.1, 3.2 and 3.4.

Road 6340 – Clean culvert catch basin at mile post 2.

Road 7000 – Deep patch repair at mile posts 0.2 and 0.3. Overlay polyfabric at mile posts 0.5, 0.7, 0.9, 1.4, 2.1 to 2.3, 2.4 to 2.5 and 2.9.

Road 7010 – Overlay polyfabric at mile posts 0.05, 0.35, 0.45, 0.7, 0.8, 1.0, 1.1, and 1.2 to 1.3. Leveling course at mile posts 0.9, 1.0, 1.1, and 1.2 to 1.3.

In addition, most haul roads would receive road maintenance including ditch and culvert cleaning and brushing. Gravel roads would be bladed and shaped where needed.

3.2.8 **Other Project Details -**

Fuels treatment would be minimal: where a mechanical harvester is used, branches would be crushed under the equipment. Elsewhere there would be no fuels treatment except the piling and burning of incidental quantities of slash and debris at landings.

3.2.9 **Unit Table Alternative B**

Unit	Acres	LSR	Ground Based Acres	Skyline Acres	Helicopter Acres	Existing Temporary Roads Reused (ft.)	Temporary Road Constructed on Skidtrails (ft.)	New Temporary Roads (ft.)
2	24.8	Yes	5.1		19.7			
4	12.6	Yes	1.5	11.1				
6	8.7	Yes	3.6	5.1				
8	46.4	Yes	42.3	4.1				
10	17.8	Yes	17.8					
12	22.2	Yes	22.2			550		
14	97.6	Yes	97.6			900		
16	12.3	Yes	12.3					
18	1	Yes	1					
20	16	Yes	16					
22	18.7	Yes	18.7					
24	6.6	Yes	6.6					
26	76.5	Yes			76.5			
28	7.2	Yes			7.2			
30	9.8	Yes	7.1	2.7				
32	21.2	Yes	7.7		13.5			
34	24.7	Yes		24.7				
36	46.1	Yes			46.1			

Unit	Acres	LSR	Ground Based Acres	Skyline Acres	Helicopter Acres	Existing Temporary Roads Reused (ft.)	Temporary Road Constructed on Skidtrails (ft.)	New Temporary Roads (ft.)
38	22.5	Yes		22.5				
40	7.4				7.4			
42	80	Yes		80				
44	38.1		4.4	33.7		350	330	300
46	12.7		12.7					
48	26.6		26.6					
50	46.4		33.6	12.8				
52	19.9		0	19.9		990		240
54	1.9	Yes		1.9				
56	33	Yes	19	14				
58	28.6		3.3	25.3			450	260
60	23.8	Yes		23.8				
62	33.8			33.8		2200		
64	55.1		20.6	34.5				
66	41.6	Yes		41.6				
68	34.3	Yes		34.3				
70	10	Yes		10				
72	2.3	Yes		2.3				
74	1.9		1.9					
76	14.4		6.6		7.8			
78	39.7	Yes		39.7				
80	20.2	Yes	7.2	13			265	635
82	30.3		27.5	2.7				
84	4.7	Yes	4.7					
86	19.4	Yes		19.4				
88	39.8		39.8			900		
90	26.8		16.5		10.3	580		
92	7.5		7.5					
96	43.7		0	22.5	21.2			
98	65.1		34.1	31				
100	39.5	Yes	6.7	32.8		320	200	
102	12.5		12.5	0				
104	63.8		63.8	0				
106	18.3	Yes			18.3			
108	37.2		15		22.2	320		
110	12.6				12.6			
112	9.7		9.7					
114	28.1		28.1					
116	28.6		28.6					
118	60.1		16.6	30.8	12.7			

Unit	Acres	LSR	Ground Based Acres	Skyline Acres	Helicopter Acres	Existing Temporary Roads Reused (ft.)	Temporary Road Constructed on Skidtrails (ft.)	New Temporary Roads (ft.)
120	27.1		27.1					
121	12.5	Yes	12.5					
122	27.7		25.1	2.6		1850		
124	21.9		21.9			950		
126	24		9.6	14.4	0			1000
128	30		17.4	12.6		370		
130	22.8		5.8	17		0	250	590
132	59.4		59.4	0		0		
134	20.6		2.3	2.5	15.8	320		
136	65.7				65.7			
138	33.9		33.9			690		
140	27.7		27.7					
142	22.2		13.5	8.7		685	210	
144	7.4				7.4			
146	13.4	Yes	2.4	11				630
148	15.4		15.4					
150	21.9		21.9					
152	49.7		39.7	10		1220		
154	17.5				17.5			
156	5.9				5.9			
158	20.3		20.3	0				
160	13.4		9.6	3.8		480		260
161	5.4	Yes	4.7	0.7				
162	37.8		33.5	4.3		1050		320
164	32.5	Yes	6.5		26			
166	16.9		16.9					
168	34.5		34.5			740		920
170	23.8		23.8	0		0		
172	18.6		18.6	0		480		
174	12.3		12.3					
176	17.1		17.1					
177	4.2	Yes	4.2					
178	12.5	Yes		12.5	0		1150	550
180	32.4		32.4	0		580		
182	29.2		15.5	13.7	0	370		460
184	1.4				1.4			
186	14.9			14.9	0			
188	48.4		1.9	39	7.5	0		
190	23.2		21	2.2				
194	28				28			

Unit	Acres	LSR	Ground Based Acres	Skyline Acres	Helicopter Acres	Existing Temporary Roads Reused (ft.)	Temporary Road Constructed on Skidtrails (ft.)	New Temporary Roads (ft.)
196	19.8		2	0	17.8			
202	14.1		9.1	5				
204	4.7		4.7					
206	41.1		18.7	14.1	8.3	850		
208	20.5				20.5			
210	2.2	Yes			2.2			
212	17.9		17.9	0		200		
214	10.7	Yes	10.7					
216	23.9	Yes	5.7	18.2		1000		
218	17.8		16.3	0	1.5	210		480
220	2.4	Yes		0.9	1.5			
222	19.5		11.7	7.8				
224	42.8		17.3	25.5		0	440	
226	16.3			14.5	1.8			
228	8.1		0	8.1				
230	19.7		4.5	15.2		640		
232	2.1		2.1					
234	15.8		12	3.8			210	
236	18.5		13.2	5.3				
238	26.2		8	18.2		1380		850
240	23.7		23.7					
242	30.6		7.6	23				
244	15.3			8.2	7.1			
246	34.5		7.6	16.6	10.3			
248	29.3		3.6	5.4	20.3	270		
250	17.4		4.2	0	13.2			
252	19.2			0	19.2			
254	13.5		3.5	0	10			
256	34.5		14.2	20.3		1750		110
258	37.1		15.9	21.2				
260	35.6		27.5	5.3	2.8	230		
262	25.4		11	14.4				
264	17.7		10.6	7.1		1320		310
266	34.4		22.2	6.1	6.1			
268	19.8		9.9		9.9	580		
270	21.1		9.9	6.8	4.4			
272	5.6			5.6				
274	27.8		27.8	0		740		
276	46.7		13.6	27.3	5.8		160	
278	2.2			2.2				

Unit	Acres	LSR	Ground Based Acres	Skyline Acres	Helicopter Acres	Existing Temporary Roads Reused (ft.)	Temporary Road Constructed on Skidtrails (ft.)	New Temporary Roads (ft.)
280	51.4		44.7	6.7		420		
282	12.4		12.4					
284	27		19.6	7.4				240
286	3.9		3.9					
288	16.6		12.3	4.3				
290	18.1		18.1					
292	6.4		6.4	0				
294	9.7		3.6	6.1				
296	13.5		4.8	3.5	5.2			
298	21.6		21.6			280		
300	30.5		16.9	13.6				
302	8.8		2	6.8				
304	22		10	12				
306	13.9			13.9				
308	56.8		2.6	54.2				
310	36.4		26.1	0	10.3			
312	57		55.1		1.9			
314	34.8		34.8	0				
316	7.3		7.3			950		
318	22.8		22.8	0				580
320	18.6				18.6			
322	29.8	Yes	17.6	12.2		500		780
324	34.1	Yes	24.2		9.9	580		
326	33.1	Yes			33.1			
328	36	Yes	34.3		1.7	2160		210
330	19.1	Yes	1.5	17.6				
332	35.2	Yes	31.5	0	3.7			
334	1.8	Yes	1.2	0.6				
336	16.2		3.3	12.9		270	110	
338	43.1		40.1	3		1530		780
340	44.8		44.8	0				
342	26.5		14.2	12.3		970		
344	40.9		40.9	0		790		
346	34.9	Yes	31.1	3.8		850		1730
348	29.7	Yes	18.9	10.8		420		1250
350	58.6	Yes	2	0	56.6			
	4374.4	1237	2312.2	1307.7	754.4	35785	3775	13485
			52.9%	29.9%	17.2%	6.8 miles	0.7 miles	2.6 miles

3.2.10 **Mitigation –** Alternative B would be implemented with the list of Best Management Practices and Design Criteria found in section 3.5. These are standard practices that implement Forest Plan standards and guidelines. No resource impacts were found that would require mitigation for Alternative B.

3.3 Alternative C

Alternative C involves thinning the same units described for Alternative B. Alternative C would not construct any new temporary roads; therefore some of the logging methods for the affected units would be changed. Alternative C also includes road closures and road decommissioning. Intermittent streams farther than one mile of listed fish habitat would have the protection buffers increased from 30 feet to 50 feet. Alternative C would be similar to Alternative B in terms of variability, riparian reserve and LSR management and skips and gaps. Sections 3.2.1, 3.2.2, 3.2.4, 3.2.5, 3.2.6, 3.2.7.3 and 3.2.8 are applicable to both Alternatives B and C. Section 3.2.3 is applicable to Alternative C except for the discussion of 30-foot protection buffers.

3.3.1 **Roads** –

3.3.1.1 Temporary Roads

Approximately 6.8 miles of old existing temporary roads would be reopened. They would be obliterated upon completion of the harvest units they access.

Approximately 0.5 miles of temporary roads would be constructed on old existing skid trails or areas otherwise already heavily disturbed. They would be obliterated upon completion of the harvest units they access.

3.3.1.2 System Roads

Many system roads are closed with berms or other devices. The same roads listed for Alternative B would be temporarily reopened with Alternative C.

To facilitate safe use, several roads are in need of repair. The repairs listed for Alternative B would be repaired with Alternative C.

Approximately 4.5 miles of roads would be decommissioned, 43.2 miles of roads would be bermed, 8.9 miles would be closed year-round with new gates and one existing gate that is only closed seasonally would be changed to a year-round closure affecting 6.5 miles. The table below shows these closures. In some cases more than one numbered road would be closed by the placement of one berm or gate. In the table below, some of the decommission roads are already closed by berms and would not be “new” closures. For berms and gates, the miles listed indicate the miles of open roads that would be closed by each closure device (tributary roads that are already closed behind the new closure are not included).

3.3.2 Road Closures For Alternative C

Road #	Miles	Type	Road #	Miles	Type
4620-011	0.13	Decommission	5410-019	0.25	Berm
4620-013	0.28	Decommission	5410-020	0.25	Berm
4620-016	0.26	Decommission	5410-120	3.00	Berm
4620-018	0.11	Decommission	5410-134	0.82	Berm
4620-022	0.22	Decommission	5410-136	0.36	Berm
4620-025	0.35	Berm	5411-011	0.18	Berm
4620-130	1.27	Berm	5411-013	0.54	Berm
4620-140	0.41	Berm	5411-162	0.83	Berm
4620-160	0.16	Decommission	5411-170	0.77	Berm
4620-170	0.75	Berm	5411-180	1.68	Berm
4620-174	0.54	Berm	5411-190	0.92	Berm
4620-187	0.38	Berm	6320	1.99	Berm past junction with 6320180
4620-190	1.32	Berm	6320-018	0.11	Decommission
4620-260	3.98	Berm	6320-022	0.65	Decommission
4621-015	0.17	Decommission	6320-024	0.11	Decommission
4621-018	0.15	Decommission	6320-120	3.41	Gate – closed year-round
4621-022	0.27	Decommission	6320-170	2.18	Gate – closed year-round
4621-027	0.24	Decommission	6320-180	1.99	Berm
4621-028	0.18	Decommission	6321	6.52	Existing Gate, change to year-round closure
4621-029	0.18	Decommission	6322-014	0.13	Decommission
4621-125	0.29	Berm	6322-150	0.47	Berm
4621-150	2.17	Berm	6330-013	0.12	Decommission
4621-180	1.03	Berm	6330-019	0.24	Decommission
4621-200	0.79	Berm	6330-160	2.01	Berm
4622-115	0.57	Berm	6330-195	0.37	Berm
4622-120	0.69	Berm	6330-200	3.39	Berm
4622-140	0.35	Berm	6330-240	0.38	Berm
4622-150	0.24	Berm	6340-032	0.15	Berm
4630-031	0.5	Berm	6340-120	0.34	Berm
4630-120	0.5	Berm	6340-150	0.93	Berm
4631-013	0.24	Berm	6340-164	0.64	Berm
4631-016	0.2	Berm	6340-170	2.16	Berm
4645-120	0.86	Berm	7010-019	0.23	Decommission
4645-135	0.57	Berm	7010-120	1.81	Gate – closed year-round
5410-011	0.81	Berm	7015-120	1.54	Gate – closed year-round
5410-012	0.56	Decommission			

3.3.3 Unit Table - Alternative C

This table only shows the units that are different than the Alternative B table.

Unit	Acres	Ground Based Acres	Skyline Acres	Helicopter Acres	Existing Temporary Roads Reused ft.)	Temporary Roads Constructed on Skidtrails (ft.)
44	38.1	4.4	33.7		350	330
52	19.9	0	11.1	8.8	990	
58	28.6	3.3	0	25.3		0
80	20.2	7.2	13			265
126	24	0	0	24		
130	22.8	5.8	0	17	0	0
146	13.4	2.4	11		0	
160	13.4	9.6	3.8		480	
162	37.8	33.5	0	4.3	1050	
168	34.5	34.5			740	
178	12.5		8.7	3.8		600
182	29.2	15.5	13.7	0	370	
218	17.8	16.3	0	1.5	210	
238	26.2	3.8	0	22.4	1380	
256	34.5	14.2	19.7	0.6	1750	
264	17.7	10.6	7.1		1320	
284	27	19.6	7.4			
318	22.8	22.8	0			
322	29.8	17.6	7.4	4.8	500	
328	36	34.3		1.7	2160	
338	43.1	40.1	0	3	1530	
346	34.9	31.1	0	3.8	850	
348	29.7	18.9	7.4	3.5	420	
	4374.4	2298.4	1200.3	875.7	35785	2525
		52.5%	27.4%	20.0%	6.8 miles	0.5 miles

3.3.4 Mitigation – Alternative C would be implemented with the list of Best Management Practices and Design Criteria found in section 3.5. These are standard practices that implement Forest Plan standards and guidelines. No resource impacts were found that would require mitigation for Alternative C.

3.4 Other Alternatives Considered

3.4.1 Comments were received suggesting that the project is too big to do an adequate analysis and that it should be reduced in size or split into multiple EAs. The size of this project was carefully considered along with the options of developing multiple EAs for the same group of plantations. The line officer decided to proceed with the current project size because

there would be increased planning efficiencies and to enable better cumulative effects analysis.

3.4.2 The LSR Assessment contains a discussion of goals for coarse woody debris and snags. The goal is to eventually have 15 to 30 snags per acre and 10 to 15 percent of the ground covered by down logs. The existing condition for plantations is well below these levels. Achieving these goals with this proposed action is not considered a viable option.

The cost of girdling and felling trees is estimated at up to $3,900 per acre. There would also be a reduced economic viability of the thinning timber sale because up to 75 additional trees per acre would have to be left after thinning. If the strategy of creating all of the dead and down wood at once were adopted, all of the LSR thinning would become unviable and the units would be deleted from the thinning timber sale, defeating the equally important long-term goal of having large live trees in LSRs. There is no source of funding to accomplish this work outside of the timber sale program.

3.5 Best Management Practices (BMPs) and Design Criteria Common to All Action Alternatives

These are practices that are part of each action alternative. The effects and benefits of these practices are included in the analyses of effects in s. 4. In some cases they are standard practices that are used in all similar projects and in other cases they are specifically tailored to this project based on site-specific factors such as the underlying land allocation and associated standards and guidelines.

1. **Seasonal restrictions**

1.1 **Soils:** No operation of off-road ground-based equipment would be permitted between November 1 and May 31. This restriction applies to the ground-based portions of harvest units. It also applies to ground-based equipment such as harvesters or equipment used for fuels treatment, road construction, road stabilization or landing construction. This restriction may be waived if soils are dry or frozen or if operators switch to skyline or other non-ground based systems. *This is a BMP and implements Forest Plan standards and guidelines FW-022 and FW-024.*

1.2 **Peregrine Falcon:** No mechanized logging, road building, log loading, yarding, slash piling or other management activities that produce sound above the ambient noise level of the area would be permitted from January 15th to July 31st. This applies to units 132 to 161, 204 to 210, 224, 244 and 262. In addition, helicopter use is also restricted below 1500 feet Above Ground Level. These restrictions may be waived if the nest site is unoccupied or if nesting efforts fail and there is not possibility of re-nesting. Documentation of nesting failures can be finalized no earlier than June 30th due to the possibility of re-nesting.

1.3 **Deer and Elk Winter Range:** No harvest operations, road construction, use of motorized equipment or blasting would be permitted in Crucial and High Value winter range areas between December 1 and March 31. The restriction would be waived in the high value zone if snow accumulation levels are less than 12 inches or if it is determined that the area is not being used by elk. Units 2-24, 30, 34, 100-154, 158-178, 208, 210, 212-220, 274-306, 310-326 and 330-348 are in the crucial zone and units 156, 204 and 206 are in the high value zone.

No log haul or snow plowing would be permitted between December 1 and March 31. This applies to all units. This *implements Forest Plan standard and guideline FW-211 and a memorandum of understanding with Oregon Department of Fish and Wildlife.*

1.4 **Owls:** Except for hauling and the removal of hazard trees to protect public safety, no activity shall take place within the disruption distance of a known activity center during the March 1 to July 15th critical nesting period, unless the habitat is known to be unoccupied or there is no nesting activity, as determined by survey to protocol. The distance and timing may be modified by the unit wildlife biologist according to site-specific information. The disruption distances vary from 35 to 440 yards based on the type of equipment. See Biological Opinion for details. The units that are partially within 440 yards include 188, 190, 208, 210, 226, 252, 254, 330, 332 and 340. The use of large helicopters (other than KMAX) and burning would be restricted for these units. Restrictions on chainsaws or heavy equipment use would only apply to portions of units 208, 210 and 340. The use of smaller helicopters typically used for this type of thinning would be restricted for units 208 and 210.

2. **Snags & wildlife trees:** To enhance diversity, variable-density thinning would include the retention of snags and wildlife trees.
   - Snags would be retained in all units where safety permits.
   - To increase the likelihood that key snags would be retained, they may be included in skips or green trees would be marked as leave trees where their live crowns touch certain key snags.
   - Certain live trees would also be selected as leave trees that have the "elements of wood decay" as described in the DecAid advisor. This may include trees with features such as dead tops, broken tops and heart rot. Five to 12 live trees per acre with "elements of wood decay" would be retained where available. They should be in the largest size class available. The lower range would be left in matrix areas and the higher in LSRs and Riparian Reserves. They may be retained in skips.
   - If funding becomes available, some live trees would be treated to provide future snags and future cavities. Techniques would vary and may include but would not be limited to topping and inoculation with fungus. **Five trees per**

acre would be treated in LSR units and two per acre would be treated elsewhere. If funding is limited, the LSR units would be the priority.

3. **Down Woody Debris:**
   - Old down logs currently on the forest floor would be retained. Prior to harvest, contract administrators would approve skid trail and skyline locations in areas that would avoid disturbing key concentrations of down logs or large individual down logs where possible.
   - Additional down woody debris would be generated by the timber sale. This would include the retention of cull logs, tree tops, broken logs and any snags that would be felled for safety reasons.
   - If funding becomes available, some trees would be felled or girdled to provide future habitat. **In the LSR units, five trees per acre would be girdled and two per acre would be felled. Elsewhere two trees per acre would be treated by with either method.** If funding is limited, the LSR units would be the priority. *This implements Forest Plan standards and guidelines as amended.*

4. **Erosion:** To reduce erosion from timber sale activities, bare soils would be revegetated or covered with slash or other debris. Grass seed and fertilizer would be evenly distributed at appropriate rates to ensure successful establishment. Mulch may be used on slopes greater than 20%. Effective ground cover would be installed prior to October 1 of each year. *This is a BMP and implements Forest Plan standard and guideline FW-025.*

   Native plant materials are the first choice in revegetation of bare soils. Non-native, non-invasive plant species may be used if native plant materials are not available or as an interim measure designed to aid in the re-establishment of native plants. Non-native invasive plant species would not be used. *This implements Forest Plan standard and guideline FW-148 and standard 13 of the Regional Invasive Plants Record of Decision.*

   Grass seed would preferably be certified by the states of Oregon or Washington or grown under government-supervised contracts to assure noxious weed free status. In certain cases, non-certified seed may be used if it is deemed to be free of Oregon State Class A & B noxious weeds. *This implements Forest Plan standard and guideline FW-148.*

   When **straw and mulch** are utilized, it would originate from the state of Oregon or Washington fields, which grow state-certified seed, or grown under government-supervised contracts to assure noxious weed free status, or originate in annual ryegrass fields in the Willamette Valley. In certain cases, straw or hay from non-certified grass seed fields may be used if is deemed to be free of Oregon State Class A & B noxious weeds. *This implements Forest Plan standard and guideline FW-148, and standard 3 of the Regional Invasive Plants Record of Decision.*

5. **Riparian Reserves –** Specific Riparian practices are described in the Alternative section (s. 3.2.1 to 3.2.4). *These are BMPs and implement NFP standards and guidelines, pages C-30-32. They also implement the guidance of the Northwest Forest Plan Temperature TMDL Implementation Strategies (9/9/05). Refer to Fisheries Biological Assessment for details of stream and riparian management.*

6. **Logging Systems –** *These are BMPs and implement Forest Plan standard and guideline FW-022.*

6.1 Avoid the use of ground based tractors or skidders on slopes generally greater than 30% and mechanical harvesters on slopes greater than 40% because of the risk of damage to soil and water resources.

6.2 Mechanical harvesters and forwarders would be required to work on a layer of residual slash and the operator would place slash in the harvester path prior to advancing the equipment.

6.3 In some units, ground-based logging is proposed for areas that have been previously harvested with ground-based systems. Existing temporary roads, landings and skid trails would generally be reused where feasible. There may be instances where it is not desirable to use an existing skid trail and in such cases, if a skid trail is needed in the area, a new skid trail would be located that minimizes the alteration of surface hydrology.

6.4 In some units, ground-based logging at the time of the original harvest has resulted in detrimental soil conditions that exceed Forest Plan standards. In these areas there is a greater urgency to reuse existing temporary roads, landings and skid trails. Some new skid trails might be needed as described above, but where detrimental soil conditions exceed 20%, only existing skid trails would be used and only those existing skid trails that do not alter surface hydrology.

6.5 Where existing detrimental soil conditions exceed Forest Plan standards, existing temporary roads and landings that are reused, would be obliterated and revegetated.

7. **Roads –** *These are BMPs.*

7.1 During the wet season, log haul would only be permitted on asphalt and rocked roads when conditions would prevent sediment delivery to streams.

7.2 If landings are needed in riparian reserves, they would be located on existing roadways that do not require expansion of the road prism or on existing landings that may require only minimum reconstruction (clearing vegetation, sloping for drainage, or surfacing for erosion control purposes) to be made suitable for use.

7.3 The re-opening of old temporary roads is encouraged over the construction of new roads if they are located in areas that would prevent sediment delivery to streams.

7.4 Newly constructed roads would not cross or be constructed parallel to stream channels. They would be built on ridge tops, benches, or gentle slopes and only where conditions would prevent sediment delivery to streams.

7.5 No road construction is proposed within riparian reserves.

7.6 Temporary roads would normally be constructed, used and obliterated in the same operating season. If this is not possible, due to fire season restrictions or other unforeseen delays, the road would be winterized prior to the end of the normal operating season by out-sloping, water-barring, effectively blocking the entrance, seeding, mulching and fertilizing.

8. **Invasive species:** *This implements Executive Order 13112 dated February 3, 1999, and standards and guidelines of the Regional Invasive Plants Record of Decision.*
   - All off-road equipment is required to be free of soil, seeds, vegetative matter, or other debris that could contain or hold seeds prior to coming onto National Forest lands. Timber sale contracts and service contracts would include provisions to minimize the introduction and spread of invasive plants. These provisions contain specific requirements for the cleaning of off-road equipment.
   - Gravel or rock used for roads would come from weed free sources.
   - Road blading, brushing and ditch cleaning in areas with high concentrations of invasive plants would be conducted in consultation with invasive plant specialists.
   - To minimize the risk of spread of false brome at one known site in the project area: (1) Roadside mowing would occur in the spring before the grass flowers and produces seed. (2) Mowing equipment would be cleaned thoroughly afterwards to prevent spreading false brome seeds or plants.

9. **Firewood** would be made available to the public at landings where feasible. *This is an opportunity to contribute to Forest Plan - Forest Management Goal #19, and provide forest products consistent with the NFP goal of maintaining the stability of local and regional economies.*

10. **Monitoring**: *This Implements Forest Plan and NFP monitoring requirements.*

    Prior to advertisement of a timber sale, a crosswalk table would be prepared to check the provisions of the Timber Sale Contract and other implementation plans with this document to insure that required elements are properly accounted for.

    During implementation, Timber Sale Administrators monitor compliance with the Timber Sale Contract which contains provisions for resource protection including

but not limited to: seasonal restrictions, snag and coarse woody debris retention, stream protection, erosion prevention, soil protection, road closure and protection of historical sites.

Post harvest reviews would be conducted where needed prior to post harvest activities such as slash treatment and firewood removal. Based on these reviews, post harvest activities would be adjusted where needed to achieve project and resource objectives.

Monitoring of noxious weeds and invasive plants would be conducted where appropriate to track changes in populations over time and corrective action would be prescribed where needed.

Monitoring is also conducted at the Forest level. For example, water quality is monitored for both temperature and turbidity at several locations across the Forest. Monitoring reports can be found on the Forest's web site at http://www.fs.fed.us/r6/mthood under Forest Publications.

3.6 Comparison of Alternatives

This section provides a summary of the effects of implementing each alternative and a comparison with the purpose and need. Information in the table is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives.

	Alternative A No Action	**Alternative B**	**Alternative C**
Issue #1 Affect of Roads on Water Quality and Fish	No road construction. No impacts to water quality from road construction.	Temporary roads: new construction - 2.6 miles, construction on existing disturbance – 0.7 mile, reconstruction - 6.8 miles of existing temporary roads.	Temporary roads: new construction – none, construction on existing disturbance – 0.5 mile, reconstruction - 6.8 miles of existing temporary roads.
Key Issue #2: Roads Closures and Decommissioning	none	none	4.5 miles decommission, 43.2 miles berm, 8.9 miles new year-round gates, 6.5 miles with existing gate changed to year –round closure.
Acres of Riparian Reserve Enhanced	0	1,225	1,225
Acres of Late-successional Reserve Enhanced	0	1,237	1,237
Acres with Diversity Enhanced	0	4,374	4,374
Acres of Stand Growth and Productivity Improved In Matrix	0	2,188	2,188

Approximate Timber Output (million board feet)	0	43.7	43.7
Economic Viability Benefit/Cost ratio	0	2.29	2.15

4.0 ENVIRONMENTAL CONSEQUENCES

This section summarizes the physical, biological, social and economic environments of the affected area and the potential changes to those environments due to implementation of the alternatives. It also presents the scientific and analytical basis for comparison of alternatives presented in the chart above.

4.1 Cumulative Effects

4.1.1 A discussion of cumulative effects is included for each resource where appropriate. Cumulative effects are impacts on the environment that result from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions. If the proposed action would have little or no effect on a given resource, a more detailed cumulative effects analysis is not necessary to make an informed decision. Cumulative effects analysis was guided by the June 2005 Memorandum on cumulative effects from the Council on Environmental Quality.

4.1.2 The land area and the time scale used for cumulative effects analysis varies by resource. The analysis for each affected resource looks at the condition of the resource considering effects from past timber sales, road construction, fires and other disturbances. Past actions are included in the baseline for the cumulative effects analysis and a list of past actions is contained in the analysis file. The analysis includes the effect of roads and permanent openings such as rock quarries and power lines where appropriate. The analysis also includes other recent or planned timber sales that overlap the analysis area where appropriate. The analysis considers the impact of activities on other ownerships where appropriate.

4.2 WATER QUALITY AND FISHERIES

This section addresses Issue #1 and the riparian purpose and need. This section also addresses effects to water quality and fisheries from all components of the alternatives including roads and logging. It also includes an assessment of the Aquatic Conservation Strategy and a discussion of Best Management Practices. The Fisheries Biological Assessment is incorporated by reference and summarized below.

4.2.0.1 **Issue #1:**

Temporary road construction may pose a risk to water quality and fish by contributing

sediment to streams. Indicators for this issue include the length of new temporary roads and the acres of thinning accessed by each road (s. 3.2.7), sediment from road construction (s. 4.2.4.1), effects to fish stocks of concern (s. 4.2.8.4) and effects to hydrologic stability (s. 4.2.6). Also refer to design criteria #1.1, 5, 6 and 7. Section 4.2.8 summarizes the Biological Assessment. The rationale for proposed road construction can be found in section 3.2.7.

4.2.0.2 **Purpose and need discussion**

One of the aspects of the purpose and need (s. 2.2.1) is to enhance riparian reserves. Alternatives B and C would equally meet this objective while Alternative A would not. A discussion of riparian resources is in section 4.2.7.6. A general discussion of stand health and growth in section 4.3.1 and 4.3.2 are also relevant to trees growing in riparian reserves.

4.2.1 **Existing Situation**

Watershed terminology and delineation has changed since the Mt. Hood Forest Plan was written. The Major Drainages referred to in Forest Plan standard and guideline FW-063 are now called Watersheds (5th field) or subwatersheds (6th field). In standard and guideline FW-064, the new terminology for subbasin is now drainage (7th field watershed).

The project is located within the Middle Clackamas River and Collawash River 5th field watersheds of the Clackamas River Basin. Portions of these watersheds are designated as Tier I key watersheds under the Northwest Forest Plan because they contain crucial refugia for at-risk fish species.

The Middle Clackamas River 5th field watershed is 138,598 acres in size and contains 53.1 miles of anadromous streams, 141.7 miles of resident fish bearing streams, and approximately 763 miles of non-fish bearing streams. The watershed is comprised of the mainstem Clackamas River and watersheds that drain into the Clackamas from North Fork Reservoir to the confluence of the Collawash River. The major subwatersheds that contribute to the Middle Clackamas River include: the South Fork Clackamas River, North Fork Clackamas, Fish Creek, and Roaring River.

The Collawash River 5th field watershed is 97,486 acres in size and includes the mainstem Collawash River and tributaries including the Hot Springs Fork of the Collawash and its tributaries. The watershed contains 38 miles of anadromous streams, 130.1 miles of resident fish bearing streams, and approximately 491 miles of non-fish bearing streams.

The proposed treatment area is located within eight drainages of the Middle Clackamas River and eight drainages of the Collawash River. The total area of the sixteen drainages associated with the project is 68,778 acres. The area of the eight drainages within the Middle Clackamas watershed is 42,117 acres and includes: Lower Fish Creek, Lower Clackamas River Tributaries, Pup Creek, Sandstone Creek, Big Creek, Trout Creek,

Lower Clackamas River Timber Lake, and the Lower Clackamas River Wards drainages. The area of the eight drainages within the Collawash watershed is 26,661 acres and includes the Hot Springs Fork Tributaries, Dutch Creek, Thunder Creek, Blister Creek, Fan Creek, Farm Creek, Lower Collawash River Tributaries - North, and the Lower Collawash River Tributaries – South drainages.

The Middle Clackamas River and Collawash River watersheds currently provide habitat for winter steelhead, spring chinook salmon, coho salmon and resident rainbow and cutthroat trout. Other fish occupying these watersheds include large-scale suckers, sculpin, longnose dace, and pacific lamprey. All of the subwatersheds within the project area support populations of resident rainbow (*Oncorhynchus mykiss*) or cutthroat trout (*Oncorhynchus clarki*). Listed fish species that could potentially be affected by project activities includes the following Evolutionarily Significant Units (ESUs): Lower Columbia River (LCR) steelhead (*Oncorhynchus mykiss*), Upper Willamette River (UWR) chinook salmon (*Oncorhynchus tshawytscha*), and Lower Columbia River (LCR) coho salmon (*Oncorhynchus kisutch*). These species and their designated critical habitat are listed as Threatened and are protected under the Endangered Species Act (ESA).

Listed fish habitat (LFH), which is defined as any stream reach potentially occupied by ESA protected fish species, occurs for all of the above ESUs downstream of the project area in the mainstem Clackamas River, Collawash River, Hot Springs Fork of the Collawash River and adjacent to the project area in Lower Fish Creek drainage. LFH for LCR steelhead occurs adjacent to project area in Big Creek and Trout Creek, and downstream of the project area in Pup Creek, Sandstone Creek, Thunder Creek, Fan Creek, and Farm Creek.

Harvest is proposed in plantations that are between 30 and 61 years old that occur in various land allocations including matrix, special emphasis watersheds, viewsheds, late-successional reserves, and the dry upland portion of riparian reserves. Entry into riparian reserves is proposed within 46.2 acres that is adjacent to LFH.

The average height of the trees within the stands proposed for treatment ranges from 85 feet to 120 feet with a diameter averaging between 10 and 14 inches. The trees are primarily Douglas-fir and western hemlock. The current stocking levels range from 245 to 540 trees per acre.

4.2.2 **Direct and Indirect Effects**

For this proposal, the following actions have the potential to affect water quality and aquatic species or their habitats: timber felling, road construction, log yarding, log haul, and road decommissioning and obliteration. These actions are of concern because they could affect stream temperature, levels of sediment in streams, and in-channel large wood recruitment.

4.2.3 **Alternative A (No Action)**

With Alternative A there would be no short-term effects to water quality or fisheries resources. Since there would be no ground disturbance from harvest activities such as timber falling, yarding, road construction/maintenance, road decommissioning, or log haul, there would be no potential for any increase in surface erosion or sedimentation. Since no timber harvest would occur within riparian reserves, there would be no change in streamside canopy cover that could reduce stream shade or increase solar radiation to the stream channel potentially increasing stream temperatures. Water temperatures within and downstream of the project area would remain in their present state with the no action alternative.

If no action were taken in riparian reserves, riparian stands would maintain their mid-seral structure for many decades not reaching the desired late-successional characteristics as quickly as thinned stands. There could potentially be negative long-term effects because stands would gradually become overcrowded, reducing the capability to produce the size and quantity of coarse woody debris sufficient to sustain in-stream habitat complexity, stream bank stability, and overall health of the riparian reserves. Stands under this condition would be denser, less diverse (structurally), have smaller diameter trees, and less understory development compared to the action alternatives.

Action Alternatives

4.2.4 **Sediment**

Erosion is the displacement of soil particles, usually by water. This section addresses the potential for fine sediment to enter streams from erosion. The soils section also addresses erosion (s. 4.6.8) and other issues such as landslide risk (s. 4.6.11).

4.2.4.1 **Sediment from Road Construction and Road Maintence Activities** – This is a concern because, if not done properly, road construction and road maintenance activities could indirectly introduce fine sediment into stream channels. The action alternatives propose to re-open old temporary roads from previous entries and to temporarily re-open system roads that have been closed with berms or other devices. Additionally, Alternative B proposes to construct approximately 2.6 miles of new temporary road to access the stands. Both action alternatives would construct some temporary roads on already disturbed land.

Road maintenance prior to log haul would help maintain the design drainage of the road surface which reduces the potential for larger sediment inputs to runoff that eventually enters stream courses. Maintenance of the existing system roads prior to hauling would include measures to upgrade the quality of the road bed and to improve road drainage. This includes the placement of new aggregate surfacing where necessary, blading, brushing out encroaching vegetation, removing berms, and ditch cleanout where needed. Aggregate road surfacing greatly minimizes the amount of fine sediment from road surfaces entering streams following log haul, especially during and following rainfall

events. Additionally, deep patch repairs to the roadbed and converting asphalt to aggregate surface is proposed along some segments of the haul route.

Road related ground disturbing activities have been designed to minimize the risk of sediment being transported to streams from erosion or surface run-off. Road work would be restricted to the dry season between November 1 and May 31. This restriction would reduce the risk of any surface erosion due to ground disturbance.

With Alternative B, the proposed temporary roads are located on dry ground, would not cross stream channels, and would have no hydrologic link to any water source. As a result, there would be a very low probability of any sediment from temporary road surfaces reaching streams. These roads would be constructed along ridgetops, benches, or gentle slopes, where they would not cause an increase in the stream drainage network. Because of the distance of any proposed new or existing temporary roads to any water source, and the fact that these roads do not cross any perennial or intermittent streams, vegetative buffers would act as an effective barrier to sediment being transported into stream channels by surface erosion or runoff.

All new temporary roads and reopened temporary roads would be obliterated and revegetated directly following completion of harvest operations to help reduce compaction, increase infiltration rates, and minimize surface erosion.

Road maintenance prior to log hauling also increases the risk of road related sediment entering streams near road crossing during rainfall events. This increase is associated primarily with aggregate and native surface roads although ditch cleaning associated with paved roads is a potential sediment source. Any fine sediment created by road maintenance activities would most likely be washed from the road surface in the first few precipitation events of the fall that are sufficient to cause runoff from the road surface. Although there is a possibility of increased sediment entering streams due to these activities, most road related sediment would be trapped and stored in the ditches or on the forest floor below cross drains. In the event that sediment was to reach stream channels within the project area, most fine particles would likely be trapped and stored in the small tributary streams before they are able to reach any habitat where ESA listed fish species are found. Any impacts from the minimal amount of sediment generated during these activities would be for a short-term duration, and undetectable at a subwatershed (6^{th} field) or watershed (5^{th} field) scale. The probability of any impacts to water quality or fisheries resources caused by sedimentation due to road construction, stabilization, maintenance, or road obliteration, is extremely low.

Although there is no new temporary road construction proposed under Alternative C, this alternative proposes the decommissioning of existing roads. Decompacting the road surface during obliteration loosens the soil, thus making it more likely to be mobilized during the first significant run-off period unless the road is on relatively flat terrain, not near streams, or sufficient ground cover is provided. Project design criteria and associated BMPs for road decommissioning would reduce the risk of sediment entering any stream course. The roads proposed to be decommissioned are on relatively flat

terrain and have no direct hydrological connection to any stream source. The impacts to water quality or fisheries resources caused by sedimentation due to road construction, stabilization, maintenance, or road obliteration, if any, would be short-term and undetectable at the watershed or subwatershed scale. The risk of road related sediment input to streams would be comparable for both action alternatives.

4.2.4.2 **Sediment from harvest activities** – Thinning, particularly within riparian reserves, is a potentially ground disturbing activity that has the potential to cause a temporary reduction in water quality by allowing sediment to enter stream channels from surface erosion or run-off. Tree falling, ground-based yarding methods, and to some extent cable yarding methods (when full suspension isn't achieved) disturb soils that may result in minor sediment movement at the site level. Ground-based harvesting equipment and cable yarding does cause some direct soil displacement which would be mitigated through project design criteria. Most of the sediment produced from timber harvesting would travel short distances before being trapped by duff, woody materials, and other obstructions. The probability of overland surface runoff on uncompacted soil surfaces is also low for the soils in the project planning area.

Project design criteria would incorporate no-cut stream protection buffers a minimum of 100 ft. wide along all perennial streams that are adjacent to LFH. A minimum 50 ft. wide no-cut protection buffer would be established along all other perennial streams within the project area. Protection buffers of 50 ft. would be established along all intermittent streams within the project area that are one mile or less from LFH. Along intermittent streams greater than one mile from LFH, a 30 ft. no-cut protection buffer would be maintained with Alternative B and 50 ft. with Alternative C. Buffer width design would take into account the stream influence zone, steepness of slope, size and location of trees, orientation of the site to the sun (aspect), slope stability, and stream bank stability. No-cut areas would include any buffer of hardwood vegetation occurring along the stream bank. No-cut buffers would generally be at the top of slope breaks on steeper ground and would circumvent all wet areas to maintain canopy cover along riparian areas.

To further reduce the risk of surface erosion entering streams as fine sediment, only low impact harvesting equipment such as, mechanical harvesters or skyline systems, which have minimal ground disturbance would be allowed within 50 feet of the stream protection buffers. Mechanical harvesting equipment would be required to operate on slash-covered paths and travel routes would be limited to one pass over a path whenever possible. Trees in this zone would be directionally felled away from the protection buffers to minimize the disturbance to the forest floor. These requirements would maintain the indicators for sediment, stream temperature, stream bank condition, and large woody material indicators.

These vegetative buffers would act as an effective barrier to any sediment being transported into stream channels by surface erosion or run-off and would minimize the risk of any channel or water quality impacts. The stream protection buffers on either side of the streams would likely retain any displaced and eroded soil before it is transported to the stream channel. These buffer widths would allow soil infiltration between the unit

and any water source. Surface roughness, vegetation, and duff in untreated buffers would filter most sediment coming off surfaces before reaching streams. The use of skyline or helicopter yarding systems on steeper ground within riparian reserves would minimize ground disturbance. Seasonal restrictions on ground-based operations would further reduce the risk of soil disturbance and run-off. Even if some soil movement occurred, the vegetated buffer strips along every perennial or intermittent channel would act as an effective barrier. The probability that measurable amounts of fine sediment would enter any stream within the project area as a direct result of logging activity is low. The difference in width of the no-cut protection buffers on intermittent streams (30 feet with Alternative B and 50 feet with Alternative C) would not result in any difference in sediment risk between the action alternatives.

Of the action alternatives, the risk of sediment from logging system sources would be slightly less with Alternative C, since helicopter logging would be used instead of ground based or skyline yarding systems on parts of some units. Skyline yarding has the potential to cause some soil displacement and compaction because it is sometimes difficult to get full suspension of logs. Helicopter yarding rarely results in soil displacement because full suspension is achieved. Because of less ground disturbance, the chance of sediment reaching the stream channel is less likely. The probability that measurable amounts of fine sediment would enter any stream within the project area as a direct result of logging activity is low under all the proposed action alternatives. With both action alternatives, helicopters would be able to use existing landings.

4.2.4.3 **Sediment from log haul** – (same effect for all action alternatives). Log hauling along aggregate surface or native surfaced roads has the potential to introduce sediment in small quantities to streams. Traffic breaks down surfacing material resulting in finer surface gradation and increased sediment transport from the road surface. Any fine sediment created by hauling traffic would more than likely be washed from the road surface in the first precipitation event that is sufficient to cause runoff from the road surface. Any input of sediment is expected to be minimal as the roads where there is a potential for surface run-off are asphalt or durable crushed rock. All native surfaced roads along the haul route are outside of riparian reserves, along ridge tops or gentle terrain, and have no hydrological connection to any streams. Road use however would be restricted to periods when road related runoff is not present and as such, little sediment is expected to leave the road bed while haul is occurring.

During the wet season, log haul would only be permitted on asphalt and rocked roads when conditions would prevent sediment delivery to streams. In periods of high rain-fall, the contract administrator would restrict log hauling when necessary to minimize water quality impacts. Haul would be stopped if there is rutting of the road surface or a noticeable increase in the turbidity of water draining to the road ditches or at stream crossings.

Log hauling would not measurably increase the amount of fine sediment in streams. The roads along the haul route are rocked or paved at stream crossings, and road ditches are well vegetated. Road maintenance prior to log haul would help maintain the design

drainage of the road surface which reduces the potential for sediment to runoff into stream courses. The potential for sediment input into streams along the haul routes would further be minimized by permitting haul only when conditions would prevent sediment delivery to streams. Any sediment that could enter a stream during haul activities would be at crossings along aggregate surfaced roads. The majority of these crossings are at intermittent or small perennial streams that would have very little flow, during the normal season of operation (June 1 to October 31). Crossings at streams where LFH occurs along the haul route are asphalt surfaced therefore the probability of sediments reaching the stream channels at these crossings is extremely rare. Any sediment that leaves the road surface due to run-off is expected to disperse over land or be stored within the smaller tributary streams along the haul route. If any sediment is transported downstream it would be during the beginning of the rainy season and would be diluted by a sufficient volume of water where it would be indistinguishable from background levels. It is very unlikely that any measurable amount of sediment produced during log haul would be transported to stream channels where listed fish species occur. There are no listed fish species that occur immediately downstream of any aggregate surfaced stream crossing along the haul route. If any sediment did enter stream courses from hauling activities, it would be in very small amounts and for a short-term duration. No adverse effect to fish or their habitat is expected to occur from log hauling activities.

4.2.4.4 **Sediment Modeling**

The *Water Erosion Prediction Project* (WEPP) soil erosion model was used to predict potential changes in erosion and sediment yield from a sample of harvest units and temporary roads. Documentation of the WEPP model is available at the following web site: http://fsweb.moscow.rmrs.fs.fed.us/fswepp. The WEPP model is a physically-based soil erosion model developed by an interagency group of scientists from the U.S.D.A. Agricultural Research Service, Forest Service, and Natural Resources Conservation Service; and the U.S.D.I. Bureau of Land Management, and Geological Survey.

The "Disturbed WEPP" module was utilized to predict runoff, surface erosion and sediment yield due to skyline log yarding for Units 80, 100, 130 182, 256, 258, and 348. Sediment yield from ground-based logging systems was modeled for units 176 and 218. Potential surface erosion from hypothetical skyline corridors and ground-based harvesting skid trails was modeled in these units in order to estimate the amount of post-activity sediment delivery to streams following relatively small and moderately large storm events. Surface erosion and sediment due to temporary road construction was also evaluated for Unit 100. Predicted erosion and sediment values are estimated to be accurate within plus or minus 50 percent of the true value (Elliot 1997). Sediment yields from road reconstruction, log haul, or from mass wasting are not evaluated with the WEPP model.

For skyline harvesting corridors (90 % ground cover, about 12 feet wide), the WEPP model predicts delivered sediment yield for selected project harvest units that ranges from 0.0 to 0.6 tons/year for a 2.5 year flood event, and 0.1 to 1.5 tons/year for a 25 year flood event. For ground-based harvest units (75 % ground cover, 100 foot buffer along

streams, and skid trails about 12 feet wide), sediment yields were less than 0.1 tons per/year for the modeled harvest units. All new temporary roads are located on dry ground, would not cross stream channels, and would have no direct hydrologic link to any water source. As a result, there would be a very low probability of any sediment from temporary road surfaces reaching streams.

The WEPP model was also used to predict sediment yield from two short segments (15 feet wide by 200 feet long) of temporary roads in unit 100. The WEPP model predicts delivered sediment yield of 0.0 tons/year for the temporary road segments for 2.5 year through 25 year flood event. These roads would be constructed along ridge tops, benches, or gentle slopes, where they would not cause an increase in the stream drainage network. No new temporary or existing temporary road would cross any perennial or intermittent stream channel.

These predicted amounts of sediment yield are minor, with 1 ton of sediment yield per acre equal to about 1 cubic yard of soil, or a thickness of about 0.007 inches of soil loss which is not measurable or detectable. If this amount of sediment is delivered to streams, it would be considered non-measurable considering background instream sediment transport during streams from various sources, including natural stream channel erosion.

Even though the WEPP model predicts various amounts of minor sediment delivery to streams, surface erosion and subsequent sediment delivery to streams is only possible when storm events are large enough to saturate soils and cause overland surface water flow. If surface soils are not compacted, the probability of surface erosion is relatively low in forested watersheds where water infiltration rates into the soil are normally greater than the precipitation intensity. When soils aren't compacted, infiltration capacities may be many times greater than maximum rainfall rates and no surface runoff occurs (Harr 1976). Soils may be compacted on skid trails but skid trails are water barred as needed to divert any surface runoff onto vegetated areas that are not compacted and have good infiltration.

4.2.4.5 Estimated Average Harvest-related Sediment Yield (tons/year) from WEPP Model

Unit	Cableway C) Road (R) Skidtrail (S)	2.5 year storm	5.0 year storm	10 year storm	25 year storm	Probability of Sediment, First year
80	C	0.5	0.9	1.2	1.5	88 %
100	C	0.0	0.1	0.2	0.3	63 %
100	R	0.0	0.0	0.0	0.0	2 %
130	C	0.1	0.1	0.1	0.2	69 %
176	S	0.0	0.0	0.0	0.0	60 %
182	C	0.6	0.8	1.0	1.1	78 %
218	S	0.0	0.0	0.0	0.0	58 %
256	C	0.3	0.6	0.8	1.4	68 %
258	C	0.1	0.2	0.3	0.5	35 %
348	C	0.0	0.0	0.0	0.1	75 %

Alternative C is similar to Alternative B except that there is no new temporary road construction. In Alternative C the areas that are not accessible without new temporary road construction would be harvested using helicopter or other logging methods. The amount of sediment yield from the activities proposed in Alternative C would be immeasurably less than that for Alternative B, since no new temporary roads would be constructed and because some units would be harvested using a helicopter. See sections 4.2.4.1 and 4.2.4.2.

4.2.5 Water Temperature

Project design criteria were developed to reduce any potential for adverse impacts to stream temperature as the result of thinning within riparian reserves, and to meet guidelines in the Northwest Forest Plan Temperature TMDL Implementation Strategy (2005). The no-cut stream protection buffers along perennial and intermittent streams are designed to meet stream temperature goals by avoiding harvest in the primary shade zone and retaining shade producing vegetation. The primary shade zone consists of vegetation that intercepts solar radiation between 1000 and 1400 hours, which is critical for providing stream shade and maintaining stream temperature.

The no-cut buffers would insure that the majority of shade producing vegetation would remain and there would be no measurable increase in solar radiation. In addition to protection buffers, project design criteria would maintain a conifer relative density (RD see Stand Health and Productivity section for more on relative density) value of at least 30 in the stand area located between the protection buffer and one site potential tree height (180 ft.) from the stream within stands that are adjacent to or within one mile of LFH. In stands adjacent to stream reaches that are greater than one mile upstream from LFH, an RD value of at least 30 would be maintained within 100 ft. from the stream. The thinning prescriptions within riparian reserves would maintain an average 50% canopy closure up to one site potential tree height from all streams in order to retain shade-producing vegetation within the secondary shade zone. This design criterion is expected to maintain a canopy closure that provides adequate shade over streams and therefore is unlikely to alter water temperatures.

Since many of the streams that flow within proposed units are relatively small, and provide very little or no flow during the hottest time of the year, the designated stream protection buffers would provide adequate canopy cover to maintain existing shade components thus, maintaining stream temperatures. Streams adjacent to LFH within the project area have increased no-cut protection buffers of 100 ft. that would maintain the existing shade components along these larger streams. Stream temperatures are not expected to exceed the tolerance limits of resident or anadromous fish species or other aquatic organisms.

Protection buffers applied to the intermittent non-fish bearing streams in the project area would retain direct overhead shading. Intermittent streams within the project area only carry water during wet times of the year (winter and spring) when temperatures are

cooler. Since these channels have little or no surface flow during the summer time when elevated stream temperatures are of concern no significant increase in stream temperature is expected downstream. The difference in width of the no-cut protection buffers on intermittent streams (30 feet with Alternative B and 50 feet with Alternative C) would not result in any difference in stream temperature between the action alternatives. No water quality effects are foreseen, and the low probability of effects would decrease, as the canopy and ground cover are re-established to pre-harvest conditions. Adherence to project design criteria would maintain the current canopy that provides shade over streams therefore, project implementation is unlikely to alter water temperatures. Any increase in stream temperatures would be immeasurable at the site or watershed scale. Current stream temperatures in all streams within and downstream of the project area are expected to be maintained.

4.2.6 **Hydrologic Recovery**

The Aggregate Recovery Percentage (ARP) index is often used to estimate the potential for adverse cumulative effects related to past, present and foreseeable future timber harvest activities. It is also a tool to determine compliance with Forest Plan standards and guidelines pertaining to cumulative watershed effects (Forest Plan, FW-061 to FW-065). By measuring the percent of a watershed in a hydrologically recovered condition, the ARP evaluates the risk of increased peak flows from rain-on-snow events. In stands with little or no forest canopy cover within the transient snow zone, more snow accumulates than would than beneath a partially or fully hydrologically recovered forest. As a result, more runoff can be expected from non-hydrologically recovered stands when there is rapid melting during periods of rain in the transient snow zone (Christner 1982). The ARP model ranks recovery from 0 to 100 with 100 being fully recovered. The Forest Plan often refers to watershed impact area or threshold of concern which are the inverse of ARP with 0 being fully recovered.

For this proposal, the following actions have the potential to affect hydrologic recovery: actions that remove or kill trees to a level below 70% canopy cover are considered a watershed impact area. These actions would include thinning, landing creation, trees removed for skid trails or skyline corridors, trees removed for road construction, snag creation and felling trees for down wood. Other aspects of the proposed action such as road reconstruction or repair would not have a meaningful or measurable affect on hydrologic recovery because they do not alter canopy cover.

The ARP model requires data sorted by analysis area boundaries. Drainages are the appropriate analysis area for water quality analyses. The Forest has been divided into drainages and there are 16 that overlap the site-specific locations of the actions listed above that could affect estimated hydrologic recovery in terms of the ARP. For the purpose of cumulative effects analysis, all land within the drainages would be included regardless of ownerships or land allocation. The watersheds associated with some streams are very small and where appropriate they are grouped together to form a "drainage" that has a meaningful size for analysis. These grouped drainages list the named tributaries in parentheses.

Stands that have trees greater than 8 inches in diameter and over 70% canopy cover are considered fully recovered in terms of hydrology (Forest Plan, FW-064). Stand age is used to determine whether stands meet these criteria. Forest hydrologists have developed recovery curves to model the changes to hydrology as young stands grow as well as the effects to hydrology for projects such as thinning that remove only a portion of the trees in a stand. The assumptions in the ARP model indicate that if post treatment canopy cover is between 50 and 69%, the stand would be considered 91% recovered and it would take five years for the stand to reach full recovery, and if post treatment canopy cover is between 30 and 49%, the stand would be considered 73% recovered and it would take ten years for the stand to reach full recovery. Any stand that would be left with greater than 70% canopy and greater than 8 inches diameter would be considered fully recovered.

4.2.6.1 **Existing Situation**

The stands proposed for thinning are currently recovered in terms of the current ARP meeting Forest Plan standards and guidelines. All of the drainages are steadily moving towards hydrologic recovery as young plantations grow. There has been relatively little regeneration harvest in the past two decades and young plantations are growing rapidly.

4.2.6.2 **Direct and Indirect Effects**

The action alternatives involve the creation of variability in the stands. Portions of the stands in stream protection buffers and skips would be left un-thinned. Other portions of the stands would have gaps, temporary road construction, landings, helicopter landings, skid trails and skyline corridors that would be open. The rest of each stand would have variable-density thinning. With the exception of temporary road construction which is modeled separately, the team silviculturist has modeled these factors and has determined that average post thinning canopy cover for all stands would be between 50 and 69 %.

The following table shows the projected change in hydrologic recovery in terms of ARP that would result if the proposed action were implemented. The effect of changes in estimated hydrologic recovery (ARP) are not measurable acre by acre or unit by unit therefore direct effects to peak flows or stream channel stability, if any, are not predicted with this model. By its very nature, the analysis of hydrology is an examination of indirect and cumulative effects. For the purpose of this analysis, it is presumed that the proposed thinning would occur in the year 2008. This table shows the down stream indirect effect of the action alternatives.

4.2.6.3

Acres	Drainage_Name	Altered Acres	%of Drainage	% Change ARP	Effect
1881	Pup Creek	420	22	-2.1	Small – short term, Not measurable
1925	Sandstone Creek	112	6	-0.5	Not measurable
2261	Big Creek	349	15	-1.5	Small – short term, Not measurable
4309	Trout Creek	595	14	-1.3	Small – short term, Not measurable
3368	Lower Clackamas River - Timber Lake (Bull)	164	5	-0.4	Not measurable
3662	Lower Clackamas River - Wards Reach (Tar)	439	12	-1.1	Small – short term, Not measurable
16244	Lower Clackamas River Tributaries (Cat, Deer, Dinner, Helion, Moore)	286	2	-0.2	Not measurable
1504	Fan Creek	96	6	-0.6	Not measurable
2911	Farm Creek	47	2	-0.1	Not measurable
5039	Lower Collawash River Tributaries – North (Sluice, Slide, Cap, Jack Davis)	142	3	-0.3	Not measurable
4535	Lower Collawash River Tributaries – South (Paste, Peat)	184	4	-0.4	Not measurable
8467	Lower Fish Creek (Dog, Rimrock, First, Second, Silk, Wanderers, Button)	596	7	-0.6	Not measurable
1194	Thunder Creek	95	8	-0.7	Not measurable
3300	Blister Creek	40	1	-0.1	Not measurable
1129	Dutch Creek	59	5	-0.5	Not measurable
7049	Hot Springs Fork Tributaries (Sand, Pink, Rock, Ferry)	753	11	-1.0	Small – short term, Not measurable

The highest percentage change in any drainage is an ARP reduction of 2% which is not likely to cause stream channel instability or increases in peak flows during rain-on-snow events. After thinning, trees would grow rapidly and canopy cover would be at an average of 70% after five years. Thinning would result in healthy stands with good root strength and broad crowns that would contribute to hydrologically stable drainages.

No action would result in no change in canopy cover. The effect of not thinning is described in detail in the Forest Health and Productivity section. Stands would gradually become overcrowded and would change in ways that may negatively affect hydrologic stability. For example crowns would become relatively narrow and root and stem strength

would be compromised over time. However, with no action, plantations would likely continue to be above 70% canopy cover and would be considered fully recovered.

Drainages that have a two percent or less reduction in hydrologic recovery (ARP) would have effects that for this analysis would not be considered meaningful or measurable. Since the Forest has emphasized the thinning of this type of habitat in recent years, a cumulative effects analysis has been conducted for drainages with greater than 1% decrease in ARP.

4.2.6.4 Cumulative Effects

Cumulative effects are impacts on the environment that result from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions. Cumulative effects analysis was guided by the June 2005 Memorandum on cumulative effects from the Council on Environmental Quality.

4.2.6.5

Space - This table shows the drainages used for cumulative effects analysis because they have greater than 1% reduction in terms of hydrologic recovery.

acres	Drainage Name	Thinning Acres	%of watershed	% change ARP
1881	Pup Creek	421	22	-2.1
2261	Big Creek	378	17	-1.5
4309	Trout Creek	601	14	-1.3
3662	Lower Clackamas River - Wards Reach (Tar)	442	12	-1.1
7049	Hot Springs Fork Tributaries (Sand, Pink, Rock, Ferry)	756	11	-1.0

Time - Stands that have trees greater than 8 inches in diameter and over 70% canopy cover are considered fully recovered in terms of hydrologic recovery estimated by the ARP. As plantations grow, these conditions would be met in approximately 30 years in the lower elevations areas and on earthflows and in as much as 40 years in the highest areas. An average of 35 years is used for drainages since they range from low to high elevations. Stands older than this would be considered fully recovered in terms of hydrologic recovery and would not enter into the analysis. Some areas such as roads, rock quarries and power lines would be considered permanent openings.

4.2.6.6 Past, Present and Foreseeable Future Projects and Actions

Project Name	**Extent, size, type, distance**	**Overlap in Time or Space**	**Type of Potential Effect**	**Measurable Effect?**	**Rationale for Inclusion or Exclusion from Analysis below.**
Present - Collawash Thin	Unit 8. 18 acres of plantation thinning.	Unit 8 is in the Hot Springs Fork Tributaries Drainage. Timber sale (Fan Thin) sold but logging will be delayed by litigation.	Thinning, 50 to 69% canopy cover.	Not by itself	Include. Unit 8 is in the Hot Springs Fork Tributaries Drainage.
Past - regeneration harvest	Throughout drainages	Yes, All plantations less than 35 years old.	Plantations of various ages modeled using ARP growth curves.	yes	Include
Past - road construction.	Throughout drainages	Yes, trees are not allowed to grow on most roads - they remain unrecovered.	Modeled as permanent opening.	yes	Include
Past - rock quarries		Yes, trees are not allowed to grow on quarries - they remain unrecovered.	Modeled as permanent opening.	yes	Include
Past - Power Line	Land clearing.	Yes, In Hot Springs Fork Tributaries Drainage.	Modeled as permanent opening.	yes	Include, trees that grow up under power line are cut for safety reasons before they reach recovery.
Past – road decommissioning	Road decommissioning	Yes	Trees will begin to grow in old road.	No	Exclude, benefit to hydrology would be many years in the future.
Present – Blister Fire	Lightning caused wildfire. 145 ac. Converted to unrecovered.	No, Fire is in Blister Creek drainage.	Fire reduced live canopy in a portion of the fire area to below 70%.	yes	Exclude, not in one of the 5 drainages being evaluated.
Past and present watershed restoration projects.	Culver replacement, Road repairs.	Yes	No change to tree canopy.	No	Exclude, No change to tree canopy.
Activities on other ownerships	Thinning and regeneration harvest, home construction, farming.	No, There are no other ownerships within these drainages.	None	No	Exclude, There are no other ownerships within one of the 5 drainages being evaluated.
Future Thinning	Hundreds of acres of plantations may eventually grow to the point where thinning is desired.	Unknown location.	Unknown intensity of thinning.	No	Exclude. No site specificity. Can not be modeled at this time. The appropriate time to conduct a cumulative effects analysis would be in a future EA after a firm proposal is developed.
Off highway vehicle use	Minor dispersed use	Yes	Compaction	No	Exclude, No change to tree canopy.

4.2.6.7 **The alternative's incremental impact when added to other actions.**

The ARP analysis looks at the existing condition of vegetation as it has been affected by past timber sales, fires and other disturbances. These disturbances are tracked by stand age (Data source – GIS data from Veg2005.shp and Roads.shp). The analysis includes the effect of projects or actions listed above. The techniques used to model hydrology are discussed in Forest Plan Management Direction Interpretations 1, 5, 6 and 10. Interpretation #10 supersedes portions of #6.

4.2.6.8 The ARP analysis indicates that the action alternatives would have very little estimated effect on the hydrology (peak flows, channel stability) of these drainages. The lowest drainage does not even approach the 18% threshold of concern (ARP value of 82%) that is often established for special emphasis watersheds. Comparing the action alternatives to no action also shows little difference. The ARP value for all of the alternatives will increase by 1 to 1.5% per year even after thinning because the plantations are experiencing rapid growth and therefore rapid hydrologic recovery.

Drainage Name	No Action %	Alternative B %	Alternative C %
Pup Creek	88.7	86.6	86.6
Big Creek	92.7	91.2	91.3
Trout Creek	90.6	89.3	89.3
Lower Clackamas River - Wards Reach (Tar)	91.6	90.5	90.5
Hot Springs Fork Tributaries (Sand, Pink, Rock, Ferry)	85.5	84.5	84.5

Thinning would result in long-term health of the watersheds by increasing health and vigor and enhancing growth that results in larger trees with broad canopies.

Roads would be decommissioned with Alternative C. Trees would begin to grow on the decommissioned surface and in approximately 35 years the area would be considered fully recovered hydrologically.

4.2.7 Forest Plan standards and guidelines

Mt. Hood Forest Plan References
Forestwide Riparian Standards and Guidelines - FW-80 to FW-136, page Four-59
Forestwide Water Standards and Guidelines - FW-54 to FW-79, page Four-53
Forestwide Fisheries Standards and Guidelines - FW-137 to FW-147, page Four-64
General Riparian Standards and Guidelines - B7-28 to B7-39, page Four-257
Mt. Hood FEIS pages IV-22, IV-47, IV-155 to IV-167
Northwest Forest Plan - Riparian Reserve Standards and Guidelines – pages C-31 to 38
Aquatic Conservation Strategy – Record of Decision to Clarify Provisions Relating to the Aquatic Conservation Strategy pages 6-10

Unlike the analysis for cumulative effects, the analysis of Forest Plan standards and guidelines only applies to National Forest lands that are available for timber management

(FW-061 & 062). This would exclude wilderness and private lands. There are Forest Plan standards that suggest additional analysis at scales broader than drainages: FW-063, FW-65 and B8-031 to B8-32.

4.2.7.1 FW-064

Watershed impact areas at the subbasin or area analysis level *(now drainage)* (i.e. typically 3000 to 6000 acres) should not exceed 35 percent. This project is consistent with FW-064: all of the affected drainages would be well below the 35% level. The analysis includes the current proposal, past actions, the recent Blister Fire and other foreseeable proposed actions that affect forest canopy cover.

Drainage_Name	Watershed impact areas %
Pup Creek	13
Sandstone Creek	4
Big Creek	9
Trout Creek	11
Lower Clackamas River -Timber Lake (Bull)	10
Lower Clackamas River -Wards Reach (Tar)	10
Lower Clackamas River Tributaries (Cat, Deer, Dinner, Helion, Moore)	7
Fan Creek	21
Farm Creek	23
Lower Collawash River Tributaries – North (Sluice, Slide, Cap, Jack Davis)	9
Lower Collawash River Tributaries – South (Paste, Peat)	11
Lower Fish Creek (Dog, Rimrock, First, Second, Silk, Wanderers, Button)	11
Thunder Creek	21
Blister Creek	18
Dutch Creek	27
Hot Springs Fork Tributaries (Sand, Pink, Rock, Ferry)	16

4.2.7.2 FW – 063

Within the 15 major drainages *(Now Watersheds - 5th field) or subwatersheds (6th field)* on the Forest (Map Four-2) watershed impact areas shall not exceed 35 percent. This project is consistent with FW-063: all of the affected watersheds would be well below the 35% level. The analysis includes the current proposal, past actions, the recent Blister Fire and other foreseeable proposed actions that affect forest canopy cover.

Major Drainage Name	Watershed impact areas %
Lower Clackamas	9
Fish Creek	9
Collawash	12
Hot Springs Fork	15

4.2.7.3 FW – 065

Within selected "Special Emphasis Watersheds" (Map Four-3), watershed impact areas should not exceed the "thresholds of concern" (TOC) for watershed stability displayed in Table Four-12. This project is consistent with FW-065: all of the affected watersheds would be below the 18% level. The analysis includes the current proposal, past actions, the recent Blister Fire and other foreseeable proposed actions that affect forest canopy cover.

Special Emphasis Watersheds, from Forest Plan page Four-56	Threshold of Concern %	Watershed impact areas %
10. Fish Creek	18	8.9
13. Hot Springs Fork Tributaries (Sand, Pink, Rock, Ferry, Thunder, Dutch)	18	17.6
4. Collawash, Upper (tributaries from Paste Creek south)	18	17.7
2. Blister Creek	18	17.7

4.2.7.4 B8-031 & B8-032 – Earthflow Recovery

On each high risk earthflow, at least 90 percent of each earthflow should be recovered. On each moderate risk earthflow, at least 75 percent of each earthflow should be recovered. See Forest Plan interpretation #10 which indicates that the ARP model would be used to show attainment of stand diameters and crown closures sufficient to provide for recovery.

Earthflows are very large naturally-occurring geological features on gentle to moderate slopes where earth, and the trees growing there, move downhill very slowly. Ten earthflows overlap the project.

Earthflow	Acres	Risk Type	Alt. A % recovered	Alt. B % recovered	Alt. C % recovered
Big Creek	231	High (90%)	93.6	89.3	89.3
Big Creek	2866	Moderate (75%)	91.3	91.1	91.2
Trout Creek	538	Moderate (75%)	96.9	92.3	92.3
Jack Davis Creek	114	High (90%)	99.1	98.8	98.8
Fan Creek	1052	Moderate (75%)	96.3	92.2	92.2
Pink Creek	1629	Moderate (75%)	93.6	79.7	79.7
Farm Creek	604	High (90%)	99.1	91.8	91.8
Farm Creek	732	Moderate (75%)	92.3	95.0	95.0
Cat Creek	1011	High (90%)	96.9	95.4	95.4
Pansy Creek	801	Moderate (75%)	94.4	91.5	91.5

For the purpose of this analysis, it is presumed that the proposed thinning would occur in the year 2008. With this timing, the high risk portion of Big Creek earthflow would be below 90% with both action alternatives but within one year it would recover to above 90%. The reason for this recovery is the rapid growth of other plantations within the

earthflow. Portions of units 132, 134 and all of unit 180 are in this earthflow. One option to deal with this standard and guideline is to grant an exception in the decision notice and another option is to delay the thinning of these units until 2009.

All of the other earthflows are consistent with B8-031 & B8-032 because they would be above the prescribed level. The analysis includes the current proposal, past actions and other foreseeable proposed actions that affect forest canopy cover.

The Northwest Forest Plan (NWP) indicates that some unstable areas and earthflows should be considered for inclusion into the Riparian Reserve land allocation. (NWP page B-30). The NWP did not require all earthflows be designated as Riparian Reserves, but that they should be analyzed for inclusion during watershed analysis. The Watershed Analyses did conduct this analysis and did include certain unstable areas as Riparian Reserves. (Collawash/Hot Springs Watershed Analysis p. 2-21 to 23 and 4-23). Earthflows vary in terms of their stability and their steepness. The Collawash/Hot Springs Watershed Analysis (p. 2-21) states "Within any landform type there will be some areas with a very low relative hazard for sediment-delivering landslides and some with an extremely high relative hazard. The high hazard areas will be identified during the planning phase of individual projects." The Interdisciplinary Team included a geologist who field verified the stability of each proposed thinning unit. Active landslides would not be thinned. The earthflows that would have plantation thinning are more stable and are considered suitable for timber management.

Other Forest Plan Standards and Guidelines

4.2.7.5 **Aquatic Conservation Strategy**

This project is designed to contribute to maintaining or restoring the fifth-field watersheds over the long term.

4.2.7.6 **Riparian Reserves**

This project is consistent with riparian reserve standards and guidelines. The action alternatives are specifically designed to meet TM-1 c. "Apply silvicultural practices for riparian Reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives." This project has adopted the concepts for riparian reserve delineation described in the three overlapping watershed analyses. The site-potential tree height is 180 feet. Also included in riparian reserves are Active Ancient Landslide landforms. While streams, rivers, ponds, wetlands and active ancient landslides were shown on maps in the watershed analyses, they were conceptual based on data available at the time and were not field verified. For this project, maps were refined based on field inspections. The project areas have been examined by a geologist to determine the presence or absence of these landforms. Stream location and fish presence were also field checked and riparian reserve boundaries adjusted accordingly.

4.2.7.7 **Key Watersheds**

The Northwest Forest Plan (page B-19) indicates that roads should be decommissioned in key watersheds and that there should be no net increase in the amount of roads in key watersheds. Both Fish Creek and Collawash River watersheds are key watersheds and the Clackamas River has a narrow key watershed designation that does not include the whole watershed. Many miles have been decommissioned in these key watersheds, (approximately 106 miles in Fish Creek, 66 miles in Collawash, and dozens of miles in the Clackamas). The action alternatives would not result in a net increase in road mileage.

4.2.7.8 **The Clean Water Act and Best Management Practices**

Sections 208 and 319 of the Clean Water Act of 1972, as amended (1977 and 1987), acknowledge land treatment measures as being an effective means of controlling nonpoint sources of water pollution and emphasizes their development. These land treatment measures are known as Best Management Practices (BMPs). BMPs are used to control or prevent nonpoint sources of pollution from resource management activities, and to ensure compliance with the Forest Plan, as amended, the Clean Water Act, as amended, the Oregon Administrative Rules (OAR Chapter 340-41-0004,0028, and 0036), Department of Environmental Quality (DEQ), and the Memorandum of Understanding between the Oregon DEQ and the USDA, Forest Service. General BMPs are described in the document General Best Management Practices, USDA Forest Service, Pacific Northwest Region (11/88). The BMPs are flexible in that they are tailored to account for diverse combinations of physical and biological environmental circumstances. The Forest has documented typical BMPs and assessed their effectiveness (USDA 2004a).

4.2.7.9 **FW-054 to FW-079, FW-080 to FW-136, FW-137 to FW-147, and B7-001 to B7-070**

The project is consistent with these standards and guidelines unless noted otherwise. Project design criteria would provide protection to fisheries and riparian dependent resources while moving these stands towards the desired future condition of restoring late-successional characteristics. Adherence to the project design criteria would maintain the existing aquatic complexity within and downstream of the project area. The 2007 Plantation Thin Project would lead to long-term improved conditions within the riparian reserves of stands proposed for treatment. All of the environmental baseline indicators for habitat and watershed condition would be maintained or improved in the long-term by implementation of the project. These indicators include: stream temperature, sediment, pool habitat and quality, large woody debris, stream channel morphology, refugia, road density and riparian areas.

4.2.7.10 **Aquatic Sensitive Species**

Columbia Duskysnail (*Lyogyrus* n. sp. 1)
This species of aquatic mollusk has been found across the Forest during surveys conducted over the past several years (Mt. Hood National Forest, unpublished data).

Habitat requirements for this species are fairly specific: cold well oxygenated springs, seeps, and small streams, preferring areas without aquatic macrophytes. Individuals have not been found in larger streams and rivers, or glacial streams.

Surveys for the Columbia duskysnail have been conducted at sites across the Forest for a wide range of projects. This mollusk has been found in many areas across the Forest and is likely to be present in seeps, springs, and smaller streams near and within the proposed project area.

Basalt Juga (*Juga Oreobasis n. sp. 2*)
These small snails have only been found at two location within the Oregon portion of the Scenic Area: in Canyon Creek just west of the town of Hood River and in several small seeps just above (south) Interstate 84 about half-mile east of The Dalles Dam. Individuals have been found at several locations on the Washington side of the Scenic Area and east of the Scenic Area on both sides of the river. They have never been found in any survey conducted on the Forest, and they are not believed to reside in Forest streams. Their habitat requirements are similar to the Columbia Duskysnail: cold well oxygenated springs, seeps, and small streams.

Surveys for the two aquatic mollusks would not be conducted as part of this project, even though the Columbia duskysnail is known to occur in many streams on the district including those within the proposed project area. Instead of conducting surveys in all adjacent streams, species presence is presumed. Riparian reserve standards and guidelines and project design criteria are sufficient to provide for the habitat needs of this species. Anticipated effects of implementing the action alternatives would not significantly affect habitat or species persistence at each site.

The effects determination for the Columbia Duskysnail and Basalt Juga (if this species is present on Forest) would be "No Impact" (NI) for Alternative A, and "May impact individuals or habitat but will not likely contribute to a trend towards federal listing" (MIIH) for Alternatives B and C.

4.2.8 Endangered Species Act and Magnuson-Stevens Fishery Conservation and Management Act Compliance

4.2.8.1 Designated Critical Habitat

Critical habitat for twelve ESUs of West Coast salmon and steelhead listed under the Endangered Species Act of 1973 was designated on September 2. 2005. Critical habitat includes the stream channels within the designated stream reaches, and includes a lateral extent as defined by the ordinary high-water line or bankfull elevation. Within these areas, the primary constituent elements essential for the conservation of these ESUs are those sites and habitat components that support one or more life stages, including: freshwater spawning sites, freshwater rearing sites, freshwater migration corridors,

estuarine areas, near-shore marine areas, and off-shore marine areas that support growth and maturation.

Primary constituent elements listed below, refer to freshwater habitat components. Nothing proposed in any alternative would have any affect on estuarine or marine habitat components, thus they are not discussed.

1. Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development.

2. Freshwater rearing sites with:

    a. Water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility;

    b. Water quality and forage supporting juvenile development; and

    c. Natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.

3. Freshwater migration corridors free of obstruction and excessive predation with water quantity and quality conditions, and natural cover, such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.

Designated critical habitat for Upper Willamette River chinook occurs within or downstream of the proposed project area in the mainstem Clackamas River, Collawash River, Hot Springs Fork, and Lower Fish Creek. Designated critical habitat for LCR steelhead occurs within or downstream of the proposed project area in the mainstem Clackamas River, Collawash River, Hot Springs Fork, Lower Fish Creek , Pup Creek, Big Creek, Trout Creek, Fan Creek, and the Farm Creek. As of this time, critical habitat for LCR coho has yet to be designated but would likely correspond with the critical habitat designation UWR chinook since they utilize the same habitat within the Clackamas River Basin.

Project design criteria was developed to minimize or eliminate any potential affect that project elements of the action alternatives might have on have on water quality, fisheries, and aquatic resources. The analysis of effects has determined that the probability of any potential effect to designated critical habitat would be very low, of a short-term duration, and of a magnitude that would be immeasurable. There would be no measurable long-term effect to any habitat or baseline habitat indicators where ESA listed fish species occur. The implementation of this project would not have any long-term adverse effect to designated critical habitat. Therefore, an effects determination of **May Affect, not Likely to Adversely Affect (NLAA)** is warranted for designated critical habitat that occurs within or downstream of the project area.

4.2.8.2 **Essential Fish Habitat**

Essential Fish Habitat (EFH) established under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) includes those waters and substrate necessary to ensure the production needed to support a long-term sustainable fishery (i.e., properly functioning habitat conditions necessary for the long-term survival of the species through the full range of environmental variation). EFH includes all streams, lakes, ponds, wetlands, and other water bodies currently, or historically, accessible to salmon in Washington, Oregon, Idaho, and California. Three salmonid species are identified under the MSA, chinook salmon, coho salmon and Puget Sound pink salmon. Chinook and coho salmon occur on the Mt. Hood National Forest in the Clackamas River, Hood River, and Sandy River basins. Chinook and coho salmon utilize the mainstem Clackamas River, Collawash River, Hot Springs Fork, and Lower Fish Creek for migration, rearing, and spawning habitat. The proposed project would not have any adverse effect on water or substrate essential to the life history of coho, chinook, or chum salmon that occur within any basin on the Mt. Hood National Forest.

Implementation of the 2007 Plantation Thinning project would **Not Adversely Affect** essential fish habitat for chinook or coho salmon. This activity would not jeopardize the existence of any of the species of concern or adversely modify critical habitat and would not adversely affect Essential Fish Habitat as designated under the 1996 Amendment to the Magnuson-Stevens Act.

4.2.8.3 **Fish Stocks of Concern**

The effects of the implementation of the 2007 Plantation Thinning Project on fish stocks of concern is based on populations of ESA listed fish species and resident fish populations classified as management indicator species in the Mount Hood Land and Resource Management Plan (LRMP) that occur within and downstream of the project area in the Middle Clackamas River and Collawash River watersheds.

ESA listed species that occur within or downstream of the project area are Lower Columbia River steelhead, Upper Willamette River chinook salmon, Lower Columbia River chinook, and Lower Columbia River coho salmon. Details about these fish can be found in the Biological Assessment.

4.2.8.4 **Effects to Fish Stocks of Concern**

Project design criteria was developed in the planning process to minimize or eliminate any adverse impacts the action alternatives might have on have on water quality, fisheries, and aquatic resources. The analysis of potential effects has determined that the probability of any impact to fish species of concern would be very low, of a short-term duration, and of a magnitude that would be immeasurable at the site-specific and watershed scale. There would be no measurable long-term effect to any habitat or watershed indicator where fish species occur. The effects determination for fish stocks is as follows:

Alternative A
Lower Columbia River Steelhead – No Effect (NE)
Upper Willamette River Chinook - No Effect (NE)
Lower Columbia River Coho - No Effect (NE)
Lower Columbia River Chinook - No Effect (NE)
Coastal Cutthroat Trout – No Impact (NI)

Alternative B and C
Lower Columbia River Steelhead – May Affect, Not Likely to Adversely Affect (NLAA)
Upper Willamette River Chinook - May Affect, Not Likely to Adversely Affect (NLAA)
Lower Columbia River Coho LCR - May Affect, Not Likely to Adversely Affect (NLAA)
Lower Columbia River Chinook - No Effect (NE)
Coastal Cutthroat Trout – "May impact individuals or habitat but will not likely contribute to a trend towards federal listing" (MIIH).

4.3 STAND GROWTH AND PRODUCTIVITY

(This section elaborates on Purpose and Need section 2.2.1.4)

4.3.1 **Introduction –** The proposed action involves the thinning of plantations. The plantations range from 30 to 61 years of age with an average of 47. Stand exam data was gathered for sample plantations. The plantations have been experiencing rapid growth in recent years but are becoming overcrowded.

For this proposal, the following actions have the potential to affect stand growth and productivity, both positively and negatively. Thinning would generally have a positive affect. Potential negative affects may include soil compaction from the use of heavy equipment, damaging leave trees, attracting insects by leaving slash and down logs on the ground and increasing wind damage susceptibility. Decompaction of roads and landings may improve growth and productivity. Other aspects of the proposed action would not have a meaningful or measurable affect on stand growth and productivity. Growth and productivity are primarily concerns in the matrix land allocation but the stand dynamics of plantations are also relevant to achieving objectives of other land allocations.

Thinning generally reduces losses to damaging agents because the vigor and strength of the trees is increased allowing continued growth. However, there are components of thinning activities that may negatively affect growth and productivity. Thinning may temporarily predispose stands to attack by certain agents even while it gradually builds up the resistance of the trees enough to reduce the harmful effects of the same agents. It is only under exceptional circumstances that thinning increases susceptibility to attack by insects. Most of the difficulty comes from a few species of bark beetles; these tend to breed in logging debris and then move to live trees when the debris is no longer inhabitable. Thinning can also result in logging wounds on the residual trees. Such wounds provide infection courts for bark beetles, wood-rotting fungi, and other existing damaging organisms.

4.3.2 Matrix

One of the aspects of the purpose and need is to increase health and growth that results in larger wind-firm trees on 2188 acres of matrix in the project area. The proposed thinning is in plantations that are at an age and density where they are beginning to experience suppression mortality and a slowing of their growth due to overcrowding. It is important to maintain the health and productivity of forests to sustainably provide future forest products in the matrix.

The term plantation is used informally to describe managed stands that were logged using the regeneration harvest method and were subsequently reforested by a combination of manual planting or trees that seeded in from adjacent live trees. In most cases, however, natural seeding has increased the stocking far beyond the original planting density. Remnant large trees are not present in these plantations with very rare exceptions.

One term used to describe the degree of crowdedness of individual trees within a stand is Relative Density (RD). It is a scale that ranges from 0 (no trees) to 100 (maximum biological potential). When a stand reaches or exceeds a RD of 55, suppression, mortality and stand decline is expected. Both tree and stand characteristics (tree growth rates, crown structure and mortality, as well as understory development and natural regeneration) are all closely related to relative density.

4.3.3 Existing Condition

The average stand diameter in the units that have not been commercially thinned is approximately 12 inches, with RDs greater than 70, and trees are experiencing growth suppression and some mortality. The understory vegetation is generally suppressed, and mortality of some trees in the suppressed and intermediate crown classes is occurring.

Approximately 120 acres (units 126, 138, 150, 172 and portions of units 114, 132, and 162) were commercially thinned within the last 20 years. For these stands the average diameter is 15 inches and the RD is now greater than 60. The understory vegetation such as conifers and some brush species are experiencing growth suppression due to a decrease in sunlight reaching the forest floor.

Direct and Indirect Effects

4.3.4 **Alternative A - No Action -** Trees that have been uniformly spaced during planting and then precommercial thinned interact differently when developing through inter-tree competition of the stem exclusion phase compared to natural stands seeded in after a fire or other stand replacement disturbance. Trees have less of a chance to express dominance when they have been planted from genetically similar seed sources and maintained at relatively even spacing. Therefore, when these stands reach density levels in which individual trees are competing with each other for growing space it may take longer for individuals to express dominance. As tree competition increases, stems would become tall

and slender as height growth continues, but diameter growth drastically slows. These trees would become more dependent on neighboring trees for support. Eventually, as some trees dominate and others fall behind, the dominant trees would develop more crown and diameter growth and therefore more individual stability. Still, as trees go through this competition phase, they are more likely to blow down or if drought conditions persist, be more susceptible to insects and disease.

Current stand diameters range from 10 to 14 inches (RD exceeds 90). With no action, the average stand diameters in 20-30 years would range from 12 to 16 inches; with stocking at levels where growth suppression and mortality continues to occur (RD would exceed 85). The understory vegetation would also continue to be suppressed.

Failure to maintain tree spacing while they are young can have consequences lasting the life of the stand (Oliver 1996). If no action is taken, the overstocked condition of current stands would result in stands with reduced vigor, smaller diameters, increased mortality, and increased susceptibility to stressors such as insects, diseases and weather.

4.3.5 **Action Alternatives –** Alternatives B and C would have similar effects in terms of stand growth and productivity. Thinning provides growing space, which gives the trees with the best competitive advantage the opportunity to quickly utilize the room to grow for the longest practical time. When trees are given the competitive advantage, the first response would be an expansion of fine roots and leaf area. This equates to more photosynthesis and carbohydrate production for height growth and larger crowns. The second response is an allocation of carbohydrate to diameter growth and finally, to the trees' defense system (Oliver 1996). Thinning can also improve the resistance of some trees to some pathogens by manipulating the structure and species composition of a young stand.

One of the objectives of thinning is to redistribute growth potential to fewer trees, while maximizing the site's potential, leaving a stand with a desired structure and composition (Oliver 1996). In general, thinning tends to improve the overall vigor, growth, health and architecture of trees. Thinning can directly affect productivity and forest health by maintaining growth rates of young stands.

There would be long-term benefits for stand growth and productivity. Average stand diameters in 20-30 years would range from 15 to 19 inches (three inches greater than with no action). At that time, tree size and stocking levels would begin to approach the stocking levels where growth suppression and mortality would occur (with RD of 50 to 55). Understory vegetation would have developed for 20-30 years without suppression from the overstory conifers. In stands thinned to 100 trees per acre (RD 30-35), the trees are expected to be narrow and shallower than treatments with fewer trees, but would increase in growth compared to unthinned stands.

Stands in the matrix would be thinned to improve stand growth, individual tree growth and to provide variability. The thinning prescription would employ a range of relative densities (25 – 35) to achieve stand growth and productivity goals while providing forest products.

Thinning results in several key changes in tree structure and vigor: larger stem diameters, longer and wider live crowns, less cylindrical stem form (reduced height to diameter ratio), and enhanced tree vigor (faster growth and healthier physiological condition. Because growing space made available by thinning is temporarily unoccupied, total tree growth production is reduced proportional to the intensity of the thinning; however, the temporary reduction in mortality from self-thinning can also lead to a higher standing live volume in thinned than unthinned stands at a later equivalent age (Maquire, D. 1996). A thinning to RD 35 would result in more trees available to put on more volume and diameter growth, sustaining health of the stand over a longer period of time while allowing for future management and silvicultural options.

4.3.6 **Late-Successional Reserves (LSR)**

One of the aspects of the purpose and need is to enhance or accelerate the development of mature and late-successional stand conditions on 1237 acres in the project area. The wildlife section contains discussions of the effects to late-successional dependent species. Timber production is not the objective in LSRs; this section focuses on tree growth and when late-successional characteristics might occur.

4.3.6.1 **Existing Condition**

The LSR plantations are 30-61 years old are overstocked and have relatively uniform tree size and distribution, little or no CWD component, lack understory development and low levels of snags. These plantations are not late-successional and do not meet the needs of dependent species.

4.3.6.2 **Direct and Indirect Effects**

No Action

See discussion above for matrix. With no intervention, these stands would remain at maximum density for many decades until natural mortality opens the canopy enough to allow expansion of crowns and understory response from increased light. The current average diameter range in LSRs is 11 to 14 inches (RD exceeds 95). With no action, the average stand diameters in 20-30 years would range from 13 to 16 inches. Development of all desired late-successional characteristics would proceed very slowly under these conditions. At this rate, stands would acquire late-successional characteristics in approximately 60-100 years.

Action Alternatives

Creating late-successional conditions necessitates altering plantations through density management (Furnish, J. 1997). Silvicultural prescriptions would incorporate variable-density thinning, wider spacing, retention of minor species, the creation of skips and gaps where appropriate to encourage accelerated growth, species and structural diversity, and increased distributions of snags and down wood.

Heavy thinning or gaps would occur on 10% of each plantation, as well as variable-density thinning (to relative densities of 20 – 40) would accelerate large tree growth, provide trees for both snag and down log creation, and promote multiple species, multi-layered canopies, and variable distribution of trees across the landscape. Average stand diameters in 20-30 years would range from 15 to 22 inches. At that time, tree size and stocking levels would begin to approach the stocking levels where growth suppression and mortality would occur (RD of 50 to 55). Where plantations are thinned to a RD of 30, it would take approximately 30 years for trees to grow to 20-inches in diameter. With the action alternatives, plantations would acquire late-successional characteristics in 30-50 years.

4.3.7 **Riparian Reserves**

One of the aspects of the purpose and need is to enhance riparian reserves on 1225 acres. The current vegetation in plantations does not meet the needs of associated aquatic and riparian resources. The water quality and fisheries section contains discussions of the effects to riparian reserves. Timber production is not the objective in riparian reserves; this section focuses on tree growth and when desired riparian conditions might develop.

4.3.7.1 **Existing Condition**

The riparian reserve plantations are 30-61 years old are overstocked and have relatively uniform tree size and distribution, little or no CWD component, lack understory development and low levels of snags. The plantations provide some shade to streams but they do not produce the size and quantity of coarse woody debris sufficient to sustain physical complexity and stability of the riparian reserves and associated streams. They do not have mature and late-successional stand conditions.

The stand structure in the Riparian Reserves is similar to that of the LSRs in regard to the lack of diversity. Stands are comprised of young, dense overstocked conifers and hardwoods.

Some riparian reserves would be thinned to a wider spacing than optimal for timber productivity. However, riparian objectives would be better served by a wider spacing where leave tree size would be maximized.

4.3.7.2 **Direct and Indirect Effects**

No Action

See discussion above for LSRs. Stands would acquire desired riparian late-successional characteristics in approximately 60-100 years.

Action Alternatives

Silvicultural prescriptions would incorporate variable-density thinning, wider spacing, and skips and gaps where appropriate throughout riparian reserves to encourage accelerated growth, species and structural diversity, and increased distributions of snags and down wood throughout riparian reserves. Vegetation manipulation maintains and restores the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.

The current average diameter range in riparian reserves is 12 to 14 inches. Where plantations are thinned to a RD of 30, it would take approximately 30 years for trees to grow to 20-inches in diameter.

Stands would acquire desired riparian late-successional characteristics in approximately 30-50 years.

4.3.8 **Windfirmness and Forest Diseases**

Denser stands are more susceptible to stem breakage or tipping in winds. Trees that grow at wide spacing and in windy areas can develop resistance to wind by growing strong stems and strong, spreading root systems. Trees that grow at tight spacing in the interior of stands are protected from the wind and would not develop the resistant stem or roots. Windthrow is a term used to describe trees knocked over by normal high wind events. Some trees that have root diseases are knocked down by wind but as the root disease develops they would eventually fall even in the absence of wind.

4.3.8.1 **Existing Condition**

The current plantations appear relatively stable and windfirm. They contain very few areas of windthrow. There are some root rot pockets with weakened trees and occasional scattered windthrow. This condition indicates that they currently have the strength to withstand the types of wind events that are typical in the project area.

Several forest diseases are present in the project area. Small isolated pockets of laminated root rot are present throughout these stands with minor occurrences of western hemlock dwarf mistletoe and armillaria root disease. These diseases, when present at low to moderate levels do not seriously compromise timber productivity and they result in down wood, some trees with the elements of wood decay and variability of spacing.

4.3.8.2 **Direct and Indirect Effects**

No Action - Allowing the current plantations to remain crowded would decrease the vigor of individual trees. Without thinning, this condition reduces trees' ability to fully develop resistant stems and roots to withstand forces from the wind. Unthinned stands cannot defend themselves against insects very well because their sap production is limited. The closer trees are to each other, the more insects and greater mortality.

Action Alternatives - Thinning plantations in the matrix would add to the continued stability during typical wind events. Variable-density thinning, minor species retention, and the incorporation of skips and gaps would add clumpiness and an element of variability to stands to both slow wind speed and lessen potential effects. Units that have been previously thinned are wind firm. Thinning the units would not increase the windthrow potential in previously thinned areas, however in areas with shallow soils and those not previously thinned, the potential exists for an increase in incidental amounts of scattered windthrow. These amounts would contribute to the down woody debris component and enhance structural diversity within the stands.

Thinning to enhance tree growth is one means to provide trees the advantage they need to increase their resistance to diseases or delay mortality.

Natural stem decays exist throughout these stands at endemic levels; they serve a necessary function in the health of the forest. Variable-density thinning that retains minor species components and retains some trees with the elements of wood decay would still meet stand health and growth objectives while enhancing diversity.

4.3.9 **Cumulative Effects - Stand Growth and Productivity**

Since there would be little or no negative direct or indirect effects to stand growth or productivity with the action alternatives, there would be no incremental impact and no cumulative effects analysis is necessary. See soils section for additional discussion of productivity.

4.3.10 Forest Plan standards and guidelines - Stand Growth and Productivity

Mt. Hood Forest Plan References
Forestwide Timber Management Standards and Guidelines - FW-306 to FW-385, page Four-86
Timber Emphasis Standards and Guidelines – C1-16 to C1-35-39, page Four-296
Mt. Hood FEIS pages IV-50 to IV-76
Northwest Forest Plan - Matrix Standards - page C-39

FW-372 Commercial thinning should maintain the desired stocking level to achieve a vigorously growing stand throughout the rotation, while considering wildlife cover needs.

The action alternatives are consistent with this standard and guideline and the No Action Alternative is not.

4.4 LANDSCAPE and STAND DIVERSITY

(This section elaborates on Purpose and Need section 2.2.1.3)

4.4.1 **Introduction -** Landscape goals include: providing a mix of forest and non-forest habitats to support diverse populations of desired plant and animal species, providing long-term sustained production of high quality water for fish and for on-Forest and off-Forest water users, providing healthy forest stands that are part of a landscape where wildfire risk is minimized, and providing for sustainable uses such as recreation and forest product utilization (s. 2.2.7). This section focuses on diversity at the stand and landscape scales.

Diversity is the distribution and abundance of different native plant and animal communities and species within an area. There are many elements of diversity including but not limited to genetic, structural, horizontal, and vertical. At the landscape scale, a mix of forest types and ages can provide habitat for a wide range of plants and animals. At the stand scale other elements become more relevant such as species composition, snag abundance or the number of canopy layers.

Both human actions and natural processes or events have the potential to alter diversity. Some actions or natural processes or events may seem to benefit one aspect of diversity while at the same time be detrimental to another.

For this proposal, the following actions have the potential to affect diversity, both positively and negatively. Thinning would have variable density with skips and gaps. Leave trees would include minor species, trees with the elements of wood decay, non-hazardous snags. Some snags and down logs would be created. Some hazardous snags may be lost.

4.4.2 **Existing Condition**

Plantations lack certain elements of diversity. They do not have the mix of tree species that were present in the original stand and they are relatively uniform in terms of tree size and spacing. There is a need for greater variability of vertical and horizontal stand structure. There is a need for more sunlight on the forest floor to create greater diversity of ground vegetation.

All of the stands, including those previously thinned, range in age from 30-61 years, are relatively dense, and generally limit sunlight penetration to the forest floor.

The plantations were planted primarily with Douglas-fir in the lower elevations; in some areas other species were planted. Some tree species are either present because they survived the clearcutting and burning or because they seeded in from stand edges.

4.4.3 Direct and Indirect Effects

No Action

The uniformity of plantations would remain unchanged in terms of species composition, vertical or horizontal structure. Recent studies have indicated that dense, closed-canopy second growth without legacy trees can result in a period of low structural diversity that can last more than 100 years and can have profound effects on the capacity of the forest to develop biocomplexity in the future (Courtney 2004, appendix 5, p. 3-24). The plantations contain some small and medium size snags (planted trees that died) and these would remain with this alternative. Over time as trees become suppressed more small and medium size trees would die. At the landscape scale there is not a shortage of this size of snag.

Action Alternatives

The thinning would enhance some elements of diversity that are lacking in plantations.

- Leave tree spacing would vary within units and between units.
- Skips and gaps would be created in a variety of sizes.
- Leave trees would include minor species.
- Leave trees would include trees with the elements of wood decay.
- Leave trees would include some live trees where their crowns touch certain key snags.
- All non-hazardous snags would be retained.
- All existing down logs would be retained and key concentrations of woody debris in the older decay classes would be protected.
- Some snags and down logs would be created.

These changes would result in improvements in diversity that would benefit the plants and animals in the project area. Plantations would have a more appropriate mix of tree species. There would be greater variability of vertical and horizontal stand structure and more sunlight would reach the forest floor to create greater diversity of ground vegetation. There would be a greater diversity of live and dead trees with the elements of wood decay.

4.4.4 Cumulative Effects

Since there would be little or no negative direct or indirect effects to diversity with the action alternatives, there would be no incremental impact and no cumulative effects analysis is necessary. Other sections of this document contain discussions of effects to wildlife and botany.

4.4.5 Forest Plan standards and guidelines - Landscape and Stand Diversity

Mt. Hood Forest Plan References
Forest Management Goals - #11 and 12, page Four-2
Forestwide Forest Diversity Standards and Guidelines – FW-148 to 169, page Four-67
Northwest Forest Plan - Aquatic Conservation Strategy Objectives - page B-11

The Action Alternatives are consistent with these standards and guidelines. The No Action Alternative would not enhance diversity.

FW-148 to 150	The thinning prescriptions retain a diversity of species.
FW-152 to 153	Not applicable
FW-154 &155	The thinning prescriptions retain a diversity of tree species based on site potential and encourage the continued presence of minor forest tree species.
FW-156	No native species would be lost.
FW-157	Some areas contain an abundance of alder. Where it is a minor species it would be retained. A portion of the alder would be removed in some areas where it is a major component. Where some is removed, sufficient quantities would be retained for nitrogen fixation.
FW-158 to 160	Not applicable
FW-163 to 169	See Wildlife section

4.5 WILDLIFE

The 2007 Plantation Thin Biological Assessment is incorporated by reference and summarized below. The 2007 Plantation Thin Project is covered by the 2007 Plantation Thin Biological Assessment (USDA 2006).

Management Indicator Species for this portion of the Mt. Hood National Forest include northern spotted owl (s. 4.5.1), pileated woodpecker(s. 4.5.14, s. 4.5.10, s. 4.5.11, s. 4.5.12), pine marten (s. 4.5.14), deer (s. 4.5.13), elk (s. 4.5.13), salmonid smolts and legal trout (4.2) (Forest Plan p. four-13).

4.5.1 Northern Spotted Owl (Threatened)

4.5.1.1 **Habitat Characteristics -** Habitat for the owl is defined as either suitable or dispersal habitat. Suitable habitat for the northern spotted owl consists of habitat used by owls for nesting, roosting and foraging (NRF). Generally suitable habitat is 80 years of age or older, canopy cover exceeds 60 percent, is multi-storied and has sufficient snags and down wood to provide opportunities for nesting, roosting and foraging. Dispersal habitat for the owl usually consists of mid-seral stage stands between 40 and 80 years of age of age with a canopy closure of 40 percent or greater and an average diameter of 11". Spotted owls use dispersal habitat to move between blocks of suitable habitat; juveniles use it to disperse from natal territories. Dispersal habitat may have roosting and foraging components, enabling spotted owls to survive, but lack structure suitable for nesting.

Owls can also disperse through suitable NRF habitat. In the tables below (s. 4.5.1.7 & 4.5.1.14) total dispersal acres are listed which includes both types of habitat.

4.5.1.2 **Analysis Area** – The spotted owl analysis area (79,173 acres) for this project includes Forest Service lands on the Clackamas River Ranger District. The mean home-range of spotted owls in the Oregon Cascades is 7,576 acres and is based on various studies (Courtney et. al. 2004). Based on this information a 1.94 radius was drawn around all the proposed harvest units and connected together to form the analysis area. This analysis area is an appropriate size for evaluating the habitat needs of the spotted owl in the project area. This analysis area includes Matrix and Riparian Reserve land allocations, Roaring River and Collawash River LSRs, and portions of the Bull of the Woods Wilderness. CHU OR-10 and 12 as well as Bull of the Woods and Salmon-Huckleberry Roadless Areas occur within the analysis area and overlap with the Matrix and LSR land allocations. Refer to maps in Appendix F.

Within the spotted owl analysis area, 25 historic nest and resident single owl locations (activity centers) were known to exist prior to 1994. These historic activity centers are distributed fairly evenly throughout the analysis area. Suitable spotted owl habitat exists throughout the analysis area and although fragmented compared to historical conditions, this habitat still is adequate to provide nesting opportunities for spotted owls in most locations. There are gaps in suitable habitat within this landscape and are located primarily in the eastern portion of Lower Fish Creek, Pup Creek, Whale Creek, Third Creek and the lower reaches of Upper Fish Creek. Proposed units 2 through 98 are located in this area. A smaller gap in suitable habitat occur within the Thunder, Dutch and the upper reaches of the Hot Springs Fork Tributary drainages. Proposed units 274 to 320 are located in the center of this area. Adequate dispersal habitat for the owl exists in all parts of the analysis area and is well distributed.

4.5.1.3 **Existing Condition of Proposed Harvest Units -** A total of approximately 4,374 acres are proposed for harvest. All of the stands are managed plantations and range in age from 30 to 61 years. Most of these units are comprised predominantly of Douglas-fir and western hemlock. Some of the stands have a substantial hardwood component of mainly alder and big-leaf maple.

Approximately 457 acres within units 54, 112, 116, 128, 130, 134, 142, 168, 276, 280, 282, 284, 286, 288, 292, 298, 302, 306, and 312, are considered non-habitat for the spotted owl due to their young age and resultant small diameter trees. The remaining 3,917 acres within the remaining units proposed for harvest are providing dispersal-only habitat for spotted owls. None of the units are considered suitable (i.e. nesting, roosting, and foraging) habitat for the spotted owl. They lack a multi-storied structure, large diameter trees and appropriate levels of snags and down wood required for nesting by the species.

Dispersal habitat described below is total dispersal habitat: a combination of nesting/roosting/foraging habitat (suitable) and dispersal-only habitat. (Owls can disperse through suitable habitat).

Snag and down woody debris are an important component of spotted owl habitat. Field data was collected in the summer of 2006 to determine down wood and snag levels within the two LSRs. The units within Roaring River and Collawash River LSRs had an overall average down wood percent cover of 5.8% and 5.9%, respectively. Snag levels of 10" diameter or greater within the Roaring River and Collawash River LSRs were at 1.5 and 1.7 trees per acre, respectively. Most snags are small to medium size. Few large legacy snags exist in the plantations. Although snag and down wood field data was not collected for the units within the CHUs and the Matrix land allocation, similar levels of down wood and snags are predicted due to the similarity in stand types throughout the project area.

4.5.1.4 **Elements of Proposal Analyzed -** The following actions have the potential to affect spotted owls: actions that remove or kill trees to a level below 40% canopy cover and activities that make noise are considered to result in a greater risk of adverse effects. These actions would include thinning, landing creation, trees removed for skid trails or skyline corridors, trees removed for road construction. Some actions are specifically designed to benefit owls and other species: variable-density thinning in LSRs, creating variability in tree spacing, creating skips and gaps, creating snags and down wood. While these elements are designed to have long-term benefits they may result in short-term impacts. Other actions such as log haul, road reconstruction, road repair or road closures would not have a meaningful or measurable affect on habitat but would create noise disturbance.

Direct and Indirect Effects

4.5.1.5 **Alternative A**

No short-term effects to the spotted owl would be predicted with this alternative. For the short term, the units would continue to function as dispersal habitat and snag levels would remain essentially unchanged. In the long term (20-40 years), the stands would start to differentiate to varying degrees and show an increase in the levels of snags, down wood and understory development. Where these developments occurred, they would improve the dispersal habitat characteristics being provided within the stands. The quality of dispersal habitat would improve only slightly in some stands while improving much more in others. Some of the stands may eventually develop nesting habitat characteristics and become suitable spotted owl habitat. However, with no action, the development of these stands into suitable habitat would take longer than with the action alternatives. Refer to Growth and Productivity and Diversity sections for further discussions of the response of trees to no action.

With no action there would be no noise related disturbance to owls.

Alternatives B and C

4.5.1.6 Effects to Dispersal Habitat on a Stand Scale

The proposed action includes commercial thinning and building temporary roads within approximately 4,374 acres of young managed plantations in the Matrix, Riparian Reserve, Roaring River and Collawash LSR land allocations; as well as Critical Habitat Units OR-10 and 12. Portions of the stands in stream protection buffers and skips would be unthinned. Other portions of the stands would include the creation of gaps, landings, helicopter landings, skid trails and skyline corridors.

The following table displays the acres of dispersal habitat treated within the spotted owl analysis area.

4.5.1.7 Proposed Treatment within Dispersal Habitat

ANALYSIS AREA	TOTAL ACRES	TOTAL ACRES DISPERSAL HABITAT TREATED	TOTAL ACRES DISPERSAL HABITAT DEGRADED	TOTAL ACRES DISPERSAL HABITAT REMOVED	PERCENT OF Analysis Area WITH DISPERSAL HABITAT DEGRADED	PERCENT ANALYSIS AREA WITH DISPERSAL HABITAT REMOVED	EFFECT TO HABITAT
Spotted Owl Analysis Area	79,173	3,938	2,953	985	3.7%	1.2%	Small

The proposed treatments within the matrix and riparian reserve land allocations as well as CHUs would include a variable thinning prescription that would improve the growth rate of the residual stand. Larger trees would eventually be provided in these young managed plantations in a much faster timeframe than they would if no management occurred. Skips and gaps would be incorporated into the prescriptions as well as the creation of snags and down woody debris; also adding to the potential for increased habitat diversity in the future.

The plantations within the late-successional reserves would be thinned as described in section 3.2.5. The incorporation of larger and more frequent skips and gaps, and the creation of additional snags and down woody debris would all add to the complexity of the stand and the acceleration of these proposed harvest units into developing spotted owl suitable habitat. In addition, a variable density thin would occur both between trees in the units and between stands, adding to the potential that the units would eventual provide diverse habitat attributes. These silvicultural techniques are more likely to push the stands to an accelerated trajectory that would result in suitable habitat sooner compared to treatments outside LSRs, and much sooner when compared to no action.

The proposed harvest treatments would temporarily degrade approximately 2,953 acres of dispersal habitat from the analysis area. This degradation of habitat would occur as a result of opening up the canopy from its current condition of 80-100% down to 40-55%; as well as the loss snags and down woody debris currently in the stands. The Design Criteria require the retention of down logs and snags where safety permits. Snag levels currently average from 1.5-1.7 snags per acre in LSRs and are expected to be reduced by 1 snag/acre after project implementation. Although the dispersal habitat within these units would be reduced in quality as described above, they would still function as dispersal habitat for the owl on 2,953 acres.

Due to the intensity of thinning within some of the units, 985 acres of dispersal habitat would be temporary removed in the stands. Even though the structural components (snags, remnant trees, down wood) would be retained, portions of these stands would be reduced to less than 40% canopy cover, the overall affect being a temporary loss of dispersal habitat within these stands. There would be a short-term loss of approximately 985 acres of dispersal habitat as a result of project implementation. This temporary loss of dispersal habitat would occur in both the Matrix and LSRs. Although dispersal habitat would be temporarily removed in LSRs, the benefits of thinning would outweigh this loss. Incorporating variable-density thinning (ranging from RD 20-40) with skips and gaps would create a mosaic of small openings with unthinned, moderately thinned and heavily thinned patches. This prescription helps generate complex structures by promoting tree growth at different rates. It also encourages understory development and diversity. Variable-density thinning with skips and gaps would also improve forest health by increasing resistance to disturbance and improving the stand's ability to recover after disturbance. By implementation these silvicultural techniques within LSRs, they would more quickly grow into late-successional forests than if no treatment occurred.

4.5.1.8 **Effects to Spotted Owls in the Vicinity of the Project Area**

Since current spotted owl surveys have not been completed for the area, it is assumed that all suitable habitat has the potential to contain spotted owl activity centers. There is suitable habitat adjacent to the many of the proposed thinning stands and it is currently providing nesting, roosting and foraging habitat. In addition, most of the units are within the mean home range (1.9 miles) of historic activity centers. Research has shown that activity centers that have been utilized in the past are likely to continue to be utilized in the future.

The following units or portions of units are within ¼ mile of spotted owl activity centers: 190, 208, 210, 226, 252, 254, 330, 332 and 340.

A recent study by Meiman (2004) reports changes in spotted owl use following a commercial thinning in stands near core areas in Clatsop State Forest. Although sample sizes were not large, proportional use of the thinned area was significantly less during and after harvest operations than during the pre-harvest period. The nature of this effect is not clear, but it may include an influence on prey availability, microclimate conditions, or higher vulnerability to predation. In addition, home range expansion of one spotted

owl was observed, and a shift of the core use area away from the thinned stand. These effects suggest that commercial thinning in proximity to spotted owl activity centers may have a short-term effect on home-range and habitat-use patterns of individuals.

The loss of dispersal habitat would preclude spotted owl movement through these stands where the habitat has been removed. The removal or reduction of quality of dispersal habitat within the proposed units could also change the habitat use and home-range of any spotted owls residing in or near the proposed treatment areas. Where activity centers are close to units, the loss of habitat or reduction in quality of dispersal habitat could alter the birds foraging habitats; or shift the core use area of an individual away from the thinned stand. However, since there would be no suitable habitat impacted by project activities, it is highly unlikely that the proposed harvest activities would negatively impact the health or resultant survival of any birds residing close to the project area.

Effects to spotted owls resulting from noise, human intrusion, or smoke-related disturbance are largely unknown. Based on anecdotal information and effects to other bird species, significant noise, smoke and human presence can result in a disruption of breeding, feeding, or sheltering behavior of the spotted owl such that it creates the potential for injury to individuals. Many of the proposed harvest units are near unsurveyed suitable habitat. However, suitable habitat is likely to be occupied at a rate of only one occupied nest site per 4,754 acres. Effects of the proposed project would only be predicted to be adverse if the proposed activities occurred during the breeding season near an active spotted owl nest, and within the applicable disturbance distance for the activity, since adult owls are able to distance themselves from disturbances. Therefore, adverse affects are linked to breeding when eggs/young have restricted mobility. Although there is a potential for an overlap between the proposed harvest and associated activities and active nests that could cause adverse effects, there is not a likelihood for such an overlap. Therefore, based on spotted owl nesting density in relation to the density of proposed projects, disturbance from these activity types are not likely to adversely affect spotted owls because while adverse effects are possibly, they are not reasonably certain to occur.

4.5.1.9 **Alternative C Only**

Alternative C involves the same units as Alternative B. Alternative C would not construct any new temporary roads; therefore some of the logging methods for the affected units would be changed. Alternative C includes road closures and decommissioning. See section 3.3 for Alternative C details.

Alternative C would log 876 acres with helicopter; compared to 754 acres in Alternative B. Alternative C would also log with a skyline and ground-based system approximately 1200 and 2298 acres, respectively. Compare this to Alternative B which treats 1307 and 2312 acres with a skyline and ground-based system, respectively.

Alternative C would have slightly reduced effect to spotted owl dispersal habitat due to the 2.6 miles of new temporary road construction proposal being dropped and the

increase of protection buffers on intermittent streams farther than one mile of listed fish habitat from 30 to 50 feet. Reduced roads and increases to streamside protection buffers would result in greater available dispersal habitat for owls. Although this change relative to Alternative B is measurable in acres, it would have no measurable or meaningful change to the effects to spotted owls related to dispersal habitat.

Alternative C would have an increase in helicopter logging by 122 acres and a reduction in skyline and ground-based system logging by 107 and 14 acres, respectively. Helicopter logging typically results in a loss of snags greater than in both tractor and skyline logging and typically has less of an effect on the existing down wood than both ground and skyline-based systems. The increase in helicopter logging by 122 acres would cause an increase on the potential loss of existing snags in the units and would cause a reduction in potential effects to existing down wood. These effects are measurable, but would have no measurable change to the effects to spotted owls related to snags and down wood being a component of spotted owl habitat. Although snags and down wood are beneficial in dispersal habitat and increase the opportunities for foraging; snags are already at low level within these stands, averaging 1.5 – 1.7 snags/acre in the LSRs. A few additional losses of existing snags would have no additional measurable impacts to spotted owls utilizing this habitat.

The 4.5 miles of proposed road decommissioning would slightly reduce the effects of fragmentation caused by road building once the roads become vegetated. The proposal to berm 43.23 miles and close 8.94 miles of roads with year-round gates would result in less noise disturbance to the owls. However, these roads would still remain intact and would continue to contribute to the fragmentation of spotted owl habitat.

4.5.1.10 Cumulative Effects

A cumulative effects analysis has been conducted for dispersal habitat within the Spotted Owl Analysis Area since there is a meaningful change. The change in dispersal habitat is small and the effects to northern spotted owls from this change would be minor. Since the Forest has emphasized the thinning of this type of habitat in recent years, a cumulative effects analysis for dispersal habitat has been conducted. Since the proposed project would have no effect on suitable habitat, no cumulative effects would occur to this spotted owl habitat type.

Alternatives B and C

Stands that have a canopy cover greater than or equal to 40 percent and conifer trees greater than or equal to 11 inches average diameter are considered dispersal habitat for spotted owls. As plantations grow, these conditions would be met at approximately age 40. Stands older than this would be considered functioning dispersal habitat and would not enter into this analysis unless their canopy has been reduced to less than 40%.

4.5.1.11 Past, Present and Foreseeable Future Projects and Actions

Project Name	Extent, Size, Type, & Distance	Overlap In Time Or Space	Type Of Potential Effect To Dispersal Habitat	Measurable Effect To Dispersal Habitat	Rationale For Inclusion Or Exclusion From Analysis Below
Present – Parts of the Moore Thin (No Whisky EA)	Units 16, 17 & 19: 98 acres of plantation thinning	Units occur within Analysis Area. Thinning is under contract but not yet logged.	Temporary loss and degradation of dispersal habitat	Yes. Approximately 38 acres of dispersal habitat lost and 60 acres of dispersal habitat degraded. These have been previously thinned.	Include. A loss and reduction in quality of dispersal habitat.
Present – Slip Thin	All units, 64 acres of plantation thinning	Units occur within Analysis Area. Slip Thin is under contract but not yet logged.	Degradation of dispersal habitat	yes	Include. A reduction in quality of dispersal habitat would occur.
Present – Elbow Thin (South Fork EA)	Units 1 & 2: 74 acres of plantation thinning	Units occur within Analysis Area. Not yet under contract.	None	no	Exclude. These units are not dispersal habitat before thinning.
Present – Fan and Thunder II Timber Sales (Collawash EA)	All units, 237 acres of plantation thinning and 55 acres of natural second-growth thinning	Units occur within Analysis Area. Fan under contract but delayed by litigation, Thunder II is Not yet under contract.	Degradation of dispersal habitat	yes	Include. A reduction in quality of dispersal habitat would occur.
Present – B Thin (Cloak EA)	Units 497, 498 & 500: 85 acres of plantation thinning	Units occur within analysis area. B Thin is currently in the process of being logged.	Degradation of dispersal habitat	yes	Include. A reduction in quality of dispersal habitat would occur.
Present – Blister Fire	Lightning caused wildfire affecting dispersal habitat	Yes. Fire occurred within Analysis Area	With current and predicted mortality, 149 ac. of dispersal habitat lost	yes	Include. A loss and reduction of quality of dispersal habitat has occurred.
Past – regeneration harvest	Throughout Analysis Area	Yes, all plantations less than 40 years*	Loss of dispersal habitat	Yes	Include. A loss of dispersal habitat has occurred.
Past – other commercial thinning not listed above	Throughout Analysis Area	No. Older thinning prescriptions used a light thinning which have recovered to dispersal habitat already.	Loss or degradation of dispersal habitat	No	Exclude. Effects no longer evident. Stands have recovered.
Past – road construction	Throughout Analysis Area	Yes. roads occur throughout	Permanent loss	Yes. Approximately	Include. A permanent loss

Project Name	Extent, Size, Type, & Distance	Overlap In Time Or Space	Type Of Potential Effect To Dispersal Habitat	Measurable Effect To Dispersal Habitat	Rationale For Inclusion Or Exclusion From Analysis Below
		the Analysis Area	of dispersal habitat	2,768 acres of dispersal habitat has been converted to roads	of dispersal habitat has occurred.
Past – rock quarries	Throughout Analysis Area	Yes. Rock quarries are permanent and occur throughout the Analysis Area	Permanent loss of dispersal habitat	Yes	Include. A permanent loss of dispersal habitat has occurred.
Past – Power Line	Southern portion of Analysis Area	Yes. Power lines are permanent	Permanent loss of dispersal habitat	yes	Include. Trees that grow under power line are cut for safety before they can become dispersal habitat.
Past – road decommissioning	Throughout Analysis Area	Yes	Trees begin to grow in road	No	Exclude. No detrimental effect to dispersal habitat. Roads eventually would become dispersal habitat.
Past and present watershed restoration projects	Culvert replacement, road repairs, etc.	Yes.	None	No	Exclude. No effect to dispersal habitat.
Activities on other ownerships	Past logging. No known foreseeable future logging.	Yes, 52 acres of private ownership	Loss of dispersal habitat	Yes	Include. A loss of dispersal habitat has occurred from past logging.
Future timber harvest	Unknown, but potential for timber harvest occurs within all parts of the Analysis Area except for Wilderness.	Unknown location	Unknown of intensity of treatments	No	Exclude. No site specificity. Can not be modeled at this time. The appropriate time to conduct a cumulative effects analysis would be in a future EA after a firm proposal is developed.
Off highway vehicle use	Minimal dispersed use throughout the Analysis Area	Yes	Compaction and disturbance	No	Exclude. No effect to dispersal habitat.

***** Timber sales occurring more than 40 years ago would likely have already grown into dispersal habitat. There has been a total of 29,738 acres if regeneration harvest. Of this total, 18,957 acres of past regeneration harvest occurred within the past 40 years.

4.5.1.12 The owl analysis area is comprised of 56,484 acres of dispersal habitat, or 71%. This calculation looks at the existing condition of vegetation as it has been affected by past regeneration harvest timber sales, fires, power line and rock quarry creation, and road construction; all of which are listed in s. 4.5.1.11. These disturbances are tracked by stand age (Data source – GIS data from Veg2005.shp and Roads.shp). In addition, this calculation takes into consideration the loss of dispersal habitat that would result from the implementation of the Moore thinning timber sale as well as the anticipated loss of dispersal habitat from the Blister Fire. There would also be approximately 688 acres that would have dispersal habitat degraded in the Moore, Fan, Thunder, Slip and B thinning timber sales. The baseline adjusted for these planned sales would be 55,796 acres of dispersal habitat or 70%.

4.5.1.13 **Effects of Past Actions:**
The landscape pattern of vegetation has been affected by past timber harvest, fires, etc, substantially impacting the habitat for spotted owls. Some ecologically important features of landscape pattern are: amount of edge habitat, degree of fragmentation of late-successional forest, and amount of interior forest. As fragmentation of a landscape pattern increases, the amount of interior forest habitat decreases and the amount of edge habitat increases. As fragmentation increases, the amount of interior forest habitat decreases, impacting organisms that prefer large patches of interior habitat, such as the spotted owl.

Past management actions, the Blister Fire and other fires have reduced the amount of dispersal habitat within the analysis area by approximately 20,000 acres. There is currently still adequate dispersal habitat for spotted owls.

Incremental Affect of Action Alternatives:

4.5.1.14 **Proposed Treatments as Related to the Current Dispersal Habitat Available Within the Spotted Owl Analysis Area**

Analysis Area	Dispersal Habitat (Includes Suitable and Dispersal-only habitat)						Total Remaining Dispersal Acres
	Total Acres	Total Acres Removed	Total Acres Remaining Post-harvest	percent of habitat Removed	Acres Degraded	Percent Acres Degraded	
Spotted Owl Analysis Area	55,796	985	54,811	2%	2,954	5%	54,811

The loss of approximately 985 acres of dispersal habitat from the current proposal as well as the subsequent implementation of the Moore timber sales would preclude spotted owl movement through these stands where the habitat has been removed. However, the

ability of the owls to move across the landscape in the analysis area would still be adequate since adequate dispersal still exists in the appropriate quantities and juxtaposition. Abundant dispersal habitat would remain in the analysis area to allow the birds to adequately disperse between suitable habitat blocks.

There would be a degradation of approximately 2,954 acres of dispersal habitat from the current proposal in addition to the subsequent implementation of the Moore, Fan, Thunder, Slip and the B Thins. The loss of dispersal habitat described above as well as reduction of quality of dispersal habitat within the proposed harvest units and on-going projects listed above could change the habitat use and home range of any spotted owls residing within the analysis area. Where activity centers are close to thinning proposals that would remove or reduce the quality of dispersal habitat, it could alter the birds foraging habitats; or shift the core use area of an individual away from the thinned stand. Since dispersal habitat would still be available in the analysis area in adequate quantities and distribution, it is unlikely that these actions would negatively impact the health or resultant survival of any birds residing within the analysis area.

The cumulative effects on dispersal habitat would be minor, mainly because dispersal habitat is not the limiting factor for owls in the area. In this analysis area, the more likely limiting factor for spotted owl occupancy of the area is the lack of spotted owl suitable habitat and lack of connectivity between these suitable habitat blocks. In the long term, thinning treatments in the LSR with the action alternatives would accelerate the development of suitable spotted owl habitat.

4.5.1.15 Forest Plan Standards and Guidelines

Mt. Hood Forest Plan References
Forestwide Wildlife Standards and Guidelines – FW-170 to 186, page Four-69
Northwest Forest Plan - Matrix Standards and Guidelines - page C-9

Many of the proposed treatment areas occur within the Roaring River and Collawash River LSRs. The following table displays acres treated in each land allocation as well as amount of acres managed in dispersal and non-habitat for spotted owls.

Forest Plan Land Allocation	**Proposed Total Acres Treated**	**Proposed Total Acres Treated in Dispersal Habitat**	**Proposed Acres Treated in Non-Habitat**
Matrix	2,236	1919	317
Streamside Riparian Reserves outside LSRs	900	782	118
Roaring River LSR	879	878	1
Collawash LSR	346	346	0
LSR 100	13	13	0
Total Acres Treated	4,374	3,938	436

The action alternatives are consistent with the following standards and guidelines

NFP C-12	Thinning in LSRs is consistent with LSR standards and guidelines because stands are less than 80 years old and thinning is designed to accelerate the development of late-successional forest conditions. The proposal is consistent with criteria developed by the Regional Ecosystem Office.
FW 170 & 171	This standard and guideline is not applicable to individual projects.
FW-174	Habitat for threatened, endangered and sensitive species has been identified and managed in accordance with the ESA (1973), the Oregon ESA (1987), and FSM 2670.
FW-175	Habitat for threatened, endangered and sensitive species is managed at the landscape scale. This standard and guideline is not applicable to individual projects.
FW -176	A Biological Evaluation has been prepared.
FW 177 & 178	Consultation with USFWS has been initiated.
FW-179	The creation of Species Management Guides is not applicable to individual projects.
FW-180	The maintenance of lists of threatened, endangered and sensitive species is done but this standard is not applicable to individual projects.
FW-181	This document does not include location information.

4.5.1.16 Endangered Species Act Compliance

The 2007 Plantation Thin Project is covered by the 2007 Plantation Thin Biological Assessment (USDA 2006). Formal consultation with U.S. Fish & Wildlife Service has been completed for this project. The Biological Opinion written by U.S. Fish & Wildlife Service is dated October 31, 2006 (USDI 2006).

4.5.1.17 Project Effects to Dispersal Habitat within Critical Habitat Unit OR-10 and OR-12

The following table displays the total dispersal acres proposed for treatment within both Critical Habitat Units.

4.5.1.18 Proposed Treatments as Related to Critical Habitat Units OR-10 and 12.

Critical Habitat Units	Proposed Total Acres Treated	Proposed Total Acres Treated in Dispersal Habitat	Proposed Acres Treated in Non-Habitat
CHU OR-10	1,344	1262	82
CHU OR-12	509	262	247
Total Acres Treated	1,853	1,524	329

Section 4.5.1.19 describes the existing condition of the Critical Habitat Units and the project effects to the CHUs.

4.5.1.19 Existing condition and effects to Critical Habitat Units

Critical Habitat Unit	Dispersal Habitat (Includes Suitable and Dispersal-only habitat)					Total Remaining Acres
	Total Acres	Total Acres Removed	percent of habitat Removed	Acres Degraded	Percent Acres Degraded	
OR-10	56,218	316	0.6%	946	1.7%	55,902
OR-12	51,069	66	0.1%	196	0.4%	51,003
Total	**107,287**	**382**	**0.7%**	**1,142**	**2.1%**	**106,905**

4.5.1.20 **Effects to critical habitat -** The effect determination for the action alternatives on northern spotted owl critical habitat units OR-10 and OR-12 is, "**May Affect, Likely to Adversely Affect."** This determination is due to the removal of currently functional dispersal habitat. The proposed harvest treatments would open up the canopy cover to less than 40% in some areas, making them unsuitable for dispersing owls. Within the CHUs, the proposed actions would also in the short-term add cumulatively to the decline of dispersal habitat, a primary constituent element of northern spotted owl critical habitat.

However, the resultant spotted owl habitat within these CHUs as a whole after project completion would be sufficient to provide spotted owl nesting and dispersal. The action alternatives would not appreciably diminish the functionality of these CHUs to provide habitat conditions that support the recovery of the northern spotted owl. Long-term effects would overall be beneficial because the proposed harvest treatments are predicted to eventually improve the quality of dispersal habitat in many of the units and speed up the succession of these stands within the CHUs into suitable habitat.

4.5.1.21 **Effects to spotted owl at the project scale -** The action alternatives would have an effects determination of "**May Affect, Not Likely to Adversely Affect**" because of the effect to dispersal habitat.

4.5.1.22 Effects to spotted owl on a province scale (Willamette Province)

The United States Fish and Wildlife Service (USFWS) issued a Biological Opinion for the 2007 Plantation Thin Timber Sale (USDI, 2006). The conclusion reached after considering the cumulative effects of this and other projects is that the action alternatives are **not likely to jeopardize the continued existence of the spotted owl and are not likely to destroy or adversely modify designated critical habitat for the spotted owl**.

4.5.1.23 Effects to spotted owl on the entire range of the species (Washington, Oregon, and California)

The Northwest Forest Plan established a system of land allocations and a rate of timber harvest (probable sale quantity) that is considered to be consistent with maintaining viability for the northern spotted owl across its range (USDA, USDI 1994b). The action alternatives would **not significantly alter the landscape's capability to provide for the continued viability of the northern spotted owl on Federal Lands.**

A report titled "Scientific evaluation of the status of the Northern Spotted Owl" was published by Sustainable Ecosystems Institute (Courtney 2004). The report is a review and synthesis of information on the status of the Northern Spotted Owl. The report was prepared to aid the U.S. Fish and Wildlife Service in their 5-year status review process, as set out in the Endangered Species Act. The report did not make recommendations on listing status or on management, but focused on identifying the best available science and the most appropriate interpretations of that science. The focus is on new information developed since the time of listing in 1990. The report relied on demography studies summarized in a report titled "Status and Trends in Demography of Northern Spotted Owls, 1985-2003" (Anthony 2004).

One of the topics discussed in this Report was the barred owl and the species' expansion into northern spotted owl territory from northeastern Canada since about 1900 and its subsequent movement into Washington, Oregon and Northern California; in some cases displacing spotted owls. Barred owls may be expanding their range because of changes to forest structure from logging, wildfire or climate change. Barred owls are known to be present on the District. By casual observation and incidental surveying since 1994, barred owls do appear to be more common on the district than they were since surveying began on 1979. Since routine surveys have not been completed for owls since approximately 1994, it is unknown as to what extent there presence has affected the population of spotted owls on the District.

This barred owl information and all other topics discussed in the Report do not reveal effects concerning the impacts of the 2007 Plantation Thin thinning proposal in a manner or extent not previously considered. See wildlife biological assessment for more detail on this report.

4.5.2 Northern Bald Eagle (Threatened)

4.5.2.1 **Habitat Characteristics**: The bald eagle is a permanent resident in Oregon. Their nests are usually located in multi-storied stands with old-growth components, and are near water bodies that support an adequate food supply. Nest sites are usually within ¼ mile of water in the Cascades.

Adequate forage sources are possibly the most critical component of bald eagle breeding and wintering habitat. Fish, waterfowl, rabbits, and various types of carrion comprise the

most common food sources for eagles in the Pacific Recovery Plan area. Wintering bald eagles perch on a variety of substrates, proximity to a food source being the most important factor influencing perch selection. Eagles tend to use the highest perch sites available that provides a good view of the surrounding area. These perch sites typically are snags and trees with exposed lateral limbs or dead tops (USFWS 1986). Communal roosts are invariably near a rich food source and in forest stands that are multi-storied and have at least a remnant old-growth component.

4.5.2.2 **Existing Situation:** Bald eagles are observed occasionally on the District, especially in late summer through late winter. Due to low numbers and sporadic use, no communal roost areas are known to exist on the District. There has been consistent use by adults in two areas of the Clackamas River Ranger District, one of which has had recent nesting success by a bald eagle pair. These areas are greater than 20 miles away from the proposed project site.

The project area is in close proximity to the Clackamas and Collawash Rivers, two areas that bald eagles are commonly observed during the spring/summer period. The Analysis Area for bald eagles is ¼ mile from the west stream banks of Clackamas River, starting at Indian Henry and ending at Two Rivers. It then continues on the Collawash River from the same place at Two Rivers to the confluence of Happy Creek. This area was designed to incorporate the area that is likely have most of the bald eagle activity and contain the proposed actions that occur within this potential bald eagle habitat.

Habitat for bald eagles is described in terms of foraging, nesting, roosting, and perching. The lower portions of the Clackamas and Collawash Rivers are fairly narrow and usually have swift water and rapids which may decrease the availability of fish to foraging eagles. The steepness of the river canyons and the narrow riverbeds limit the views of the river for a bald eagle from any areas except right along the rivers' banks. The high use paved roads in the area occur adjacent to the river banks along much of the Clackamas and Collawash Rivers, often without any visual buffer. This prevents any potential foraging areas from being free of disturbance.

Although there have been no documented nesting eagles in the area, there is suitable nesting and roosting habitat along these Rivers. The nesting quality is considered fair in the analysis area, with prey availability being the likely limiting factor. Most of the better forest stands with characteristics favorable to bald eagles are also located along the rivers, so nest sites would likely be located very near the rivers. Most adequate nesting habitat in these areas would also be impacted by disturbance from the heavy traffic and easy access. Roosting quality in the analysis area is considered marginal to fair?

4.5.2.3 **Existing Condition of Proposed Harvest Units:** Some of the proposed harvest units occur within ¼ mile the Clackamas and Collawash Rivers, a potential foraging source. Portions of units 100, 102, 104, 144, 146, 148, 150, 160, 161, 162, 164, 166, 176, 177, 178, 208 and 210 are within ¼ mile of the Clackamas River and portions of units 202,

204, 206, 322, 326, 346 and 348 are within ¼ mile of the Collawash River. None of these proposed harvest units have the structural components necessary for potential bald eagle nesting or communal roosting habitat. The units lack a mature multi-story structure with old-growth or old-age second-growth trees. However, these units may provide potential perching habitat due to their proximity to these two rivers. This potential perching habitat is considered fair/poor quality due to the minor amounts of snags and trees providing a good view of the surrounding area. In addition, many of the proposed harvest units within ¼ mile are directly adjacent to potential bald eagle nesting habitat (i.e. late-seral stands that within ¼ mile of these two rivers).

4.5.2.4 **Elements of Proposal Analyzed:** The following actions have the potential to affect bald eagles: actions that remove perch trees within ¼ mile of the Clackamas or Collawash Rivers. These actions would include thinning, landing creation, trees removed for skid trails or skyline corridors, trees removed for road construction. One aspect of the proposal is to create snags. Other actions farther than ¼ mile from the rivers would not have a meaningful or measurable affect on bald eagles. Log haul would occur along these rivers but not in the winter.

Direct and Indirect Effects

4.5.2.5 **Alternative A**

There would be no effects to the northern bald eagle with this alternative. In the short term, some of the units would continue to provide poor/fair quality perching habitat. In the long-term (20-40 years), the stands would increase in tree size and show an increase in the levels of snags. When these developments occurred, they would improve the perching habitat characteristics being provided within the stands adjacent to the Clackamas and Collawash Rivers. Some of the stands may eventually develop nesting habitat characteristics and become potential nesting or communal roosting habitat for the bald eagle. However, the development of these stands into improved perching habitat and eventual suitable nesting habitat would be delayed in the no action alternative due to the current densities of the stands and their resultant slower growth rates. Refer to Growth and Productivity and Diversity sections for further discussions of the response of trees to no action.

Alternatives B and C

4.5.2.6 **Effects to Habitat**

There would be no effects to potential nesting or communal roosting bald eagle habitat due to the lack of these habitats within the proposed harvest units. Some of the units listed above could have a few remnant trees or snags still remaining in the unit that could serve as a potential perch trees. Although no potential perch trees would be proposed for harvest, it is possible a few, mainly snags, would need to be cut down due to safety

concerns during harvest operations. It is also possible that a few potential perch trees would blow down as a result of helicopter logging or "opening up the stand."

Perch trees along these portions of the Clackamas and Collawash Rivers are currently abundant and have moderate to high densities of relatively large trees with irregular crowns. Because there is currently moderate to high qualities of perch trees present within ¼ mile of these two portions of the Clackamas and Collawash Rivers, the loss of a few perch trees as a result of the proposed harvest treatments is not predicted to meaningful impact the quality of perching habitat for bald eagles within the area. It is unlikely that this loss of perch trees would meaningfully lower the availability of potential bald eagle habitat currently being provided in the area. In addition, the action alternatives contain would create some snags (s. 3.5.2).

With Alternative B, approximately 2.6 miles of new temporary roads would be built. However, only one of the roads would be built within ¼ mile of the Collawash River; none would be built this close to the Clackamas River. This road is approximately 1250 feet in length and occurs within unit 348. The construction and temporary use of this road would cause a slight increase in potential disturbance to bald eagles potentially using this habitat or the surrounding stands for perching and foraging. However, this increase in disturbance would create no meaningful impacts to the bald eagle. There would be no meaningful decrease in potential perching habitat available for bald eagles in the area. All other roads built would be beyond ¼ mile of the two rivers and have no effect on bald eagles or their habitat.

All other proposed activities associated with this project that fall outside of this analysis area would have no impacts to bald eagle habitat.

4.5.2.7 **Effects to Individuals**

If a bald eagle were present in any of the units during project implementation, it would have the ability to quickly move to adjacent acceptable habitat. No harm would come to the individuals. Several of the proposed harvest units within ¼ mile of the rivers are directly adjacent to potential nesting, communal roosting and high quality perching habitat. Disturbance caused by project implementation could cause these potential habitats to be temporary unavailable to bald eagles. Since the availability of a high quality foraging source is the limiting factor for bald eagle in the area and not the habitat components comprising roosting, nesting and perching habitats, the temporary unavailability of a small percentage these habitats is not predicted to impact bald eagles. Because of the high visibility of bald eagles, it is unlikely that this project would be implemented in an area with an undiscovered bald eagle nest or roost. If a new bald eagle nest or roost is discovered within 0.25 mile (or 0.5-mile sight distance) of the project, the situation would immediately be evaluated by the District biologist for potential effects on bald eagles and mitigated to prevent disturbances.

All other proposed activities associated with this project that fall outside of this analysis area would have no disturbance impacts to bald eagles.

4.5.2.8 **Alternative C Only**

Alternative C involves the same units as Alternative B. Alternative C would not construct any new temporary roads; therefore some of the logging methods for the affected units would be changed. Alternative C includes road closures and decommissioning. Approximately 4.5 miles of roads would be decommissioned, 43.23 miles would be bermed, and 8.94 miles would be closed year-round with gates. Intermittent streams farther than one mile of listed fish habitat would have the protection buffers increased from 30 to 50 feet.

Alternative C would log 876 acres with helicopter; compared to 754 acres in Alternative B. Alternative C would also log with a skyline and ground-based system approximately 1200 and 2298 acres, respectively. Compare this to Alternative B which treats 1307 and 2312 acres with a skyline and ground-based system, respectively.

As a result of no new road building in this alternative, there would be an increase in helicopter logging by 21 acres within 4 units (178, 322, 346, and 348) that are within ¼ mile of the Clackamas and Collawash Rivers. There would also be a subsequent reduction in skyline and/or ground-based logging in these same units. Helicopter logging typically results in a loss of snags greater than in both tractor and skyline logging. The increase in helicopter logging by 21 acres compared to Alternative B would cause a very slight increase in the potential loss of existing snags, and possibly potential perch trees, in the units and surrounding stands. There would be no measurable change to potential bald eagles perching habitat. The majority of snags lost would be small/moderate diameter snags less than 20" diameter; too small for a bald eagle perching site. Although snags are the most common perching sites for bald eagles, they are already at low level within these stands, averaging 1.5 – 1.7 snags/acre. The loss of some existing snags, most of which would be too small to be utilized by bald eagles, would have no additional meaningful impacts to potential bald eagle perching habitat.

There are no roads proposed for decommissioning or closed with a gate that are within ¼ mile of the Clackamas or Collawash Rivers. However, there are four roads proposed to be bermed that are within ¼ mile; one near the Collawash and three close to the Clackamas River. These roads are 6340-120, 4621-150, 4621-162 and 4620-130. Only small portions of these roads proposed to be closed with a berm are within ¼ of the rivers, so only approximately 2000 additional feet of road would be closed in potential perching habitat for bald eagles. The closing of access to these segments of road would cause a slight decrease in potential disturbance to bald eagles potentially using this habitat or the surrounding stands for perching and foraging. However, these almost immeasurable decreases in disturbance would create no meaningful benefits to the bald eagle potentially using the area.

4.5.2.9 Effects to Population

None expected since there would be no meaningful effects to bald eagles and their habitat.

4.5.2.10 Cumulative Effects

The action alternatives would have no effect on potential bald eagle nesting or communal roosting habitat. The loss of a few perch trees would reduce the total amount of potential perch trees available; but the change would be so minor it would essentially have no effect to the available habitat for bald eagle foraging or perching. A cumulative effects analysis is not needed for bald eagle habitat since there is no meaningful change in bald eagle habitat with implementation of the action alternatives.

4.5.2.11 Forest Plan Standards and Guidelines

Mt. Hood Forest Plan References
Forestwide Wildlife Standards and Guidelines – FW-170 to 186, page Four-69
Management Area Standards and Guidelines – A13-001 to 038, page Four-203

The action alternatives are consistent with the following standards and guidelines

FW-172	There are no A13 – Bald Eagle Habitat Areas in the project area.
FW-173	There would be no perch trees removed within 200 feet of a river or lake used by eagles for hunting and feeding.
A13-001 to 038	The A13 Bald Eagle Habitat Area standards and guidelines (A13-001 to A13-038) do not apply because there is no A13 land allocation within the project area.

4.5.2.11 Endangered Species Act Compliance

Bald Eagle Effects Determination

All action alternatives would have a "**May Affect, not Likely to Adversely Affect**" for disturbance only on the bald eagle.

There would be no effect to bald eagle habitat so consultation with the U.S. Fish and Wildlife Service was not needed for modification to bald eagle habitat. However, there is the potential for disturbance effects to the species. Consultation with the U.S. Fish and Wildlife Service is covered under the Letter of Concurrence dated October 17, 2005.

4.5.3 Special Status Species

The following table summarizes effects to Sensitive Species.

4.5.3.1

Species	Suitable Habitat Presence	Impact of Alternatives*	
		Alt. B	Alt. C
Oregon Slender Salamander	No	NI	NI
Larch Mountain Salamander	No	NI	NI
Cope's Giant Salamander	Yes	MII-NLFL	MII-NLFL
Cascade Torrent Salamander	No	NI	NI
Oregon Spotted Frog	Yes	MII-NLFL	MII-NLFL
Painted Turtle	No	NI	NI
Northwestern Pond Turtle	No	NI	NI
Horned Grebe	No	NI	NI
Bufflehead	No	NI	NI
Harlequin Duck	No	NI	NI
American Peregrine Falcon	Yes	MII-NLFL	MII-NLFL
Gray Flycatcher	No	NI	NI
Baird's Shrew	No	NI	NI
Pacific Fringe-tailed Bat	Yes	NI	NI
California Wolverine	No	NI	NI
Puget Oregonian	No	NI	NI
Columbia Oregonian	No	NI	NI
Evening Fieldslug	Yes	MII-NLFL	MII-NLFL
Dalles Sideband	No	NI	NI
Crater Lake Tightcoil	No	NI	NI

* "NI" = No Impact
"MII-NLFL" = May Impact Individuals, but not likely to Cause a Trend to Federal Listing or Loss of Viability to the Species

Effects to the species listed above include changes to habitat as well as potential harm to individuals caused by physical impacts of logging equipment, falling and dragging trees, noise, fuels treatment, road construction, reconstruction, obliteration, log haul, snag creation, and down woody debris creation.

4.5.3.2 Forest Plan Standards and Guidelines

Mt. Hood Forest Plan References
Forestwide Wildlife Standards and Guidelines – FW-170 to 186, page Four-69
Northwest Forest Plan – Survey and Manage Standards and Guidelines

The action alternatives are consistent with the following standards and guidelines

FW-186	None of the proposed actions would occur within ¼ mile of an active peregrine falcon nest between April 1 and July 31st.
NFP C-4	There are no known survey and manage sites that would be affected by the proposed actions.
NFP C-5	No surveys are required for any survey and manage species
NFP C-5 & 6	The need for extensive survey and manage surveys and general regional surveys are outside the scope of this project.
NFP C-6	There is no grazing that occurs on the Clackamas River Ranger District.

4.5.3.3 Wildlife Survey and Manage Species: Terrestrial Mollusks, Red Tree Voles, Salamanders and Great Gray Owls

Surveys were not conducted for terrestrial mollusks, red tree vole, salamanders or great gray owls because habitat for these species is not affected by the project. Even though the plantations are less than 80 years of age and therefore survey and manage standards and guidelines are not applicable, the project would be in compliance with both the 2001 and 2004 Records of Decision for survey and manage.

4.5.4 Snags and Down Wood

4.5.4.1 **Existing Situation –** The snag and down woody debris density data in the watershed analyses was based on the 1992 Forest Inventory.

The Forest has implemented snag and down woody debris transects within proposed units to determine more accurately what the current level of snags and coarse woody debris is within the proposed LSR thinning units. Small snags less than 10 inches diameter were not counted because the proposed harvest units already have moderate levels of small snags.

4.5.4.2 Existing snag and down wood levels in the proposed harvest units within the Roaring River and Collawash LSRs. Data taken by Forest Service Field Crews in 2006.

	Roaring River LSR: 32-49 year-old units	Roaring River LSR: 50-61 year-old units	Collawash LSR: 40-50 year-old units
Snags greater than 10 inches diameter	1.8 snags/acre	1.3 snags/acre	1.7 snags/acre
Snag diameter (inches)	Average - 16.5 Ranges from 10 to 64	Average - 16.5 Ranges from 10 to 64	Average - 15.4 Ranges from 10 to 38
Percent Ground Cover of wood ≥3 inches diameter	Average of 4.9%. Ranges from 0.7% to 13%.	Average of 6.4%. Ranges from 0.6% to 15%.	Average of 5.9%. Ranges from 1.5% to 15.4%.

4.5.4.3 In looking at the units individually it is apparent that there is a wide variation in the amount and size of down wood currently in the stands. One stand that had very large remnant logs from the past harvest were 3-4 feet in diameter and still very sound. This stand had pockets of down wood that would exceed 15 percent ground cover.

The primary and secondary cavity nesting species for the western hemlock zone are: pileated woodpecker, northern flicker, hairy woodpecker, red-breasted sapsucker, and red-breasted nuthatch. The 100% biological potential level is 3.7 snags per acre (Austin 1995). The primary and secondary cavity nesting species for the Pacific silver fir zone are: pileated woodpecker, northern flicker, hairy woodpecker, Williamson's sapsucker, red-breasted sapsucker, and the red-breasted nuthatch. The 100% biological potential level is 4 snags per acre (Austin 1995).

In the 2007 Plantation Thin planning area, the standard and guideline from the Forest Plan (FW-215) for harvest units is 60% of the full biological potential, which translates into 2.4 snags per acre in the mid and late-seral stages for the units within the Pacific Silver fir zone and 2.2 snags per acre for those units occurring within the Western Hemlock zone.

Many species in the Pacific Northwest evolved to use large snags and logs that were historically abundant in the landscape. The loss of snag and log density from managed stands affects biodiversity and potentially could cause a loss of critical function in the landscape such as control of forest insects.

4.5.4.4 DecAid Advisor

DecAID is a planning tool intended to help advise and guide managers as they conserve and manage snags, partially dead trees and down wood for biodiversity (Mellen 2003). Refer to the DecAID web site listed in the References section for more detail and for definition of terms. This advisory tool focuses on several key themes prevalent in recent literature concerning this subject and is as follows:

- Decayed wood elements consist of more than just snags and down wood, such as live trees with dead tops or stem decay.
- Decayed wood provides habitat and resources for a wider array of organisms and their ecological functions than previously thought.
- Wood decay is an ecological process important to far more organisms than just terrestrial vertebrates.

DecAid is an advisory tool to help managers evaluate effects of forest conditions and existing or proposed management activities on organisms that use snags and down wood. DecAid also can help managers decide on snag and down wood sizes and levels needed to help meet wildlife management objectives. This tool is not a wildlife population simulator nor is it an analysis of wildlife population viability.

A critical consideration in the use and interpretation of the DecAID tool is that of scales of space and time. DecAID is best applied at scales of subwatersheds, watersheds, subbasins, physiographic provinces, or large administrative units such as Ranger Districts or National Forests. DecAID is not intended to predict occurrence of wildlife at the scale of individual forest stands or specific locations. It is intended to be a broader planning aid not a species or stand specific prediction tool.

Modeling biological potential of wildlife species has been used in the past. DecAid was developed to avoid some pitfalls associated with that approach. There is not a direct relationship between the statistical summaries presented in DecAid and past calculations or models of biological potential.

4.5.4.5 Snags and Down Wood Levels Compared to DecAid Data

All of the units are located within the habitat type identified in DecAid as the Westside Lowland Conifer-Hardwood Forests of Western Oregon Cascades and vegetation condition of "small/medium trees."

Within the Westside Lowland Conifer-Hardwood Forests and vegetation condition of small/medium trees noted above, the DecAID advisor identifies the 30% tolerance level for these mid-seral stands (small/medium trees) as 5.3 snags per acre greater than 10 inches with almost 5 per acre greater than 20 inches in diameter. The 50% tolerance level for these mid-seral stands would be 18.6 snags acre greater than 10 inches with 8 per acre greater than 20 inches in diameter.

DecAID advisor identifies the down wood 30% tolerance level for Western Lowland Conifer-Hardwood Forest mid-seral stands as up to 4.5% cover of down wood (including all decay classes) with sizes of pieces averaging 8-12 inches in diameter. The 50% tolerance level for these mid-seral stands would be up to 10% cover of down wood with sizes of pieces averaging 8-12 inches in diameter.

All the units sale within the 2007 Plantation Thin currently contain snag numbers that are less than the 30% tolerance level for snag density and size based on the surveys completed in the Roaring River and Collawash LSRs. These units also contain down woody debris densities that are just above the 30% tolerance level.

4.5.4.6 **Elements of Proposal Analyzed -** The following actions have the potential to affect snags and down logs. Since snags may be hazardous some of them may be felled adjacent to operations such as tree felling, landing use, skidding or yarding, road use, road construction, road repair, road closure and log haul. Existing down logs may be disturbed by yarding operations. Some aspects of the proposal are specifically designed to benefit snag dependent species and species that unitize down logs: creating snags and down wood, and design criteria 2 and 3.

Direct and Indirect Effects –

4.5.4.7 **Alternative A –** The plantations would continue to be deficient in snags and down wood. Based on the data discussed above, it is presumed that there would continue to be on average 1.6 snags per acre ≥10 inches diameter for the units within the 2007 Plantation Thin project. This is below the level of snags required for 60% biological potential (2.2 – 2.4 snags/acre). In terms of the tolerance levels for snags within the applicable habitat type and structural condition identified in the DecAID advisor, these areas would continue to be well below the 30% tolerance level. Levels would be slightly higher if live trees with elements of wood decay were included.

Based on Forest Inventory surveys, the units within the 2007 Plantation Thin project would continue to provide approximately 2 hard and 4 soft down logs per acre and average approximately 5.8% down wood cover.

In the future, these stands would continue to increase in size and density and start to become increasingly more susceptible to damaging agents such as insects and diseases. These natural processes would create new snags and down logs, mainly from the smaller intermediate and suppressed trees in the stands. However, much of these snags and down woody debris would be small to medium in size. The attainment of large diameter snags and down woody debris would be delayed with the no action alternative.

4.5.4.8 **Action Alternatives**

Some snags are difficult to retain during logging because of their inherent instability and danger. It is likely that some snags would need to be cut down during harvest operations due to safety considerations and that some downed logs would be degraded through the process of logging. Approximately 2312 acres would be tractor logged, 1308 acres would be harvested using a skyline logging system, and 754 acres would be helicopter logged. Due to the creation of corridors involved in skyline logging, this method usually involves a greater loss of snags and down woody debris than in tractor logging. Helicopter logging typically results in a loss of snags greater than in both tractor and skyline logging and typically has less effect on the existing down wood than both ground and skyline-based systems.

Approximately 2.6 miles of new temporary road would be constructed with this alternative. The stands affected with the construction of these roads would also occur in young managed plantations and consist of snags and down wood levels similar to the proposed harvest units. This would result in an additional loss of snags and damage to the coarse woody debris.

Snags that are left standing after the timber sale would be more prone to wind damage and snow breakage than they would have been without thinning. There would likely be some loss of the remaining snags within 10 years after harvest. These would become down wood.

To increase the likelihood that snags would be retained after timber harvest, green trees would be marked as leave trees where their live crowns touch certain key snags (Design Criteria #2). Certain live trees would also be selected as leave trees that are defective or have the elements of decay as described in the DecAid advisor. Hollow structures are created in living trees by heartrot decay organisms over many years. These hollow structures in living trees provide especially valuable habitat for a variety of wildlife, including cavity users. Trees that have heartrot decay present may include features such as openings in the bole, broken boles with bayonet tops, large dead tops or branches, punk knots, flattened stem faces, old wounds on the bole, crooks in the bole signifying previous breakage, and the presence of fruiting bodies. Defective trees with deformities such as forked tops, broken tops, damaged and loose bark or brooms caused by mistletoe or rust can also provide important habitat for a number of species.

Logs existing on the forest floor would be retained. Prior to harvest, contract administrators would approve skid trail and skyline locations in areas that would avoid disturbing key concentrations of down logs or large individual down logs where possible. The harvesting operations would also add small woody debris of the size class of the cut trees to the site. This would include the retention of cull logs, tree tops, broken logs and any snags that would be felled for safety reasons. Snags or green trees that fall down after the harvest operation would contribute to the down wood component of the future stand.

Currently tree sizes within the potential harvest units are approximately 12 inches in diameter. Implementation of the action alternatives would reduce the amount of natural selection that would have occurred through the process of stress and mortality. Some of the snags and downed logs that might have formed in the future from the death of the intermediate and suppressed trees would be removed through the timber harvest. As a result, the action alternatives would delay the attainment of moderate-sized snags and down wood through natural process because of the reduction in density of the stands. Although some trees with elements of wood decay would be left and some snags would be created to provide habitat for snag-dependent species, fewer new snags, trees with elements of wood decay, or large down wood would be created for the short-moderate term because of this silvicultural treatment. However, the proposed action involves leaving the largest trees standing and growing. This would accelerate the growth and size

of trees and would eventually provide larger snags in the long term. Some would eventually fall naturally to create large coarse woody debris as well.

4.5.4.9 **DecAid levels for snags and down wood:** Snags and wildlife trees described in Design Criteria #2 are combined for the purpose of determining DecAID levels for the action alternatives. Due to the lack of snags and trees with elements of wood decay within all these young managed plantations, most would have snag and defective tree densities and size guidelines below the 30% tolerance level. Leave trees damaged during the harvesting operation sometimes have the potential to become defective or decayed trees useful for wildlife species.

Based on the design criteria and previous experience, the units would have down wood levels after project implementation similar to what they are currently, above the 30% but below the 50% tolerance level. The project would not remove any existing coarse woody debris; although it would likely damage some of the pieces in decay class 3, 4, and 5, especially in the areas utilizing a tractor-based system.

4.5.4.10 **Differences between Alternatives B and C -** The alternatives would be similar except that Alternative C would not construct new temporary roads and it would close and decommission roads. This would result in more acres being logged with a helicopter and skyline system and less acres logged with a ground-based system. There would be an increase in helicopter logging from 754 acres to 876 acres, an increase of 122 acres. There would also be a decrease in skyline logging from 1307 to 1200 acres, a reduction of 107 acres. Acres logged with a ground-based system would decrease to 2,298 acres, a decrease of 14 acres. Helicopter logging typically results in a loss of snags greater than in both tractor and skyline logging and typically has less effect on the existing down wood. Skyline logging instead of tractor logging typically results in a decrease in the loss of snags and resultant damage in down woody debris.

Alternative C would result in the more snag loss than Alternative B. Alternative C would result in less effect to the existing coarse woody debris compared to Alternative B.

Taking all the above in consideration, the predicted tolerance levels for down wood cover and snags would be similar for both alternatives: less than 30%.

4.5.4.11 **Cumulative Effects –**
Snags are utilized by species that have medium size home ranges so appropriate size analysis areas using topographic features have been developed to calculate cumulative effects for snags.

4.5.4.12 Past, Present and Foreseeable Future Projects and Actions

Project Name	Extent, Size, Type, & Distance	Overlap In Time Or Space	Alteration of snag or down log	Meaningful Effect	Rationale For Inclusion Or Exclusion From Analysis Below
Present – Slip Thin	All units, 64 acres of plantation thinning	Units occur within Analysis Area. Slip has been sold and awarded.	yes	yes	Include. A loss of snags would occur, mainly in the small to moderate size class
Present – Fan and Thunder Timber Sales (Collawash EA)	All units, 237 acres of plantation thinning and 55 acres of natural second-growth thinning	Units occur within Analysis Area. Timber sale sold but logging delayed by litigation	yes	yes	Include. A loss of snags would occur, mainly in the smaller size classes but some in the larger classes as well.
Present – Blister Fire and Bowl Fire	Lightning caused wildfire affecting dispersal habitat	Yes. Fire occurred within Analysis Area	yes	yes	Include. An increase in snags of all sizes has occurred
Past – regeneration harvest	Throughout Analysis Area	Yes	yes	yes	Include. A loss of snags in all size classes has occurred.
Past – commercial thinning	Throughout Analysis Area	Yes	yes	yes	Include. A loss of snags, mainly in the small to moderate size classes has occurred.
Past – road construction	Throughout Analysis Area	Yes. roads occur throughout the Analysis Area	yes	yes	Include. A loss of snags in all size classes has occurred.
Past – rock quarries	Throughout Analysis Area	Yes. Rock quarries are permanent and occur throughout the Analysis Area	yes	yes	Include. A loss of snags in all size classes has occurred.
Past – Power Line	Southern portion of Analysis Area	Yes. Power lines are permanent	yes	yes	Include. A loss of snags in all size classes has occurred.
Past and Present – developed camp ground	Indian Henry camp ground	Yes	yes	yes	Yes, A loss of snags in all size classes has occurred
Past – road decommissioning	Throughout Analysis Area	Yes	yes	No	Exclude. No meaningful loss of snags would occur.
Past and present watershed restoration projects	Culvert replacement, road repairs, etc.	Yes.	yes	No	Exclude. No meaningful loss of snags would occur.
Activities on other ownerships	Timber harvest	No other ownerships within analysis area	no	no	N/A
Future timber harvest	Unknown, but potential for timber harvest occurs within all parts of the Analysis Area except for Wilderness.	Unknown location	Unknown of intensity of treatments	No	Exclude. No site specificity. Can not be modeled at this time. The appropriate time to conduct a cumulative effects analysis would be in a future EA after a firm proposal is developed.

4.5.4.13 The snag analysis presented in the table below is based on stand type and plant associations and was generated from field surveys completed by Forest inventory and ecology crews (see Existing Situation in the Snag and Down Wood Section). Weighted averages include the entire land base including all forest types, as well as all non-forest areas within the analysis area. The 100% biological potential would be between 3.7 and 4 snags per acre, respectively.

The analysis of snag habitat within the snag analysis areas includes all past and present projects including 2007 Plantation Thin. For purposes of this analysis, it is assumed some snags would need to be felled for safety reasons in the 2007 Plantation Thin project. Past experience and monitoring indicate that there would likely be some snags remaining afterwards. Many past timber sales have had projects to create snags afterwards.

The action alternatives include the creation of snags by heart rot inoculation or by topping with explosives or chainsaws. Down woody debris would be created by girdling or felling.

4.5.4.14 **Snag Habitat** (analysis areas that overlap 2007 Plantation Thin units)

Snag Analysis Areas	Total Acres	Snags/Ac. 15-21"	Snags/Ac. > 21"	Total Snags/Ac. Existing Condition*	Plantations Proposed for Treatment (Acres)	Action Alternatives Snags/Ac. **
Big Creek	4,266	1.2	2.7	3.9	840	3.7
Blister Creek	6,435	3.1	3.8	6.9	40	6.9
Cat Creek	3,912	1.8	2.9	4.6	253	4.5
Fan Creek	3,567	1.7	2.7	4.4	238	4.3
Farm Creek	4,179	1.9	3.0	4.9	231	4.8
First Creek	4,622	1.1	2.9	4.0	596	3.9
Pup Creek	4,754	1.2	3.1	4.6	706	4.5
Sandstone Creek	3,846	2.3	4.2	6.5	222	6.4
Thunder Creek	5,353	1.6	2.3	3.9	653	3.8
Trout Creek	4,364	1.6	3.0	4.6	597	4.5
Totals	45,298				4,376	

* This represents the existing situation after all of the projects in s. 4.5.4.12 are incorporated.
** If one snag per acre greater than 15 inches diameter were lost in harvest units.

The analysis shows that within the snag analysis areas, the snag levels after the past and present harvest activities would still be above the 100% biological potential level for all alternatives.

4.5.4.15 Forest Plan Standards and Guidelines

Mt. Hood Forest Plan References
Forestwide Wildlife Standards and Guidelines – FW-215 to 240, page Four-74.
Northwest Forest Plan - Matrix Standards and Guidelines - pages C-40 to 42.

4.5.4.16 Snags and Wildlife Trees - Forest Plan standards and guidelines FW-215, FW-216, FW-234 & FW-235

In the project area, the standard and guideline from the Forest Plan (FW-215) for harvest units is 60% of the full biological potential, which translates into 2.2 snags and wildlife trees per acre in the medium to large size class for the units within the western hemlock stands and 2.4 snags and wildlife trees per acre in the Pacific silver fir stands.

Past experience and monitoring indicate that there would likely be some snags remaining after harvest. Retained wildlife trees with the elements of wood decay and created snags would add to existing snags retained. None of the alternatives, including no-action, would achieve the 60% biological potential level considering snags alone but would meet it when wildlife trees and created snags are considered. Currently most of the trees are not large enough to produce snags of the desired size, (22 inches diameter, FW-234) but FW-235 allows the retention of smaller trees if the treated stand is too young to have trees of sufficient size. In these cases, snags and green leave trees retained should be representative of the largest size class present in the stand. Design Criteria #2 would result in additional protection to snags and leaves live trees with elements of wood decay which would provide some habitat in the interim. Snag creation would occur in many of the proposed harvest units, with an emphasis within the Late-Successional and Riparian Reserves.

FW-216 indicates that snags and wildlife trees at the landscape scale be at 40% of biological potential, which equates to about 1.5 in the western hemlock zone and 1.6 snags per acre in the Pacific silver fir zone. The table in s. 4.5.4.14 above shows that this level is being met throughout the entire planning area.

Down Logs - Forest Plan standards and guidelines FW-219, FW-223, FW-225 & FW-226

FW-219 and FW-223 indicate that stands should have 6 logs per acre in decomposition class 1, 2, and 3 and that they should be at least 20 inches in diameter and greater than 20 feet in length. However, FW-225 and FW-226 indicate that smaller size logs may be retained if the stand is too young to have 20 inch trees. In these, cases, logs representing the largest tree diameter class present in the stand should be retained. Design Criteria #2 would result in additional protection to down woody debris which would protect some of this habitat in the interim. Down woody debris creation would occur in many of the proposed harvest units, with an emphasis within the Late-Successional and Riparian Reserves.

4.5.4.17 The action alternatives are consistent with the following standards and guidelines.

NFP C-40	The amount of down logs left would reflect the timing of stand development cycles.
FW-215, 234 to 239	60% of maximum biological potential is currently not present in many of the proposed harvest units. See s. 4.5.4.16 above.
FW-216 to 217	40% of maximum biological potential is being maintained at the area analysis level.
FW 218	All primary cavity nesting species indigenous to the site would be considered in the wildlife tree prescriptions.
FW-219 & 229	An average of 6 logs per acre in decomposition classes 1, 2, and 3 and in the appropriate size class are currently not present in some of the proposed harvest units. See s. 4.5.4.16 above.
FW-230 to 231	Snag and wildlife trees would be well distributed. No 10-acre area in a unit would be devoid of wildlife trees.
FW - 232 & 233	The priority for wildlife tree retention would be Douglas-fir. Emphasis would be placed on retaining windfirm wildlife trees, such as western red cedar within riparian areas.

4.5.5 Deer and Elk Habitat (Management Indicator Species)

4.5.5.1 **Habitat Characteristics within the Clackamas River Ranger District –** Elk herds in the Clackamas drainage exhibit a close association with riparian habitat in areas of gentle terrain and low road density. A study within the Clackamas River Ranger District from 1987 to 1992 recorded location and habitat type being utilized by radio-collared elk (Fiedler 1994). Seventy percent of all observations on these elk occurred within 100 meters of a stream or wetland. Shrub/seedling stage clearcuts received more than twice as much use than they were proportionally available to elk as a habitat type. Also, elk were observed to browse on a wide range of native shrubs, trees, forbs and grasses as well as utilizing non-native grasses (Fiedler 1994).

High road densities lead to harassment of elk herds. Harassed elk move more often than elk left alone and use of habitat decreases as road density increases (Witmer 1985). The study mentioned above also reported that elk within or moving through areas of high open road densities moved longer distances; several miles per day was not uncommon.

For this proposal, the following actions have the potential to affect deer and elk (both positively and negatively): actions that remove or kill trees to a level below 70% canopy cover would reduce thermal cover but would also increase forage availability. Activities that make noise may potentially affect deer and elk. These actions would include thinning, landing creation, trees removed for skid trails or skyline corridors, trees removed for road construction, and trees killed for snags and down wood. Some actions specifically designed to benefit deer, elk and other species including the creation of skips and gaps and

closing roads to public access. While these elements are designed to have long-term benefits they may result in short-term impacts. Other actions such as log haul, road reconstruction, road repair or road closures would not have a meaningful or measurable affect on habitat but would create noise disturbance.

4.5.5.2 **Existing Situation –** The harvest units are located within summer (SR) and winter range (WR). Forest Plan standards and guidelines have minimum requirements for optimal cover and thermal cover habitat components but no specific level for hiding cover or forage. Thermal cover for elk is defined as a stand of coniferous trees at least 40 feet tall with an average crown closure of 70 percent or more. Thermal cover for deer may include saplings, shrubs, or trees at least 5 feet tall with a 75 percent crown closure. Optimal cover is found mainly in multi-storied mature and old-growth stands.

All of the proposed harvest units and stands that would have new temporary road construction contain deer and elk thermal cover. None of the areas proposed for treatment have optimal cover.

The most accurate summer and winter range delineation for deer and elk habitat was completed by the Oregon Department of Fish and Wildlife. The relationship between proposed harvest units and range delineations for deer and elk is displayed in the following table.

4.5.5.3 **Proposed Project and its Relationship to the Oregon Department of Fish and Wildlife Winter Range Habitat Designations for Elk**

Deer and Elk Summer and Winter Range	Acres	Acres Proposed for Treatment Containing Thermal Cover
Crucial Winter Range	15,050	2,213
High Value Winter Range	4,496	56
Moderate Value Winter Range	6,685	339
Summer Range	37,659	1,766

Forest Plan standard and guideline FW-202 indicates that deer and elk optimal and thermal cover be measured at an area analysis level, which is defined as approximately 5000 acres. This is the basis for the analysis areas contained in the following table. These analysis areas were developed around topographic features such as ridges and streams as well as the winter/summer boundary. These are also good boundaries for deer and elk effects analysis.

Since there are no other ownerships within the deer and elk analysis areas, the same boundaries are used for cumulative effects analysis and Forest Plan standards and guidelines compliance.

4.5.5.4 Deer and Elk Analysis Areas (analysis areas that overlap 2007 Plantation Thin units)

Deer and Elk Analysis Areas	Total Acres	Plantations Proposed for Treatment Containing Thermal Cover (Acres)
WR 19	4254	82
WR 21	5065	268
WR 23	6396	1250
WR 24	1779	123
WR 25	4904	418
WR 26	3832	466
SR 36	4842	623
SR 37	3087	328
SR 38	3873	409
SR 39	3528	209
SR 40	4943	40
SR 45	5386	161
Totals	51,889	4,374

4.5.5.5 At least two elk herds occupy the Collawash Watershed near the project area. One roams the benchy area north of the Hot Springs Fork in winter and summer, remaining in lower elevations of the same general area. Many proposed harvest units occur in this and the surrounding vicinity. This herd mixes on occasion with herds in the Tag Creek and Ripplebrook areas by way of forested stands flanking the lower Collawash and Clackamas Rivers. There is also a small herd on the bench on Buckeye and Happy Creeks near the farthest southern proposed harvest units, but little is known about herd size and movement in this area (USDA 1995).

Several potential calving areas are located near the northern tributaries of the Hot Springs Fork, particularly Rock Creek, Dutch Creek, Fan Creek, Jack Davis Creek, and Pink Creek. This is in the vicinity of several proposed harvest units within the southern portion of the project area (USDA 1995).

Within the Middle Clackamas Watershed there are 4 herds that occur within or adjacent to the project area: Sandstone, Ripplebrook, Tag and Fish Creek Herds. The Fish Creek herd is located near the far northern part of the project area (USDA 1996). Sandstone, Ripplebrook and the Tag herd are all overlapping and occur within or to the east of the Sandstone portion of the project area.

Elk generally respond readily to road closures in their home range by utilizing the habitat more frequently and moving less frequently. The current seasonal road closures appear to be benefiting the Collawash and Sandstone herds during the winter by reducing their daily movements and reducing their home ranges (Fiedler 1994).

Forage is widely available within the analysis area, but is generally of low quality. The low quality of the forage, especially in winter range, and the lack of wetlands and

permanent low-gradient streams within winter range on the District are considered the limiting factors for elk and possibly deer within the project area.

Direct and Indirect Effects

4.5.5.6 **Alternative A –** Approximately 4,374 acres of young managed plantations would continue to serve as thermal cover. No cover would be lost and no forage would be gained in this alternative. In addition, no roads would be closed or obliterated. Currently lack of forage and high road densities are the two main limiting factors for deer and elk in the area. In the no action alternative the stands would continue to remain crowded and forage would not increase above current levels. Road densities would remain unchanged from current conditions. Refer to Growth and Productivity and Diversity sections for further discussions of the response of trees to no action.

4.5.5.7 **Action Alternatives**

The action alternatives include commercially thinning and building temporary roads within approximately 4,374 acres of young plantations within summer and winter range for deer and elk. Portions of the stands in stream protection buffers and skips would be unthinned.

The proposed commercial thinning would temporarily remove the thermal cover from the stands. This habitat would be downgraded to non-habitat. These areas would incur a temporary moderate increase in forage for deer and elk. The increase in forage would be caused by increased sunlight reaching the forest floor as a result of opening up the canopy. This forage created by the thinning is predicted to be low to moderate in quality. Canopy closure is expected to eventually increase to the point in which most forage benefits are lost, in approximately 15 years. Consequently forage levels would return to pre-treatment levels at this time. Most of the lost thermal cover characteristics in the stands should be regained in about 30 years.

Other portions of the stands would include the creation of gaps, landings, helicopter landings, skid trails and skyline corridors and are further discussed in section 3.2. These gaps are areas within the units ranging from 0.1 to 1.25 acres that have 50 trees per acre or less. These areas receiving a gap prescription would be heavily thinned and would no longer provide thermal cover but would promote high quality forage to develop. Opening up the canopy to this degree allows abundant sunlight to reach the forest floor, promoting the development of understory vegetation. Usually this vegetation consists of shrubs and sometimes grasses highly palatable to deer and elk. The areas treated in gaps should lose much of their forage qualities in about 20 years and return to providing thermal cover in about 40 years.

The skips and stream protection buffers would maintain their forest structure and continue to provide thermal cover.

As described above, thinning would result in the temporary removal of thermal cover and a temporary increase in forage. The quality of forage created would be greater in LSRs and riparian reserves because they would have heavier thinning and a greater proportion of gaps created, allowing more sunlight to reach the forest floor.

The loss of thermal cover and increase in forage in the proposed harvest units could alter distribution of deer and elk use of the project area. Although there would be an extensive amount of acreage lost in thermal cover, there would also be an increase in forage in these same stands. Because thermal cover is not limiting, the project would likely increase the quality of deer and elk habitat in the immediate area because of the increased forage provided in the treated stands; especially in the gaps, landings, skid trails and skyline corridors.

However, there are three areas of proposed harvest treatments in the project in which the proposed units occur together in relatively large groups. These areas are the clump of units in Collawash on the northern bench of the Hot Springs Fork Tributary, the clump of units in Fish Creek within the Pup Creek subdrainage; and to a lesser extent, the sandstone units near the Big and Tag Creek subdrainages. The collawash and sandstone units also happen to be completely within critical winter range for elk, as defined by the ODFW. In addition, the Pup Creek clump of units occurs within the winter range home range boundaries for the Fish Creek herd; the sandstone units occurs on the western side of the home range boundaries for the Sandstone and Ripplebrook herds; and the Hot Springs Fork Tributary clump of units occurs within the winter range home range for the Collawash herd.

In these three locations, the action alternatives are predicted to temporarily reduce the quality of habitat being provided for deer and elk, especially during the critical winter months (December to March). Although there would be an increase in forage in the thinned units as described above, especially in the gaps; much of this gained forage would not occur close enough to cover for it to be utilized by deer and elk. Deer are a ubiquitous species and can easily adapt to the above changes. No impacts predicted to the deer populations in the area. However, the elk are more selective and not as adaptive. The proposed harvest treatments in these three areas could potentially cause a temporary small reduction in herd size in the Collawash and Sandstone herds, and possibly a slight reduction in the Fish Creek herd. The critical winter range habitat for the Tag and Ripplebrook herds occur outside these treatment areas and would not be meaningfully affected by the proposed project. No change in numbers for the Tag and Ripplebrook herds is expected with these proposed actions.

Although there is the possibility that herd sizes would be reduced to a small degree, these effects are not predicted to last long. Once some of the habitat regains its thermal cover characteristics, in about 30 years; these core winter range areas utilized by the three herds are predicted to once again to provide adequate winter habitat for elk.

4.5.5.8 **Haul Routes -** There are potential haul routes that go through deer and elk winter range. All haul roads go through crucial winter range and their use would be restricted between December 1st and March 31st.

4.5.5.9 **Disturbance -** The logging and road construction/reconstruction activities could potentially disturb animals that happen to be in the area at the time of implementation. Approximately 2.6 miles of temporary road construction, 6.8 miles of old temporary road reconstruction, and 6 miles of bermed roads re-opened are proposed with this alternative. The project area is in both summer and winter range and disturbance that occurs during their respective seasons could potentially displace animals, and may have the potential to affect the health of individuals if the disturbance occurs near active calving sites. Harvest operations and associated noise level producing associated activities would be restricted between December 1st and March 31st within all areas designated as crucial winter range.

This seasonal restriction is expected to reduce disturbance effects created by the project. In addition, project activities would not be occurring all at once, but only in a few places at any one time. The remaining potential disturbance is predicted to be small in scale, temporary in nature and only affect a few individuals negatively. The project is not predicted to cause a measurable reduction in the current local population size for either deer or elk.

Alternative B –

4.5.5.10 **Open Road Density –** Approximately 2.6 miles of new temporary road construction and 6.8 miles of old existing temporary roads would be reopened and usually reconstructed to access several of the units. In addition, approximately 6 miles of bermed roads would be opened. These roads would not be open to the public and the only disturbance occurring as a result of these roads being opened is their use by the loggers, truck drivers and associated Forest Service personnel required to accomplish the logging operations. After logging, the roads that were opened would be closed and open road density would be back to the current level. There would be no increase in the long-term harassment of deer and elk with this alternative; effects would be short-term only. There would be no increase in the permanent roads open to the public, and therefore no increase in open road density with this alternative.

The closure of currently open system roads is not part of Alternative B. Roads in this area are used for forest management, recreational driving, hunting and fire suppression.

4.5.5.11 **Alternative C –** Effects would be similar to Alternative B except that no new temporary roads would be built and roads would be closed. Approximately 6.8 miles of old existing temporary roads would still be reopened to access several of the units, essentially the same as Alternative B. Refer to unit table s. 3.3.3. Approximately 6 miles of bermed roads would be opened. After logging, the roads that were opened would be closed.

The elimination of temporary road building would increase the disturbance effects to deer and elk because there would be an increase in 122 acres of helicopter logging. At the

time of helicopter use, disturbance to deer and elk would increase in the area due to the noise and activity of the helicopter. This disturbance would be short term, lasting only as long as the helicopter was in flight. This additional disturbance could potentially displace animals, and may affect the health of individuals if the disturbance occurs near active calving sites. A seasonal restriction limiting helicopter use within winter range from Dec. 1st to March 31st would help mitigate effects to deer and elk as a result of this activity. There would be no increase in the long-term harassment of deer and elk with this increased helicopter use in this alternative; effects would be short term only.

This alternative proposes approximately 4.5 miles of road decommissioning, 43 miles of road berming, and approximately 9 miles of roads closed with year-round gates. These road closures would improve the deer and elk habitat being provided in the area of the proposed road closures. They would reduce the disturbance to deer and elk in summer and winter as well as reducing the likelihood of poaching due to reduced accessibility of the areas. The proposed road closures and decommissioning occur throughout the project area but are concentrated in the winter range portions of the Sandstone and Collawash areas. These road closures totaling 57 miles are substantial and are likely to result in a small increase in herd numbers.

There would be a large change in thermal cover within some of the deer and elk analysis areas. Because the Forest has emphasized the thinning of this type of habitat in recent years, a cumulative effects analysis for thermal cover habitat is included. Since the proposed project would have no effect on optimal cover, no cumulative effects would occur to this deer and elk habitat type. The proposed project would only have very minor impacts on disturbance/ harassment issues to deer and elk and neutral or beneficial effects on open road densities.

4.5.5.12 Cumulative Effects

The land area and the time scale for a cumulative effect analysis varies by resource. In terms of the "space" criteria, the effects to thermal cover within the deer and elk analysis areas are used for a cumulative effects analysis because the project would have a measurable direct effect on the amount of thermal cover available in the analysis area. No direct or indirect effects to optimal cover and only very minor or beneficial effects to harassment/disturbance issues would occur with any of the action alternatives and a cumulative effects analysis is not warranted for this habitat type and disturbance issue.

In terms of the "time" criteria, stands that consist of coniferous trees 40 feet or more tall with an average crown closure of 70% or more are considered thermal cover for elk. For deer, cover may include saplings, shrubs, or trees at least 5 feet tall with a 75% crown closure. Since elk thermal cover is the more limiting habitat, this would be the basis for the cumulative effects analysis. As plantations grow, these conditions would be met at an age of approximately 25 years. Stands older than this would be considered functioning thermal cover and would not enter into this analysis unless their canopy cover has been reduced.

4.5.5.13 Past, Present and Foreseeable Future Projects and Actions

Project Name	Extent, Size, Type, & Distance	Overlap In Time Or Space	Type Of Potential Effect To Thermal Cover	Measurable Effect To Thermal Cover	Rationale For Inclusion Or Exclusion From Analysis Below
Present – Slip Thin	All units, 64 acres of plantation thinning	Units occur within WR 23. Slip has been sold and awarded.	Removal of thermal cover	Yes	Include. A reduction in thermal cover would occur
Present – Fan and Thunder Timber Sales (Collawash EA)	All units, 237 acres of plantation thinning and 55 acres of natural second-growth thinning	Units occur within WR 24 and 25, and SR 39. Timber sale sold but logging delayed by litigation	Removal of thermal cover	Yes	Include. A reduction in thermal cover would occur
Present – Blister Fire	Lightning caused wildfire affecting thermal cover	Yes. Boundaries of fire occur within SR 40	Fire removed approximately 145 ac. of thermal cover	Yes	Include. A loss of thermal cover has occurred
Past – road construction	Throughout Analysis Area	Yes. Most roads built for timber sales, power lines and recreation are permanent and occur throughout the Analysis Area	Permanent loss of thermal cover	Yes	Include
Past – regeneration harvest	Throughout Analysis Area	Yes, all plantations less than 25 years*	Loss of thermal cover	Yes	Include. A loss of thermal cover
Past – commercial thinning	Throughout Analysis Area	Any loss of thermal cover would have recovered by now. Most forage benefits would also be back to pre-harvest conditions. However, increase in road densities might still be present	Loss of thermal cover	No	Exclude. Effects no longer evident for thermal cover
Past – rock quarries	Throughout Analysis Area	Yes. Rock quarries are permanent and occur throughout the Analysis Area	Permanent loss of thermal cover	Yes	Include
Past – Power Line	Southern portion of	Yes. Power lines are	Permanent loss of thermal	Yes	Include. Trees that grow under

Project Name	Extent, Size, Type, & Distance	Overlap In Time Or Space	Type Of Potential Effect To Thermal Cover	Measurable Effect To Thermal Cover	Rationale For Inclusion Or Exclusion From Analysis Below
	Analysis Area	permanent	cover		power line are cut for safety before they can become thermal habitat.
Past – road decommissioning	Throughout Analysis Area	Yes	Trees begin to grow in road and allows forage and eventually thermal cover to develop. Road densities decrease	No	Include. No detrimental effect to thermal cover, but road densities decrease
Past and present watershed restoration projects (excluding road closures and decommissioning)	Culvert replacement, road repairs, etc.	Yes.	None	No	Exclude. No detrimental effects to thermal. No effects to road densities.
Future timber harvest	Unknown, but potential for timber harvest occurs within all parts of the Analysis Area except for Wilderness.	Unknown location	Unknown of intensity of treatments	No	Exclude. No site specificity. Can not be modeled at this time.
Off highway vehicle use	Minor dispersed use throughout the Analysis Area	Yes	Disturbance	No	Exclude. No effect to thermal cover

* Timber sales occurring more than 25 years ago would likely have already grown back into thermal cover.

The following table displays the level of thermal cover within each of the applicable deer and elk summer and winter range analysis areas.

The current condition for each of the analysis areas takes into consideration all the past and present activities shown in the table in s. 4.5.5.13. No foreseeable future projects are known at this time.

4.5.5.14 Thermal Cover and Forage Analysis

Analysis Area	Present and Recent Actions Reducing Thermal Cover	Total Thermal Cover Existing Condition and No Action (ac. and %) *	Total Forage Existing Condition (ac. and %)	Total Post-Harvest Thermal Cover Acres Lost and %– Alt. B & C
WR 19		3307 - 78%	138 – 3%	82– 76%
WR 21		3511 – 69%	595 – 12%	268– 64%
WR 23	Slip (64 ac.)	4020 – 63%	576 – 9%	1250– 43%
WR 24	Fan (68 ac.)	1082 – 61%	363 – 20%	123– 54%
WR 25	Fan (128 ac.)	2933 – 60%	644 – 13%	418– 51%
WR 26		2472 – 65%	579 – 15%	466– 52%
SR 36		3161 – 65%	624 – 13%	623– 52%
SR 37		2899 – 57%	523 – 10%	328– 51%
SR 38		2626 – 68%	513 – 13%	409- 57%
SR 39	Thunder (96 ac.)	1868 – 53%	874 – 25%	209– 47%
SR 40	Blister Fire (145 ac.)	2721 – 55%	1062 – 21%	40 – 54%
SR 45		3280 – 61%	1103 – 20%	161– 58%

*Optimal cover also provides thermal cover habitat. These columns represent optimal and thermal cover combined.

The reduction in thermal cover as compared to the amount present is displayed in the above table. Within most of the winter and summer range analysis areas, the level of thermal cover only changes by a few percentage points. However, there is a substantial drop in thermal cover levels in WR 23.

For deer and elk in this area, forage availability is more of a limiting factor than thermal cover. Because of a decline in clearcutting in recent years and because the trees in young plantations are growing rapidly shading out forage, there is projected to be a long-term trend of declining forage, and there is expected to be a commensurate decline in deer and elk populations (USDA 2004c, p. 72). Forage in the analysis areas is declining by approximately 1% per year. This project has only a very limited ability to add forage. Some forage would be created in gaps and on skidtrails, landings and obliterated roads. However this would not be sufficient to counter the landscape's trend of declining forage.

4.5.5.15 Forest Plan Standards and Guidelines

Mt. Hood Forest Plan References

Forestwide Wildlife Standards and Guidelines – FW-187 to 214, page Four-71

The following table displays the level of thermal cover and road density within each of the applicable deer and elk summer and winter range analysis areas. There are no Forest Plan standards and guidelines for forage.
The Forest Plan recognizes different categories of summer and winter range: 1/ The entire area used by deer and elk in the winter is often referred to as "inventoried" winter range. 2/ The rest of the Forest is often referred to as "inventoried" summer range. 3/ Special portions of the winter range are referred to as "designated" winter range and these areas have a land allocation (B10), and 4/ Special portions of the summer range are referred to as "designated" summer range and these areas have a land allocation (B11). Standards and guidelines for B10 and B11 only apply to those land allocations while the forest-wide standards and guidelines apply across all portions of the inventoried range.

The 2007 Plantation Thinning project does not overlap any designated B10 or B11 areas, but every unit is either inventoried summer or winter range.

The analysis takes into consideration all the past and present activities shown in the above cumulative effects table. No foreseeable future projects are known at this time.

4.5.5.16 Thermal Cover (Forest Plan Standard and Guideline FW-205)

Thermal Cover Analysis Area	Post-Harvest %– Alt. B & C	Minimum Forest Plan Level for Thermal Cover (%) *
WR 19	76%	40
WR 21	64%	40
WR 23	43%	40
WR 24	54%	40
WR 25	51%	40
WR 26	52%	40
SR 36	52%	30
SR 37	51%	30
SR 38	57%	30
SR 39	47%	30
SR 40	54%	30
SR 45	58%	30

*Optimal cover also provides thermal cover habitat. These columns represent optimal and thermal cover combined.
**There are no Forest Plan requirements for forage.

Thermal cover levels would be met in all winter and summer range analysis areas with all alternatives.

4.5.5.17 Open Road Density Analysis (FW 208)

Road Density Analysis Areas	Open Road Density goal from FW-208 (mi./sq. mi.)	No Action & Alt. B (mi./sq. mi.)	Proposed Road Closures and road decommissioning in Alt. C (miles)	Road Density After Implementation of Alt. C (mi./sq. mi.)
WR 19	2.0	1.3	1.33	1.1
WR 21	2.0	0.7	2.81	0.4
WR 23	2.0	1.0	2.46	0.8
WR 24	2.0	1.6	0.09	1.6
WR 25	2.0	2.1	3.33	1.6
WR 26	2.0	2.9	8.05	1.5
SR 36	2.5	2.9	5.84	2.2
SR 37	2.5	0.9	0.53	0.9
SR 38	2.5	2.1	3.37	1.5
SR 39	2.5	3.3	5.63	2.2
SR 40	2.5	2.5	2.41	2.2
SR 45	2.5	2.2	3.31	1.8

The total miles of proposed road closure above (39.16 miles) does not equal the figures listed in s. 3.3.1.2 for a number of reasons: 1/ Some roads proposed for decommissioning are already closed with berms and are not counted again, and 2/ Some roads in winter range with existing gates are closed only in the winter. Where berms or year-round closures are proposed behind these gates, they would not change the winter time open-road density and are not counted again.

An exception for FW-208 is not needed for No Action or Alternative B. FW-208 does not contain a requirement that all proposed actions include road closures. These alternatives do not add to the open road network therefore FW-208 is not applicable to them. Alternative C includes road closures because they were requested by public input.

The action alternatives are consistent with the following standards and guidelines.

4.5.5.18

FW-187	Key habitat areas such as wetlands would be protected.
FW-188	The Forest communicates with ODFW regularly and they are given an opportunity to comment on all projects. ODFW does not develop population objectives for each project planning area but for much larger regions. This standard and guideline is no longer considered to be applicable at the project scale.
FW-189	Natural meadows and openings are being protected.
FW-190	Logging slash would be left in the units. Experience in similar completed plantation thinning has shown that slash is pressed down by snow and deteriorates quickly. The action alternatives would not result in levels of slash that would impede deer or elk movements.
FW-191	Thinning design has incorporated skips and gaps.
FW-192 &	Forage areas created would include small gaps and landings which would

193	be within 600 feet of cover.
FW-194 to 197	Not applicable. The action alternatives do not involve regeneration harvest.
FW-198 & 199	Forage would temporarily be increased. Grass and other plants seeded for erosion control would also enhance forage quality.
FW-200 & 201	Not applicable
FW-202 to 212	See detailed analysis above where applicable.

4.5.6 Pine Marten & Pileated Woodpecker (Management Indicator Species)

The status and condition of management indicator species are presumed to represent the status and condition of many other species. This document focuses on certain key species and does not specifically address common species except to the extent that they are represented by management indicator species.

The pileated woodpecker was chosen as an MIS because of its need for large snags, large amounts of down woody material, and large defective trees for nesting, roosting and foraging. The pine marten is an indicator species to mature or older forests with dead and defective standing and down woody material. It has a feeding area that utilizes several stand conditions that range from poles to old growth (USDA 1990a).

4.5.6.1 **Existing Situation –** The pileated woodpecker is associated with forest habitats that have large trees, especially snags for nesting and foraging. It will use both coniferous and deciduous trees, but tends to be most common in old-growth Douglas-fir forests in western Oregon (Csuti 1997)

Pine martens are associated with forested habitats at any elevation, but will wander through openings and even up into alpine areas. They prefer mature forests with closed canopies, but sometimes use openings in forests if there are sufficient downed logs to provide cover (Csuti 1997).

None of the proposed harvest units provide habitat for these species. All the stands proposed are young managed plantations and range in age from 30 to 61 years. None of the units contain sufficient numbers of large trees or snags to provide potential habitat for the pileated woodpecker. These stands also lack the mature forest structure and sufficient downed logs to provide habitat for the pine marten.

4.5.6.2 **Effects**

There would be no meaningful or measurable direct or indirect effect because no habitat would be affected; therefore a cumulative effects analysis is not necessary.

4.5.6.3 Forest Plan Standards and Guidelines

Mt. Hood Forest Plan References
Management Area Standards and Guidelines – B5-001-B5-042, page Four-242

There are no applicable standards and guidelines for pine martin or pileated woodpeckers because none of the proposed actions are within B5- Pileated Woodpecker/Pine Marten land allocation. Snag standards and guidelines are discussed in section 4.5.4.16.

4.5.7 Migratory Birds

Existing Situation – Close to 30 species of migratory birds occur within the District, some of which are likely present within the project area during the breeding season. Some species favor habitat with late-successional characteristics while others favor early-successional habitat with large trees.

Direct and Indirect Effects

4.5.7.1 **Alternative A -** There would be no alteration of habitat for migratory birds. There would be no benefits to species that prefer thinned stands or negative effects to species that prefer un-thinned stands.

4.5.7.2 **Action Alternatives –** Research has demonstrated that thinning enhances habitat for a number of migratory species and provides habitat for some species that are rare or absent in un-thinned stands. However, some species of migratory songbirds have been shown to decline following thinning. The effects of thinning in mid-successional stands would most likely have a combination of positive, neutral, and negative impacts on migratory bird use within the stands depending on which species are present. The following migratory species present in the watershed may benefit from thinning: Hammond's flycatcher, warbling vireo, and western tanager. The following migratory species may be negatively impacted by thinning: hermit warbler, Pacific slope flycatcher, black-throated warbler, and Swainson's thrush. This project covers only a very small portion of the migratory songbirds breeding habitat on the Forest. Since relatively young plantations on the district are very common, any loss of habitat would not result in any measurable population change of the species, only a redistribution of the individuals affected.

4.5.7.3 **Cumulative Effects**

Because there would be no meaningful or measurable direct or indirect effect to migratory birds; a cumulative effects analysis is not necessary.

There are no forest plan standards and guidelines for migratory birds. Snag standards and guidelines are discussed in section 4.5.4.16.

4.6 SOIL PRODUCTIVITY

4.6.1 Introduction

The productivity and health of entire plant communities depend on the maintenance of healthy soils. Regional soil productivity protection guidance was originally developed in 1976, and has been revised several times since then (Pacific Northwest Region Monitoring and Evaluation Report, 2001), including incorporation into the Mount Hood LRMP as part of the soil productivity chapter. Soil distribution is complex across the watersheds where this analysis area is located. Each soil map unit (number) has been assessed for many risks and hazards called management ratings (e.g. erosion risk, compaction hazard, etc.), which are located in the Mount Hood National Forest Soil Resource Inventory (SRI, Howes, 1979). The SRI is most useful as an initial broad-scale planning tool to identify and display maps of possible soil concerns or sensitive areas. Interpretations are based on observations of soil characteristics at sites thought to best represent the entire soil mapping unit. Because of the scale of the SRI (1 inch per mile), soil properties can vary significantly within a mapping unit and on-site investigations are often required to refine or modify interpretations. Qualified soil scientists adjust management interpretations to reflect on the ground conditions and provide resolution to the soil map units at a site-specific scale.

4.6.2 **Methodology**

A three-step field methodology was used to gather data needed for this effects analysis. In addition, previous field experience, personal observation and knowledge of how soils respond to the proposed types of management actions were used to predict impacts.

4.6.2.1 **Revised soil mapping** - Priority stands were chosen for field evaluation and validation of SRI soil mapping. Appropriate map changes were made to reflect field observations. With updated and validated soil mapping, pertinent management interpretations should be more accurate and therefore provide high confidence when determining levels of risk.

4.6.2.2 **Assessment of existing soil disturbance condition** – Priority stands were chosen based on logging method (with emphasis on ground based systems) for field estimates and study of existing soil disturbance conditions. Soil disturbance condition was based on Howes Disturbance Classes, developed on the Wallowa-Whitman National Forest. This is a process that breaks soil disturbance into six classes based on visual evidence. The visual evidence is correlated to infiltration rates, percolation, channeling of surface water, productivity, potential restoration work, and Regional and Forest Plan standards and guidelines. The details of the classification system and the results of surveys are contained in analysis file.

The stands to be studied were chosen based on amount of impact (percentage of area) estimated from old aerial photos (from the earliest flight flown after the stand was originally clearcut). Stands were chosen with a mix from each of the two primary soil

types in the planning area – one derived from glaciation and the other on earthflow terrain. The resulting subset of monitored stands provided feedback to calibrate aerial photo estimates, and ultimately were used in the prediction of percentage of detrimental soil condition following logging. Skyline and helicopter stands were not included in the detrimental soil condition study because of the relatively small soil impacts resulting from those logging methods as compared to ground based logging.

4.6.2.1 **Areas of concern -** Field notation of specific logging concerns such as proximity to riparian areas or high water tables, and/or unstable areas. Observed and noted concerns were shared with the interdisciplinary team.

4.6.3 Measures

For this analysis the following measures are used to assess impacts:

4.6.3.1 Erosion

Soil erosion can directly affect soil productivity by reducing soil depth and volume, resulting in a loss of nutrients and water holding capacity. An indirect affect from soil erosion is runoff from bare areas carrying soil particles to water bodies where it becomes sediment. Sediment is also addressed in the Water Quality and Fisheries section. This hazard rating is based upon bare surface soil properties that affect detachability, such as soil texture, slope, etc. Management ratings for erosion risk, as an example, follow the variability of the soils across the landscape, with some soils mapped with a severe erosion risk, others with slight, and many in between. Although ratings are a good preliminary analysis tool, in actuality almost any soil regardless of rating can become more erosive than rated under the right (or wrong) circumstances. Slight erosion risk soils that are compacted and bare can become erosive even on gentle slopes. Conversely, erosive soils occurring on very steep slopes in this analysis area may be stable for decades because of sufficient protective groundcover (tree needles, leaves, wood, rocks, etc.).

4.6.3.2 Soil Disturbance

Soil productivity can be affected by compaction, puddling, displacement, erosion and severe burning. These conditions, if severe enough can result in soils that have low levels of porosity, reduced root penetration, increased runoff, reduced infiltration, reduced soil water storage capacity, reduced soil water availability, reduced nutrient availability, and reduced levels of mycorrhizae and other soil organisms.

4.6.3.3 Organic Matter

Soil fertility and soil biological systems will properly function if certain components are present, such as appropriate levels of organic matter and coarse woody debris. Poor or

non-functioning soil biological systems may lead to difficulties in revegetation efforts, or decline in existing desirable vegetation. Soil biology involves complex interactions occurring between organisms and their soil habitats, including physical and chemical characteristics.

4.6.3.4 **Landslide Risk**

The proposed thinning units are located on a wide variety of landforms but these landforms can be grouped into two general types: ancient landslide deposits (deep seated mass failures) formed in pyroclastic parent materials, and all other landforms.

The ancient landslide deposits developed during a much wetter climate than our present climate. The wetter climate occurred thousands of years ago. During that time unstable hillslopes collapsed and formed earthflows and large debris slides that became large coalescing deposits of landslide material. These landslide deposits can be several square miles in area and may be several hundred feet deep. Slope angles are usually gentle. These landslide deposits are more stable now than they were in the past but there are still portions of them that are adjusting to their "new" slope position. Most of the ancient landslide deposits are dormant and would require a major change in their hydrology or slope geometry to become active again. These dormant landslide deposits have been mapped as landform type ALD. Other ancient landslide deposits have been recognized as being recently active. Evidence for recent movement includes fresh scarps, cracks, very tilted trees, and similar clues. These recently active landslide deposits have been mapped as landform type ALA.

Landform type ALD can have locally steep areas, often along the banks of creeks, where small scale landsliding can occur. The types of landslides that can develop at these locally steep areas are usually slumps or debris slides.

Landform type ALA can have a variety of types of landslides, but they are usually earthflows, debris slides, or slumps.

Landslides can also occur on landform types other than ancient landslide deposits. Usually these are debris slides and debris flows that originate on steep slopes. Debris slides typically occur on slopes that are greater than 60%. Debris flows typically originate in channels that have a gradient that is steeper than about 35%. On these landform types the soil depths are relatively shallow and tree root strength is a factor in slope stability.

The Northwest Forest Plan (NWP) indicates that some unstable areas and earthflows should be considered for inclusion into the Riparian Reserve land allocation. (NWP page B-30). The NWP did not require all earthflows be designated as Riparian Reserves, but that they should be analyzed for inclusion during watershed analysis. The Watershed Analyses did conduct this analysis and did include certain unstable areas as Riparian Reserves. (Collawash/Hot Springs Watershed Analysis p. 2-21 to 23 and 4-23). Earthflows vary in terms of their stability and their steepness. The Collawash/Hot

Springs Watershed Analysis (p. 2-21) states "Within any landform type there will be some areas with a very low relative hazard for sediment-delivering landslides and some with an extremely high relative hazard. The high hazard areas will be identified during the planning phase of individual projects." The other watershed analyses followed the same process. Areas mapped as ALA were included in riparian reserves and are shown on maps F-5 & F-6 in Appendix F. The earthflows that would have plantation thinning are more stable and are considered suitable for timber management. Refer to section 4.2.7.4 for a discussion of earthflow recovery.

4.6.4 **Analysis Area**

The analysis areas for soil resources for direct, indirect and cumulative effects are the boundaries of the plantations proposed for thinning. These are appropriate boundaries because actions outside the plantation boundaries would have little or no affect to soil productivity within the plantations, and the actions within the plantation boundaries would have little or no affect to soil productivity elsewhere.

Actions within the unit boundaries may have an effect on hydrologic properties elsewhere. The analysis of hydrology for earthflows and watersheds can be found in s. 4.2.6 and s. 4.2.7.

4.6.5 **Elements of proposal that could affect soil productivity**

For this project, the following actions have the potential to affect soil productivity: actions that disturb soil such as skidding and yarding of logs, the use of harvesters (mechanical tree fellers), temporary road construction, actions that harvest or kill trees, burning and landing creation. Other aspects of the proposed action such as road reconstruction or repair, road closures, log haul, and the creation of snags would not have a meaningful or measurable affect on soil productivity because they do not alter soil conditions. Some actions are specifically designed to benefit soil productivity including the creation of down logs, road decommissioning and decompacting temporary roads and landings.

The analysis also considers restorative actions and the design criteria and best management practices that minimize impact. For example: existing roads, landings and skid trails would be reused where feasible, equipment would be restricted to appropriate slopes, erosion control methods such as water bars, seed and mulch would be used. Refer to section 3.5 for details.

4.6.6 **Soil Types and Geographic Locations in the Planning Area**

Soils in this analysis can be divided into two main categories and further subdivided into a total of five general types based on slope steepness. A summary of SRI mapping units and their associated management interpretations is located in table in s. 4.6.6.1 below.

Earthflow terrain – these soils are located in both the Sand and Collawash geographic areas. They are the most productive of all the soils mapped in this analysis area. These

soils are subdivided into less than 30% slope, between 30% and 60% slopes, and greater than 60% slope. Soils tend to become coarser textured as slope increases.

Glacially derived soils – these soils are located in the Pup Creek geographic area on a broad ridge dividing Fish Creek from the Clackamas River and in the Collawash geographic area on the ridge extending east from Thunder Mountain. These soils are subdivided into less than 30% slope and greater than 30% slope.

4.6.6.1 **Summary of soil types in the analysis area and associated management interpretations from the SRI.**

Soil Map Unit	Compaction Hazard	Erosion Risk	
		Surface	Subsurface
Earthflow terrain <30% slope			
3 – 4	Moderate-High	Very Slight	Low
100	High	Moderate-Severe	High
104	Moderate-High	Slight-Moderate	Moderate-High
Earthflow terrain >30% slope			
101	High	Severe	High
102	High	Severe	High
103	High	Moderate	High
105	Moderate	Moderate-Severe	High
106	Moderate	Moderate-Severe	High
Earthflow terrain >60% slope			
108	Moderate	Severe	High
109	Moderate	Severe	High
113	Low-Moderate	Severe	High
Steep uplands >30% slope			
2	High	Moderate-Severe	High
5	N/A	N/A	N/A
13-12	Low	Slight	Moderate
15	Low	Very Severe	High
200	Low	Severe-Very severe	High
201	Low	Severe-Very severe	High
Glacial deposits <30% slope			
320	Moderate	Slight	Moderate
323	Moderate	Slight	Moderate
327	Moderate	Slight-Moderate	Moderate
Glacial deposits >30% slope			
321	Moderate	Moderate	Moderate-High
322	Low-Moderate	Moderate	Moderate-High
324	Moderate	Moderate	Moderate-High
325	Moderate	Moderate	Moderate-High

4.6.7 Direct, Indirect and Cumulative Effects

The current condition described in the analysis below incorporates all past actions that have occurred within the analysis areas which correspond to the proposed thinning unit boundaries. There are no other ownerships to consider within the analysis areas. There are also no foreseeable future actions to include. While there may be future thinning or other actions, there is no proposal now for future actions that have sufficient site specificity to conduct an analysis. The appropriate time to conduct a cumulative effects analysis for future projects would be in a future EA after a firm proposal is developed.

4.6.8 Erosion

No active erosion from previous vegetation management was observed during the field reconnaissance for this project. The table in s. 4.6.8.1 displays a subset of stands monitored for groundcover levels during the field reconnaissance process. Ground cover is used as an indication of erosion risk. All of the units have well above 90% groundcover.

Alternative A – No Action

The risk of erosion within the analysis area would remain as it is because the amount of groundcover protecting the soil surface from erosional influences is widespread.

Action Alternatives

With the action alternatives, all thinning units would have a reduction in effective ground cover but the remaining ground cover would be sufficient to minimize erosion.

4.6.8.1 Existing Condition, Direct and Cumulative Effects to Groundcover.

Monitored Unit #	SRI Map Unit(s)	Erosion Risk Rating (surface soil)	Current % Groundcover	Predicted Groundcover After Thinning
10	323	Slight	100	> 60%
12	323	Slight	100	> 60%
20	323	Slight	100	> 60%
50	320, 325	Slight-Moderate	98	> 60%
52	323, 324	Slight-Moderate	100	> 60%
	200	Severe-Very Severe		> 85%
56	324	Moderate	100	> 75%
130	100	Moderate-Severe	97	> 75%
132	100	Moderate-Severe	98	> 75%
148	100	Moderate-Severe	100	> 75%
166	100	Moderate-Severe	98	> 75%

Monitored Unit #	SRI Map Unit(s)	Erosion Risk Rating (surface soil)	Current % Groundcover	Predicted Groundcover After Thinning
176	100	Moderate-Severe	100	> 75%
190	2	Moderate-Severe	100	> 75%
212	102	Severe	94	> 75%
224	101	Severe	97	> 75%
322	100	Moderate-Severe	98	> 75%
332	100	Moderate-Severe	100	> 75%

4.6.9 **Soil Disturbance**

Soil disturbance, such as soil compaction, soil displacement and puddling, severe burning, accelerated erosion, excess removal of organic material, and aggravated mass wasting equate to an irretrievable loss of soil productivity (for definitions of listed impacts, see Forest Service Manual [FSM] 2521.1, Region 6 supplement 2500-96-2, effective 6/4/96). See Chapter 4, Soil Physical Properties: Importance to Long-Term Forest Productivity (Perry, 1989) for a review of impacts and effects of compaction, surface soil disturbance, soil loss, and fire effects, and their relation to long term soil productivity.

The extent of detrimental soil condition was determined from field observations of a representative sample of units. The condition of soils was evaluated for the amount of detrimental disturbance from past activities using a combination of qualitative measures and professional judgment. Qualitative data was acquired by transecting units and classifying soil disturbance using Howes (2000) protocol. The level of disturbance was rated as a percentage of each unit area. The portion of units sampled was typical of the project area from visual observations throughout the rest of the project area. The results of field surveys are included in analysis file. Detrimental soil condition was assessed on the remaining units from additional field visits by the district soil scientist, and interpretation of 1946, 1958, 1959, 1967, 1972, and 1979 aerial photographs in relation to the transect information.

The majority of readily observable ground disturbances in the field were heavily compacted old skid trails, landings, and temporary roads. Also observed were areas where displacement or excess removal of organic material had occurred from historic logging activity. It was observed that all ground-based units visited still show signs of skid trail compaction. There does not seem to have been substantial recovery on skidtrails where the old harvest units are located on gentle slopes. Soil Mapping Units 323 and 100 appear to have been especially impacted, probably due to their ease of access for tractor use and finer texture soil properties. Historic disturbance on these soil types mainly attributed to skid trails and landings, still rated as detrimental in nearly all cases.

The percentage of area in a detrimental soil condition varies from stand to stand due to the occurrence, manner, and extent of past timber harvest and fuel treatment activities. All

units were clear cut harvested from 1945 to 1975 and subsequent site preparation included broadcast burning or machine piling. Management practices at that time did not restrict machine movement, skid trail density, removal of woody debris or intense burning; therefore existing detrimental impacts to soil are generally higher than allowed under the current Forest Plan standards and guidelines. The table in s. 4.6.9.5 column 4 (Estimated Existing Condition) summarizes the estimated percent area of detrimental soil condition in each of the sampled units.

Glacial soils - For glacial soils, detrimental condition in the sampled units ranged from 3% to 43%. Based on this sample, it is estimated that 80% of the area that had been previously logged with ground-based equipment exceed 15% detrimental soil condition. None of the units previously logged with skyline or other cable methods exceed 15%.

Earthflow soils - On earthflow soils, detrimental condition in the sampled units ranged from 11% to 42%. Based on this sample, it is estimated that all units previously harvested with ground-based equipment and almost all units previously harvested with skyline or other cable systems exceed 8 % detrimental soil condition.

4.6.9.1 **Alternative A**

Percent disturbed soil condition would slowly decline as compacted areas move toward recovery due to physical and biological processes.

4.6.9.2 **Action Alternatives**

Changes to disturbed soil condition were estimated. It was assumed that existing landings and skid trails would be reused. Estimates include anticipated road and landing rehabilitation described in s. 3.5.6.5. Existing temporary roads or landings not used during the project would remain in a compacted condition. The rehabilitation of skidtrails is not included in the action alternatives. Since the roots of trees have penetrated into the skid trails, deep soil tillage on skid trails would cause adverse impacts to roots, leading to reduced growth, and increased root disease and tree mortality. The opportunity to mechanically rehabilitate skid trails may come in the future if and when regeneration harvest occurs.

4.6.9.3 **Alternative B**

Approximately 2,312 acres of ground-based yarding, 1,307 acres of skyline yarding, and 754 acres of helicopter yarding are proposed. Most units thinned with ground-based equipment would be felled mechanically. Approximately 6.8 miles of old temporary roads would be reused, 0.7 miles of temporary roads would be located on old skidtrails, and 2.6 miles of new temporary road would be constructed. After logging is complete, where detrimental soil conditions are in excess of the Forest Plan standards, all newly constructed and re-opened roads and landings would be decompacted and revegetated.

A net increase in disturbed soil condition is predicted where more skidtrails, yarding corridors, landings and roads would be constructed than already exist. In units with greater than 8% and 15% disturbed conditions, restoration of temporary roads and landings by subsoiling and revegetation would initiate recovery of productivity, but is not expected to return the soil to its original condition and productivity.

4.6.9.4 **Alternative C**

Alternative C would be similar to B except that no new temporary roads would be constructed, and helicopter or other logging systems would be used where needed (23 units). There would be approximately 122 acres of additional helicopter yarding, 107 acres less skyline logging and 14 acres less ground-based logging. Approximately 6.8 miles of old temporary roads would be re-used and approximately 0.5 miles of temporary roads would be located on old skidtrails. Roads would be closed and decommissioned. After yarding is complete, the roads that were used would be obliterated and revegetated. No new roads would be constructed.

A net increase in disturbed soil condition is predicted where more skidtrails, yarding corridors, landings and roads would be constructed than already exist. The increase would be less than in Alternative B in those units proposed for helicopter yarding where new roads would not be constructed, and skidtrail and yarding corridor impacts would not occur. In units with greater than 8% and 15% disturbed conditions, restoration of temporary roads and landings by subsoiling and revegetation would initiate recovery of productivity, but is not expected to return the soil to its original condition.

4.6.9.5 **Estimated Disturbed Soil Conditions**

Terrain type	**Compaction Hazard**	**Slope**	**Percent Disturbed Soil Condition**			**Acres in Thinning Units**
			Estimated Existing Condition	**Estimated Change with Action Alternatives**	**Estimated Result for Action Alternatives**	
Glacial	Moderate	< 30%	26% - 43%	2 – 4%	28% - 47%	564
	Moderate	>= 30%	3% - 8%	2%	5% - 10%	702
Earthflow	High	< 30%	15% - 42%	2 – 4%	17% - 46%	2025
	High	>= 30%	11% - 17%	2%	13% - 19%	1083

4.6.9.6 **Direct and Cumulative Effects**

The results of field surveys are shown in the table in s. 4.6.9.5 above. Despite most of the monitored units having relatively high levels of detrimental soil condition there is no obvious visible symptom in the amount or quality of vegetation currently within these units. Detrimental soil condition is built on the premise that soil damage negatively affects vegetative growth by reducing site productivity caused by a reduction of soil water and nutrients. It might be expected that a stand with 43% detrimental soil conditions would have visible signs of stressed trees. Yet this is not the case; all units are growing well as demonstrated by stand exams and exhibit no reduction in site productivity (see section 4.3.1). There are a few, factors that may explain this:

- The shape and distribution of the damage is usually long and linear and not concentrated. There may be sufficient undamaged growing space spread out between the old skid trails to support the stand of trees we see today.

- The local climate of the area is very conducive to high levels of vegetative production, and it is possible that the high measured level of detrimental soil impact does not affect site productivity as much as it would in drier areas.

- The field data for soil damage was noted and organized so that percentage could be calculated. Soils in the field were examined for certain criteria that placed each in a damage class, with 0 being totally undisturbed, up to class 6, which is the highest level of damage. The line that determines non-detrimental and detrimental lies between class 2 and class 3, which is where the current bulk of the soil samples were placed according to their diagnostic features. Many samples are just above or just below the line separating effect from no effect. In reality, soil recovery is more like a gradual continuum.

4.6.10 **Organic Matter**

Alternative A – No Action

Soil organic matter and corresponding soil functions would continue to occur as they are. Organic matter decomposition and nutrient cycling is influenced substantially by temperature and moisture which would remain unchanged.

Action Alternatives

Logs existing on the forest floor would be retained. Prior to harvest, contract administrators would approve skid trail and skyline locations in areas that would avoid disturbing key concentrations of down logs or large individual down logs where possible. The harvesting operations would also add small woody debris of the size class of the cut trees to the site. This would include the retention of cull logs, tree tops, branches, broken logs and any snags that would be felled for safety reasons. Snags or green trees that fall down after the harvest operation would contribute to the down wood component of the future stand. The action alternatives would also fell some trees to create coarse woody debris.

4.6.11 **Landslide Risk**

All the proposed thinning units are plantations that were regeneration harvest units (clear cuts) in the past. The removal of all the trees in an area has a much greater impact on the slope stability of that area than a thinning would. The level of stability of the slopes of all the proposed thinning units was therefore “tested” in the past by that original harvest. A conservative approach to evaluating the effects of thinning on slope stability is to

identify the areas of the original harvest units that show evidence of landslide activity and exclude those areas from any harvest. Areas that remained stable after the original regeneration harvest would continue to be stable after thinning.

4.6.11.1 The determination of landslide incidence after the original unit harvest was accomplished by using historical aerial photos, existing landslide mapping, field reports of landslide incidence by other resource specialists, and field visits to selected units by a slope stability specialist.

The slope stability specialist visited the following categories of proposed thinning units:

1. all units that contained landform types mapped as Active Ancient Landslides (ALA)
2. all units that contained mapped active landslides
3. other units that contain a steep area within landform types mapped as Dormant Ancient Landslides (ALD)
4. all other units reported to have a landslide by other resource specialists

The following table displays the units that fell into one of the above four categories and were examined in the field by the slope stability specialist.

4.6.11.2

Category	Thinning unit number (the same unit may appear in categories 1 and 2)
1	126, 134, 136, 176, 177, 178, 180, 182, 188, 190, 194, 196, 204, 228, 250. 256, 258, 260, 270, 272, 308, 326, 330, 350
2	2, 4, 8, 10, 12, 26, 28, 30, 32, 126, 134, 136, 176, 177, 178, 180, 182, 190, 194, 196, 204, 216, 234, 250, 252, 256, 258, 260, 268, 270, 272, 326, 330, 336, 348
3	56, 70, 98
4	212, 224, 236, 312, 338

4.6.11.3 There are some mapping inaccuracies present in the GIS coverage of landform type ALA and the mapped active landslides. This resulted in some map overlap between the proposed thinning units and the landform type ALA and/or mapped active landslides that did not actually exist on the ground.

The boundaries of fifteen proposed thinning units were modified to exclude from thinning those areas that were judged to be unstable or potentially unstable: 70, 136, 178, 190, 196, 204, 212, 216, 224, 234, 236, 256, 312, 336, and 338.

Additional unstable or potentially unstable areas may be discovered during unit layout. If so, then a slope stability specialist would check the area and guide or assist with unit layout.

4.6.11.4 Landslides and Roads

Poorly located, poorly constructed, or poorly maintained roads can result in slope stability problems and can result in resource damage. Well located, well constructed, and well maintained roads would have minimal effect on slope stability.

Alternative B includes the construction and later obliteration of a number of temporary roads. These roads are located on stable slopes. Both action alternatives would reconstruct existing temporary roads or build temporary roads on the alignment of existing skid trails. These existing roads showed little or no signs of instability.

Alternative C includes the closure of existing system roads for wildlife enhancement. Most of the roads would be closed with berms which would inhibit regular inspection of the closed roads and culverts by resource specialists. This would delay the recognition of developing problems and rapid response of road maintenance equipment which is important during storm events or other landslide inducing conditions in order to minimize damage to roads and other resources.

The action alternatives include the repair and maintenance of roads used for timber haul. If no action were taken to repair these sites which are becoming increasingly unstable, there could eventually be a failure that would threaten hillslope stability and water quality. Repair and maintenance of these roads would occur as part of the action alternatives resulting in a beneficial effect on slope stability and water quality.

Direct and Indirect Effects of Alternatives

4.6.11.5 No Action

No thinning would occur under the no-action alternative. The overcrowded trees would continue to grow slowly. Existing shallow landslide scars within the project area would slowly heal as vegetation became denser. The level of instability of deeper-seated active landslide areas would likely remain about the same.

Road access would remain as it presently exists. No temporary road construction would occur so there would be no increased landslide risk from road construction. No maintenance or repair of existing roads would be scheduled so there would be an increasing risk of resource damage from the existing road system. No road closures would occur so access for road maintenance equipment would remain as it presently exists.

4.6.11.6 Alternative B

Alternative B would thin areas that are considered to be stable by a slope stability specialist. Known unstable or potentially unstable areas have already been deleted from the proposed thinning units. Additional unstable areas identified during unit layout would be designated as “skips” or otherwise deleted from the unit. The thinning would

enhance tree growth and tree root growth over the long term, restoring hill slope stability to original levels. Thinning would not significantly affect hill slope stability because the roots of leave trees already intermingle with those of cut trees and new root growth would result before the roots of cut trees decay and loose their strength. Existing shallow landslide scars within the project area would be protected and would continue to slowly heal as vegetation on the scars became denser. The level of instability of deeper-seated active landslide areas would be unaffected by the thinning.

The construction of temporary roads on stable ground would have no perceptible effect on slope stability. These roads would be obliterated after use. Existing system roads that would be used for timber haul would be maintained and repaired. These actions would greatly reduce the risk of resource damage from these roads. No road closures would occur under this alternative so access for road inspection and road maintenance equipment would remain as it presently exists.

4.6.11.7 Alternative C

The effects of this alternative would be similar to the effects of Alternative B except for the effects of the road closures. Many roads would be closed with berms for wildlife enhancement. This would result in fewer road inspections and much less awareness of developing road-related problems behind the berms. It is likely that some culverts would plug and road washouts and channel scour would occur, adversely affecting water quality. Road repair costs would increase since problem sites would develop into larger and more expensive problems.

4.6.11.8 The action alternatives would have no measurable incremental impacts on slope stability when added to the impacts of other nearby past, present, or reasonably foreseeable future actions.

4.6.12 Forest Plan Standards and Guidelines

Mt. Hood Forest Plan References
Forestwide Soil Productivity Standards and Guidelines - FW-22 to FW-38, page Four-49
Forestwide Geology Standards and Guidelines - FW-1 to FW-21, page Four-46
Earthflow Standards and Guidelines - B8-28 to B8-41, page Four-264
See Mt. Hood FEIS pages IV-11, and IV-155 to IV-167
Northwest Forest Plan - Coarse Woody Debris Standards and Guidelines - page C-40
Soil Disturbance Standards and Guidelines - page C-44
Modify Fire and Pesticide Use, Minimize Soil Disturbance Standards and Guidelines - page C44

FW-1 to 16	Slope stability concern areas have been identified by the Forest Geologist, and have been deleted from the proposed units.
FW-017 to 019	Most units that were logged with ground-based equipment in the original harvest are not consistent with these standards. See discussion below for exception for FW-018.
FW-020	Most units that were logged with ground-based equipment in the original harvest would be logged similarly this time reusing existing landings and

	skid trails. See discussion below for exception.
FW-021	Natural drainage features would be maintained or improved.
FW-22 to 23	Most units that were logged with ground-based equipment in the original harvest are not consistent with these standards. See discussion below for exception.
FW-24	Minimization of rutting would be achieved through the BT6.6 and CT6.6 provisions in the Timber Sale Contract.
FW-25	Ground cover would be maintained at the prescribed levels.
FW-28 to 30	Rehabilitation would be accomplished only on roads and landings used by the operator. Rehabilitative techniques would not restore the soil resource to a level of less than 15% impaired. See discussion below for exception.
FW-31 to 34	Sufficient woody debris would be left on site including existing down logs, tops and branches and trees felled to create coarse woody debris.
FW-037	Many aspects of the project include design features that limit disturbance to the soil's organic horizon: broadcast burning and mechanical fuel treatments would not occur, skyline and helicopter systems are used where appropriate, existing temporary roads, landings and skid trails would be reused where appropriate and mechanical fellers would operate on top of branches and tops.
B8-31 to 32	These are addressed in section 4.2.7.4
B8-36	Most units that were logged with ground-based equipment in the original harvest would be logged similarly this time reusing existing landings and existing skid trails. See discussion below for exception.
B8-40	Most units that were logged with ground-based equipment in the original harvest are not consistent with this standard and guideline. See discussion below for exception.
B8-48 to 49	Road locations have been reviewed by the Forest Geologist.

4.6.12.1 **Exceptions**

Exceptions to Forest Plan standards and guidelines FW-018, FW-020, FW-022, FW-028, FW-030, B8-036 and B8-040 are proposed.

FW-028 & FW-030

This standard and guideline suggests rehabilitation of impacted soils where the cumulative detrimental condition is greater than 15%. While this is proposed for temporary roads and landings that are used by the contractor, it is not proposed for skid trails in plantations. Most units that were logged with ground-based equipment in the original clear cut harvest would remain above 15%. Mechanical treatment of skid trails in these units would cause excessive root damage that would lead to reduced growth, and increased root disease and tree mortality. The action alternatives would reuse existing skid trails where appropriate but not all areas that were disturbed in the original logging would be disturbed again because of the requirements of the design criteria and best management practices. The opportunity to mechanically rehabilitate skid trails may come in the future if and when regeneration harvest occurs. In areas not disturbed again,

natural recovery would continue to occur as roots and burrowing animals penetrate and break up compacted soils, and as organic matter accumulates.

FW-22

This standard and guideline suggests that cumulative detrimental soil condition should not exceed 15%. Many units already exceed this level. Even though there was no standard for long-term soil productivity when the original clearcuts were logged, the stands continue to grow well and are projected to continue to grow well after the proposed thinning. Stand exams show that plantations that have detrimental soils above 15% have similar growth rates compared to nearby similar plantations that are below 15%. The action alternatives have been designed to minimize additional soil impact and to restore soils where appropriate. In areas not disturbed again, natural recovery would continue to occur as roots and burrowing animals penetrate and break up compacted soils, and as organic matter accumulates. The objective of maintaining long-term site productivity would still be met.

B8-36 & FW-020

These standards and guidelines suggest that ground-based yarding of logs should not occur. For all action alternatives, ground-based yarding would be used on earthflow plantations where ground-based systems were used in the original logging. An exception is proposed because examination of the units has found that the use of existing roads, skid trails and landings with restoration, would result in minimal impact. The objective of providing for earthflow stability would still be met. One option would be to switch to a skyline system, which would overlay the impact of skyline corridors over an existing network of skid trails and in many cases would result in the need to build new roads and landings to facilitate skyline logging. Another option would be to switch to helicopter logging with its associated increase in cost. These options were adopted in some situations where appropriate but in most earthflow units, the objective of earthflow stability would still be met by thinning to create healthy, productive stands using ground-based methods.

B8-40 & FW-018

These standards and guidelines suggest that cumulative detrimental soil condition should not exceed 8% on earthflows. Many units already exceed this level. Even though there was no standard for long-term soil productivity or earthflow stability when the original clearcuts were logged, the stands continue to grow well and are projected to continue to grow well after the proposed thinning. The action alternatives have been designed to minimize additional soil impact and to restore soils where appropriate. In areas not disturbed again, natural recovery would continue to occur as roots and burrowing animals penetrate and break up compacted soils, and as organic matter accumulates. The objective of maintaining long-term site productivity and earthflow stability would still be met.

4.7 SCENERY

The following actions have the potential to affect scenery: actions that remove or kill trees, create bare soil or slash. This would include thinning, landing creation, trees removed for skid trails or skyline corridors, trees removed for road construction, snag creation and felling trees for down wood. Bare soil from landings, skid trails and road construction and slash would likely only be visible from close up. Other aspects of the proposed action such as road reconstruction or repair would not have a meaningful or measurable affect on scenery. A plantation is generally no longer considered visually disturbed when the vegetation within it reaches an average of 20 feet in height (Forest Plan – FW-562).

An analysis area of 47,200 acres was designed to address scenery that incorporates topographic features such as ridges and valley bottoms. This boundary includes the proposed actions and the primary viewer positions. Refer to map in Appendix F.

4.7.1 **Existing Situation**

The stands proposed for thinning currently meet the criteria of being visually recovered. The analysis area is experiencing a period of steady visual recovery because there has been relatively little regeneration harvest in the past two decades and plantations are growing rapidly. On the landscape scale, there are some areas where a "patchwork" pattern exists and observers can see the difference in texture and line between plantations and adjacent mature forest stands. This pattern is subtle as seen from the most sensitive viewer positions but is much more noticeable from local forest roads. Power lines cross through the area creating a straight line effect. Some of the proposed thinning units are directly adjacent to the power line right-of-way.

The following table lists the areas and viewer positions ranked from most sensitive to least in terms of scenery.

Area	**Viewer Position**
Clackamas River, Highway 224, Road 46,	river, roads, Clackamas River Trail, Indian Henry Campground, Fish Creek Campground
Collawash River, Fish Creek	river banks
Roads 63 and 70	roads, recreation rites
All other areas	local open roads

4.7.2 **Direct and Indirect Effects**

Alternative A:

Changes in scenery would come slowly from forest growth. Gradually, over approximately 50 years, the contrast between plantations and mature forest would become less evident but plantations would remain dense and uniform in texture.

Action Alternatives

The action alternatives involve the creation of variability in the stands. Portions of the stands in stream protection buffers and skips would be unthinned. Other portions of the stands would have gaps, temporary road construction, landings, helicopter landings, skid trails and skyline corridors that would be open. The rest of each stand would have variable-density thinning.

4.7.3 **Effects to scenery as seen from sensitive viewer positions:** Clackamas River, Highway 224, Road 46, Clackamas River Trail, Indian Henry Campground, Fish Creek Campground, Collawash River, Fish Creek, Road 63 and Road 70. The proposed thinning units can not be seen from any of these viewer positions. Alterations to scenery if any would be very slight because of a combination of topographic screening, vegetative screening near the viewer position, the density of green trees retained within thinning units, the distance and the viewer angle. No log landings would occur on, or be visible from the primary viewer positions. These factors combined would result in no noticeable change to the casual observer; the viewer would not notice any dramatic changes in forest structure or see bare ground or slash. Similar plantation thinning has been implemented in other viewsheds and the results there confirm that this type of treatment has very little if any affect to scenery. For these viewer positions there would be little or no difference between Alternatives B and C. However when comparing the action alternatives to No Action, variable-density thinning in the long term would result in accelerated tree growth and the breaking up of the solid "patchwork" pattern between plantation and adjacent mature forest stands. In the long term, the action alternatives would result in improved scenery and this improvement would occur much faster with the action alternatives than with no action.

4.7.4 **Effects to scenery as seen from local roads:** Local roads are generally roads that were built by loggers to access the forest for timber harvest. Drivers on these local roads would expect to see other roads and some evidence of logging. They would see a closer view of the "patchwork" pattern that exists and would see landings, stumps, skid trails and rock quarries.

Some minor changes to foreground views from local open roads would occur with the action alternatives. The action alternatives would emphasize the reuse of existing roads, landings and skid trails. Log landings, temporary roads, skid trails and skyline corridors that lead to the landings and landing slash piles would be noticeable in the short term by viewer positions at the landings. Landing size would be kept to the minimum size needed for safety and areas of bare soil would be seeded with grass for erosion control. The thinned forest may have some bare soil, red slash and stumps visible in the short term, but over time this would become less noticeable. From other more distant viewer positions, the thinning would not be evident to the casual observer. In some cases landings occur on closed system roads or on temporary roads. When these roads are reclosed following logging, most of the visual impact would not be seen from open roads except for the berms and the first section of closed road.

There would be differences between Alternatives B and C. Alternative C would not construct any new temporary roads and therefore forest users would not see the berms and the first section of the obliterated temporary road as they would with Alternative B. Alternative C would close some roads that are currently open. This would have the effect of reducing the quantity of viewer positions and concentrating forest users into a smaller area.

When comparing the action alternatives to No Action, variable-density thinning in the long term would result in accelerated tree growth and the breaking up of the solid "patchwork" pattern between plantation and adjacent mature forest stands. In the long term, the action alternatives would result in improved scenery.

4.7.5 Cumulative Effects

Since there would be little or no direct effect to scenery with the action alternatives, there would be no negative incremental impact and no cumulative effects analysis is necessary.

4.7.6 Forest Plan standards and guidelines

Mt. Hood Forest Plan References
Forestwide Visual Resource Standards and Guidelines - FW-552 to FW-597, page Four-107
Scenic Viewsheds Standards and Guidelines - B2-12 to B2-42, page Four-221
Mt. Hood FEIS pages IV-127, IV-131, IV-142, and IV-155 to IV-167

FW-554 – Visual Quality Objectives

Management Area or Designated Viewshed	**Viewer Position**	**Fore-ground**	**Middle-ground**	**Back-ground**
A1 - Clackamas River (Scenic Segment)	River, trails	R	PR	PR
A1 - Clackamas River (Recreational Segment)	River, trails	PR	PR	PR
B2- Collawash River (Eligible Recreational Segment)	River	PR	PR	PR
B2- Collawash River (Eligible Scenic Section)	River	R	PR	PR
B2- Fish Creek (Eligible Recreational Segment)	Stream	PR	PR	PR
B2- Highway 224, Road 46,	Road, Campgrounds	R	PR	PR
B2- Roads 63 and 70	Road, Recreation Sites	PR	PR	M
A7 – Special Old Growth	Viewers within the Old Growth portion	R	R	N/A

A9 – Key Site Riparian	Stream	PR	PR	N/A
B7- Riparian Reserve	Stream	PR	M	N/A
All other areas	Local Roads	M	M	M

R = Retention
PR = Partial Retention
M = Modification

The action alternatives involve the creation of variability in the stands. Portions of the stands in stream protection buffers and skips would be unthinned. Other portions of the stands would have gaps, temporary road construction, landings, helicopter landings, skid trails and skyline corridors that would be open. The rest of each stand would have variable-density thinning. The action alternatives are consistent with the prescribed visual quality objectives. Similar plantation thinning has been implemented in other viewsheds and the results there confirm that this type of treatment has very little if any effect to scenery.

FW-562-566

Only a limited portion of the "seen area" within viewsheds should be in a visually disturbed condition at any time. This analysis considers past timber harvest and road construction as well as fires, power lines, rock quarries, concurrently planned timber sales. Current projects that may be seen from the project viewer positions include the Slip Thin and the Fan and Thunder thins from the Collawash Thin EA.

Visual Quality Objective	**Visually Disturbed Area maximum%**	**Visually Disturbed Area After Project Implementation %**
Retention	8	4
Partial Retention	16	4
Modification	25	8

4.8 BOTANY

The term "special-status botanical species" is used in this section to describe species of fungi, bryophytes, lichens and vascular plants on the Regional Forester's Sensitive Species list. It also refers to the Northwest Forest Plan's Survey and Manage list.

The following actions have the potential to affect special-status botanical species: actions that disturb soil such as skidding and yarding of logs, temporary road construction, actions that harvest or kill trees and landing creation. Other aspects of the proposed action such as road reconstruction or repair would not have a meaningful or measurable effect on special-status botanical species because they do not alter habitat.

The project area includes a diversity of habitats: upland forest, riparian forest, meadows, wetlands/seeps, and beaver ponds. Intuitive-controlled field surveys were conducted for Region 6 Sensitive, Survey and Manage, and invasive plant species from June through mid-August 2006.

Botany surveys concentrated on high priority habitats and focused primarily on wetlands/meadows, seeps, and streamside habitats in the project area where plant diversity was found to be higher than in upland forest habitats. The forest stands/communities surveyed appeared to be relatively homogeneous and similar in plant composition and diversity. Surveyed microhabitats included tree boles and branches, the forest floor, litterfall, decaying logs, stumps, snags, edges of streams and beaver ponds, and wetlands, seeps, and meadows. The entire project area is rich in wetland-meadow habitat, seeps, streams, and beaver ponds. These wet habitat areas would be managed as described in s. 3.2.4.

The following is a summary of the Botanical Biological Evaluation.

4.8.1 **Existing Situation**

Special-status botanical species were either already documented to occur within or adjacent to the project area or were found during the 2006 surveys. They include: *Peltigera pacifica* (lichen), *Pseudocyphellaria rainierensis* (lichen), *Ophioglossum pusillum* (vascular plant), *Sisyrinchium sarmentosum* (vascular plant), *Usnea longissima* (lichen), and *Leptogium cyanescens* (lichen).

4.8.1.1 A number of locations (39) for *Peltigera pacifica,* a lichen, were found in the project area. *Peltigera pacifica* is a foliose (leaflike) lichen that grows on soil, moss, rocks, decaying logs, and tree bases. The lichen can easily be overlooked during field surveys. There are probably many more populations (individuals) of *P. pacifica* in the project areas than were found. *P. pacifica* may be relatively common in some localities on the Mt. Hood National Forest although it is considered rare regionally. Individuals found in the area were usually growing on rocks.

4.8.1.2 One site for *Pseudocyphellaria rainierensis*, a lichen, was found in an old-growth stand along the decommissioned road between units 134 and 136.

4.8.1.3 There is one site for *Ophioglossum pusillum* (adder's-tongue), a vascular plant, in the project area in unit 348. The site is a "scooped-out" wet depression about ¼ acre in size along the 6340 road. The greatest risk to this site is continued encroachment of Canada thistle, which threatens to displace populations. This site has been identified in the invasive plant Draft Environmental Impact Statement (DEIS) for Canada thistle treatment.

4.8.1.4 There are three sites for *Sisyrinchium sarmentosum* (pale blue-eyed grass), a vascular plant in the project area: two in unit 346 and one in unit 348. All of the sites are in wet meadows. The greatest risk to these sites is continued encroachment of Canada thistle,

which threatens to displace populations. Two of the pale blue-eyed grass sites have been identified in the invasive plant DEIS for Canada thistle treatment.

4.8.1.5 Two sites for *Usnea longissima* (Methuselah's Beard), a lichen, were found in the project area.

4.8.1.6 Several specimens of *Leptogium* lichen were collected. It is possible that the lichens are *Leptogium cyanescens*. Additional laboratory examination is needed to determine the species. At this time it is presumed that the lichens are *Leptogium cyanescens*. *Leptogium burnetiae* var. *hirsutum* is also present.

4.8.1.7 *Bridgeoporus nobilissimus* is the only special-status species of fungi that is practical to survey for; it was looked for but not found. Surveys to detect the presence of other special-status species of fungi are not considered practical because of the variability in fruiting-body (e.g. mushroom, truffle) production from year to year. Where surveys determined suitable habitat was present in the project area, the species was assumed to be present. There are 17 species of fungi on the Regional Forester's Sensitive Species list identified as having potential habitat in the project area.

Direct and Indirect Effects

4.8.2 **No Action**

There would be no short-term impact to special-status botanical species.

4.8.3 **Action Alternatives**

Botanical surveys detected the following special-status species in the project area.

4.8.3.1 The 39 *Peltigera pacifica* sites found in the project area would be protected by skips where trees would be retained and ground-disturbance if any would be minimal. Whether these *P. pacifica* sites would respond negatively to changes in stand microclimate induced by thinning stand density in their vicinities, however, is unknown. But *P. pacifica* appears to be a lichen that is adaptable to and tolerant of more open forest conditions where solar radiation, ambient heat and cold extremes, and the potential for desiccation are greater. For example, *P. pacifica* has been found growing on moss and rocks in open lodgepole pine forest. Although considered rare throughout Region 6, this species may be relatively common in certain localities on the west side of the Mt. Hood National Forest. Because of the presence of this lichen species in younger stands (30-61 years old) and the number of sites found during surveys in the project area, it would be logical to assume that it appears to be reasonably adaptable to disturbance since it is growing in younger stands that were clearcut 30-61 years ago.

4.8.3.2 No impact is expected to the one *Pseudocyphellaria rainierensis* site found in the project area since it is outside the thinning unit boundary. The site was flagged and would not be

impacted by the action alternatives. *P rainierenis* is considered an old-growth forest associate.

4.8.3.3 The *Ophioglossum pusillum* site and the three sites of *Sisyrinchium sarmentosum* are in wet areas and would be protected by riparian management described in sections 3.2.2, 3.2.3 and 3.2.4. The treatment identified in the invasive plant DEIS to control Canada thistle would benefit these species.

4.8.3.4 No impact is expected on the *Usnea longissima* sites, which are along Road 54 that parallels Fish Creek. These sites would be protected from thinning operations by including them in skips.

4.8.3.5 Some sites presumed to be *Leptogium cyanescens* would be protected by designating skips. It would be protected wherever hardwoods (its preferred substrate) are protected but undiscovered individuals may be lost. This species is difficult to find and difficult to distinguish between it and other "look-alike" Leptogium species.

4.8.3.6 With Alternative C, there would be reduced potential for impact to special-status botanical species because of reduced road construction and increased helicopter logging resulting in less ground disturbance. Road closures are expected to benefit special-status botanical species because ground vegetation and forest cover eventually would return to closed roads, returning these areas over time to a more natural condition that is favorable to special-status and other species. However, at the same time, road closure operations, such as road decommissioning, may have a negative impact on special-status botanical species if those species occur in the affected road prism. No special-status botanical species were found in or along roads proposed for closure in Alternative C.

There would be little or no direct or indirect effects for any of these special-status species.

4.8.4 **Cumulative Effects**

There would be no meaningful or measurable direct or indirect effect to special-status botanical species; therefore a cumulative effects analysis is not necessary.

4.8.5 **Forest Plan Standards and Guidelines**

Mt. Hood Forest Plan References

Forestwide Threatened, Endangered and Sensitive Plants and Animals Standards and Guidelines - FW-170 to FW-186, page Four-69

See FEIS pages IV-76 and IV-90

Northwest Forest Plan

The Forest Plan was amended by the 2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (USDA, USDI 2001).

This project is consistent with Forest Plan standards and guidelines FW-174 through FW-181 because the procedures for sensitive species were followed.

Biological Evaluation Summary

Species	**Habitat present?**	**Species present?**	**Conflict?**
Vascular Plants	Yes	No	No Impact
Botrychium minganense	Yes	No	No Impact
Botrychium montanum	Yes	No	No Impact
Botrychium pinnatum	Yes	No	No Impact
Carex livida	Yes	No	No Impact
Cimicifuga elata	Yes	No	No Impact
Coptis trifolia	Yes	No	No Impact
Corydalis aquae-gelidae	Yes	No	No Impact
Diphasiastrum complanatum	Yes	No	No Impact
Howellia aquatilis. var. *howellii*	Yes	No	No Impact
Montia howellii	Yes	No	No Impact
Ophioglossum pusillum	Yes	Yes	No impact
Scheuchzeria palustris	Yes	No	No Impact
Sisyrinchium sarmentosum	Yes	Yes	No impact
Taushia stricklandii	Yes	No	No Impact
Wolfia boralis	Yes	No	No Impact
Wolfia columbiana	Yes	No	No Impact
Bryophytes			
Rhizomnium nudum	Yes	No	No Impact
Schistostega pennata	Yes	No	No Impact
Tetraphis geniculata	Yes	No	No Impact
Lichens			
Chaenotheca subroscida	Yes	No	No Impact
Dermatocarpon luridum	Yes	No	No Impact
Fuscopannaria rubiginosa	Yes	No	No Impact
Hypogymnia duplicata	Yes	No	No Impact
Leptogium burnetiae var. *hirsutum*	Yes	Assumed Presence	MII
Leptogium cyanescens	Yes	Yes	MII
Lobaria linita	Yes	No	No Impact
Peltigera neckeri	Yes	No	No Impact
Peltigera pacifica	Yes	Yes	MII
Usnea longissima	Yes	No	No Impact
Fungi			
Bridgeoporus nobilissimus	Yes	No	MII
Cordyceps capitata	Yes	Assumed Presence	MII

Species	Habitat present?	Species present?	Conflict?
Cortinarius barlowensis	Yes	Assumed Presence	MII
Cudonia monticola	Yes	Assumed Presence	MII
Gomphus kauffmanii	Yes	Assumed Presence	MII
Gyromitra californica	Yes	Assumed Presence	MII
Leucogaster citrinus	Yes	Assumed Presence	MII
Mycena monticola	Yes	Assumed Presence	MII
Otidea smithii	Yes	Assumed Presence	MII
Phaeocollybia attenuata	Yes	Assumed Presence	MII
Phaeocollybia californica	Yes	Assumed Presence	MII
Phaeocollybia oregonensis	Yes	Assumed Presence	MII
Phaeocollybia piceae	Yes	Assumed Presence	MII
Phaeocollybia pseudofestiva	Yes	Assumed Presence	MII
Phaeocollybia scatesciae	Yes	Assumed Presence	MII
Ramaria amyloidea	Yes	Assumed Presence	MII
Ramaria gelatiniaurantia	Yes	Assumed Presence	MII
Sowerbyella rhenana	Yes	Assumed Presence	MII

MII = May Impact Individuals or Habitat, but will ***not*** likely contribute to a trend towards Federal listing or loss of viability to the population or species.

4.8.6 **Survey and Manage –** Surveys are not required because the stands are less than 80 years old. Surveys were conducted for sensitive species and all rare species were looked for.

The action alternatives are compliant with both the 2001 and 2004 Records of Decision for survey and manage.

4.9 MANAGEMENT OF COMPETING AND UNWANTED VEGETATION

This section addresses invasive plants and unwanted vegetation.

The Record of Decision and Mediated Agreement (MA) for the "Managing Competing and Unwanted Vegetation" Final Environmental Impact Statement (FEIS) apply to invasive plants (sometimes called noxious weeds), unwanted native vegetation, brush control and fuel treatments. Invasive plant management is now covered by the 2005 Record of Decision for Preventing and Managing Invasive Plants (USDA 2005) that amended the Forest Plan.

The use of herbicides is not being proposed for any of the activities associated this project.

Invasive plants are species not native to a particular ecosystem that may cause economic or environmental harm, or harm to human health. They are sometimes informally referred to as "weeds" and are listed in Appendix B of the Preventing and Managing Invasive Plants Final Environmental Impact Statement, 2005. Invasive Plants may disrupt natural ecosystems by displacing native species and reducing natural diversity through the replacement of native communities with invasive monotypic weed stands.

The following actions have the potential to affect invasive plants: actions that disturb soil such as skidding and yarding of logs, actions that harvest or kill trees, landing creation, temporary road construction, road reconstruction, road repair, road maintenance, road closure, road decommissioning, road use by any vehicle and vehicle or equipment transportation to the project area from off-site. Invasive plant species were found along roads, in skid roads and old landings, and in forest openings with ground disturbed by previous timber harvest activities. Also considered in this analysis are the design criteria to minimize the spread of invasive plants (#4 and 8 in section 3.5). The action alternatives do not involve the use of herbicides.

Invasive plants are spread by people, wild and domestic animals, and natural processes (e.g., wind, water, fire). Vehicles can transport entire plants, parts of plants, or seeds onto National Forest System lands. Ground-disturbing activities can often expose bare ground where invasive plants can colonize and spread (e.g., timber harvest, road building, reconstruction and decommissioning). All of these activities/processes can result in the spread of weeds and infestation of previously un-infested sites. Many invasive plant species can be found wherever one travels along roads on the Mt. Hood National Forest.

The Forest recently completed a Draft EIS for the treatment of invasive plants entitled *Site-Specific Invasive Plant Treatments, Environmental Impact Statement (EIS) for the Mt. Hood National Forest and Columbia River Gorge National Scenic Area*. The final EIS will be completed followed by a Record of Decision (ROD) expected in 2007. The DEIS identifies 208 invasive plant populations/infestations that would be treated manually, mechanically, or chemically (with herbicides). Some treatment areas occur within or near the 2007 Plantation Thin project area. Additionally, the DEIS includes an early detection/rapid response strategy (EDRR) for treating new populations/infestations (i.e., newly discovered sites or not yet inventoried sites on the Forest).

4.9.1 Existing Situation

Many of the roads in the project area contain tansy ragwort (*Senecio jacobaea*), St. Johns-wort (*Hypericum perforatum*), Canada thistle (*Cirsium arvense*), bull thistle (*Cirsium vulgare*), Scotch/Scot's broom (*Cytisus scoparius*), and oxeye daisy (*Leucanthemum vulgare = Chrysanthemum leucanthemum*). These species also can be found within forests in the project area, especially in forest openings where ground disturbance has occurred. English holly (*Ilex aquifolium*) was found scattered within forests in the project area. Spotted knapweed (*Centaurea biebersteinii)* occupies the northwest corner of a large field in unit 312 in the Collawash drainage, which was used for a helicopter landing for a firefighting operation in the past. Other non-native plants found in this field and elsewhere in the project area include grass pink (*Dianthus armeria*), European centaury (*Centaurium umbellatum*), cats-ear (*Hypochaeris radicata*), nipplewort (*Lapsana communis*), and timothy (*Phleum pretense*). Diffuse knapweed (*Centaurea diffusa*) was found growing along the uphill side of the 6322 road along unit 222 in the Collawash drainage. Recently, a population of false brome (*Brachypodium sylvaticum*), a highly invasive species capable of monopolizing forest understories, was discovered in the Collawash drainage along a paved Forest Service road: the population is approximately one acre in size. The false brome site—first one reported on the Mt. Hood NF—is adjacent to Road 70, a haul route. Its location is about 1.2 miles west of the junction of Roads 63 and 70. False brome is a highly invasive grass, capable of invading and monopolizing forest understories.

Direct and Indirect Effects

4.9.2 No Action

It is expected that invasive plants would continue to invade roadsides, timber harvest units, burned areas and other disturbed ground within the project area. People drive the roads in the project area and thereby inadvertently transport, introduce and spread invasive plants. It is expected, for both the short and long term, that invasive plant populations would increase in the project area because of human activities. Increased visitor use is expected as human population growth continues to expand in the Portland metropolitan area and surrounding areas over time. Also, routine road maintenance may spread weeds. For example, mowing roadside vegetation can spread invasive plants such as false brome, spotted and diffuse knapweed, tansy ragwort, St. Johns-wort, Canada thistle, bull thistle, Scotch broom, oxeye daisy, and cats-ear. All of these species, except for oxeye daisy and cats-ear, are listed as noxious weeds by the Oregon Department of Agriculture (ODA). Existing populations would be expected to expand into disturbed habitat because invasive plants are able to outcompete native plant species in disturbed habitats. It is likely that some of the invasive plant populations in the project area will be treated when the *Site-Specific Invasive Plant Treatments EIS for the Mt. Hood National Forest and Columbia River Gorge National Scenic Area* is implemented.

4.9.3 **Action Alternatives**

It is highly likely that opportunities for spreading invasive plants across the landscape within the project area would increase. Increased traffic on Forest Service roads due to logging operations would likely spread weeds. Roads are conduits for the spread of weeds and vehicles are weed-spreading vectors. Construction of new system or temporary roads, landings, and skid roads would provide opportunities and growing space for weeds to colonize. Openings in forest stands with disturbed ground resulting from thinning operations would provide opportunities and growing space for weeds. The magnitude of increase is not measurable. Forest Service roads in the project area already receive a good deal of traffic from recreation seekers (e.g., sportsmen/hunters, campers, hikers) and Forest Service employees. In general, however, traffic intensity can be expected to increase with logging operations, which create ground-disturbed areas where invasive plants can thrive.

Scotch broom is considered naturalized, but is still listed as a noxious weed by the ODA. Canada thistle, bull thistle, tansy ragwort, and St. John's-wort are common and widespread on the Forest, including in the project area, and are also listed as noxious weeds by the ODA. There are approximately eight small populations of spotted and diffuse knapweed on the Clackamas River Ranger District, a few are within the project area. These populations have been treated manually and chemically by the ODA in the past and they continue to treat them manually and monitor them. Both knapweed species are listed as noxious weeds by the ODA, are highly invasive, and especially problematic in drier eastside forest and range lands. Oxeye daisy and cats-ear are common and widespread on the Forest, including in the project area, but are not listed as noxious weeds by the ODA. There is one known site of false brome in the project area. This species is highly invasive and is listed as a noxious weed by the ODA. Log trucks and other traffic associated with logging operations could potentially spread this plant while driving by the site if false brome seeds or entire plants happen to hitchhike onto passing vehicles. Project design criteria #8 would prevent or reduce the spread of false brome in the project area. Hand pulling the false brome plants is likely to occur before seedheads form. Handpulling is effective but labor intensive.

Design criteria such as cleaning and washing the undercarriage of vehicles in order to reduce the possibility of spreading invasive plants from one thinning site to another and the use of weed-free seed and mulch would minimize the risk of spread of invasive plants. However, even with these measures it is likely that invasive plants would spread more with the action alternative than with no action. The best management practice for reducing weed populations is prevention (blocking their establishment) and early detection followed by rapid response with appropriate treatment when weed populations are found. It is likely that some of the invasive plant populations in the project area will be treated. The most aggressive weeds such as knapweed, but other weeds that are common on the Forest, especially along roadsides, such as tansy ragwort and St. John's-wort, have not been identified as high priorities for treatment. As a result the common weeds would likely spread along more roads. If new sites develop, the early detection/rapid response strategy would be applied where appropriate.

With Alternative C, there would be increased potential for spreading invasive plants because of increased helicopter logging that can blow seeds around. However, there would be some reduced ground disturbance and reduced road construction resulting in less bare soil for invasive plants to colonize. Road closures would reduce traffic on those roads reducing vehicle spread. Where invasive plants are present on roads proposed for decommissioning, they would have to be treated in advance.

4.9.4 **Cumulative Effects**

Past actions have resulted in the presence of invasive plants discussed in the existing situation section. All recently planned and future actions would use similar design criteria to limit the spread of invasive plants. Several foreseeable future actions are the implementation of the practices outlined in the Regional Invasive Plant EIS, adoption of the Forest Invasive Plant EIS, and development of a Forest-wide invasive plant prevention strategy. The prevention practices and rapid response techniques developed in these processes would result in a landscape where invasive plant populations are stable or declining.

4.9.5 **Forest Plan Standards and Guidelines**

Mt. Hood Forest Plan was amended by the 2005 Record of Decision for Preventing and Managing Invasive Plants.

Standards from the Regional Invasive Plant Record of Decision

Standard #	**Topic**
1	Prevention of invasive plant introduction, establishment and spread will be addressed in assessments. *Section 4.9.*
2	The cleaning of heavy equipment. *Design Criteria #8.*
3	Use of weed-free straw and mulch. *Design Criteria #4.*
7	Use only gravel, fill, sand, and rock that is weed free. *Design Criteria #8.*
8	Road blading, brushing and ditch cleaning in areas with high concentrations of invasive plants. *Design Criteria #8.*
13	Native plant materials are the first choice in revegetation. *Design Criteria #4.*
4,6,11,12,14, 15,16,18,19, 20,21,22,23	Not Applicable

The action alternatives would meet applicable standards and guidelines for invasive plants.

4.9.6 **Other Competing and Unwanted Vegetation**

There are no issues with brush competition for this project. Fuels treatments in thinning projects are exempt from the requirements of the Record of Decision and Mediated Agreement (MA) for the "Managing Competing and Unwanted Vegetation" Final Environmental Impact Statement (FEIS). Slash treatments associated with road construction is included. The following analysis covers the proposed treatment of slash from temporary roads and landings. Appropriate design criteria would be incorporated into project work to minimize potential adverse impacts to the environment, project workers, and public.

Site-Specific Objectives for Roads and Landing Related Slash and Vegetation:

- Vegetation control shall be completed along Forest roads to provide for user safety (FW-428).
- Dead, down woody material loading levels shall be managed to provide for multiple resource objectives. Fuel profiles shall be identified, developed and maintained that contribute to the most cost effective fire protection program consistent with Management Area objectives (FW-263 and FW-265).

Expected Site Conditions

Site conditions do exist that favor the presence of slash from newly constructed roads and other vegetative debris created during road maintenance or other reconstruction projects. Treatment of road related slash and vegetation would be needed to meet the safety needs and fuel management objectives. Damage thresholds for road projects would be exceeded if slash and debris obscures driver visibility or if there is greater than 15 tons/acre of slash in the 0-3" size class adjacent to the road. Road construction, reconstruction and maintenance projects are expected to need treatment of both live vegetation and slash so that management objectives can be attained.

For road projects, the correction strategy is selected when the damage thresholds are exceeded. The following methods would be used where needed: Lop and Scatter - this method would entail manually cutting the slash or brush with chain saws and then scattering it outside the road prism. Piling and Burning - this method would use mechanical equipment to pile the slash. The piles would then be burned under a set of prescribed weather conditions.

The potential effects of the above treatments that have been considered include soil compaction, puddling, surface erosion, consumed coarse woody debris, removal of surface organic matter, overheating the soil, scorch or death of reserve trees, air quality degradation and the potential for an "escape" becoming a wildfire. A more complete discussion of the effects on these resources can be found elsewhere in this document.

Adverse impacts would be prevented or minimized by the proper use of equipment, project supervision, training, the seasonal timing of activities, the development of a site specific burn plan, and the incorporation of appropriate design criteria.

Cumulative Effects

There would be no meaningful or measurable direct or indirect effect to workers, the public or resources from the treatment of slash created during road construction; therefore a cumulative effects analysis is not necessary.

Mt. Hood Forest Plan References
Forestwide Timber Management Standards and Guidelines - FW-375 to FW-385, page Four-91
Record of Decision for Preventing and Managing Invasive Plants (2005)

This project is consistent with standards and guidelines for competing and unwanted vegetation.

4.10 AIR QUALITY

The first step is to determine what portions of the proposed action could potentially affect air quality. The proposed action involves burning of slash. Exhaust is created by vehicles, equipment, chainsaws and helicopters. Dust is created by vehicles that drive on aggregate surface and native surface roads.

The second step is to determine the analysis area boundary for air quality. The following are areas of concern for smoke and pollution intrusion: Portland/ Vancouver Metropolitan Area, Mt. Hood Wilderness, Bull of the Woods Wilderness, Salmon –Huckleberry Wilderness and Mt. Jefferson Wilderness. The analysis area includes a large airshed that incorporates the west side of the Mt. Hood National Forest, the area west of the Forest and the specific listed areas of concern.

4.10.1 **Existing Situation** – Air pollution sources in the project area include campfire smoke and wildfire smoke. Air dispersing from the project area toward the areas of concern is generally good to excellent except when prolonged wildfires are burning. Fuel accumulation is not a major concern in the project area and it does not have an elevated wildfire risk. The nearest area of concern is the Bull of the Woods Wilderness which is a few miles from the nearest proposed thinning unit. The nearest town is approximately 20 miles away.

Direct and Indirect Effects

Alternative A (No Action) would not change air quality. Alternative A would not result in a trend toward increased risk of wildfire or degradation of air quality.

Action Alternatives

4.10.2 **Exhaust** and its pollutants would be created by vehicles and equipment used for all aspects of the proposed action. Helicopters use more fossil fuel that other types of

logging equipment. Alternative C has more helicopter logging and would use proportionally more fuel. Pollutants would disperse and would not likely cause health concerns for forest users.

4.10.3 **Dust** from trucks and equipment driving on aggregate or native surfaced roads would drift approximately 100 meters but would not drift toward campgrounds or any other area of popular public use.

4.10.4 **Landing slash** would be burned. The action alternatives would have several hundred landing piles but since the logging would be spread out over several years, the burning would also be spread out over several years. There would not likely be very much slash at the landings to burn because many units would use harvester/processors which leave the limbs and tops in the units. Any pieces of wood that come to the landing that are suitable for firewood would be removed for that purpose. The small amount of debris remaining at the landings would be burned. Burning has the potential to degrade local air quality for short periods of time. The principle impact to air quality from burning is the temporary visibility impairment caused by smoke to the recreational users. Past experience has shown that air quality declines are limited in scope to the general burn area and are of short duration. The effects to forest visitors would be minimal because burning would happen after the peak recreation season, in the fall (October – December) or during periods of inclement weather. Slash in the harvest units would not be burned. The branches and tops of harvested trees and the felling of trees for woody debris recruitment would increase fuels by approximately 5 tons per acre.

Health risk are considered greater for those individuals (workers and others) in close proximity to the burning site. Particulate matter is measured in microns and calculated in pounds per ton of fuel consumed. Particulate matter that is 10 microns or less in size create the greatest health risk. At this size the material can move past normal pulmonary filtering processes and be deposited into lung tissue. Particulates larger than 10 microns generally fallout of the smoke plume a short distance down range. Members of the public are generally not at risk. Few health effects from smoke should occur to Forest users due to their limited exposure.

4.10.5 **Indirect Effects** – All prescribed burning would be scheduled in conjunction with the State of Oregon to comply with the Oregon Smoke Implementation Plan to minimize the adverse effects on air quality. Due to the season of the burn, strong inversions are unlikely to develop and hold a dense smoke plume to adversely affect distant residential areas. Since the quantity of burning is minimal and would be conducted when smoke dispersion conditions are favorable to minimize the potential for adverse effects there would be no effect to these Class I airsheds - Portland/ Vancouver Metropolitan Area, Mt. Hood Wilderness, Bull of the Woods Wilderness, Salmon –Huckleberry Wilderness and Mt. Jefferson Wilderness. Burning would occur during the time of year when there are few visitors to the nearby Bull of the Woods Wilderness.

4.10.6 **Cumulative Effects –** The action alternatives would have little or no effect to air quality in the Portland/Vancouver Metropolitan Area or in wildernesses. Therefore no cumulative effects analysis is necessary.

4.10.7 **Mt. Hood Forest Plan References**
Forestwide Air Quality Standards and Guidelines – FW-39 to FW-53, page Four-51
See Mt. Hood FEIS pages IV-19, and IV-155 to IV-167.

The analysis above shows that the project would be consistent with air quality standards and guidelines.

4.11 ECONOMICS – FINANCIAL ANALYSIS

One of the aspects of the purpose and need (s. 2.2.1.5) and one of the dual goals of the Northwest Forest Plan is to provide a sustainable level of forest products for local and regional economies and to provide jobs. The Northwest Forest Plan Final Environmental Impact Statement has an in-depth analysis of the economic basis behind the goal of providing forest products for local and regional economies. It also contains an analysis of the social and economic benefits and impacts of preservation, recreation and other values. To benefit local and regional economies, timber is auctioned to bidders. For contracts to sell they must have products that prospective purchasers are interested in and they must have log values greater than the cost of harvesting and any additional requirements.

The purpose of this analysis is to approximate the economic feasibility of timber sales, estimate the potential value generated and to provide a comparison of the alternatives.

Alternative A would not provide forest products consistent with the Northwest Forest Plan goal of maintaining the stability of local and regional economies now and in the future. The action alternatives would provide for jobs associated with logging and sawmill operations and would contribute to meeting society's forest product needs. The NFP (p. 3&4-297) contains an analysis of employment in the timber industry. The annual incremental contribution of each million board feet of timber is approximately 8.3 jobs.

The following table displays a summary of the cost and benefits associated with the timber harvesting for each alternative. The table displays present value benefits, cost, and net value, as well as the benefit/cost ratio for each alternative as if it was sold as one timber sale. The selected alternative may be divided into multiple timber sales based on haul routes, location, harvesting systems. These figures display the relative difference between the alternatives. If timber prices or other factors fluctuate in the future, the relative ranking of alternatives would not likely change.

4.11.1 Costs and Benefits

	Alternative A	Alternative B	Alternatives C
Present Value - Benefits	0	26,246,400	26,246,400
Present Value – Logging Cost	0	10,749,400	11,456,450
Present Value – costs for road stabilization	0	700,000	700,000
Present Value – costs for road closures/decommissioning	0	0	75,000
Present Net Value	0	14,797,000	14,014,950
Benefit/Cost Ratio	NA	2.29	2.15

Present Value - Benefits: This is the present day value based on delivered log prices (estimated at $600/mbf).

Present Value - Cost: This is the present day value of the cost associated with harvesting (estimated harvesting cost is $125/mbf for mechanical, $250/mbf for skyline and $600/mbf for helicopter).

Present Net Value: This is the present net value of the alternative, which is based on the value of delivered logs to a mill minus the value of cost associated with harvesting.

Benefit Cost Ratio: This is a ratio derived from dividing the "Present Value – Benefits" by the "Present Value – Cost".

The bidding results of the timber sales sold recently indicates substantial competition for forest products in the region as well as a high demand for forest products from the Mt. Hood National Forest. Timber sales prepared from this project would provide forest products consistent with the Northwest Forest Plan goal of maintaining the stability of local and regional economies now and in the future.

Administrative costs are not included in the analysis above. Administrative costs for planning are already spent and would be the same for all alternatives including the no-action alternative. Other costs for timber sale preparation and sale administration would be similar for the action alternatives.

4.11.2 Forest Plan standards and guidelines

Mt. Hood Forest Plan References

Forest Management Goals - 19, page Four-3, page Four-26, See FEIS page IV-112
Northwest Forest Plan Standards and Guidelines page A-1, and FSEIS pages 3&4-288 to 318

The action alternatives are consistent with Forest Plan goal to efficiently provide forest products.

4.12 TRANSPORTATION

Roads Analysis is a process of considering landscape-level information before making site-specific decisions about road management. A Roads Analysis has been developed at the Forest scale (USDA 2003). Road management decisions are informed by this Forest-level analysis, and are focused by project-level specific information.

Across the Forest, funding for road maintenance is lower than the level needed to properly maintain the approximate 3000 miles of open roads on the Forest. The Forest-wide Roads Analysis identified, for approximately half of the current road system, the need to change maintenance levels to lower standards, to store roads in a maintenance level one category or decommission. This discussion relates to system roads. There are also many temporary roads constructed and closed by loggers that do not result in the expenditure of road maintenance funds.

The objective of this project-level roads analysis is to provide information to decision makers so that the future road system can be one that is safe, environmentally sound, affordable and efficient. A project level roads analysis may include topics such as: 1) construction of new permanent system roads, 2) reconstruction or stabilization of existing roads needed for the project, 3) making changes to road maintenance levels, 4) decommissioning system roads, 5) storm proofing, 6) road closures and 7) the construction or reconstruction of temporary roads. The items particularly relevant to this project are #2, 4, 6 and 7.

Temporary roads are roads that are built by timber operators to access landings and are closed upon completion of logging until they are needed again. They are not considered part of the Forest's system of permanent roads.

4.12.1 **Existing Situation**

There are no inventoried roadless areas in the project area. No uninventoried roadless areas have been identified. Areas adjacent to the project are areas being considered for wilderness designation.

The closure of currently open system roads is not part of Alternative B but it is part of Alternative C. The analysis area has an open road density of 1.9 miles per square mile.

The units proposed for thinning are plantations, many of which were accessed by temporary roads during the original clear cut logging. Existing temporary roads were assessed to determine whether they are needed for the current thinning proposal. These existing temporary roads are closed and in some cases have vegetation, brush and trees growing on them.

4.12.2 **Direct and Indirect Effects**

4.12.3 **Alternative A**

No roads would be built, closed, decommissioned or repaired. Because funding is not available to repair roads, they would continue to deteriorate. The impact of unrepaired roads is addressed in the water quality and fisheries section. In the long term, roads would become unsafe and would need to be closed. Closing them would not resolve the water quality issues.

4.12.4 Action Alternatives

The action alternatives would utilize helicopters. There are existing landings along existing roads that would meet the needs of helicopter operations.

The unit tables in sections 3.2.9 and 3.3.3 show the lengths of old existing temporary roads would be reopened to access the units (6.8 miles). These roads are on dry stable landforms and do not cross any streams. In addition, approximately 6 miles of bermed system roads would be temporarily opened. (4620-011, 4620-013, 4620-016, 4620-025, 4620 (near unit 270), 4620-150, 4620-174, 4620-180, 4621-017, 4621-018, 4621-019, 4621-020, 4621-022, 4621-027, 4621-125, 4621-140, 5410-016, 5412-012, 6320-021, 6320-022.) These roads would not be open to the public. They would temporarily be used by the loggers, truck drivers and Forest Service personnel. After logging, the roads that were opened would be closed. There would be no increase in the permanent roads open to the public.

Road Repair and Stabilization

To facilitate safe use, several roads are in need of repair.

Note: Road 4620 has two unconnected sections due to previous decommissioning in a middle section.

Road 4620 beginning at junction with 6322 - Grind pavement and convert to gravel from mile posts 1.9 to 2.3, 2.5 to 3.1, 3.6, to 6.5. Deep patch repairs are needed at mile posts 4.0, 4.1, 4.15, 4.25, 4.3, 4.35, 5.1, 5.35, 5.4, 5.5, 5.7 to 5.9, 6.2, 6.3, and 6.4.

Road 4620 beginning at Highway 224 – polyfabric and leveling at mile post 5.2. (Repairs needed at mile posts 1.1, 1.5, and 2.6 will be made by operator of Slip Thin timber sale.)

Road 4620340 would have 2 inches of gravel added.

Road 4621 – deep patch repair and fill slope repair at mile post 0.

Road 5400 – deep patch repair at mile posts 0.7 and 1.1.

Road 5410 – Grind pavement and convert to gravel from mile posts 0 to 5.8 except at stream crossing. Stump removal mile posts 1.8, 2.2, 2.4, 2.6 and 3.3. Deep patch repair

– mile posts 0.7, 2.9, 3.1, 3.5, 5.37 and 5.7. Spot rocking at mile post 7.3. Install cross drain culvert at mile post 5.3.

Road 5411 – Deep patch repairs at mile posts 2.8, 2.9 and 3.7.

Road 6300 – Overlay with polyfabric at mile posts .05, .1, .5, .9, 1.3, 2.9, 3.1, 3.2 and 3.4.

Road 6340 – Clean culvert catch basin at mile post 2.

Road 7000 – Deep patch repair at mile posts 0.2 and 0.3. Overlay polyfabric at mile posts 0.5, 0.7, 0.9, 1.4, 2.1 to 2.3, 2.4 to 2.5 and 2.9.

Road 7010 – Overlay polyfabric at mile posts 0.05, 0.35, 0.45, 0.7, 0.8, 1.0, 1.1, and 1.2 to 1.3. Leveling course at mile posts 0.9, 1.0, 1.1, and 1.2 to 1.3.

In addition, most haul roads would receive road maintenance including ditch and culvert cleaning and brushing. Gravel roads would be bladed and shaped where needed.

These repairs and maintenance items would cost approximately $700,000.

4.12.5 **Alternative B**

Alternative B would construct new temporary roads to access landings. Some of the roads would be built on old skid trails (0.7 miles) and some would be new construction (2.6 miles). The temporary roads are located on dry stable landforms and do not cross any streams.

Even though all of the proposed units were clear cut logged before, there are cases where it is not feasible or desirable to use the same roads, landings or logging method used before. To protect the residual trees and soil and water resources, in some cases new temporary roads are proposed to access the landings where the existing system roads and old temporary roads do not adequately access the ground. The unit tables show the lengths of road for each unit and the unit maps show their location.

4.12.6 **Alternatives C**

Alternative C would construct temporary roads on old skid trails (0.5 miles) but would not construct new roads on previously undisturbed ground. The temporary roads are located on dry stable landforms and do not cross any streams. Logging systems would be different and more expensive than with Alternative B. Helicopters would be used more and some units would require multi-span skyline logging methods.

Alternative C would close and decommission roads (s. 3.3.2). Most of the roads proposed for decommissioning are currently closed with berms. After decommissioning the roads would be managed the same as temporary roads that are closed; they would be available for future management if needed. Other roads that are currently open would be

closed with berms and gates. These roads would no longer be available for public use with vehicles but may be used hiking, cycling or horseback riding. It might be expected that road maintenance expenses would be reduced when roads are closed, but in this situation there is currently little or no funding to maintain these roads. Little or no maintenance is occurring and therefore little money would be saved. If the roads were not closed, they would eventually deteriorate and roadside brush would encroach creating safety issues.

4.12.7 **Cumulative Effects**

Since there would be little or no direct or indirect effect with the action alternatives, there would be no negative incremental impact to the transportation system. No cumulative effects analysis is needed for transportation. Refer to the Forest-wide Roads Analysis (USDA 2003) for a discussion of the transportation system as a whole. An open road density analysis can be found in the Wildlife section.

4.12.8 **Forest Plan standards and guidelines**

Mt. Hood Forest Plan References
Forestwide Timber Management Standards and Guidelines - FW-407 to FW-437, page Four-95
See FEIS page IV-123

The action alternatives are consistent with Forest Plan goal to efficiently provide transportation.

4.13 HERITAGE RESOURCES

Surveys conducted for this project located no new sites. This project is discussed in heritage resource report numbers 2006-060605-003, 2006-060605-005, 2007-060605-002. Road 4620340 would have 2 inches of gravel added to protect a previously documented heritage site. There would be no anticipated effects on heritage resources with any of the alternatives. Contracts would contain provisions for the protection of sites found during project activities. Documentation of this information has been forwarded to the State Historic Preservation Office.

Forest Plan standards and guidelines

Mt. Hood Forest Plan References
Forestwide Timber Management Standards and Guidelines - FW-598 to FW-626, page Four-118
See FEIS page IV-149 and IV-155 to IV-167

The action alternatives are consistent with Forest Plan goal to protect important cultural and historic resources.

4.14 ENVIRONMENTAL JUSTICE – CIVIL RIGHTS

Executive Order 12898 directs agencies to identify and address disproportionately high and adverse human health or environmental effects of projects on certain populations. This includes Asian Americans, African Americans, Hispanics, American Indians, low-income populations and subsistence uses. The Civil Rights Act of 1964 prohibits discrimination in program delivery and employment. There are communities with minorities and low-income populations that may be affected by the project. The town of Estacada (the nearest community) is approximately 20 miles away. Even farther away, but potentially affected are the American Indian communities of Warm Springs and Grande Ronde. There are no known areas of religious significance in the area. There are no known special places for minority or low-income communities in the area. Individuals may work, recreate, gather forest products or have other interests in the area. The impacts and benefits of this project would not fall disproportionately on minorities or low-income populations. No adverse civil rights impacts were identified. There would be no meaningful or measurable direct, indirect or cumulative effects to environmental justice or civil rights.

4.15 RECREATION

4.15.1 In the vicinity of the project units there are no campgrounds, trails or other destination recreation features. Fish Creek Campground and Indian Henry Campground are each approximately ½ mile from the nearest thinning units. The Clackamas River Trail follows the river connecting the two campgrounds. Recreational uses of the river include rafting, kayaking and fishing. None of the thinning units can be seen by viewers in the campgrounds or on the trail or from the river itself. The action alternatives would not affect these recreational uses.

4.15.2 The primary use in the vicinity of thinning units is dispersed recreation. The project area is relatively close to urban areas and is often used for dispersed camping, hunting and for gathering special forest products such as mushrooms. Fire rings are present at old landings and road junctions. With the action alternatives, there may be short-term movement of individuals or groups during project implementation. Even with this temporary displacement, the availability of dispersed recreation opportunities on a landscape level would not be negatively affected. Many thousands of acres are available for camping and other forms of recreation and the project units do not represent a special or unique recreational opportunity that is not available elsewhere. The no-action alternative would not have these effects.

4.15.3 Alternative C would close roads and reduce some opportunities for dispersed recreation. While some people advocate the reduction of open-road density to benefit wildlife, there are others that object to road closures. Some road closures that are short and do not access any special places are usually not a problem, but the closure of long roads that access a relatively large landscape or roads that go to special dispersed recreation sites are often objected to. While there are many miles of open roads available for camping, hunting and other forms of recreation elsewhere on the Forest, many of those roads may

also be considered for closure in the near future. The project area and adjacent areas have already had many road closures: In the Fish Creek watershed, over 100 miles of roads have already been decommissioned making vast areas inaccessible by vehicles and in the Collawash watershed over 60 miles of roads have already been decommissioned.

One road in particular that is proposed for decommissioning is 5410012 which accesses an area popular for target shooting as well as illegal dumping. Not only has this area has been heavily impacted but it is in an LSR, a Key Watershed, a Wild and Scenic River and crucial winter range. Closing this road may help restore this area but it may also result in shooting and dumping activities moving to other areas.

Other areas of concern are where one or more closures block access to large portions of the forest. These include the proposed closure of 5410-120 (3 miles), 4620-260 and all tributary roads (4 miles), 6320-120 and all tributary roads (3.4 miles), 6320-170 and all tributary roads (6.8 miles) and 6321 (6.5 miles). The table in s. 4.5.5.17 indicates that far more roads are proposed for closure than needed to meet Forest Plan standards and guidelines.

Alternatives A and B would not close roads.

4.15.4 Under the Wild and Scenic Rivers Act, the Clackamas River has been designated with both recreational and scenic segments. The river corridor has a land allocation (A1) that extends up slope. Portions of units 14, 16, 18, 20, 22, 146 and 210 are in recreational segments and units 161, 164, 177 and 178 are in scenic segments. The river is also a state scenic waterway. The outstandingly remarkable values identified in the River's management plan are Botany/Ecology, Fish, Wildlife, Recreation and Cultural Resources. Scenery was not found to be an outstandingly remarkable value. These resources are addressed in detail elsewhere in this document (see table of contents).

4.15.5 Fish Creek and the Collawash River are identified as eligible for recreational and scenic designation. Several wilderness bills are being developed by Oregon's congressional delegation, some of which would finalize the designation of these eligible river segments. Portions of units 2, 4, 14, 206, 322 and 346 are in the eligible recreational segments and portions of unit 348 are in the eligible scenic segment. The outstandingly remarkable value for Fish Creek is Fisheries and for Collawash is Geology and Fisheries (Forest Plan Appendix E-9). Scenery was not found to be an outstandingly remarkable value. These resources are addressed in detail elsewhere in this document (see table of contents).

4.15.6 The action alternatives would not degrade any of the outstandingly remarkable values or affect the rivers' eligibility. The thinning units would not be visible from the rivers due to topographic breaks in slope and vegetative screening. Existing roads and proposed temporary roads in the vicinity of thinning units would meet the recreation opportunity spectrums of roaded natural and semi-primitive motorized. The roads, both existing and proposed, would not exacerbate any unauthorized motorized incursions toward the rivers because of the road-to-river distance and limiting steep topography. Alternative C would close some roads and would reduce access to the outer edges of the A1 land allocation.

4.15.7 The effects to recreational fisheries would be minimal because fish habitat conditions downstream would not be detrimentally affected. Access to streams for angling is not altered by Alternative A or B but would be limited to some small fish bearing streams by the road closures of Alternative C.

4.15.8 **Cumulative Effects**

There would be no meaningful or measurable direct or indirect effect to recreation or to designated or eligible scenic and recreational rivers, therefore no cumulative effects analysis is warranted.

4.15.9 Forest Plan standards and guidelines

Mt. Hood Forest Plan References

Forestwide Timber Management Standards and Guidelines - FW-453 to FW-466, page Four-98 and FW-467 to FW-551 page Four-100. Management Area Standards and Guidelines – A1-CLA-01 to A1-CLA-70

The action alternatives are consistent with Forest Plan goal to provide recreational opportunities and the following standards and guidelines. Other standards and guidelines are not applicable.

A1-CLA-01	No degradation of any of the outstandingly remarkable values.
A1-CLA-03	River characteristics would not be changed.
A1-CLA-04	Recreation opportunity spectrums of roaded natural and semi-primitive motorized would be met by all alternatives.
A1-CLA-28-31	Timber harvest is designed to protect or enhance river values. All of the units in A1 land allocation are in late-successional reserves.
A1-CLA-58-59	New temporary roads are constructed on gentle terrain, are not near the river, and would be obliterated after project completion.
FW-467 to 551	There would be no degradation of the outstandingly remarkable values of Fisheries and Geology. The rivers would remain eligible for recreational and scenic designation. All standards and guidelines would be met.
FW-453 to 466	There would be little or no affect to dispersed recreation.

4.16 OTHER

Farm And Prime Range Land

There would be no effect upon prime farmland or prime rangeland. None are present.

Flood Plains Or Wetlands

No flood plains or wetlands are affected by the alternatives.

Laws, Plans and Policies
There are no identified conflicts between the proposed action and the objectives of Federal, Regional, State laws and local land use plans, or policies.

Productivity
The relationship between short-term uses and the maintenance of long-term productivity: no reductions in long-term productivity are expected. See soils section.

Irreversible and Irretrievable Commitments
The use of rock for road surfacing is an irreversible resource commitment.

List of Preparers

David Lebo - Westside Zone Botanist, Mt. Hood National Forest. B.A. Frostburg State College; M.A. University of Montana; M.S. University of Washington (forest ecology). David specializes in forest ecology and botany with a particular interest in cryptogamic botany (fungi, lichens, and bryophytes). He has worked for the Forest Service for two decades in Washington and Oregon including a six-year stint as interagency ecologist for the BLM and Forest Service in the Klamath Basin in southern Oregon.

Glenda Goodwyne, - Forester, Certified Silviculturist. Glenda has B.S. Forest Management from Oregon State University, 1985 and an A.A.S. Forest Management from Tuskegee University, 1980. She completed Silviculture Institute at Oregon State University/University of Washington in 1998, and is certified as silviculturist and most recently re-certified in 2003. Glenda has worked as a forester with the Forest Service for 25 years in Oregon, Washington, and California.

Bob Bergamini – Fisheries Biologist. A.A. Fisheries Technology, Mt. Hood Community College, B.A. Biology, University of Connecticut. He has worked for the Forest Service for 16 years.

Sharon Hernandez - Wildlife Biologist. Sharon graduated from Michigan State University in 1992 with a B.S. in Wildlife Management. She has worked as a biologist for the Forest Service for 12 years in Washington and Oregon.

Jim Roden - Writer/Editor. Jim has a B.S. in Forest Management from Northern Arizona University. He has worked as a forester for the Forest Service for 26 years in Wyoming, California, Idaho and Oregon. He is a specialist in timber sale planning, geographic information systems and economic analysis.

James Rice – Supervisory Forester. Jim has a B.S. in Forest Science from Humboldt State University. He has worked for the Forest Service for 27 years in Southern

California, Northern California and Oregon. He was a certified silviculturist in Region 5 and is currently a certified silviculturist in Region 6.

Gwen Collier - Soil Scientist. Gwen has a B.S. in Biology and Environmental Science from Willamette University and a B.S. in Soil Science from Oregon State University. She has worked for the Forest Service for 27 years in Oregon, Washington and Idaho. She is a specialist in soil science and hydrology.

John Dodd - Soil Scientist. John graduated from the Oregon State University in 1989 with a B.S. in Soil Science. He has worked as a Soil Scientist for the Forest Service for 18 years in Oregon, 17 of which have been on the Mt. Hood National Forest.

Mike Redmond - Environmental Analysis Review - Mike has a B.S and a M.S. degree in Forestry from the University of Illinois. Mike has worked for the Forest Service for 28 years. He is a specialist in the preparation of environmental documents under the National Environmental Policy Act.

Ivars Steinblums - Forest Hydrologist. Ivars has a B.S. in Forestry from Humboldt State University (1973), and a M.S. in Forest Engineering (Watershed Management) from Oregon State University (1977). He has worked 2 years as a timber appraiser for county government in Northern California, and 28 years as a hydrologist for the Forest Service in California and Oregon.

Todd Parker - Hydrologist. Todd graduated from Oregon State University in 1981 with a B.S. in Forest Management and a B.S. in Business Administration. He has worked as a Hydrologist on the Columbia Gorge and Zigzag Ranger Districts since 1992.

Tom DeRoo - Geologist. Tom graduated from the University of Washington in 1978 with a B.S. in Geology. He has worked as a geologist for the Forest Service for 28 years in Washington and Oregon, including 20 years on the Mt. Hood National Forest.

Jerry Polzin - Logging Systems Specialist. Jerry received a certificate of completion from Missoula Technical Center in 1977. He completed Forest Engineering Institute at Oregon State University in 1981 and Sale Area Layout and Harvest Institute in conjunction with Oregon State University and the University of Idaho in 2002. He has worked in timber sale preparation for the Forest Service for 25 years.

Susan Rudisill - Archaeological Technician. Susan has worked for the Forest Service for 21 years. She has served as an Archaeological Technician for the Forest Service for 15 years in Oregon. Training: Archaeology at Mt. Hood Community College, Anthropology at Clackamas Community College, Lithic Analysis at The

University of Nevada, Reno. She has also received the following training sessions through the Forest Service: Rec. 7, Federal Projects and Historic Preservation Laws.

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