Environmental Assessment

Lake Branch Thinning

United States Department of Agriculture

Forest Service

2009

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

The project is located in T.1 N., R.8 E.; and T.1 S., R.8 E.; Willamette Meridian.

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An example of post harvest plantation thinning

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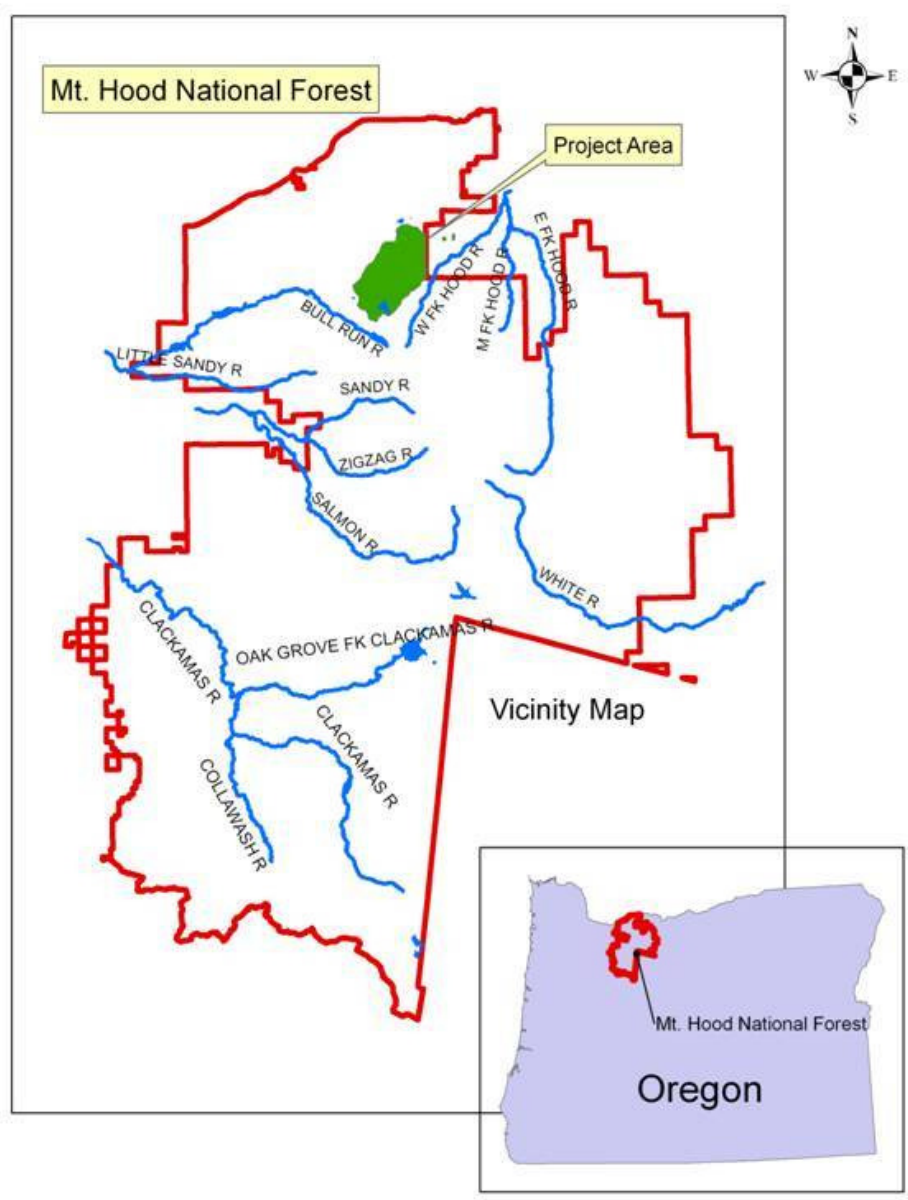
1.0 SUMMARY

The project is located in the Hood River Ranger District, Mt. Hood National Forest, Oregon. The Mt. Hood National Forest proposes a restoration thinning project in plantations ranging in age from 30 to 60 years old and the decommissioning, closing and repairing of roads. The Mt. Hood National Forest will be referred to as 'the Forest' in this document.

The purpose of this project is to thin second-growth plantations to achieve multiple restorative objectives. The proposed action is to thin and harvest wood fiber from approximately 2,163 acres of matrix land and riparian reserves. The proposed action also includes road reconstruction, road closure and road decommissioning. Refer to section 2.3 (s. 2.3) for greater detail.



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. This document uses a section number system. This paragraph for example is in section 2.1 and may be referred to as s. 2.1. 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 discussion also includes design criteria and Best Management Practices. This section also details how the Forest Service informed the public of the proposal and how the public responded.
- *Alternatives:* This section provides a description of alternative methods for achieving the stated purpose. These alternatives were developed based on issues raised by the public and other agencies. 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.
- *Consultation and Coordination:* This section provides a list of preparers and agencies consulted during the development of the environmental assessment.
- *References and Appendices:* The appendices provide more detailed information to support the analyses presented in the environmental assessment.

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

2.2 Purpose and Need for Action

The following purposes of this project are derived from the Mt. Hood National Forest Land and Resource Management Plan as amended (USDA 1990b). (It will be referred to as the Forest Plan in this document.)

2.2.1 Riparian Reserves

One of the purposes of this project is to enhance riparian reserves.

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 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. Sections 4.1.3 and 4.3 have more detail about riparian reserves.

2.2.2 Diversity

One of the purposes of this project is to enhance diversity.

This action is needed because these 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 and to increase the quantity and palatability of forage plants. (The 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. Diversity would continue to decrease if no action is taken. If no action is taken, species such as deer and elk that require more open stands for foraging would decline. Section 4.2 has more detail about diversity.

2.2.3 Health and Growth

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

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 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. Section 4.1 has more detail about health and growth.

2.2.4 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. 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, Forest Plan p. Four-26). Section 4.12 has more detail about forest products.

2.2.5 Road Management

One of the purposes of this project is to manage the road system to restore hydrologic function and reduce road maintenance costs.

This action is needed because there is insufficient funding to maintain all of the Forest's road system to keep them safe and properly functioning. If no action is taken, roads that are not properly maintained would pose a risk of failure and may contribute sediment to streams. Based on site-specific assessments, roads may be repaired, closed after storm-proofing or decommissioned. Section 4.13 has more detail about roads, and section 4.3 has more detail about the hydrologic impact of roads.

2.2.6 Management Direction – The action alternatives have 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 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 and sets the stage for project level analysis.
- The Forest Plan was amended by the 2005 Record of Decision for Preventing and Managing Invasive Plants (USDA 2005). Consistency is addressed in section 4.8.
- The Forest Plan was amended by the 2007 Record of Decision To Remove the Survey and Manage Mitigation Measure Standards and Guidelines from Forest Service Land and Resource Management Plans within the Range of the Northern Spotted Owl. (USDA 2007).

2.2.7 Maps – In addition to the vicinity map above, Appendix A contains maps showing the proposed actions, land allocations and other details.

2.2.8 Land Allocations

The project has many overlapping land allocations. Some units have two or three land allocations on the same ground.

Allocation	Approximate Acres
Riparian Reserves, B7 – General Riparian and A9 Key Site Riparian	1080
B2 - Viewsheds	429
B6 – Special Emphasis Watersheds	2,163
B10- Winter Range	610

2.2.9 Watershed Analysis – The project is covered by the West Fork Hood River Watershed Analysis (1996).

This project is consistent with the recommendations of the watershed analysis. The project is located in a key watershed (this is not a land allocation). The watershed analysis recommends thinning plantations (page 7-1). Approximately 22 miles of old system roads have already been decommissioned within the Lake Branch key watershed.

2.2.10 Riparian Reserves

This project has adopted the concepts for riparian reserve delineation described in the watershed analysis. The site-potential tree height for this project is 165 feet. Also included in riparian reserves are certain sensitive areas described in the watershed analysis on pages 6-12 to 14. While streams, rivers, ponds, wetlands and certain

unstable geological features were shown on maps in the watershed analysis, they were conceptual based on data available at the time with limited field verification. For this project, maps were refined based on field inspections. For example, some streams shown on the watershed analysis maps were found to not be there while other unmapped streams were discovered. The project areas have been examined by a geologist to determine the presence or absence of unstable landforms. All of this field-verified information was used to create a more accurate riparian reserve map. This new map is not considered a change to the recommendations put forward in the watershed analysis or the Northwest Forest Plan but simply a more accurate refinement of the intent of those documents.

2.2.11 Roads Analysis – A Forest-wide Roads Analysis was completed in 2003 (USDA 2003. Section 4.12 discusses roads for this project and how they relate to the Forest-wide analysis.

2.2.12 Desired Future Condition

The desired future conditions from the **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 site's 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.
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 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. At the Forest scale, most timber outputs come 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 (Alternative B)

The Forest proposes a restoration thinning project in plantations ranging in age from 30 to 60 years old and the decommissioning, closing and repairing of roads. The proposed action is to thin and harvest wood fiber from approximately 2,163 acres of matrix land and riparian reserves. The thinning component of the proposed action has been designed to achieve the multiple objectives of enhancing riparian values (s. 2.2.1), enhancing diversity (s. 2.2.2), improving health and growth (s. 2.2.3), and providing forest products (s. 2.2.4). Additional elaboration on the needs can be found in the Environmental Consequences Section (s. 4). The road component of the proposed action includes decommissioning, closing and repairing of roads to achieve the objectives of restoring hydrologic function and reducing road maintenance costs (s. 2.2.5).

2.3.1 Variability – Thinning would be conducted to introduce structural diversity through variable spaced thinning. The concepts of variable density thinning are elaborated in recent research by Carey, Chan and Tappeiner (Carey 2003) (Chan 2006) (Tappeiner 1999). Diversity and variability would be introduced in several ways.

- Leave tree spacing would vary within units and between units. Tree density would be measured by basal area, trees per acre or relative density depending on the circumstances for each unit (s. 4.1.2). Where the objective is to delay the time at which the stand reaches the stem exclusion stage, a heavy variable density thinning would be prescribed (wide leave tree spacing). In other areas the objective would be to have stands reach the stem exclusion stage sooner and they would have moderate or light variable density thinning.
- Skips and gaps would be created in a variety of sizes. The sizes and total quantity would vary within and between units. (Skips are areas where no trees would be removed; Gaps are areas where few trees would be retained.)

- Skips may be placed where there are special features such as clumps of minor species, clumps of down logs, key snags, wet areas, or locations of rare or uncommon species.
- Gaps would be 0.1 to 0.25 acre in size and would retain one to six trees. In gaps, minor tree species would be retained if present.
- Areas of heavy thinning (25 to 50 trees per acre retained) would be created in a variety of sizes 0.25 acre or greater. Heavy thinning is proposed to benefit species such as deer and elk as well to enhance diversity.
- Alder is present in many riparian reserves where mature conifers once dominated. In wet areas or where they are a minor species they would be retained but in dry upland areas where alder is shading conifers it would be thinned to promote conifer growth. (Watershed Analysis p. 7-4)
- Leave trees would include minor species.
- Leave trees would include trees with the elements of wood decay.
- 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.

2.3.2 Streamside Riparian Reserves - For this project, riparian reserve widths are 165 feet for non-fish-bearing streams and 330 feet for fish-bearing streams. In some areas, the Watershed Analysis created much wider riparian reserves. In riparian reserves the thinning would be designed to create conditions suitable for maximum diameter growth to enhance the potential for large wood recruitment and to enhance diversity. The intention is to enhance riparian reserves by accelerating the development of mature and late-successional stand conditions. The proposed treatments would be designed to meet Riparian Reserve objectives with a single thinning entry.

This project is designed to be consistent with the NOAA Fisheries Programmatic Letter of Concurrence for Thinning - the design criteria are summarized in Appendix B (USDC 2008b).

Skips & Gaps - The protection buffers along streams may be considered skips. Skips would be created outside of protection buffers that would vary in size and would make up to 5% of each unit. Gaps would be created within riparian reserves but they would be 100 feet or farther from a stream. Gaps would make up 0-10% of the available riparian component. For units adjacent to listed fish habitat, gaps would be 165 feet or farther from listed fish habitat.

2.3.3 Protection Buffers – A protection buffer is the portion of the riparian reserve that would not be thinned. The minimum width of protection buffers would be based on stream type and location and may also be wider based on site conditions. The details of protection buffer widths and what actions may occur there are in Appendix B.

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.

2.3.4 Other Riparian Reserves – Also included in riparian reserves are certain sensitive areas described in the watershed analysis on pages 6-12 to 14. 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 rare and uncommon aquatic mollusks 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.

2.3.6 Matrix - In the matrix, thinning would be designed to increase health and growth that results in larger wind-firm trees and to enhance diversity and forage. Trees would be retained at a relative density of 25 to 35 (s. 4.1.2).

Skips & Gaps - Skips would be created that would vary in size and would comprise up to 10% of each unit. Where riparian reserves cross through matrix, the protection buffers adjacent to streams may be counted as skips. Gaps would be created on up to 5% of each unit and heavy thins would be created on up to 10% of each unit. Local and regional experience has shown that these levels help create variability and diversity while still meeting other project objectives.

2.3.7 Roads

2.3.7.1 System Road Repairs

Road Number	Length (miles)	Cost $	Notes
13	8.6	**374,000**	Road 13 - from junction with Lost Lake Road, M.P. 0.0 to Unit 246 at M.P. 8.6 - (North side of loop)
13	3.4	**1,702,000**	Road 13 – from M.P. 8.6 near Unit 246 – to the junction with road 1340 at M.P. 11.99 (West side of loop, not needed for log haul)
13	4.5	**18,000**	Road 13 – from junction with road 1340 at M.P. 11.99 to the junction with road 1330 at M.P. 16.5 (South side of loop).
1300.630	0.78	**25,300**	
1300.640	0.80	**8,100**	

Road Number	Length (miles)	Cost $	Notes
1300.700	0.4	**14,000**	
1310	1.5	**35,000**	To landings of unit 2, paved. Needed for log haul.
1310	4.5	**245,000**	Just past landings of unit 2 at M.P. 1.58 to Wahtum lake. Not needed for log haul at this time. Includes $185,000 repair at M.P. 1.58
1311	3.4	**43,600**	To berm
1320	0.78	**8,300**	Paved section.
1320	1.2	**38,900**	Rocked section to berm
1330	3.0	**10,000**	West part. Will use existing bridge with light loads.
1330	0.65	**7,200**	East part.
1330.620	0.64	**5,500**	Repair debris flow.
1340.630	1.27	**9,600**	
1340.631	0.36	**2,400**	
1350	3.5	**34,600**	To unit 386.
1350.011	0.40	**2,800**	
1350.013	1.3	**11,300**	To end of unit 406
	33.08	**648,600**	Subtotal needed for log haul
	7.9	**1,947,000**	Subtotal not needed for log haul
	40.98	**2,595,600**	Total

2.3.7.2 System Road Decommissioning

In this document, the term 'decommissioning', is used for Forest Service system roads to describe the process of removing them from the system so that no road maintenance is needed in the future. Decommissioning varies in intensity based on site-specific needs. The final process of decommissioning is the removal of the road from the Forest's data base of system roads. Any future change to the status of decommissioned roads such as reconstruction would require analysis through the NEPA process including public participation and evaluation of environmental effects (s. 2.3.7.8).

2.3.7.3 Potential Decommissioning Treatments

- Removing culverts or bridges
- Reestablishing former drainage patterns or natural contours at stream channels
- Installing water bars
- Removing gravel surfacing
- Decompacting road surfaces
- Pulling back unstable fill slopes or road shoulders
- Scattering slash on the roadbed
- Applying erosion control mulch and seed on disturbed areas
- Planting trees or shrubs
- Blocking the former road entrance to prevent motorized vehicle traffic

2.3.7.4 Entrance Management

Regardless of the intensity of treatment along a road, there is usually the need for some form of entrance management to keep vehicles from driving on the decommissioned road. This would occur at or near where the decommissioned road connects to an open road. Sometimes the most effective place to block a decommissioned road is not at the intersection, but a short distance away where side slopes or other features contribute to effective vehicle blockage.

Entrance management may include some or all of the following treatments both on the road surface and adjacent to the road as needed:

- Installing one or more large earth berms
- Placing stumps, rootwads, logs, or boulders on the roadway
- Deeply decompacting approximately 1/8 mile (or line-of-sight from entrance)
- Planting trees or shrubs on decompacted areas

In the project area, approximately 22 miles of old system roads have already been decommissioned.

2.3.7.5 The proposed action includes the **decommissioning** of the following roads.

Road Number	Length (miles)	Cost $	Notes
1300.620	1.71	**27,000**	Accesses 60 ac ready in 10 to 15 years. Partial fill failure at Laurel Creek. Roads analysis identified this as a high priority culvert. Not needed for current project.
1300.640	0.78	**12,000**	Accesses 30 ac now, 40 ac in 5 years and 20 ac in 10-15 years, (end section 0.37 mi. is already decommissioned)
1310.630	0.96	**15,000**	Accesses 192 ac ready in 15 to 25 years. End section past 633 junction is already decommissioned. Not needed for current project.
1310.633	0.51	**7,500**	Already closed with berm, accesses 105 acres ready in 15 to 25 years. Not needed for current project.
1310.661	1.05	**16,000**	Accesses 166 ac ready in 5 to 10 years. Not needed for current project.
1350.011	0.37	**5,600**	Accesses 34 ac now, 11 ac in 5 years, 80 ac in 10 to 15 years, 16 ac in 25 years.
1350.013	1.72	**27,000**	Accesses 137 ac now, 80 ac in 5 years, 100 ac in 10-25 years.
1350.620	0.27	**4,100**	Accesses 66 ac ready in 10 to 15. Not needed for current project.
	7.37	**114,200**	Total

2.3.7.6 System Road Closure

System roads are sometimes closed with berms or other devices until they are needed again. Roads are closed for a number of reasons such as reducing wildlife harassment and reducing road maintenance costs. Closed roads remain on the Forest's system as maintenance level 1. Closure varies in intensity based on site-specific needs. Roads are typically bermed at the entrance, after storm proofing. Storm proofing would involve installing water bars. If side slopes near the berm are gentle, debris such as rootwads, slash, logs or boulders are placed along the first portion of the road to discourage unauthorized use. Gates and drivable water bars may be used where routine administrative access is needed.

Roads proposed for **closure**

Road Number	Length (miles)	Cost $	Notes:
1300.630	0.94	**1,500**	Over grown.
1300.700	0.4	**900**	North part is closed with a berm and still on the system. Accesses 20 acres. Only need first 0.4 mile.
1310.662	1.4	**12,000**	Gate
1311	3.39	**4,400**	
1320	1.98	**2,700**	First 0.78 is paved. Broken gate near road 1300.
1330 west	2.95	**3,900**	First 0.32 would need to stay open to access quarry. Center section was decommissioned.
1330 east	1.22	**1,800**	Already closed with a berm at mp 0.6
1330.620	2.05	**2,800**	Last ½ mile is already closed.
1340.630	1.41	**2,000**	Has broken gate. Also closes 0.35 mi. of road 1340.631.
1350	3.51	**4,600**	Has drivable waterbars in places.
	19.57	**36,600**	Total

2.3.7.7 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. Approximately **6 miles of existing temporary** roads would be reused and obliterated upon project completion.

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 methods used before. To protect residual trees, soil and water, in some cases new

temporary roads are proposed to access landings where the existing system roads and old temporary roads do not adequately access the ground. Approximately **½ mile of new temporary roads** would be constructed and obliterated upon project completion.

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 are bermed at the entrance, water barred, decompacted and roughened with the jaws of a loader or excavator, and debris such as rootwads, slash, logs or boulders are placed near the entrance and along the first portion of the road.

2.3.7.8 Some system roads were decommissioned and were taken off the Forest's data base of system roads. These old decommissioned roads were assessed considering both cost and resource impacts to determine whether it would be appropriate to reuse them for the current thinning proposal. Even though all of the proposed units were clear cut logged before using the now decommissioned roads, there are cases where it is not feasible or desirable to use the same roads, landings or logging methods used before.

Reconstructing a road on the alignment of an old decommissioned road could be considered "new" construction to create a "new" system road. However the proposed action involves reusing only roads that were lightly decommissioned therefore they can now be treated like old temporary roads: they can be reopened with minimal earth movement without side casting material. They can be obliterated the same way temporary roads are after project completion. The proposed action would not add these roads back to the system but would manage them like existing temporary roads.

Old Road Numbers	Length (miles)	Cost $	Notes: **Cost includes opening and reclosing.**
1300.640	0.25	**11,100**	Berm, moderate surface roughing. No culverts.
1310.620	0.14	**4,500**	Berm, some surface roughing, brush, no culverts.
1311	0.2	**4,800**	Several large waterbars. No surface roughing. No brush. No culverts.
1311.630	0.46	**12,400**	Berm, minor surface roughing, no culverts.
1320	1.3	**63,200**	Berm. Concrete bridge left in place. Moderate surface roughing with moderate resloping. No culverts.
1330.630	0.4	**10,100**	No berm.
1350.012	0.91	**22,000**	Berm. Light surface roughing. No culverts.
Old temps	5.9	**148,000**	Reconnect junction, remove small trees growing in road surface.
	9.56	**276,100**	Total

2.3.8 Logging Systems

Ground Based	787 ac.
Skyline	904 ac.
Helicopter/Down Hill Skyline	472 ac.

2.3.8.1 Adaptive Management

This project will utilize the concept of adaptive management. The treatment strategy that is currently considered appropriate for each unit or road segment was based on initial field visits and analysis. However, the exact treatment details may be adjusted at the time of implementation. For example:

- Monitoring of road decommissioning or closure projects may indicate that additional treatment is necessary to more effectively block vehicles or to more effectively control erosion.
- Logging systems shown on maps may be adjusted based on actual slopes encountered and the analysis of feasibility. For example, at this time it is not known if skyline logging is feasible until profiles are taken and analyzed.
- Helicopter units may be deferred. At this time it is not known if down hill skyline logging is feasible until profiles are taken and analyzed. Where it is not feasible, helicopter logging would be prescribed. At the present time, the economic viability of helicopter logging is cost prohibitive given the value of the timber and the high cost of jet fuel. There is a high probability that helicopter units would receive no bids in today's market. The option of deleting all of the helicopter units was considered. However, the action alternatives retain the helicopter units and they would be offered for bidding when market conditions improve.

Before adjustments are made, an interdisciplinary team would be assembled to review the proposal and make recommendations to the District Ranger. The review would consider whether the adjustment meets the purpose and need, would consider its cost effectiveness and would determine whether the scope of the adjustment and the anticipated effects fall generally within the range of effects and benefits described in the EA. It would consider effects and benefits to threatened, endangered, sensitive or rare species of plants and animals. If necessary, a supplemental heritage resource report would be prepared. Documentation of the change would be signed by the District Ranger and kept in the analysis file.

2.3.9 Best Management Practices (BMPs) and Design Criteria

These are practices that are part of the action alternatives. 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**

1a **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. This restriction may be waived if soils are dry, frozen or snow covered 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.*

1b **Northern Spotted Owl:** Except for hauling and the removal of hazard trees to protect public safety, no activity would 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 use of large helicopters (other than KMAX) and burning would be restricted for units within 440 yards (units 28, 30, 106, 294, 307, 310, 312 and 314). Restrictions on chainsaws or heavy equipment use would not apply to any units. Restrictions on the use of smaller helicopters typically used for this type of thinning would not apply to any units.

1c **Fish**: In-stream projects would only occur within work timing guidelines for in-stream projects set up by Oregon Department of Fish and Wildlife (ODFW) to protect incubating fish eggs and spawning fish. In-stream work would occur between July 15 through August 31. This restriction may be waived if ODFW biologists concur. This restriction applies only to the portion of a project where in-stream work is conducted.

1d **Deer and Elk Winter Range:** No harvest operations, road construction, use of motorized equipment or blasting would be permitted in the B10 winter range land allocation between December 1st and April 1st.

2. **Snags & wildlife trees:** To enhance diversity, variable-density thinning would include the retention of snags and wildlife trees. The snags within plantations are small planted trees that have died. Few if any legacy snags are present.

2a Snags would be retained in all units where safety permits. If snags must be cut for safety reasons they would be left on site.

2b To increase the likelihood that key snags would be retained, they may be included in skips.

2c 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. They may be retained in skips.

2d 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. **One to two trees per acre would be treated.**

3. **Down Woody Debris:**

3a 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.

3b Additional down woody debris would be generated by thinning. This would include the retention of cull logs, tree tops, broken logs and any snags that would be felled for safety reasons.

3c If funding becomes available, some trees would be felled or girdled to provide future habitat. **Two to three trees per acre would be treated.** *This implements Forest Plan standards and guidelines as amended.*

4. **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). This project is designed to be consistent with the NOAA Fisheries Programmatic Letter of Concurrence for Thinning - the design criteria are summarized in Appendix B (USDC 2008b).*

5. **Logging Systems and Roads –** The Programmatic Letter of Concurrence for Thinning from NOAA Fisheries (USDC 2008b) contains design criteria and other requirements for thinning designed to protect listed fish. It is incorporated by reference and would be used in the development of contracts. The design criteria contain detailed practices for logging systems, roads, minimizing erosion, protecting fish and preventing fuel spills. The full Biological Assessment and Letter of Concurrence are in the analysis file and the design criteria are summarized in Appendix B.

Some specific details are not addressed in Appendix B:

5a 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.

5b 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.

5c Where existing detrimental soil conditions exceed Forest Plan standards, existing temporary roads and landings that are reused, would be obliterated and revegetated.

5d Helicopter logging has unique issues of feasibility and safety. Where harvesters cannot be used, a special thinning technique would be used to provide for safety and feasibility. Dominant trees would be designated as leave trees and the other trees within 25 feet would be cut. This would create sufficient opening in the canopy to allow logs to be safely lifted out and would meet the variability goals described in s. 2.3.1 to 2.3.6.

5e Some units have unique hydrology including areas where water may flow overland during snow melt, or where water travels downslope across a series of coalescing debris flow fans. Water is repeatedly forming and using new and previously used channels while other channels appear to have had no flow for many years. At the time of layout, a fish biologist or hydrologist would assist in devising appropriate logging systems and protection measures as needed. The units of concern are: 116, 224, 225, 226, 228 and 242.

6. **Road Decommissioning:** Two programmatic biological opinions for fish and aquatic habitat restoration projects have been issued by NOAA Fisheries and the US Fish and Wildlife Service (USDI 2007, USDC 2008a). These biological opinions contain design criteria and other requirements for various activity types such as road decommissioning and culvert removal. The design criteria are almost identical in each biological opinion but there are some differences. These are incorporated by reference and would be used in the development of contracts. The design criteria contain detailed practices for minimizing erosion, protecting fish and wildlife, preventing the spread of invasive plants, preventing fuel spills and restoring riparian vegetation. The full biological opinions are in the analysis file and the design criteria from the biological opinions are in Appendix B.

   The two programmatic aquatic restoration biological opinions contain specific design criteria for erosion control. Local experience indicates that better results would be achieved by making the following changes:

   6a The design criteria indicate that if local native seed mixes are unavailable that non-native sterile seed would be appropriate. Local experience has shown that local native seed works well but seed availability is limited. When a substitute is needed, annual ryegrass is preferred over sterile seed

because it is more effective at controlling erosion and does not spread or become invasive.

6b The design criteria indicate that seed would be applied within three days of project completion. Local experience has shown that seed put down in the dry season would not germinate properly. Applying seed before the fall rains come has proven to have better success at seed establishment. Adjacent to streams, mulch would be applied within three days and seed would be applied before the fall rains. Elsewhere, mulch would be applied after seeding before the fall rains.

6c The design criteria require weed-free straw. Local experience was used in the development of the following contract language to implement this design criteria: Straw shall be certified by the State of Oregon, or shall originate from fields which grow State of Oregon certified annual ryegrass seed, or shall originate from Willamette Valley Oregon fields which grow only annual ryegrass seed for seed production.

7. **Erosion:** To reduce erosion from project 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.*

7a **Native plant** materials are the first choice in revegetation of bare soils, [e.g., *Elymus glaucus* (blue wildrye), lupine (*Lupinus latifolius*)]. 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.[e.g., *Lolium multiflorum* (annual ryegrass), Madsen sterile wheat.] 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.*

7b **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.*

7c When **straw and mulch** are utilized, it would be certified by the State of Oregon, or would originate from fields which grow State of Oregon certified annual ryegrass seed, or originate from Willamette Valley Oregon fields which grow only annual ryegrass seed for seed production. In place of straw, wood fiber mulch may be used. *This implements Forest Plan standard and guideline FW-148, and standard 3 of the Regional Invasive Plants Record of Decision.*

8. **Invasive species:** *This implements Executive Order 13112 dated February 3, 1999, and standards and guidelines of the Regional Invasive Plants Record of Decision.*

8a The Record of Decision for Site-Specific Invasive Plant Treatments (USDA 2008) authorizes treatment of invasive plants and includes a strategy for early detection and rapid response for treating newly discovered infestations quickly. The Forest would prioritize treatments based on available funding. Areas infested with invasive species along haul routes, adjacent to harvest units, and along roads proposed for closure or decommissioning should be pre-treated prior to ground disturbing activity.

8b All contracts would include a provision such as BT6.35 to minimize the introduction and spread of invasive plants by cleaning off-road equipment.

8c Schedule implementation of work beginning in areas free of infestations and then moving to infested areas. If this is not possible equipment would be cleaned before moving from infested areas to uninfested areas.

8d Gravel, rock or soil brought in from offsite would come from a certified weed-free source; certification may be requested from the county weed and pest control division or from a Forest Service botanist upon inspection of the source. Gravel, rock or soil that is recovered, removed, or excavated from roads, ditches or culverts in the project area should remain onsite if possible or may be moved to an approved storage area offsite if necessary. Consult with the district noxious weed coordinator to identify storage sites.

8e Road blading, brushing and ditch cleaning in areas with high concentrations of invasive plants would be conducted in consultation with invasive plant specialists.

9. Contracts would contain provisions for the protection of **heritage resource** sites found during project activities. In the event that sites are located during implementation, project activities would be halted until consultation with the Forest Archeologist can determine appropriate site-specific mitigation. Protection measures would be developed in consultation with the Oregon State Historic Preservation Officer (SHPO), appropriate Tribes, and, if necessary, the Advisory Council on Historic Preservation.

   Prehistoric site 666NA0255 is located just outside of unit 422: a culturally modified tree. A 25-foot buffer would be placed around the perimeter of the site and directional felling away from the site is recommended to protect the site during harvesting activities.

   Historic site 666IS244 is located near the northeast corner of unit 226: a bench marker. A 25-foot buffer would be placed around the perimeter of the site and directional felling away from the site is recommended to protect the site during harvesting activities.

10. **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.*

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

    Prior to advertisement of a contract, the provisions of the contract and other implementation plans would be reviewed to insure that required elements are properly accounted for.

    During implementation, Contract Administrators monitor compliance with the 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.

2.3.10 Fuels Treatments

The project area is not in an area of high fire hazard or near a wildland urban interface. Branches and tops and other debris created by the thinning would be retained on the ground to decompose naturally to enhance soils and site productivity. In units operated with a harvester machine, branches and tops would be placed in front of the machine and compressed. Stands in this area are very similar to those on the west side of the Forest. Previous experience with similar thinning has shown that snow pack and natural processes of decay cause the debris to break down and compress quickly to the point where fire hazard is not a concern. Some incidental quantities of debris typically end up coming to the landing where it would be piled. If it is not removed for firewood or as biomass it would be burned. Based on previous experience with similar stands, approximately 27 tons per acre of debris would be

retained in the units.

2.4 Public Involvement

A scoping process to request public input for this project was conducted. A letter describing the proposed project and requesting comments was sent out on October 27, 2008. The Forest publishes a schedule of proposed actions (SOPA) quarterly. The project first appeared in October 2008, and in subsequent issues. A 30-day comment period ended on August 3, 2009. Responses to substantive comments are included in Appendix C. A list of persons and organizations that were sent notice is in the analysis file along with a list of commenters and the complete text of comments.

2.4.1 Issues

Key Issue

There is a concern raised by the public about the reopening of previously decommissioned roads and the construction of new temporary roads. Roads are discussed in the following sections: lengths of roads (s. 2.3.7 & s. 3.2.1), sediment from road construction (s. 4.3.2.2), effects to fish stocks of concern (s. 4.3.6.3), and effects to road density (s. 4.5.4.11). Responses to comments are in Appendix C.

2.4.2 **Discussion of Concern about Decadence** (dead trees, down logs and trees with disease)

Some feel there is an excessive emphasis on the health of trees and would like greater attention paid to the value of dead and down trees. Healthy ecosystems should have an abundance of large decaying live trees, large snags and coarse woody debris all of which are lacking in plantations. Decadence is discussed in the following sections: s. 4.1, s. 4.1.6.1, s. 4.2 & s. 4.5.3. The action alternatives, no action and the other alternatives considered, display the range of effects and benefits for this concern. Responses to comments are in Appendix C.

3.0 ALTERNATIVES

This chapter describes and compares the alternatives considered for this project. It includes a description of each alternative considered. 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. The Proposed Action is described in s. 2.3 and is sometimes referred to as Alternative B.

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 Alternative C

This alternative would not construct any new roads or reconstruct any previously decommissioned roads. Alternative C would thin the same acres although many units would be changed to helicopter. Most aspects of the proposed action would apply to this alternative including the introduction of variability, riparian management, design criteria and best management practices.

3.2.1 Roads

3.2.1.1 System Roads

System road repairs, decommissioning and closure would be same as described for Alternative B in s. 2.3.7.1, s. 2.3.7.5, and s. 2.3.7.6.

3.2.1.2 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. Approximately 6 miles of existing temporary roads would be reused and obliterated upon project completion.

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 are bermed at the entrance, water barred, decompacted and roughened with the jaws of a loader or excavator, and debris such as rootwads, slash, logs or boulders are placed near the entrance and along the first portion of the road.

	Length (miles)	Cost $	Notes: **Cost includes opening and re-closing**
Old temps	5.1	**128,000**	Reconnect junction, remove small trees growing in road surface.

3.2.2 Logging Systems

Ground Based	663
Skyline	749
Helicopter/Down Hill Skyline	751

3.3 Unit Table

			Alternative B			Alternative C		
UNIT #	Size Acres	Riparian Acres	Ground Based Acres	Skyline Acres	Helicopter/ Down Hill Skyline Acres	Ground Based Acres	Skyline Acres	Helicopter/ Down Hill Skyline Acres
2	32.7	10.3		32.7			32.7	
4	15.0				15			15
6	5.3				5.3			5.3
8	9.2	3.6		9.2			9.2	
10	4.6	3.7		4.6			4.6	
11	2.7	2.7		2.7			2.7	
12	4.5	4.5		4.5			4.5	
13	5.5	5.5		5.5			5.5	
14	20.7	9.5		20.7			20.7	
16	13.1	5.7		13.1			13.1	
18	11.6	11.6		11.6			11.6	
22	12.7	4.6			12.7			12.7
24	4.2	0.2			4.2			4.2
28	1.8	1.8	1.8			1.8		
30	12.7	10.2	7.9	4.7		7.9	4.7	
32	3.9	0.8	3.9			3.9		
34	6.7	3.6		6.7			6.7	
36	22.4	6.9		22.4			22.4	
38	22.6	8.8		22.6			22.6	
40	25.2	0.6	19.8	5.4		19.8	5.4	
48	10.6			10.6			10.6	
50	11.1		11.1					11.1
56	18.0	0.1		18				18
60	42.0	14.8		28.2	13.7		28.2	13.7
62	7.7	0.1	7.7			7.7		
72	11.8	2.1	11.8			11.8		
78	9.1	5.0			9.1			9.1
80	41.1	31.2		41.1			41.1	
82	30.8	14.1	1.9		28.8	1.9		28.8
84	15.9	9.4		15.9			15.9	
86	2.8				2.8			2.8
92	8.7		8.7			8.7		
94	26.6			26.6			26.6	
102	22.2	8.0		22.2				22.2
104	17.5	6.4			17.5			17.5
105	11.8	5.1			11.8			11.8
106	10.6	10.4		10.6			10.6	

			Alternative B			Alternative C		
UNIT #	Size Acres	Riparian Acres	Ground Based Acres	Skyline Acres	Helicopter/ Down Hill Skyline Acres	Ground Based Acres	Skyline Acres	Helicopter/ Down Hill Skyline Acres
108	29.7	19.7	22.3	7.4		22.3	7.4	
112	19.1	1.9	19.1			19.1		
114	13.7	3.7		13.7			13.7	
116	16.4	15.8	16.4			16.4		
118	5.7	5.7	5.7			5.7		
122	3.3	2.1	3.3			3.3		
124	22.5	4.2	3.6	18.9		3.6	18.9	
126	5.0	4.7	1.7	3.2		1.7	3.2	
128	2.7		1.7	0.9		1.7	0.9	
130	16.5	1.3	14.3	2.2		14.3	2.2	
132	10.6	8.3		10.6				10.6
138	6.3				6.3			6.3
142	14.9	3.9		14.9			14.9	
146	32.2	24.6		32.2			32.2	
148	18.8	18.8		18.8				18.8
154	18.8	6.1		18.8				18.8
156	5.8	1.3		5.8				5.8
162	7.9	2.7			7.9			7.9
164	6.7	5.6			6.7			6.7
166	3.2	1.3		3.2				3.2
168	4.5	4.5			4.5			4.5
180	5.7	3.1			5.7			5.7
182	8.7	8.7			8.7			8.7
184	23.0	23.0			23			23
186	22.0	22.0			22			22
188	11.1	11.1			11.1			11.1
190	3.1	3.1			3.1			3.1
194	20.2	20.2	20.2				20.2	
196	40.7	40.7	12.9		27.8	12.9		27.8
198	13.1	13.1	9.6		3.6	9.6		3.6
200	4.0	4.0	4			4		
204	21.2	21.2	8.4		12.8	8.4		12.8
206	19.8	19.8	13.8		6	13.8		6
210	20.2	20.2	16.7		3.5	16.7		3.5
212	18.7	18.7	15.2		3.4	15.2		3.4
214	9.7	9.7	5.9	3.7		5.9	3.7	
216	8.9	8.9			8.9			8.9
218	12.9	12.9	11.3		1.6	11.3		1.6
220	14.8	14.8	6.3	4.1	4.4	6.3	4.1	4.4
222	6.3	6.3	3.6		2.7	3.6		2.7
224	12.4	12.4	10.8		1.6	10.8		1.6
225	5.7	5.7	5.7			5.7		
226	4.4	4.4	4.4			4.4		
228	22.9	22.9	12.3		10.6	12.3		10.6

			Alternative B			Alternative C		
UNIT #	Size Acres	Riparian Acres	Ground Based Acres	Skyline Acres	Helicopter/ Down Hill Skyline Acres	Ground Based Acres	Skyline Acres	Helicopter/ Down Hill Skyline Acres
230	14.6	14.6			14.6			14.6
232	9.2	9.2			9.2			9.2
234	14.8	14.8			14.8			14.8
242	17.9	17.9	17.9			17.9		
245	12.8	11.8	12.8			12.8		
246	23.9	17.1	23.9			23.9		
248	26.2	13.5			26.2			26.2
274	20.8	20.1	20.8			20.8		
276	15.5	4.4			15.5			15.5
286	15.3	15.3	15.3			15.3		
288	25.1	25.1	25.1			25.1		
290	13.4	3.6			13.4			13.4
294	24.1	22.2	24.1			24.1		
298	23.2	13.2	18.5		4.6	18.5		4.6
300	31.9	25.6	31.9			31.9		
302	6.1	5.1	6.1			6.1		
304	13.0	3.5			13			13
305	6.1	6.0		6.1			6.1	
306	29.3	17.7		14.6	14.7		14.6	14.7
307	12.0	12.0		12			12	
310	6.5	1.3			6.5			6.5
312	5.7	2.2			5.7			5.7
314	16.4	16.4			16.4			16.4
326	35.0	14.6	35			35		
328	33.2	16.5	33.2					33.2
334	35.0	4.8	4.0	31		4.0	31	
340	15.7	0.9		15.7			15.7	
342	6.8	1.0			6.8			6.8
346	23.9			23.9			23.9	
348	20.3		20.3			20.3		
350	20.5	1.6		20.5			20.5	
352	20.2		20.2			20.2		
358	14.1			14.1			14.1	
360	23.5	9.6		23.5				23.5
361	7.8	2.5		7.8				7.8
362	22.4	8.0	22.4					22.4
364	7.5			7.5				7.5
386	27.5	4.0		27.5			27.5	
398	9.4			9.4			9.4	
400	28.2			28.2			28.2	
402	29.9		14	15.9				29.9
404	25.7	7.6		25.7			25.7	
405	20.2	0.1		20.2			20.2	
406	54.3	0.9	5.6	48.7		5.6	48.7	

			Alternative B			Alternative C		
UNIT #	Size Acres	Riparian Acres	Ground Based Acres	Skyline Acres	Helicopter/ Down Hill Skyline Acres	Ground Based Acres	Skyline Acres	Helicopter/ Down Hill Skyline Acres
407	7.6	6.8		7.6			7.6	
408	36.1	8.8		36.1				36.1
410	2.2	1.1			2.2			2.2
412	29.7	26.5	22.7	6.9		22.7	6.9	
420	19.0	4.3	19			19		
422	7.5	1.9	7.5					7.5
424	4.0	0.8	4					4
435	18.6		2.8	15.8		2.8	15.8	
436	10.1	0.7	10.1			10.1		
440	34.1		34.1			34.1		
	2,163	1,080	775	917	471	663	749	751

3.4 Other Alternatives Considered

3.4.1 An alternative was considered that would delete all of the helicopter units. At the present time, the economic viability of helicopter logging is cost prohibitive given the value of the timber and the high cost of jet fuel. There is a high probability that helicopter units would receive no bids in today's market, however, timber markets and fuel prices are not static. The helicopter units were retained in the action alternatives so that the agency could take advantage of market swings quickly.

3.4.2 Public comment suggested that units be deleted if they were adjacent to suitable spotted owl habitat. This option would delete 333 acres of restoration thinning. The project as designed would not likely adversely affect northern spotted owls. This modification would only marginally benefit owls.

3.4.3 Public comment suggested that instead of building temporary roads, the areas should be treated non-commercially by thinning lightly, creating lots of snags, and leaving the material on site. Approximately 42 acres are accessed by new temporary roads with Alternative B. There is limited funding for this type of work and it would not achieve one of the purposes of this project which is to provide forest products consistent with the Northwest Forest Plan goal of maintaining the stability of local and regional economies. This option was considered but the snags and down wood created would be relatively small and thinning lightly would not achieve the desired release. The development of the proposed action considered the balance between providing some snags, down wood and accomplishing variable density thinning.

3.5 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.

Comparison of Alternatives	Alternative B	Alternative C
Helicopter / Down Hill Skyline Logging (acres)	471	751
Conventional Logging Systems (acres)	1,692	1,412
New Temporary Road Construction (miles)	0.5	0
Old Temporary Roads Reopened (miles)	5.9	5.1
Old Decommissioned Roads Reopened (miles)	3.7	0
Cost of Road Repairs Needed for Log Haul	$648,600	$648,600
Cost of Road Repairs Not Needed for Log Haul	$1,947,000	$1,947,000
Roads Decommissioned (miles)	7.37	7.37
Roads Closed (miles)	19.57	19.57

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.

Cumulative Effects

4.0.1 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.

4.0.2 The land area and the time scale used for cumulative effects analysis varies by resource.

4.0.3 The analysis considers the impact of activities on other ownerships where appropriate. Future logging on private ownership is likely but details of location and timing are not known. Where appropriate, estimates are included in the analysis.

4.0.4 In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis relies on current environmental

conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects.

The cumulative effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several reasons for not taking this approach:

- A catalog and analysis of all past actions would be impractical to compile and unduly costly to obtain. Current conditions have been impacted by innumerable actions over the last century (and beyond), as well as by natural processes of growth and recovery since. Trying to isolate the individual actions that continue to have residual impacts would be nearly impossible.
- Providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the proposed action or alternatives. In fact, focusing on individual actions would be less accurate than looking at existing conditions, because there is limited information on the environmental impacts of individual past actions, and one can not reasonably identify each and every action over the last century that has contributed to current conditions.
- Focusing on the impacts of past human actions risks ignoring the important residual effects of past natural events, which may contribute to cumulative effects just as much as human actions. By looking at current conditions, we are sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed to those effects.
- The Council on Environmental Quality issued an interpretive memorandum on June 24, 2005 regarding analysis of past actions, which states, "agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions.
- The cumulative effects analysis in this document is also consistent with Forest Service National Environmental Policy Act (NEPA) Regulations (36 CFR 220.4(f)) (July 24, 2008), which state, in part:

> "CEQ regulations do not require the consideration of the individual effects of all past actions to determine the present effects of past actions. Once the agency has identified those present effects of past actions that warrant consideration, the agency assesses the extent that the effects of the proposal for agency action or its alternatives will add to, modify, or mitigate those effects. The final analysis documents an agency assessment of the cumulative effects of the actions considered (including past, present, and reasonable foreseeable future actions) on the affected environment. With respect to past actions, during the scoping process and subsequent preparation of the analysis, the agency must determine what information regarding past actions is useful and relevant to the required analysis of cumulative effects. Cataloging past actions and specific information about the direct and indirect effects of their design and implementation could in some contexts be useful to predict the cumulative effects of the proposal. The CEQ regulations, however, do not

require agencies to catalogue or exhaustively list and analyze all individual past actions. Simply because information about past actions may be available or obtained with reasonable effort does not mean that it is relevant and necessary to inform decision making. (40 CFR 1508.7)"

Each resource includes a discussion of how information on past projects was considered. For the reasons discussed above, the analysis of past actions is primarily based on current environmental conditions. Some resources utilize the current GIS vegetation layer which includes information on current condition of forest stands as they have been affected by events such as forest fires, past regeneration harvest and road construction as well as the growth that has occurred since.

4.1 STAND GROWTH AND PRODUCTIVITY

(This section elaborates on Purpose and Need - section 2.2.3)

4.1.1 Introduction – The action alternatives involve the thinning of plantations. The plantations range from 30 to 60 years of age. Stand exam data was gathered for these plantations. The plantations have been experiencing rapid growth in recent years but are becoming overcrowded. The Forest Vegetation Simulator (Crookston 1999) was used to model stand growth under the various scenarios presented in the following sections.

One area has recently been partially thinned to obtain logs for fish structures. Approximately 20 acres has been thinned in portions of units 242, 245 and 246. This area is included for additional thinning to obtain the desired stocking level as described in section 2.3.

For this proposal, the following actions have the potential to affect stand growth, productivity and health, both positively and negatively. Thinning would generally have a positive effect. Potential negative effects 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 action alternatives would not have a meaningful or measurable effect on stand growth, productivity or health. 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, productivity or health. 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. Thinning can also result in logging wounds on the residual trees. Such wounds

provide infection sites for bark beetles, wood-rotting fungi, and other existing organisms.

4.1.2 Matrix

One of the aspects of the purpose and need is to increase health and growth that results in larger wind-firm trees in the matrix. 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 (Smith 1986).

Tree density would be measured by basal area, trees per acre or relative density depending on the circumstances for each unit. Relative Density (RD) is a scale that ranges from 0 (no trees) to 100 (maximum biological potential) (Ellen 1983) (Curtis 1982). 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.

4.1.2.1 Existing Condition

The average stand diameter is approximately 12.2 inches, with RDs greater than 85, 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.

Direct and Indirect Effects

4.1.2.2 Alternative A - No Action - Trees that have been uniformly spaced during planting 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 continue to grow in height, but diameter growth would drastically slow. These trees would become more dependent on neighboring trees for support. When trees develop in this manner they are more likely to blow down in large groups or if drought conditions persist, be more susceptible to insects and disease.

With no action, the average stand diameters in 30 years would range from 15-17 inches; with stocking at levels where growth suppression and mortality continues to occur (RD would exceed 95). 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, small size, increased mortality, and increased susceptibility to stressors such as insects, diseases and weather.

4.1.2.3 Action Alternatives – 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).

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, productivity and health. Average stand diameters in 30 years would range from 20-23 inches. 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 without suppression from the overstory conifers.

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, productivity and health 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 can also lead to a higher standing live volume in thinned than unthinned stands at a later equivalent age (Maquire 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.

4.1.3 Riparian Reserves

One of the aspects of the purpose and need is to accelerate the development of mature and late-successional stand conditions in riparian reserves. 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.

4.1.3.1 Existing Condition

The riparian reserve plantations are overstocked and have relatively uniform tree size and distribution, have low to moderate amounts of small diameter coarse woody debris, lack understory development and have low levels of snags. These plantations are not late-successional and do not meet the needs of riparian dependent species. 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.

Direct and Indirect Effects

4.1.3.2 No Action

With no intervention, these stands would remain at maximum density for many decades until natural processes (mortality, disturbance) opens the canopy enough to allow expansion of crowns and understory response from increased light. Development of desired late-successional characteristics would proceed very slowly under these conditions. At this rate, stands would acquire some late-successional characteristics in approximately 70-100 years.

4.1.3.3 Action Alternatives

Silvicultural prescriptions would incorporate variable-density thinning, retention of minor species, and the creation of skips and gaps to move the stands toward the eventual acquisition of late-successional characteristics. Many of these same practices are also proposed in the matrix, but the riparian reserve portion would have protection buffers and an emphasis on stream shading.

Eventually trees would be larger, future snags and down wood would be larger, and there would be greater diversity compared to no treatment. Plantations would acquire late-successional characteristics in 30-40 years.

This would maintain and restore 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 large-diameter coarse woody debris sufficient to sustain physical complexity and stability.

4.1.4 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 stems 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.

4.1.4.1 Existing Condition

The current plantations appear relatively stable and windfirm. There are some root rot pockets where some trees have fallen. Overall the plantations 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.

4.1.4.2 Direct and Indirect Effects

With no action stands would remain crowded and would eventually decrease in vigor. Overcrowded stands cannot defend themselves against insects very well because their sap production is limited. 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. Stands eventually reach density levels in which individual trees are competing with each other for growing space. As tree competition increases, stems would continue to grow in height, but diameter growth would drastically slow. These trees would become more dependent on neighboring trees for support. When trees develop in this manner they are more likely to blow down in large groups or if drought conditions persist, be more susceptible to insects and disease.

Thinning results in greater root and stem strength and 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. In areas with shallow soils or root disease, 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.

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.

4.1.5 Cumulative Effects – Health and Growth

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.

4.1.6 Public Comments

4.1.6.1 A concern was expressed that thinning would create stands that are too healthy instead of focusing on healthy ecosystems which have an abundance of decaying live trees, disease, insects, snags and down logs. The goal of the proposed thinning is not to eliminate elements that would kill trees or cause decay. The project has been designed to provide some small snags and small down woody debris while thinning to enhance diversity and grow larger trees. While plantations have limited ability to quickly gain large snags and large down logs, these elements are present in abundance at the landscape scale. They occur in mature and old-growth forests and in areas burned by forest fires and not salvaged. These elements are also discussed in detail in the Diversity, Wildlife and Soils sections.

4.1.7 Forest Plan standards and guidelines

Forest Plan References
Forestwide Timber Management Standards and Guidelines - FW-306 to FW-385, page Four-86
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.

4.2 LANDSCAPE and STAND DIVERSITY

(This section elaborates on Purpose and Need section 2.2.2)

4.2.1 Introduction - Landscape goals include: providing a mix of habitats to support diverse populations of desired plant and animal species and providing healthy forest stands that are part of a landscape where wildfire risk is minimized (s. 2.2.12). 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 feature variable density with skips and gaps. Leave trees would include minor species, trees with the elements of wood decay and non-hazardous snags while some snags and down logs would be created. Some hazardous snags may be lost.

4.2.2 Existing Condition

Plantations lack certain elements of diversity. They often 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. When the original clear cut harvesting occurred, all large trees and all snags were removed. There is a need for greater variability of vertical and horizontal stand structure as well as a need for more sunlight on the forest floor to create greater diversity of ground vegetation.

All of the stands are relatively dense, and generally limit sunlight penetration to the forest floor. Snags that are present in the stands are the result of planted trees that have died from tree competition or disease over time. 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.

Direct and Indirect Effects

4.2.3 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 stands 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.

4.2.4 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. The sizes and total quantity would vary within and between units. (Skips are areas where no trees would be removed; Gaps are areas where few trees would be retained.)
- Areas of heavy thinning 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.
- 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 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.

4.2.5 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.

4.2.6 Forest Plan standards and guidelines - Landscape and Stand Diversity

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	Not applicable

153	
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

4.3 FISHERIES AND WATER QUALITY

(This section elaborates on Purpose and Need - sections 2.2.1 and 2.2.5, and the key issue – 2.4.1)

4.3.1 Introduction

The Lake Branch Thinning Project is located within the West Fork Hood River 5th field watershed. The West Fork Hood River is a major tributary to the mainstem Hood River originating on the north side of Mt, Hood along the Cascade Crest. The West Fork watershed is approximately 65,500 acres in size. About 42,728 acres (65%) of the watershed is on National Forest lands. Hood River County and Longview Timberlands are the principle landowners of the remaining 35% of the watershed. The West Fork of Hood River contains 22.4 miles of anadromous streams, 40.4 miles of resident fish bearing streams, and approximately 198 miles of non fish-bearing streams.

The project would thin approximately 2,163 acres of plantations ranging in age from 30 to 60 years old that occur in various land allocations including matrix, viewshed, special emphasis watershed, winter range, and the dry upland portion of riparian reserves. Thinning riparian reserves is proposed within approximately 1,080 acres with the action alternatives. Of these acres, thinning would occur on approximately 122 acres of riparian reserve directly adjacent to Listed Fish Habitat (LFH).

The proposed project area is located in the Lake Branch Creek 6th field subwatershed and the Laurel Creek drainage, a tributary to Lake Branch. The Lake Branch subwatershed is approximately 18,519 acres in size. The lower one-third of Lake Branch (RM 0.0-3.4) flows through private land. The remainder of the stream (RM 3.4-11.0) lies entirely within National Forest land. The Laurel Creek drainage is approximately 1,800 acres and flows into Lake Branch at approximately RM 2.0.

The West Fork Hood River and Lake Branch were designated as a Tier 1 key watershed in the Northwest Forest Plan. Tier 1 watersheds have been identified as having crucial refugia for at-risk fish species.

West Fork Hood River and Lake Branch currently provide habitat for steelhead, spring chinook salmon, and resident rainbow (*Oncorhynchus mykiss*) and cutthroat trout (*Oncorhynchus clarki*). Other fish occupying these watersheds include brown trout, brook trout, and sculpin. 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*) and Lower Columbia River (LCR) chinook salmon (*Oncorhynchus tshawytscha*). These species and their designated critical habitat are listed as Threatened and are protected under the Endangered Species Act (ESA).

Listed fish habitat (LFH) is defined as any stream reach potentially occupied by ESA protected fish species, any stream reach designated as Critical Habitat (CH), or any stream reach designated as Essential Fish Habitat (EFH). LHF occurs adjacent to the proposed project area in Lake Branch, No Name Creek, and Indian Creek. LFH also occurs downstream of the project area in the mainstem West Fork Hood River.

Silvicultural prescriptions are designed to hasten the development of mature and late-successional stand conditions. These prescriptions would incorporate variable-density thinning to encourage accelerated growth, species and structural diversity, and increased distribution of future large-diameter snags and down wood throughout the treatment areas. Diversity and variability would be introduced into the stands by incorporating skips and gaps, areas of heavy thinning, retaining minor species, and leaving trees with elements of wood decay.

4.3.2 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, peak flows, and future in-channel large wood recruitment.

4.3.2.1 Alternative A (No Action)

With no action, there would be no changes to water quality, fisheries resources, or peak flows. Since there would be no ground disturbance or loss of forest canopy from 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/sedimentation, or peak flows. Since no timber harvest would occur within riparian reserves, there would be no short-term 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.

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. Additional information regarding forest stand conditions can be found in the Stand and Growth Productivity section 4.1.

With Alternative A, no system roads would be closed or decommissioned. Roads may not be adequately maintained because of insufficient funding. Roads that are not properly maintained would pose a risk of failure and may contribute sediment to streams.

Action Alternatives

4.3.2.2 Sediment from Road Construction, Road Decommissioning, and Road Maintenance Activities – Road construction and road maintenance activities have the potential to indirectly introduce fine sediment into stream channels. 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. The action alternatives would re-open old existing temporary roads and to temporarily re-open system roads that have been closed with berms or other devices. Alternative B would construct approximately ½ mile of new temporary roads. It would also re-construct approximately 3.7 miles of previously decommissioned roads that were passively or lightly decommissioned that can be reopened with minimal earth movement without side casting material. These roads would be obliterated after project completion.

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, removing debris from landslides, brushing out encroaching vegetation, removing berms, and ditch and culvert inlet 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 and other forms of reconstruction would occur along some segments of the haul route and roads that are not needed for log haul.

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.

The reopened temporary roads re-trace the alignment of older overgrown or decommissioned roads that are sufficiently stable. Re-opening these roads and the construction of new temporary roads would pose a minimal risk of introducing sediment to streams because no culverts would need to be installed and design criteria for roads would be followed. The existing old temporary roads and new 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 live water source, and the fact that these roads do not cross any perennial streams, vegetative buffers would act as an effective barrier to any sediment being transported into stream channels by surface erosion or runoff.

All new temporary roads and re-opened temporary roads would be obliterated and revegetated directly following completion of harvest operations to help reduce compaction, increase infiltration rates, minimize surface erosion, and re-establish natural drainage patterns.

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, reconstruction, maintenance, or road obliteration, is extremely low.

Decompacting the road surface during decommissioning or obliteration activities 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 (mulch, woody debris, etc.) is provided. Since there is culvert removal associated with the proposed decommissioning activities there is the

potential to deliver sediment into stream channels during project implementation. Road obliterations near streams would have short-term, construction-related effects. These projects may cause a short-term degradation of water quality due to sediment input and turbidity. Stream bank condition and habitat substrate may also be adversely affected in the short term. This would be a short-term effect since turbid conditions would dissipate soon after the completion of in-stream work, generally in a few hours. However, with careful project design and mitigation measures such as erosion control, these effects are expected to be of a limited extent and duration.

Road decommissioning projects can involve work in and around active stream channels. One of the most important aquatic components of watershed restoration is reducing habitat fragmentation by eliminating passage barriers to aquatic species. Whenever culvert removal is associated with road decommissioning, the potential exists to deliver sediment to streams and create turbidity. Some of these road decommissioning projects would involve work in or adjacent to active fish-bearing stream channels.

Direct effects to fish and aquatic species resulting from project activities include reduced feeding efficiency during times of increased turbidity and the possibility of individual mortality during construction. Fish rely on sight to feed so feeding success could be hampered during those times turbidity is increased. This would be a short-term effect since turbid conditions would dissipate soon after the in-stream work phase was completed, generally in a few hours.

Project design criteria and associated BMPs for road obliteration and decommissioning would reduce the risk of sediment entering any stream course. The impacts to water quality or fisheries resources caused by sedimentation due to road construction, reconstruction, maintenance, or road decommissioning, if any, would be short-term and undetectable at the watershed scale.

4.3.2.3 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 where LFH occurs. A minimum 50 ft. wide no-cut protection buffer would be established along all other perennial and intermittent streams that are within one mile of LFH. Intermittent streams farther

than one mile from LFH habitat would have 30-foot wide buffers. 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 extend to 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 also 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 reduce ground disturbance, thus lowering the probability of soil displacement within the project area. Seasonal restrictions on ground-based harvesting 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.

4.3.2.4 Sediment from log haul – 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 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 rainfall, 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. Road maintenance and repair would have a beneficial effect on slope stability and would reduce the risk of water quality and resource damage from the use of these roads. 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 stream 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).

There is one crossing along an aggregate surfaced road along the haul route that crosses over LFH at Lake Branch Creek. This crossing is a wooden bridge on road 1330. In order to reduce the risk of road related sediment from entering LFH, haul would not be allowed over this crossing when conditions exist (e.g. during intense or prolonged rainfall) that may cause generation of road related runoff to streams.

4.3.2.5 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 stream 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 (165 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.

Streams within the project area where LFH occurs have increased no-cut stream protection buffers of 100 ft. that would maintain the existing shade components along these larger streams. Since many of the streams that flow within proposed units are relatively small, and provide very little 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. 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 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. 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.

4.3.2.6 Alternative C

With Alternative C, there would be similar short-term effects to water quality and fisheries resources as under Alternative B for harvest activities, log haul, and road decommissioning. There would be less ground disturbance and a reduced potential for sediment or water temperature impacts for road construction and decommissioning because this alternative would not construct any new temporary roads or reconstruct any previously decommissioned roads. There would also be a reduced potential for sediment related impacts from harvest activities since more units would be harvested by helicopter so there would be less ground disturbance.

4.3.3 Cumulative Effects

Cumulative effects on fishery and aquatic resources, or water quality resulting from project implementation, generally focus around an increase in peak stream flows, fine sediment input into streams, or the loss of stream shading. In areas where there are

many harvest related openings in the transient snow zone, peak flow increases result from rapid snow melt during rain-on-snow events. Peak flow increases can also result from the more efficient routing of water to streams by road drainage ditches. Sediment can result from surface erosion during a rainfall event from areas where soil has been disturbed during treatment activities prior to vegetation being re-established. Stream temperature increases can result from the loss of stream shading following land treatment activities.

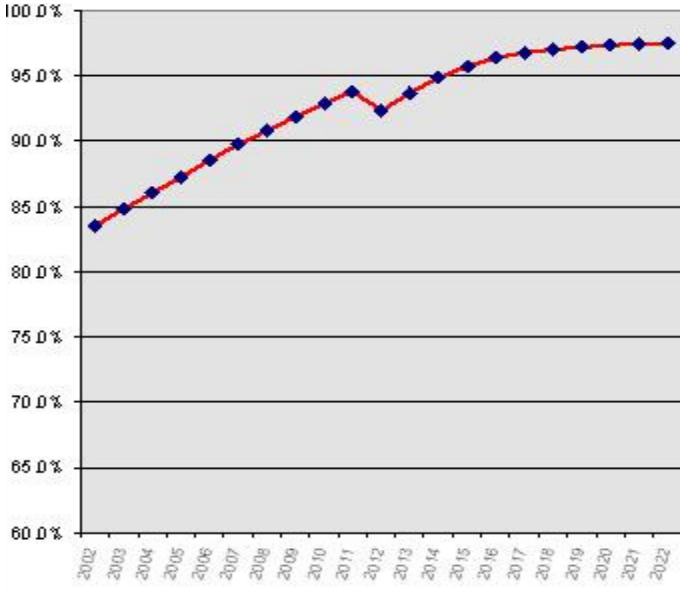
4.3.3.1 The Aggregate Recovery Percentage (ARP) index is often used to estimate the potential for adverse cumulative effects related to past, present and foreseeable future harvest activities. The ARP model ranks recovery from 0 to 100 with 100 being fully recovered. The Forest Plan often refers to watershed impact area or threshold of concern which are the inverse of ARP with 0 being fully recovered.

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). In the ARP model, 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. A regeneration harvest would result in a stand that would be modeled at zero% recovery. As time goes by the regenerated plantation would grow and recovery would gradually occur. Depending on site conditions, full recovery may take approximately 35 years. Thinning results in much less impact to hydrology.

To conduct an analysis of hydrology, all of the stands in the analysis area need to be considered, not just the ones proposed for thinning. A computer model in the analysis file contains the spatial data and ages of the stands. The analysis is conducted in two phases:

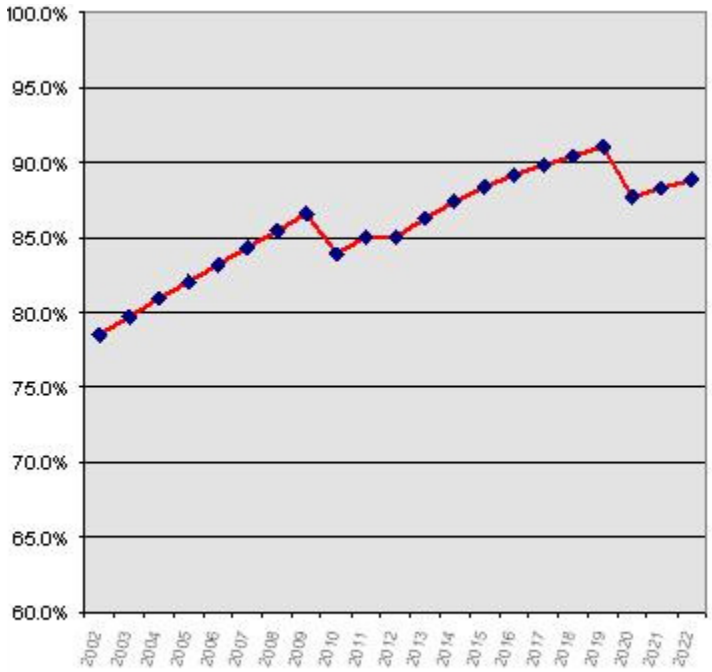
- Using only Forest Service land available for timber management to determine consistency with Forest Plan standards and guidelines FW-61 to 65, and
- Using all lands including private ownership within the watershed to display cumulative effects.

4.3.3.2 The computer model generates a graph for each drainage. This graph is for the Forest Service portion of Laurel Creek. (The Lake Branch graph is very similar.) It represents the hydrologic condition for a 20-year period and shows the cumulative condition of dozens of stands as they grow and as harvest occurs. The recovery percentage at any given time is a weighted



average of all of the stands including mature forest and plantations. There hasn't been any regeneration harvest in the Forest Service portion for many years and the plantations are growing rapidly. The dip in the graph represents the proposed thinning. For this analysis it is presumed that the thinning would happen all at once in 2012 but in reality it is much more likely that the thinning would take several years to complete. The Forest Service components of both the Lake Branch and Laurel Creek drainages are over 90% recovered and steadily moving higher as young plantations grow. The threshold for this watershed is 82%. The action alternatives would result in less than 2% change in ARP.

4.3.3.3 This graph is for the entire Lake Branch watershed including private lands. It represents the hydrologic condition for a 20-year period and shows the cumulative condition of hundreds of stands as they grow and as harvest occurs. For the watershed as a whole, the regeneration harvest on private lands has the greatest effect to hydrology. The graph includes the assumption that approximately 700 acres would be regenerated on private lands each decade, shown by the dip in 2010 and 2020. The Lake Branch thinning is the barely noticeable dip in 2012.



Since the project would result in very small changes to ARP values, it is very unlikely that the proposed thinning activities would cause stream channel instability, or increases in peak flows during rain-on-snow events. After thinning, trees would grow rapidly and canopy cover would increase contributing to hydrological recovery. Effects to hydrology in terms of peak flow changes would be immeasurable and undetectable within the action area and would not be of sufficient magnitude to affect the overall conditions within the watersheds where project activity would take place. Cumulative effects pertaining to peak flow increases are not expected because changes to the Aggregate Recovery Percentage (ARP) are very small in the watersheds were the project would be implemented.

4.3.3.4 Other Cumulative Effects

Cumulative effects from sediment are not expected to occur because ground-based skidding activities would only be conducted when soil conditions are favorable. In the event of any soil disturbance, erosion control measures and stream protection buffers would minimize the amount of sediment entering streams. Cumulative effects

on water temperature are not expected because stream protection buffers along all perennial and intermittent streams would protect primary stream shading. Since no new permanent or temporary roads are being constructed that have a hydrological connection to any water source, there is little potential for peak flow increases due to the more rapid routing of water by road drainage ditches.

Past activities that have occurred within the West Fork fifth-field watershed include timber harvest, pre-commercial thinning, and various restoration projects that have focused on improving fish passage, stream function, decreasing road densities, and restoring off-channel habitat and floodplain connectivity. Over the past several years' project activities decommissioned approximately 22 miles of roads in the Lake Branch watershed, replaced culverts that were passage barriers to Threatened and Endangered fish species, restored important side channel habitat, and repaired roads that were damaged by floods.

Recent restoration EAs have planned projects have not yet been implemented. These projects include aquatic habitat and floodplain restoration projects in Elk Creek, McGee Creek, Lake Branch, and the West Fork Hood River. The projects would be implemented over multiple years in a number of different subwatersheds. The Fisheries Programmatic Biological Opinions for Aquatic Restoration contain guidance for spreading out the impacts of restoration projects so that only a few of them occur cumulatively in any given year. The recovery from short-term effects from one project may be complete by the time another project in the same watershed is implemented. Cumulative effects from the thinning and road work of the action alternatives when combined with other proposed restoration projects are expected to be of a short-term duration and undetectable at the watershed scale.

Beneficial effects from implementation of these restorative projects include long-term improvements to water quality, fish habitat and riparian areas, restored fish passage, a decrease in drainage network, re-established floodplain connectivity, restoration of hydrologic function, and a reduction in sediment delivery to streams.

4.3.4 Forest Plan goals, standards and guidelines

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

4.3.4.1 Forest Management Goals

Protect, maintain or enhance the characteristics of floodplain, wetland and riparian plant communities. Maintain or increase aquatic and terrestrial habitat complexity and

diversity within the riparian zone. Assure long-term provision for riparian associated wildlife and plant species within the full spectrum of riparian zones across the Forest. (#6 Four-2)

Protect, maintain or enhance the character and quality of water. Provide long term sustained production of water. Provide a favorable condition of water flow from the Forest for both on-Forest and off-Forest water users. (#7 Four-2)

Maintain or increase fish habitat capability and assure long term sustained production of fish. (#8 Four-3)

In the long term, thinning would enhance riparian characteristics, water quality and fish. The current conditions for riparian areas, water quality, and fish habitat capability would be maintained at the watershed scale.

4.3.4.2 Aquatic Conservation Strategy

The Aquatic Conservation Strategy of the Northwest Forest Plan was developed to restore and maintain the ecological health of watersheds and aquatic ecosystems. The four components of the Aquatic Conservation Strategy are Riparian Reserves, Key Watersheds, Watershed Analysis, and Watershed Restoration.

Riparian Reserves are addressed in s. 2.2.10, s. 4.1.3 and s. 4.3.

The entire project is within a Key Watershed as described in s. 2.2.9, s. 4.3.4.4.

The Watershed Analysis has been completed as described in s. 2.2.9.

Watershed Restorations have occurred in this area already including road decommissioning (s. 4.13) and riparian thinning.

These components and land management actions incorporate the objectives of the Aquatic Conservation Strategy which are elaborated on page B-11 of the Northwest Forest Plan. The objectives are to maintain and restore nine key elements of watershed and aquatic ecosystems. There are several indicators that make up the elements of the Aquatic Conservation Strategy objectives; they are evaluated to determine if the project would restore, maintain, or degrade aquatic resources.

The following table displays the Aquatic Conservation Strategy objectives and the indicators that comprise each objective. All of the indicators that are checked for a particular objective should be evaluated together to determine whether the action maintains or enhances the specific Aquatic Conservation Strategy objective.

	Aquatic Conservation Strategy Objectives								
Indicators	**#1**	**#2**	**#3**	**#4**	**#5**	**#6**	**#7**	**#8**	**#9**
Temperature		X		X				X	X
Sediment				X	X	X		X	X
Chemical Contamination				X				X	X
Physical Barriers	X	X						X	X
Substrate			X		X	X			X
Large Woody Debris			X					X	X
Pool Frequency			X						X
Pool Quality			X						X
Off-Channel Habitat	X	X	X						X
Refugia	X	X						X	X
Width/Depth Ratio			X					X	X
Streambank Condition			X			X		X	X
Floodplain Connectivity	X	X	X				X	X	X
Peak/base Flows					X	X	X		
Drainage Network Increase					X	X	X		
Riparian Reserves	X	X	X	X	X	X		X	X

The following is a summary the nine Aquatic Conservation Strategy objectives and how the action alternatives would influence them:

1. **Distribution, Diversity and Complexity of Watershed and Landscape-Scale Features:** This project would meet this objective because of the protection that Riparian Reserves provide and because roads would be decommissioned. Riparian prescriptions would restore plantations by creating diversity and complexity. The project would have no new stream crossings and some culverts would be removed decreasing the current level of aquatic habitat fragmentation.

2. **Spatial and Temporal Connectivity Within and Between Watersheds:** The project would increase the spatial and temporal connectivity within and between watersheds due to the removal of culverts on decommissioned roads. Stream temperature would be maintained by the protection buffers adjacent to streams. Riparian prescriptions would restore plantations by creating diversity and complexity.

3. **Physical Integrity:** This project would meet this objective through design criteria and the protection provided by Riparian Reserves. Design criteria would minimize erosion, and establish protection buffers adjacent to streams. Thinning in Riparian Reserves would restore a diverse, healthy riparian area and would accelerate the growth of trees for greater shade and larger woody debris when trees eventually fall into streams. The project would not alter shorelines, banks or bottom configurations.

4. **Water Quality:** This project would meet this objective through design criteria and the protection provided by Riparian Reserves. Stream temperature would be maintained by the protection buffers adjacent to streams. Protection buffers also provide a place for entrapment and deposition of moving soil particles to minimize sedimentation. Design criteria aimed at reducing erosion would maintain or reduce sediment levels in the long-term. In the long term, water quality would be restored by removal of culverts on decommissioned roads. There would be some short term degradation during decommissioning.

5. **Sediment Regimes:** This project would restore sediment regimes in the long term through culvert removal and road decommissioning. Design criteria such as establishment of protection buffers adjacent to streams.

6. **In-Stream Flows:** This project would maintain hydrologic recovery well above the levels identified in the Forest Plan. There would be no measurable change in peak flow. Road decommissioning would "disconnect" the road system from streams which should slow down the rate of runoff currently experienced.

7. **Timing, Variability and Duration of Floodplain Inundation:** This project would meet this objective because of the protection that Riparian Reserves provide and because roads would be decommissioned. Design criteria would establish protection buffers adjacent to streams. This project would maintain hydrologic recovery well above the levels identified in the Forest Plan. There would be no measurable change in peak flow. Road decommissioning would "disconnect" the road system from streams which should slow down the rate of runoff currently experienced.

8. **Species Composition and Structural Diversity of Plant Communities:** This project would meet this objective through protection provided by Riparian Reserves. Thinning in Riparian Reserves would restore a diverse, healthy riparian area, would retain minor species and would accelerate the growth of trees for greater shade and larger woody debris when trees eventually fall into streams.

9. **Well-Distributed Populations of Native Species:** This project would meet this objective through protection provided by Riparian Reserves. Thinning would restore a diverse, healthy riparian area that retains minor species.

Details on conditions for the fifth-field watersheds are described in watershed analysis documents on file at the Ranger District. This project is designed to maintain and enhance aquatic resources. There would be some localized or short-term effects to riparian and aquatic resources to achieve the overall objective.

Project design criteria for thinning such as stream protection buffers and operating restrictions on ground based machinery, and the road repair and decommissioning projects were developed to reduce impacts and to maintain the function of key watershed indicators that make up elements of the Aquatic Conservation Strategy. The key indicators would be maintained or enhanced.

This project is designed to be consistent with the NOAA Fisheries Programmatic Letter of Concurrence for Thinning - the design criteria are summarized in Appendix B (USDC 2008b). Two programmatic biological opinions for fish and aquatic habitat restoration projects have been issued by NOAA Fisheries and the US Fish and Wildlife Service (USDI 2007, USDC 2008a). These biological opinions contain design criteria and other requirements for various activity types such as road decommissioning and culvert removal. The regulatory agencies found that extensive lists of design criteria were sufficient to protect threatened species and restore their habitats.

4.3.4.3 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." Section 2.2.10 explains refinements made to riparian reserves since the time of the watershed analysis.

4.3.4.4 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. Lake Branch is a key watershed. The project would not build any new permanent roads and 22 miles have already been decommissioned in the key watershed.

4.3.4.5 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).

4.3.4.6 Other Standards and Guidelines - FW-054 to FW-079, FW-080 to FW-136, FW-137 to FW-147, B6-001 to B6-042, B7-001 to B7-070, and A9-020 to A9-021

The project is consistent with these standards and guidelines. Project design criteria would provide protection to fisheries and riparian dependent resources. Adherence to the project design criteria would maintain the existing aquatic complexity within and downstream of the project area. 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.

4.3.5 Regional Forester's Special Status Species (Aquatic)

Special Status Species are those plant and animal species identified by a Regional Forester for which population viability is a concern, as evidenced by:

- Significant current or predicted downward trends in population numbers or density.
- Significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution." (FSM 2670.5)

Special Status aquatic species that occur on the Forest include:

Interior Redband Trout *(Oncorhynchus mykiss spp.)*
Redband/inland rainbow trout (redband trout) occur in the White River, Tygh Creek, Fifteenmile Creek, and Middle Columbia/Mill Creek fifth-field watersheds on the Forest. Interior redband trout do not occur within the Hood River basin.

Columbia Duskysnail (*Colligyrus sp. nov.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 project area.

Barren Juga (*Juga hemphilli hemphilli*)
This species of aquatic mollusk is found in fresh water habitats in small to medium sized highly oxygenated cold water streams at low elevations. The species prefers streams that have moderate velocity level bottoms with stable gravel substrates. The known range of this species is the Columbia River Gorge in Oregon and Washington. They have been found in the Forest and the Columbia Gorge National Scenic Area. They are also suspected to occur in the Gifford Pinchot National Forest.

Purple-lipped Juga (*Juga hemphilli maupinensis*)
The Purple-lipped Juga is endemic to Oregon. It is found in large streams at low elevations. These snails prefer riffle habitat with stable gravel substrates, in cold well oxygenated water. It is more tolerant of silt and slack water than other Juga subspecies. The known range of the species is the Lower Deshutes River drainage, below Pelton Dam, and the Warm Springs River in Wasco and Sherman Counties, OR. Sites are known from the Warm Springs Reservation and the Prineville BLM in Deschutes Wild and Scenic River Area.

Scott's Apatanian Caddisfly *(Allomyia scotti)*
This species of caddis fly inhabits small cold mountain streams. The species has been found in four locations on Mt. Hood: from an alpine stream below Timberline Lodge, the south fork of Iron Creek, from a stream at the junction of Highways 35 and 48, and on a tributary of the Salmon River. The species may occur in other localities on or near Mt. Hood, however extensive surveys have not been conducted.

The decision to conduct surveys for all special status species lies with the line officer based on site-specific recommendations from resource specialists. In making such determination, the line officer considered the probability of the species being present on the project site, as well as the probability that the project would cause a significant negative effect on the species habitat or the persistence of the species at the site. Surveys for special status species 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.

As special status species, these species are discussed in the Biological Evaluation. The effects determination 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.

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

4.3.6.1 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 effect 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 Lower Columbia River chinook and LCR steelhead occurs downstream of the proposed project area in Lake Branch Creek, No Name Creek, Indian Creek, and West Fork Hood River.

Project design criteria was developed to minimize or eliminate any potential effect 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.

4.3.6.2 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 Forest in the Clackamas River, Hood River, and Sandy River basins. Chinook salmon utilize the West Fork Hood River mainstem 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 these drainages of the Hood River.

Implementation of the Lake Branch 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.

4.3.6.3 Fish Stocks of Concern

The effects of the implementation of the Lake Branch Thin Project on fish stocks of concern is based on populations of ESA listed fish species and resident fish populations that are classified as management indicator species in the Mount Hood Land and Resource Management Plan (LRMP). These species occur within and downstream of the project area in Lake Branch Creek, No Name Creek, Indian Creek, and West Fork Hood River, and all fish bearing tributaries that flow into these streams.

ESA listed species that occur within or downstream of the project area are Lower Columbia River steelhead and Lower Columbia River chinook. The coastal cutthroat trout is the management indicator species that occurs within or downstream of the project area. Details about these fish can be found in the Biological Evaluation.

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)
Lower Columbia River Chinook - No Effect (NE)

Alternatives B and C
Lower Columbia River Steelhead – May Affect, Not Likely to Adversely Affect (NLAA)
Lower Columbia River Chinook - May Affect, Not Likely to Adversely Affect (NLAA)

4.4 NORTHERN SPOTTED OWL

The Biological Evaluation has been prepared and is incorporated by reference and summarized below. No thinning would occur within the Late-Successional Reserve or in Critical Habitat Units.

4.4.1 Introduction

4.4.1.1 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 and 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.

4.4.1.2 Noise Disturbance - The U.S. Fish and Wildlife Service has concluded that noise, smoke and human presence in the canopy 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 (i.e. incidental take in the form of harassment). For a significant disruption of spotted owl behavior to occur as a result of disturbance caused by the proposed actions, the disturbance and spotted owl(s) must be in close proximity to one another. Human presence on the ground is not expected to cause a significant

disruption of behavior because spotted owls do not seem to be startled by those situations.

A spotted owl that may be disturbed at a roost site is presumably capable of moving away from a disturbance without a substantial disruption of its behavior. Since spotted owls forage primarily at night, projects that occur during the day are not likely to disrupt its foraging behavior. The potential for effects is mainly associated with breeding behavior at active nest sites.

In the late breeding period, potential effects from disturbance decline because juvenile spotted owls are increasingly more capable of moving as the nesting season progresses. To ensure that more than 86 percent of juvenile spotted owls in the Oregon Western Cascades Physiographic Province are able to move away from disturbance without increasing their risk of predation or harm, the critical breeding period is considered to be March 1 through July 15th. After July 15th, it is estimated that most fledgling spotted owls are capable of sustained flight and can move away from most harmful disturbances.

The U.S. Fish and Wildlife Service has assumed disruption distances based on interpretation of best available information. The proposed actions for this project that generate noise above the local ambient levels are heavy equipment, chainsaw and helicopter use. Disruption distances of 35 yards for heavy equipment use, 65 yards for chainsaw, and 120 yards for most helicopters have been set by the Fish and Wildlife Service.

4.4.1.3 Analysis Area – The project proposal involves the degradation and temporary removal of dispersal habitat for spotted owls. Thinning of second-growth mixed conifer stands near nesting areas of spotted owls may result in short term adverse impacts (Meiman et. al. 2003). Since there are few recent surveys for spotted owls that show the locations of active nest sites, historical spotted owl information was used. Historical activity centers are used because studies show nest sites are used for many years. In addition, predicted owl sites will be used. These are areas that may be able to support resident spotted owls (i.e. a potential breeding pair) as determined by the USFWS et al. (2007) northern spotted owl occupancy template. This is used for determining effects to spotted owls where survey data is insufficient.

While it is usually the degradation or removal of suitable habitat that potentially results in harm to a territorial pair of spotted owls, the loss or degradation of dispersal habitat may also result in short-term impacts to the owl pair. The U.S. Fish and Wildlife Service has guidelines for how much removal of suitable habitat would result in take but there are no such guidelines for dispersal habitat.

For the Willamette Province the home range is a 1.2 mile radius circle (2,955 acres) centered on the historic activity center. The proposed project is within the home range of 3 historical and 1 predicted pair. Incidental take would be presumed to occur

when suitable habitat is removed from a home range and if suitable habitat is less than 40% of the home range.

A core area has been defined as the area within a home range that receives disproportionately high use (503 acres or 0.5 mile radius circle). Incidental take would be presumed to occur when suitable habitat is removed from a core and if suitable habitat is less than 50% of the core.

4.4.1.4 Elements of Proposal Analyzed - The following actions have the potential to affect spotted owls: cutting trees to a level below 40% canopy cover and activities that make noise above the ambient noise level of the area and are within the disruption distance of a historic or predicted owl activity center. These actions would include thinning, landing creation, trees removed for skid trails or skyline corridors, and trees removed for road construction. Some actions can benefit owls and other species: variable-density thinning, creating variability in tree spacing, creating skips and gaps, and 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, road decommissioning or road closures would not have a meaningful or measurable affect on habitat but would create noise disturbance.

4.4.2 Existing Condition

Approximately 2,163 acres are proposed for harvest. All of the stands are second-growth stands that range in age from approximately 30 to 60 years.

Previously, the proposed treatment areas contained stands of large mature Douglas-fir, noble fir, and western redcedar. Today, the entire area contains second growth stands of Douglas-fir with inclusions of western hemlock, true fir, scattered western redcedar, and alder dominated riparian communities. These second growth stands were the result of clearcutting in the past followed by planting.

Approximately 1,190 acres are providing dispersal-only habitat for spotted owls. The remaining 973 acres of the project area is considered non-habitat for the spotted owl. These stands are still young, generally less than 40 years and have average diameters less than 11" in diameter. The sizes of trees in these stands are considered too small to support spotted owls. None of the units are considered suitable habitat (nesting, roosting or foraging). They lack a multi-storied structure, large diameter trees and appropriate levels of snags and down wood required for suitable habitat.

Snags and down woody debris are an important component of spotted owl habitat. Few remnant (i.e. legacy) snags and down wood remain in the units. When they are found, they are scattered and few in numbers. Most of the snags and down wood that exists are of small diameter, usually less than 12" in diameter. Some patches occur in the unit with moderate to high concentrations of coarse woody debris. These are generally scattered throughout the project area and consist of small diameter snags and down wood created from suppression mortality.

4.4.3 Direct and Indirect Effects

4.4.3.1 Alternative A (No Action)

No short-term effects to the spotted owl would occur with this alternative. In the short term, the units that are providing dispersal habitat would continue to function as dispersal habitat and snag levels would remain essentially unchanged. In 20-30 years, the stands would start to differentiate to varying degrees and show an increase in the levels of small snags and small down wood. Where these developments eventually occur, they would improve the dispersal habitat. The quality of dispersal habitat would improve only slightly in some stands while improving much more in others. The stands that are currently considered non-habitat for the owls would likely become dispersal habitat. Some of the stands may eventually develop nesting habitat characteristics and become suitable spotted owl habitat. However, with no action, it could take as much as 60 to100 years for these stands to develop into suitable habitat. 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.

4.4.3.2 Action Alternatives

Effects to Owl Habitat on a Stand Scale

	TOTAL ACRES Of DISPERSAL HABITAT	DISPERSAL HABITAT REMOVED (ACRES)	DISPERSAL HABITAT DEGRADED (ACRES)
Project Area (Matrix and Riparian Reserves)	1,190	714	476

The proposed treatments would include a thinning prescription that would improve the growth rate of the residual stand. Larger trees would eventually be provided in the second-growth stands in a much faster timeframe than they would with no thinning. Skips and gaps would be incorporated into the prescriptions as well as the creation of small snags and small down woody debris.

The proposed harvest treatments would temporarily degrade approximately 476 acres of dispersal habitat. This degradation of habitat would occur as a result of opening up the canopy cover to a level just above 40%; as well as the loss of some snags. The Design Criteria require the retention of all down logs and non-hazardous snags. Although the dispersal habitat within these units would be reduced in quality, they would still function as dispersal habitat. It is estimated that these units would again provide quality dispersal habitat in approximately 10 to 15 years after harvest.

Due to the intensity of thinning within some of the units, 714 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 just less than 40% canopy cover: the threshold for dispersal habitat. These units would regain dispersal habitat attributes in approximately five years after harvest as trees grow and canopy cover increases.

4.4.3.3 Effects to Spotted Owls in the Vicinity of the Project Area

There is suitable habitat adjacent to some of the proposed thinning stands which is currently providing nesting, roosting and foraging habitat. In addition, many of the units are within the mean home range (1.2 mile radius) of historic or predicted 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.

A recent study by Meiman (2004) reports changes in spotted owl use following a thinning in stands near core areas in Clatsop State Forest. Although sample sizes were not large, proportional use of the thinned area was 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 observations suggest that 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 affect the ability of owls to move through these stands. The removal or reduction of dispersal habitat could also change the habitat use and home-range of any spotted owls residing in or near the proposed treatment areas. Since many units are within the home range of a pair, 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 unlikely that the proposed harvest activities would negatively impact the health or resultant survival of any birds residing close to the project area.

4.4.3.4 Effects Due to Noise Disturbance

Log-hauling on open roads is not expected to have adverse effects during anytime of the year, since spotted owls rarely nest at or immediately adjacent to a road or edge.

Ambient noise caused by this activity would not adversely affect the breeding behavior of spotted owls during their critical breeding period because no heavy equipment, chainsaw use or helicopter use would occur within the 35-120 yard disruption distances.

Some activities would take place within the critical nesting season, but they would either be beyond the disruption distance of an actively nesting spotted owl pair or beyond the disruption distance of a nest patch of a predicted site. Therefore, all the proposed projects **may affect, but are not likely to adversely affect**, nesting northern spotted owls due to disturbance.

4.4.4 Cumulative Effects

The proposed project would have no effect on suitable habitat, and therefore, the cumulative effects analysis focuses on dispersal habitat. There is virtually no suitable habitat on the private lands east of the project area. These private lands are not counted on to assist with the recovery of spotted owls; therefore it is presumed that they would not have any long-term dispersal habitat. The analysis area is the Lake Branch and Laurel Creek drainages.

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%.

The analysis area is approximately 76% dispersal habitat when considering only the portion on Forest. When considering the entire analysis area, dispersal habitat would make up 61% with the presumption that there would be none on private lands. The project would remove or degrade approximately 8% of the analysis area.

4.4.4.1 Effects to the Historic Owl Activity Centers in the Vicinity of the Project Area

There are four historic or predicted owl activity centers whose home range (1.2 mile radius) overlaps the project area. All 4 of these centers would have dispersal habitat removed and degraded in their home range. Within 3 of these owl activity circles, dispersal habitat would be removed and degraded in the core area. Although dispersal habitat would be impacted, suitable (i.e. nesting/roosting/foraging) habitat would not. Therefore, the impacts are predicted to be small.

The action alternatives could have an effect on the ability of owls to forage or shelter in their core area or home range. In terms of the dispersal habitat, the action alternatives **may affect, but are not likely to adversely affect** spotted owls.

4.4.4.2 Effects of Past Actions

The landscape pattern of vegetation has been affected by past timber harvest, road construction and fires, 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 increases, the amount of interior forest habitat decreases and the amount of edge habitat increases, impacting organisms that prefer large patches of interior habitat such as the spotted owl.

The temporary loss of approximately 714 acres of dispersal habitat and the temporary degradation of approximately 476 acres of dispersal habitat may affect the spotted owl's ability to move through the analysis area. However, owls would still be able to move across the landscape because there would be adequate dispersal habitat in appropriate quantities and distribution. Abundant dispersal habitat would remain in

the analysis area to allow owls to adequately disperse between suitable habitat blocks and it is unlikely that these actions would substantially impact the health or resultant survival of any owls 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 would accelerate the development of suitable spotted owl habitat

4.4.5 Forest Plan Standards and Guidelines

Forest Plan References
Forestwide Wildlife Standards and Guidelines – FW-170 to 181, page Four-69
Northwest Forest Plan - Standards and Guidelines - section C

The action alternatives are consistent with the following standards and guidelines

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 completed.
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.

4.4.6 Endangered Species Act Compliance

The Lake Branch Project is covered by the Batched Biological Assessment of NLAA Projects with the Potential to Modify the Habitats of Northern Spotted Owls (USDA 2008). Informal consultation with U.S. Fish & Wildlife Service has been completed for this project. The Letter of Concurrence written by U.S. Fish & Wildlife Service is dated October 2nd, 2008 (USDI 2008).

4.4.6.1 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 disturbance effects and the effect to dispersal habitat.

4.4.6.2 Effects to spotted owl on a province scale (Willamette Province)
None of the proposed actions are in Critical Habitat Units. The United States Fish and Wildlife Service (USFWS) issued a Letter of Concurrence that included the Lake Branch Project (USDI, 2006). The conclusion reached after considering the cumulative effects of this and other projects is that the action alternatives are not likely to adversely affect spotted owls and are not likely to adversely affect spotted owl critical habitat. The action alternatives are also not likely to diminish the effectiveness of the conservation program established under the NWFP and the Recovery Plan for the Northern Spotted Owl to protect the spotted owl and its habitat on Federal lands within its range including designated spotted owl critical habitat.

4.4.6.3 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 Forest. 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 Forest. The wildlife biological assessment has more detail on this report.

4.5 OTHER WILDLIFE

4.5.1 Management Indicator Species

The 2005 planning rule for National Forest System Land and Resource Management Planning addresses management indicator species. (36 CFR 219.14f) "(f) *Management indicator species.* For units with plans developed, amended, or revised using the provisions of the planning rule in effect prior to November 9, 2000, the Responsible Official may comply with any obligations relating to management indicator species by considering data and analysis relating to habitat unless the plan specifically requires population monitoring or population surveys for the species. Site-specific monitoring or surveying of a proposed project or activity area is not required, but may be conducted at the discretion of the Responsible Official."

Management Indicator Species for this portion of the Forest include northern spotted owl (s. 4.4), pileated woodpecker (s. 4.5.3, s. 4.5.5), pine marten (s. 4.5.5), deer (s. 4.5.4), elk (s. 4.5.4), salmonid smolts and legal trout (4.3) (Forest Plan p. four-13). The analysis in these sections discusses the project's impacts to these species and their habitats.

Monitoring at the Forest scale has been documented in Annual Monitoring Reports available on the Forest's web site - http://www.fs.fed.us/r6/mthood in the Publications section. There is no requirement in the Forest Plan as amended to survey for or gather project-scale population data for management indicator species prior to implementing a site-specific project. The Forest Plan as amended provides habitat to maintain viable populations of these species. Land allocations near the project area that provide habitat for these species include Pileated Woodpecker and Pine Marten Habitat Areas (B5), Late-successional Reserves (LSR), and Riparian Reserves (RR) for pine marten, pileated woodpecker and the northern spotted owl; Winter Range (B10) for deer and elk; and Riparian Reserves (RR) for fish. Of these land allocations, the project units overlap Winter Range (B10) and Riparian Reserves. There are also numerous Forest-wide standards and guidelines that pertain to these species. This project has been designed to minimize effects on management indicator species.

4.5.2 Effects to Sensitive Species and Other Rare or Uncommon Species

The following table summarizes effects to Sensitive Species from the Biological Evaluation.

Species	Suitable Habitat Presence	Impact of Proposed Action (B)*	Impact of Alternative (C)*	Impact of No Action*
Johnson's Hairstreak	Yes	MII-NLFL	MII-NLFL	NI
Mardon Skipper	No	NI	NI	NI
Oregon Slender Salamander	No	NI	NI	NI
Larch Mountain Salamander	No	NI	NI	NI
Cope's Giant Salamander	Yes	MII-NLFL	MII-NLFL	NI
Oregon Spotted Frog	Yes	MII-NLFL	MII-NLFL	NI
Northern Bald Eagle	Yes	NI	NI	NI
White-Headed Woodpecker	No	NI	NI	NI
Lewis' Woodpecker	No	NI	NI	NI
Bufflehead Duck	No	NI	NI	NI
Harlequin Duck	Yes	NI	NI	NI
American Peregrine Falcon	Yes	NI	NI	NI
Townsend's Big-eared Bat	No	NI	NI	NI
Fringed Myotis	Yes	MII-NLFL	MII-NLFL	NI
California Wolverine	No	NI	NI	NI
Puget Oregonian Snail	No	NI	NI	NI
Columbia Oregonian Snail	No	NI	NI	NI
Evening Fieldslug	No	NI	NI	NI
Dalles Sideband Snail	No	NI	NI	NI
Crater Lake Tightcoil Snail	No	NI	NI	NI
Crowned Tightcoil Snail	No	NI	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.

The following species are documented in more detail below. Further information can be found in the Wildlife Biological Evaluation.

Johnson's Hairstreak: This small brown butterfly occurs in isolated pockets in the western mountains of California up into British Columbia. This butterfly is an old growth obligate and spends much of its time in the tops of mature conifer forests, making survey efforts extremely difficult. They do nectar on some plants, like Oregon grape and males come into damp earth sites, such as seeps and springs. Caterpillars feed on mistletoe. The project would not alter mature forests but may

affect feeding or dispersal. None of these treatments would substantially remove or degrade mistletoe habitat.

Cope's Giant Salamander: The Cope's Giant salamander prefers streams and seepages in moist coniferous forests. They limit their occurrence to waters with temperatures ranging from 8 to 14 degrees Celsius. They will also inhabit cold clear mountain lakes and ponds. They occur in suitable areas from sea level up to 4,500 feet elevation. The Cope's salamander breed and rear their young within the cracks and crevices of the rocky substrates within the stream course. They sometimes leave streams on wet rainy nights but remain on wet rocks and vegetation near the stream. This salamander is most frequently found on pieces of wood in streams, under logs, bark, rocks or other objects near streams. This species can be affected by sediment from logging, road management or road decommissioning. Riparian reserve standards and guidelines and project design criteria would minimize effects to this species.

Oregon Spotted Frog: The range of this species is from Northern British Columbia and coastal southern Alaska south to the Rocky Mountains of Idaho, Montana, and Utah. Populations are also present in both the interior and coastal mountains of the Pacific Northwest. The Oregon Spotted Frog is a highly aquatic species that is rarely found far from permanent water. The elevation range of the Oregon spotted frog is from near sea level in British Columbia to just over 5,000 feet in Oregon. Breeding habitats used by Oregon spotted frog are generally moderate to large wetlands with extensive emergent marsh coverage that warms substantially during seasons when Oregon spotted frogs are active at the surface. Sites always include some permanent water juxtaposed to seasonally inundated habitat. This species can be affected by sediment from logging, road management or road decommissioning. Riparian reserve standards and guidelines and project design criteria would minimize effects to this species.

Fringed Myotis: Although the Fringed Myotis bat is found in a wide variety of habitats throughout its range, they seems to prefer forested or riparian areas. Most Oregon records are west of the Cascade Mountains. Their nursery colonies and roost sites are established in caves, mines, and buildings. The species is thought to forage by picking up food items from shrubs or the ground. It consumes beetles, moths, harvestmen, crickets, craneflies, and spiders. No breeding or roosting sites are known to occur in project area. There is the potential for the project area to contain foraging habitat, although foraging usually occurs near the species' breeding and roosting sites. Species would only occur in area during dispersal or possibly foraging.

Red-tree vole: Habitat for this species is conifer forests containing Douglas-fir, grand fir, Sitka spruce, western hemlock, and white fir. Optimal habitat for the species occurs in old-growth Douglas-fir forests. Large, live old-growth trees appear to be the most important habitat component. The proposed harvest units are second-growth stands that contain few if any remnant old-growth trees. It is highly unlikely

red tree voles would be nesting in the stands proposed for thinning. Surveys were not conducted for this species due to lack of habitat.

White-headed woodpecker, pigmy nuthatch, and flammulated owl: These three species are found generally in mature ponderosa pine habitat on the east side of the Cascades. The project area does not contain any ponderosa pine trees. There is no habitat present in project area for these species.

Black-backed woodpecker: Habitat for this species is found in mixed conifer and lodgepole pine stands in the higher elevations of the Cascade Range. There is no habitat present in the project area for this species.

Great gray owl: Potential habitat for the Great Gray Owl consists of stands comprised of large diameter trees for nesting, and located within close proximity to foraging sites such as meadows. None of the units proposed for harvest are potentially providing either foraging or nesting habitat for the species. In addition, none of the proposed harvest units or associated actions occurs adjacent to potential habitat for the Great Gray owl.

Canada lynx: This species is Federally listed as threatened but is not known or suspected to occur on the Forest. No suitable habitat for this species occurs within the project area.

Bats: Caves, mines, abandoned wooden bridges and buildings can be used as roost sites for bats. None of these features are known to occur in the project area.

4.5.3 Snags and Down Wood

4.5.3.1 Existing Situation – All the proposed harvest units consist of young second-growth stands that have undergone a regeneration harvest 30-60 years ago. As a result of this, few remnant or legacy snags or large down wood remain in the units. When they are found, they are scattered and few in numbers. Most of the snags and down wood that exists are of small diameter, usually less than 12 inches in diameter.

Based on snag and down woody debris surveys conducted in similar young plantations, the following assumptions can be made for the project area. The percent ground cover of wood $\geq$ 3 inches diameter would likely be less than 5%; much less in many cases. The number of snags $\geq$ 10 inches diameter would be less than 2.5 per acre, and in many cases less than 2 per acre.

The project area occurs within both the western hemlock and Pacific silver fir zones. 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. In this zone, the 100% biological potential level is 3.7 snags per acre greater than 15 inches diameter (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. In this zone, the 100% biological potential level is 4 snags per acre greater than 15 inches diameter (Austin 1995). The 60% biological potential level is 2.2 snags per acre in the western hemlock zone and 2.4 snags per acre in the Pacific silver fir zone.

Many species in the Pacific Northwest evolved to use large snags and logs that were historically abundant in the landscape. The loss of large snags and logs from managed stands affects biodiversity. Approximately 48% of the analysis area has been logged in the past.

4.5.3.2 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). It 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.

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:

- 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.

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."

For this type, the DecAID advisor identifies the 30% tolerance level for snags as 5.3 snags per acre greater than 10 inches with almost 5 per acre greater than 20 inches in diameter. It identifies the 30% tolerance level for down wood as up to 4.5% cover of down wood (including all decay classes) with sizes of pieces averaging 8-12 inches in diameter.

Most of the Lake Branch units contain snag and down wood numbers at less than the 30% tolerance level.

4.5.3.3 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, road decommissioning 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.

4.5.3.4 Direct and Indirect Effects

Alternative A – In the short term, plantations would have few snags and down wood. It is presumed that there would continue to be low numbers of snags per acre $\geq$10 inches diameter in the units. Most snags present would be smaller than this. In terms of the tolerance levels for snags and down wood within the applicable habitat type and structural condition identified in the DecAID advisor, most of the proposed harvest units would remain below the 30% biological potential level (5.3 snags/acres).

In the short term, plantations would provide low amounts of down wood cover. Most areas would be below 4.5% cover of down wood and therefore be below the 30% tolerance level for wildlife habitat. However, some of the harvest units would likely have at least 3% of down wood comprised of class 1-4 and therefore would meet the 30% tolerance level for natural down wood conditions, as indicated by DecAID inventory data from unharvested plots.

In the next 20 to 30 years these stands would begin to experience increased stand density and start to become increasingly more susceptible to damaging agents such as insects and diseases. These natural processes would create an abundance of new snags and down logs, mainly from the smaller intermediate and suppressed trees. Trees would take more than 30 years to reach the 20 inch size class (USDA 2009a).

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. In skyline logging, there is usually a greater loss of snags compared to tractor logging. Helicopter logging typically results in a greater loss of snags compared to both tractor and skyline logging but typically has less effect on the existing down wood.

About ½ mile of new temporary road would be constructed. There would be impact to the snags and down wood present within the new road prism. All snags and down wood that need to be cut or moved but would remain nearby.

Snags that are left standing after the thinning 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.

Certain live trees would 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 small sized trees are present within the proposed harvest units. Implementation of the action alternatives would reduce the amount of natural selection that would have occurred through the process of stress and mortality in the next 20 to 30 years. Some of the snags and downed logs that might have formed 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 down wood would be created for the short to mid term because of this thinning. With thinning, trees would take less than 30 years to reach the 20 inch size class but they would be healthy and less likely to die and become snags (USDA 2009a). In the long term, trees would be larger compared to no action, and some would eventually die and become large snags. Some would eventually fall naturally to create large coarse woody debris.

With the action alternatives, skips and streamside protection buffers would provide short and mid-term recruitment of snags and down wood similar to the level described for no action.

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. Due to the lack of snags and trees with elements of wood decay in plantations, most would have snag and defective tree densities and sizes below the 30% tolerance level.

Based on the design criteria and previous experience, the units would have down wood levels after project implementation similar to what they are currently, at or below the 30% 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.

4.5.3.5 Cumulative Effects

The effects of past timber harvest on snags and down woody debris levels is included in the discussion above for direct and indirect effects.

Snags are utilized by species that have medium size home ranges which usually ranges in the 1,000s of acres.

Past harvest on approximately 48% of the analysis area has reduced the abundance of large snags. There are large snags in the mature forests outside plantations. When considering both plantations and mature forests across the landscape, the weighted average numbers of large snags (>20 inches diameter) is approximately 6.5 per acre in the Montane Mixed Conifer type and 4.4 per acre in the Westside Lowland Conifer type (Mellon 2003) (USDA 2009b). Implementation of this project would result in a loss of very few large diameter snags because there are very few snags greater than 20 inches diameter in the plantations. There would be no substantive reduction in the percentage of biological potential being provided for species dependent on snags and down wood.

4.5.3.6 Forest Plan Standards and Guidelines

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 zone and 2.4 snags and wildlife trees per acre in the Pacific silver fir zone.

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 would achieve the 60% biological potential level considering snags alone, but would be closer to the standard 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 would 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.

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. This level would be met because of the quantity of large snags present in mature stands scattered across the watershed.

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 #3 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.

4.5.3.6 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 218	All primary cavity nesting species indigenous to the site would be

	considered in the wildlife tree prescriptions.
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.

4.5.4 Deer and Elk Habitat (Management Indicator Species)

4.5.4.1 Introduction – Elk herds in the West Fork Watershed likely exhibit a close association with riparian habitat in areas of gentle terrain and low road density. Research on elk in this type of habitat generally shows that elk spend allot of time in close proximity to a stream or wetlands. Shrub/seedling stage clearcuts also receive relatively high levels of use.

Forage is widely available on the district, 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 one of the limiting factors for elk and possibly deer.

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). It is also recognized that elk within or moving through areas of high open-road densities move longer distances; often several miles per day.

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 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 or decommissioning roads. 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 effect on habitat but would create noise disturbance.

The Forest Plan recognizes different categories of summer and winter range:

- The entire area used by deer and elk in the winter is often referred to as "inventoried" winter range.
- Inventoried winter range is further divided into severe and normal winter range.
- The rest of the Forest is often referred to as "inventoried" summer range.
- Special portions of the winter range are referred to as "designated" winter range and these areas have a land allocation (B10). Standards and guidelines

for B10 only apply to those land allocations while the forest-wide standards and guidelines apply across all portions of the inventoried range.

The project area has been identified in the Forest Plan as normal inventoried winter range, most of which also has the B10 allocation. The West Fork Watershed Analysis found that not many deer or elk reside here during the winter, especially in the harsher winters when snowpacks are heavy. The deer and elk that reside in the project area during the summer usually move off-Forest onto other ownerships in the winter. The West Fork Watershed Analysis recommended de-emphasizing management of elk in the Lake Branch area. It also recommended entering into discussions with the Oregon Department of Fish and Wildlife (ODFW) to reevaluate the need for the B10 land allocation in this area. The area lacks forage and B10 standards and guidelines restrict enhancement of forage. This discussion has not been a high priority and it is likely that a change to B10 would occur when the Forest Plan Revision occurs in a few years.

4.5.4.2 Existing Situation – The harvest units are located within summer and winter range. 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. Optimal cover is found mainly in multi-storied mature and old-growth stands and would not be affected by this project.

The analysis area for deer and elk includes the Lake Branch and Laurel Creek drainages.

Deer and Elk Analysis Area	Acres	Acres and % in Thermal Cover – Current Condition		Miles of Open Roads	Open Road Density (miles/square mile)
Inventoried Summer Range	9110	8146	89%	25.24	1.8
Inventoried Winter Range	2140	2030	95%	14.51	4.3

Black-tailed deer are common and relatively abundant in the spring, summer and fall within the watershed. Elk are also common. Population numbers for deer and elk are probably most limited by the unavailability of quality winter range. Even though the Forest has designated winter range on this portion of West Fork, in reality, most of the sites used as winter range in this area by deer and elk lies on other ownerships, such as Longview Timberlands and especially on the orchard production private lands. While animals use the private lands they are not highly productive because there is little or no optimal thermal cover. The designated winter range with Forest Service ownership occurs on south aspects, is heavily forested and generally lacks forage.

East of the project area just beyond the Longview Timberlands property, elk presence often conflicts with orchard production on private lands. Elk can significantly damage an orchard during the winter. The ODFW has been known to conduct depredation hunts in winter to reduce elk numbers in these orchards. The agency has been considering de-emphasizing elk through much of the Hood River basin,

including the project area, to reduce the need for depredation hunts and thereby reducing orchard damage.

Direct and Indirect Effects

4.5.4.3 No Action – Approximately 2,163 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. With 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 of EA for further discussions of the response of trees to no action.

4.5.4.4 Action Alternatives

The action includes thinning and building temporary roads. Portions of the stands in stream protection buffers and skips would remain un-thinned. Other portions of the stands would be heavily thinned and have gaps placed within them.

The proposed commercial thinning would temporarily remove the thermal cover from the stands. This habitat would be downgraded to non-cover for deer and elk. These areas would have a temporary 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 15 years.

4.5.4.5 Results for the Action Alternatives in the Lake Branch and Laurel Creek analysis area

Deer and Elk Analysis Area	Acres	Acres of Removed Thermal Cover and Remaining % Thermal Cover		Miles of Open Roads	Open Road Density (miles/square mile)
Inventoried Summer Range	9110	1146	77%	8.51	0.6
Inventoried Winter Range	2140	1017	47%	7.29	2.2

Portions of the stands would include the creation of heavy thins, gaps, and gap-like features such as landings, helicopter landings, skid trails and skyline corridors. These gaps are areas cleared to create openings within the units ranging in size up to a maximum of 2 acres. The areas receiving a heavy thin prescription would retain approximately 50 trees per acre. These gaps and heavy thins would no longer be providing thermal cover. However, 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 could 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.

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. While there would be an extensive amount of acreage lost in low-moderate quality thermal cover, there would also be an increase in forage in these same stands. Some of this gained forage would not occur close enough to cover for it to be fully utilized by deer and elk. There would be no loss of the high quality thermal cover being provided in this area, most of which is present in older, mature stands.

Deer are a species that can readily adapt to these changes. Elk are more selective and not as adaptive. Only small impacts are predicted to the deer populations in the area. Elk do not appear to use this habitat extensively in the winter, so only small impacts are predicted to the elk population as well. Although there is the possibility that herd sizes would be reduced to a small degree, these effects are not predicted to last long and would be partially off-set by the increase in forage. Once some of the habitat regains its thermal cover characteristics, in about 15 years; these winter range areas utilized by elk are predicted to once again provide adequate winter and summer habitat for elk.

4.5.4.6 Haul Routes - There are potential haul routes that go through deer and elk winter range. All haul roads that go through the B10 winter range land allocation would have their use restricted between December 1st and April 1st.

4.5.4.7 Disturbance – Logging, road construction, reconstruction and decommissioning activities could potentially disturb animals that happen to be in the area at the time of implementation. 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 activities would be restricted between December 1st and April 1st in all areas occurring within the B10 land allocation.

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.

4.5.4.8 Open-Road Density – New temporary road construction and old existing temporary roads would be reopened and usually reconstructed to access several of the units. In

addition, 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.

This alternative proposes approximately 7.5 miles of road decommissioning and approximately 20 miles of road closures. (Some of this mileage is outside the Lake Branch and Laurel Creek deer and elk analysis area.) These actions would improve the deer and elk habitat being provided in the areas 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. These road closures are likely to help compensate for the short-term loss of thermal cover with the proposed treatments.

4.5.4.9 Cumulative Effects

The analysis area and the time scale for a cumulative effect analysis varies by resource. Since deer and elk move up and down the watershed depending on the season, it is appropriate to extend the analysis area used for the analysis of direct effects (Lake Branch and Laurel Creek drainages) down into the private lands. The analysis will focus on thermal cover because that is the habitat type most affected by the project.

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.

The effects of past timber harvest on thermal cover is included in the discussion above for direct and indirect effects. The Forest has no foreseeable future projects to include in this analysis. However potential future harvest on private lands has been estimated. It is assumed that 50% of the private acreage would not meet thermal cover standards at any given time.

Deer and Elk Analysis Area	Acres	Acres of Thermal Cover and Remaining % Thermal Cover	
Summer Range	9922	7406	75%
Winter Range	4140	2013	48%

The level of thermal winter cover changes substantially in the winter range areas.

For deer and elk in this area, forage availability is more of a limiting factor on-Forest but is more available off-Forest as a result of regeneration harvest on private lands. Generally, thermal cover is not a limiting factor. This project has only a very limited ability to add forage. Some forage would be created in the heavy thins, gaps and on skidtrails, landings and obliterated roads.

4.5.4.10 Forest Plan Standards and Guidelines

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

The following table displays the level of thermal cover 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 Lake Branch project has approximately 610 acres of plantations in the B10 land allocation. Approximately 20% of this acreage would be retained as skips or as no-cut riparian buffers.

4.5.4.11 Thermal Cover and Road Density
(Forest Plan Standard and Guidelines FW-204, FW-206, FW-208, B10-019, B10-036)

Thermal Cover Analysis Area	Post-Harvest	Forest Plan Minimum for Thermal Cover*	Open Road Density	Forest Plan Level
Inventoried Winter Range	47%	35%	2.2	2.0
Inventoried Summer Range	77%	30%	0.6	2.5
B10 Deer&Elk Winter Range	53%	50%	3.4	1.5

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

Thermal cover levels would be met in the winter and summer range analysis areas.

Approximately 0.5 mile of new temporary roads would be built. An additional 6 miles of old existing temporary roads and 3.7 miles of old decommissioned roads would be re-opened. All these roads would be re-closed upon completion of the harvest units they access. The length of time in which these roads would be open would be of very short duration and would have any measurable effects to deer and elk.

The action alternatives include many additional road closures that would reduce current road densities in the area upon completion. Approximately 7.4 mile of system roads would be decommissioned in the area. Another approximately 20 miles of roads would be closed at the entrance.

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

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 not applicable at the project scale, however, communications are occurring with the ODFW on the effectiveness of the B10 winter range land allocation.
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, heavy thins and gaps.
FW-192 & 193	The action would not create significant quantities of forage.
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.
FW- 208 & B10-036	These standards deal with open road density during the winter season. There would be no increases in open road densities in the winter range. The action alternatives do not add to the open-road network therefore these standards are not applicable. Winter range in the project area is a long narrow strip that includes road 1300. It is not possible to meet these standards without closing road 1300. This has not been proposed because it is a primary travel route. However the project area is effectively blocked by deep snow during most normal winters. And as described in s. 4.5.4.1, the area has so much snow that it does not get used in the winter by deer or elk.

4.5.5 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 EA 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).

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 about 30 to 60 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.

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.

Forest Plan Standards and Guidelines

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 action alternatives are within B5- Pileated Woodpecker/Pine Marten land allocation. Snags are discussed in section 4.5.3.

4.5.6 Migratory Birds

A Draft Memorandum of Understanding (MOU) between the USDA-Forest Service, USDI-Bureau of Land Management and USDI – Fish and Wildlife Service has been developed to promote the conservation of migratory birds (USDA-USDI 2001). The MOU meets the requirements of the Executive Order 13186, January 17, 2001 on the responsibilities of federal agencies to protect migratory birds. The purpose of the MOU is to strengthen migratory bird conservation by identifying and implementing strategies that promote conservation and minimize the take of migratory birds through enhanced collaboration between the Forest Service, BLM and the Fish and Wildlife Service, in coordination with state, tribal, and local governments. This MOU directs the Forest Service to protect, restore, enhance, and manage habitat of migratory birds,

and prevent the loss or degradation of remaining habitats on National Forests and BLM land.

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

Alternative A - There would be no alteration of habitat for migratory birds.

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 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.

Cumulative Effects

Because there would be no meaningful or measurable direct or indirect effect to migratory birds; a cumulative effects analysis is not necessary.
Snags are discussed in section 4.5.3.

4.6 SOIL PRODUCTIVITY

4.6.1 Introduction

The productivity and health of entire plant communities depend on the maintenance of healthy soils. Soil distribution is complex across the analysis area. Each soil map unit (number) has been assessed for many risks and hazards called management ratings (erosion risk, compaction hazard, etc.), which are located in the 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 four-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*** - Representative stands proposed for treatment were visited during the summer and fall of 2008. Stands were chosen based on logging method, with emphasis on ground based systems. Fewer proposed skyline and helicopter units were visited because of the relatively small soil impacts resulting from those logging methods as compared to ground based logging. Stands included the primary soil types in the planning area – soils derived from glacial parent materials, pyroclastic flow parent materials, and those located on debris flow terrain. The stands were assessed in the field for the amount of impact (percentage of area with existing soil disturbance). Soil disturbance condition was based on Howes Disturbance Classes, developed on the Wallowa-Whitman National Forest (Howes, 2000). 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. Past treatment activities observed from old aerial photos (from the earliest flight flown after the stand was originally clearcut) were compared to soil disturbance features observed in the field. The field visits provided feedback to calibrate aerial photo estimates, and ultimately were used in the prediction of percentage of detrimental soil condition following logging.

4.6.2.3 ***Assessment of landslide risk*** within the planning area was accomplished by a review of aerial photos dating from 1952 to the present, a review of past geological and engineering reports for projects in the Lake Branch area, discussions with other resource specialists, and field visits to selected units.

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 effect 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 and slope. 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 certain 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*

Landslides in this area are typically small to medium sized debris flows and occasional small debris slides. Debris flows are mixtures of soil, rock, and water that flow down steep, confined channels and deposit material on the valley floor or in a larger stream. Debris flows typically originate in channels that have a gradient that is steeper than about 35%. They can have beneficial effects, such as delivering large wood and rock to streams, but can have detrimental effects also, such as delivering fine sediments to fish habitat, or blocking road crossings and diverting drainages. Debris slides are shallow hillslope failures that typically occur on slopes that are greater than 60%. In this watershed they are usually small stream bank failures or road-related failures. Tree root strength is usually a factor in the stability of slopes prone to debris flows and/or debris slides.

The Northwest Forest Plan (NWP) indicates that some unstable areas should be considered for inclusion into the Riparian Reserve land allocation. (NWP page B-30). The NWP did not require all areas with stability concerns be designated as Riparian Reserves, but that they should be analyzed for inclusion during watershed

analysis. The Watershed Analysis did conduct this analysis and did include certain unstable areas as Riparian Reserves. 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 would be identified during the planning phase of individual projects. The project areas have been examined by a geologist to determine the presence or absence of landslide prone landforms.

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, decommissioned road locations, and adjacent slide paths that affect the proposed units. These are appropriate boundaries because actions outside the plantation boundaries and adjacent areas would have little or no effect to soil productivity within the plantations, and the actions within and adjacent to the plantation boundaries would have little or no effect to soil productivity elsewhere.

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 and reconstruction, re-opening of decommissioned roads, actions that harvest or kill trees, burning and landing creation. Other aspects of the action alternatives such as road repair, road closures, log haul, and the creation of snags would not have a meaningful or measurable effect 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.

4.6.6 Existing Condition

4.6.6.1 Physiographic Factors

In general, landforms in the project area are typical of terrain shaped by the alpine glaciers that occupied this area during the last ice age. Indian, No Name, and Lake Branch drainages have the typical glacial U-shaped valley forms with broad, flat bottoms, commonly with wet or marshy areas along the stream, steeper to vertical slopes on the edge of the canyon and rock outcrop along the top. Talus is usually found at the base of the rock outcrop. Ridges and upper hill slopes are lightly dissected with generally sharp divides. Valley side slopes are moderately dissected with steep first and second order incised tributary drainageways. The area south of

Laurel Creek is a much younger landform forming a smooth, gentle to moderate sloped, lightly dissected topography.

4.6.6.2 Soil Parent Materials

Soils in the area have formed from weathering of the following bedrock and surface materials:

Bedrock

Pyroclastic flow materials - Primarily volcanic breccias interbedded with thin andesite lava flows. The breccias weather into residual and colluvial soils with silt loam and loamy textures. Slopes are generally steep. Andesites are more resistant to weathering, and also form steep slopes. Springs can be found at the contact between the highly permeable andesite layers and the less permeable pyroclastic layers. Landslides in the project area can occur where a combination of steep slopes and saturated soils are underlain by weak and unstable soils weathered from these exposed breccia flows, or where incised streams have removed the support on steep drainage side slopes. These soils are generally found on the middle to lower slopes of No Name, Indian, and Lake Branch Creeks, and the lower south facing slope of Sawtooth Mountain. (Mapping Unit (MU) 2, 118, 119, complexes containing 6, 12, 13).

Basalt lava flow materials - These rocks are resistant to erosion, generally forming steep cliffs where exposed. They can form a barrier to subsurface water movement, and can cause spring activity along the upper contact surface. Talus is frequently found at the base of the cliffs. In the project area these soils are generally found in complex with pyroclastic and glacial soils in the upper portion of most slopes. (complexes containing MU 6, 12, 13)

Surface deposits

Glacial till north of Laurel Creek - These soils have formed in unconsolidated medium textured glacial till primarily from rocks derived from andesite, with smaller amounts of basalt and pyroclastic materials. These materials are generally a mixture of clay, silt, sand, gravel, stones, and boulders. These tills are poorly cemented, and can erode easily when disturbed by road construction or water concentration. The glacial till is generally found along the valley floor of Lake Branch Creek (MU 300), or overlaying the pyroclastic materials along the upper slopes of Indian, No Name, Lake Branch and north slope of Sawtooth Mountain (333, 334, 335), and south facing slopes of Sawtooth Mountain (375).

Glacial till south of Laurel Creek - These soils formed from weathering of a glaciated surface overlaying a young basalt lava flow exuded from a vent at the top of Lost Lake Butte. These soils are mapped as medium textured till of mixed geologic origin, are dominated by a mixture of silt to boulder-sized fragments, and have a hard compacted till at approximately 20 inches. (MU 374, 376)

Colluvium is material that has moved downslope by gravitational forces. In this project area it has generally been deposited by debris flows, debris slides, slumps,

rock fall, or soil creep. It generally consists of large percentages of coarse rock fragments in a finer-textured matrix. Soils with a large component of colluvium (due to landslide deposits) are located on the lower, east facing slope of Lake Branch Creek in the area of Units 224, 225, 226, 228, 230, 232, and 242, and the lower slopes of Lake Branch Creek west of Skipper Creek, in the area of Units 28 and 30.

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 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.

4.6.7.1 EROSION

Alternative A – No Action
Erosion rates within the analysis area would remain unchanged. Over time as bare areas become revegetated, erosion levels would decrease. If an existing slide were to become more active, or it new landslides were to occur, an increased level of soil erosion is expected in the exposed soil areas.

Action Alternatives
With the action alternatives, all thinning units would have a reduction in effective ground cover. Erosion would not occur where duff and other effective ground cover is retained. Therefore, practices which limit the amount of soil exposure, or which re-establish ground cover after soil is exposed, would result in less erosion occurring. Of the proposed yarding systems, ground based systems result in a greater amount of ground exposure than skyline and helicopter systems. Units that are prescribed for ground based systems generally have gentle to moderate slopes, so even if the potential for erosion may be high, eroding materials would not move far before redeposition occurs. With Best Management Practices, there is a low potential for sediment delivery to streams. Low slopes, use of designated skidtrails, and establishing effective ground cover by applying seed, fertilizer and straw mulch on the disturbed soils would aid in minimizing erosion.

4.6.7.2 SOIL DISTURBANCE

Alternative A – No Action
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, fuel treatment, and road construction activities. All units were clear cut harvested from 1948 to 1978. Site

preparation was by broadcast burning. 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 majority of readily observable ground disturbances in the field were heavily compacted old skid trails, landings, and temporary roads, areas where excess soil displacement or removal of organic material had occurred from historic logging activity, and debris flow or debris slides occurring as the result of road construction and the original harvest activity. Soil Mapping Units 118 and 119 appear to have been especially impacted, probably due to the steep slopes on which tractors were used, and the finer texture soil properties. The majority of historic disturbance on these soil types still rated as detrimental in nearly all cases. The estimated percent area of detrimental soil condition in each of the treatment units can be found in the analysis file.
Estimated detrimental condition ranged from 10 to 30%. Units previously harvested with ground based equipment, and those that had been downhill cable yarded, are estimated to exceed 15% detrimental soil condition. The highest percentages were found on units where ground based logging systems were used on steep slopes, on units that were logged when the land was owned privately (Units 242 and 245), and where debris from a management initiated debris slide was deposited in the unit (Unit 30).
The majority of uphill cable yarded units did not exceed 15% detrimental soil condition.

With Alternative A, disturbed soil condition would slowly decline as compacted areas move toward recovery due to physical and biological processes.

Action Alternatives

Estimated Detrimentally Disturbed Soil Conditions summarized by original and proposed logging system.

Past Harvest			Direct Effects (Action Alts.)		Cumulative		
Logging System	Acres	Estimated Existing Condition	Logging System	Estimated Change with Action Alternatives	Estimated Result from Action Alternatives	Alt. B Acres	Alt. C Acres
Ground	1752	12% - 30%	Ground	2% – 6%	14% – 36%	752	647
			Skyline	2% - 3%	14% – 28%	619	508
			Helicopter	1%	12% – 26%	361	579
Cable	430	10% – 20%	Ground	2% – 6%	12% – 26%	21	16
			Skyline	2% - 3%	12% – 23%	298	241
			Helicopter	1%	11% – 21%	110	172

For this analysis, it was assumed that existing landings, temporary roads, and skid trails would be reused, and where previous entries created higher percent detrimental conditions, a progressively greater number of existing skidtrails would be available to be reused. It was assumed that in some cases, new landings may need to be constructed

where logging system changes from the original entry require alternate locations (i.e. originally tractor, now skyline), or existing landings are located too close to streams. New skidtrail locations may be required in places where current management practices regarding stream and drainage crossing protection differ from the previous logging. 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.

Despite many 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 30% 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 (s. 4.1). 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.

4.6.7.3 ORGANIC MATTER

Alternative A

Percent disturbed soil condition would slowly decline as compacted areas move toward recovery due to physical and biological processes. Duff layers are relatively thin, presumably due to the past harvest and fuel treatment history, and range from 0.5 to 3 inches with an average of 1 inch. Generally there was a lack of notable quantities of course woody debris (CWD) on the forest floor in most units observed. It is inferred that this condition is well below historic ranges of CWD that naturally occurred in pre-settlement times in these types of plant communities. CWD plays an important role in nutrient cycling; therefore it is presumed that a general lack of it may have diminished inherent site productivity to some degree. The exact impact of this condition on soil nutrient capital and cycling is not explicitly known for the soil types in the project area.

Forest organic litter input, organic decomposition rates, duff layer development and soil fauna and microbe activity would continue unchanged. Organic matter

decomposition and nutrient cycling is influenced substantially by temperature and moisture. Organic materials would be subject to natural disturbances such as windthrow, fire, and natural climatic change. As unthinned stands age, trees would eventually fall over in a natural thinning process. In the absence of disturbances such as insect, disease, or fire, these stands should eventually produce large trees which would be a source of future large decaying logs on the ground.

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. If funding becomes available, two to three trees per acre would be felled or girdled to create coarse woody debris.

Duff disturbance would be minimized where full suspension yarding occurs in skyline and helicopter operations, and where designated and existing skidtrails are used in ground-based yarding operations. Soil microbial populations would likely be reduced initially in areas of exposed soils until soil organic matter and litter layers build back up. Leaving slash and needles where trees are felled should help maintain carbon and nutrient levels.

4.6.7.4 LANDSLIDE RISK

All the proposed thinning units were regeneration harvest units (clear cuts) in the past. The removal of all the trees in an area has a much greater potential to affect slope stability than thinning would. The level of stability of the slopes in all 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 future harvest. Areas that remained stable after the original regeneration harvest would likely continue to be stable after thinning.

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 mapped active landslides
2. all units reported to have unstable areas by other resource specialists

3. other units that are representative of the various geologic terrains and slope stability regimes within this planning area

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

Category	Thinning unit number (the same unit may appear in categories 1 and 2)
1	2, 4, 130, 132, 146, 148, 154, 225, 228, 230, 232, 234, 306, 307, 310
2	2, 78, 80, 224, 276, 286, 294, 360, 361, 362
3	11, 14, 18, 22, 36, 38, 40, 56, 78, 226, 246, 340, 342, 346, 388, 390, 398, 400, 402, 404, 405, 406, 408, 412, 420, 440,

The boundaries of six proposed thinning units were modified to exclude from thinning those areas that were judged to be unstable or potentially unstable: 2, 132, 148, 310, 360, and 361.

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

Alternative A – No Action

The overcrowded trees would continue to grow slowly. Existing shallow landslide scars within the project area would slowly heal as vegetation becomes denser. The level of instability of deeper-seated active landslide areas would likely remain about the same.

Action Alternatives

The action alternatives 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 becomes denser. The level of instability of deeper-seated active landslide areas would be unaffected by the thinning.

Some roads would be repaired and some would be decommissioned reducing the risk of road related slides.

The action would have no measurable incremental impacts on slope stability when

added to the impacts of other nearby past, present, or reasonably foreseeable future actions.

4.6.8 Forest Plan Standards and Guidelines

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
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-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.

4.6.8.1 Exceptions

Exceptions to Forest Plan standards and guidelines FW-22, FW-028 and FW-030 are proposed.

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 (stand exam data) 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 would still be met.

FW-028 & FW-030

These standards and guidelines 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. Most units that were logged with ground-based equipment in the original clear cut harvest would remain above 15% detrimental soil condition. 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.

4.7 BOTANY

This section addresses rare or uncommon botanical species including fungi, bryophytes, lichens and vascular plants some of which are on the Regional Forester's Sensitive Species list. Invasive species are discussed in s. 4.8.

The following actions have the potential to affect rare or uncommon 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 action alternatives such as road reconstruction, repair or decommissioning would not have a meaningful or measurable effect on rare or uncommon botanical species because they do not alter habitat.

The project area includes upland forest, riparian forest and wetlands/seeps. Intuitive-controlled field surveys were conducted for rare or uncommon botanical species in 2008.

The following is a summary of the Botanical Biological Evaluation.

Hypogymnia duplicata. Rhizomnium nudum, and *Schistostega pennata* sites are documented near the proposed project area. There is also a documented historical site of the rare Columbia River Gorge endemic plant, *Erigeron howellii* (Howell's daisy), near the proposed project area.

4.7.1 No species of concern were found in the vicinity of project activities. Two species were found in the watershed: *Hypogymnia duplicata* (ticker-tape lichen) and *Erigeron howellii* (Howell's daisy) but these would not be affected by the action alternatives. The action would have an effects determination of **May Impact Individuals or habitat but is not likely to lead to a trend toward federal listing.**

4.7.2 Surveys to detect the presence of most fungi species are not considered practical because of the variability in fruiting-body production from year to year. Therefore, fungi (other than *Bridgeoporus nobilissimus*) were not targeted during field surveys.

Where field surveys determined the presence of suitable habitat for a particular species of fungi, it was presumed 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. They are *Cordyceps capitata, Cortinarius barlowensis, Cudonia monticola, Gomphus kauffmanii, Gyromitra californica, Leucogaster citrinus, Mycena monticola, Otidea smithii, Phaeocollybia attenuata, Phaeocollybia californica, Phaeocollybia oregonensis, Phaeocollybia piceae, Phaeocollybia pseudofestiva, Phaeocollybia scatesiae, Ramaria amyloidea, Ramaria gelatiniaurantia,* and *Sowerbyella rhenana.* The action would have an effects determination of **May Impact Individuals or habitat but is not likely to lead to a trend toward federal listing.**

4.8 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.

4.8.1 Introduction

Non-native plants are species that have been introduced either intentionally or unintentionally to areas where they do not naturally occur. Most invasive non-native plants in the Pacific Northwest originate from Europe and Asia. The predators and diseases that control these plant species in their native habitats are not present in the habitats where they have been introduced. Unchecked by predators or disease, such plants may become invasive and dominate a site, displacing native plants and altering a site's biological and ecological integrity. For example, invasive plants can reduce biological diversity, displace entire native plant communities, decrease and degrade wildlife habitat, alter fire regimes, change hydrology, disrupt mycorrhizal

associations, alter nutrient dynamics, and increase soil erosion. Invasive plants can also poison livestock and reduce the quality of recreational experiences.

For all Forests in Region 6, the 2005 Record of Decision (ROD) for the *Final Environmental Impact Statement (FEIS) for Preventing and Managing Invasive Plants* (April 2005) replaces the direction established by the 1988 ROD for *Managing Competing and Unwanted Vegetation* and *1989 Mediated Agreement* for invasive plant management.

The Record of Decision for the *FEIS for Site-Specific Invasive Plant Treatments for the Mt. Hood National Forest and Columbia River Gorge National Scenic Area* (March 2008) provides guidance for managing invasive plants on the Forest. It identified 208 areas to be treated manually, mechanically, or with herbicides and providing an early detection/rapid response strategy for treating new infestations quickly.

4.8.2 Risk Assessment

The risk level for the introduction or spread of invasive plants/noxious weeds is high for this project. The following species are present in the project area.

Species Name	**Common Name**
Centaurea biebersteinii	spotted knapweed
Centaurea diffusa	diffuse knapweed
Centaurea pratensis	meadow knapweed
Cirsium arvense	Canada thistle
Cirsium vulgare	bull thistle
Cytisus scoparius	Scotch broom
Hypericum perforatum	St. John's-wort
Senecio jacobaea	tansy ragweed

These noxious weed species are included in the Oregon Department of Agriculture's (ODA) "B" noxious weed list. Species on the B list are those that are widely established regionally and the management objective is to control infestations on a case-by-case basis.

4.8.2.1 Spotted knapweed is one of the most dominant weed species in the western United States. Infested acres in Oregon are still limited but increasing and have caused millions of dollars in economic losses.

Spotted knapweed infests roadsides and gravel roads in the Lake Branch Thinning project area.

Ecological Impacts: This species will form dense stands on any open ground,

excluding more desirable forage species and native plants. Control success is hampered by seed longevity. Weeds of the *Centaurea* genus have more negative impacts on natural and agricultural ecosystems than any other weedy species.

Establishment Mode: Seeds are dispersed by wind, animals, and people.

Treatment: Spotted knapweed is a prolific seed producer. Handpulling or mowing diffuse knapweed would prevent it from seeding if done early in the growing season before plants produce seed, but at the present time herbicide is the most effective tool for controlling spotted knapweed

4.8.2.2 Diffuse knapweed infests roadsides and gravel roads in the Lake Branch Thinning project area.

Ecological Impacts: Diffuse knapweed will form dense stands on any open ground, excluding native species. The species grows in a wide range of habitats: in riparian areas, along sandy river shores and gravel banks, on rock outcrops and rangelands, and along roadsides.

Establishment Mode: Spreads by seed, aided by the tumbling of windblown mature plants.

Treatment: Diffuse knapweed is a prolific seed producer. Handpulling or mowing diffuse knapweed would prevent it from seeding if done early in the growing season before plants produce seed, but at the present time herbicide is the most effective tool for controlling diffuse knapweed.

4.8.2.3 Meadow knapweed infests roadsides and gravel roads in the Lake Branch Thinning project area.

Ecological Impacts: Meadow knapweed favors moist roadsides, sand/gravel bars and river banks, irrigated pastures, moist meadows, forest openings, and roadsides. Meadow knapweed out-competes grasses and other pasture species and is difficult to control. It threatens wildlife habitat. Knapweed invasions cause losses averaging up to 63 percent of available grazing forage.

Treatment: Meadow knapweed is a prolific seed producer. Handpulling or mowing diffuse knapweed would prevent it from seeding if done early in the growing season before plants produce seed, but at the present time herbicide is the most effective tool for controlling meadow knapweed.

4.8.2.4 Canada thistle is common and widespread on the Forest, found in open areas and forests, in disturbed and undisturbed habitats.

Ecological Impacts: Canada thistle is found in cultivated fields, riparian areas, pastures, rangeland, forests, lawns, gardens, roadsides, and waste areas.

Establishment Mode: This plant spreads from rhizomes or seeds. Although it produces a large number of seed, only a low percentage are viable.

Treatment: Canada thistle can be treated through *solarization* (covering plants with an opaque geotextile fabric or plastic tarp), which smothers plants. Handpulling is not effective because the plant can reproduce from its deep root system or rhizomes. At the present time, herbicide is the most effective tool for controlling Canada thistle.

4.8.2.5 Bull thistle is common and widespread on the Forest, especially along roadsides and in other disturbed areas.

Ecological Impacts: Bull thistle is a widespread weed that can grows in a wide range of environments but is most troublesome in recently or repeatedly disturbed areas such as pastures, overgrazed rangelands, recently burned forests, forest clear-cuts, and along roads, ditches, and fences. It is found on dry and wet soils, but is most common on soils with intermediate moisture. Although bull thistle is a problem predominantly in disturbed areas, it also can be found in natural areas. Unlike Canada thistle, which is a perennial and forms rhizomes, bull thistle is a perennial, or sometimes annual or biennial, that does not form rhizomes but produces a taproot. Once established, bull thistle out-competes native plant species for space, water, and nutrients.

Establishment Mode: Spreads by seed dispersal.

4.8.2.6 Scotch broom establishes in open areas with little tree cover and along roadways at low and moderate elevations, mostly west of the Cascade Range crest. Management priority on the east side of the Forest is to control Scotch broom populations to keep them from expanding, with the long-term goal of eradication. Biological control agents (insects) are established west of the crest and are relied on to depress Scotch broom infestations where resource concerns are not critical.

Ecological Impacts: Where Scotch broom establishes, it can form a monoculture, out-competing and displacing native trees, shrubs and other species, delaying forest development and altering ecosystem functions. Scotch broom's hard, long-lived seeds can persist in the soil for up to 75 years.

Establishment Mode: Scotch broom establishes from seed that may be transported by vehicles carrying soil or plant parts.

4.8.2.7 St. John's-wort is distributed across the Forest along road shoulders, in rock-storage areas and quarries, and in other areas of soil disturbance. Similar to Scotch broom, active management to control or eradicate a St. John's-wort infestation occurs when there are overriding resource concerns. Biocontrol insects are well established and are the primary means of control on the Forest.

Ecological Impacts: While infestations do not result in a great deal of economic harm

in forestry settings, St. John's-wort displaces native vegetation and can alter ecological function.

Establishment Mode: St. John's-wort establishes from seed and lateral roots that may be transported by vehicles carrying soil or plant parts.

4.8.2.8 Tansy ragwort distribution on the Forest is similar to that of Scotch broom. West of the Cascade Range crest, control efforts on the Forest are mostly limited to biological control agents (cinnabar moth larvae). East of the crest, bio-control insects have not established because of the colder winters. Management priority for the east side of the Cascade Range crest is to control and eradicate infestations by manual, mechanical, or chemical treatment methods.

Ecological Impacts: Tansy ragwort is poisonous to livestock, particularly horses. At sites where it becomes dominant, tansy ragwort can displace native vegetation and alter ecosystem functions.

Establishment Mode: The light seed is dispersed by wind and can be transported in soil on vehicles.

4.8.3 Summary

All of the species listed above are well-established, especially along roadsides and in other areas where ground disturbance has occurred, in the Lake Branch project area. Spotted, diffuse, and meadow knapweed are of particular concern. They infest all of the roadsides and gravel roads in the Lake Branch area. The 1311 road (a gravel road) is particularly infested with knapweed species. Vehicles traveling on gravel roads like the 1311 road would pick up, transport, and spread knapweed plants and seed elsewhere.

Management objectives are to (a) reduce the risk of spread from the existing infestations into newly disturbed areas and to areas outside the Lake Branch area and (b) to reduce the risk of noxious weed species not presently in the project area from being introduced and spread as a result of project actions.

If funding is available, treatment of knapweed may begin before the Lake Branch Thinning project gets started.

The design criteria would minimize the likelihood that invasive plants would spread.

4.8.4 Other Invasive Plants

Other invasive plants found in the project area, but not ranked as noxious weeds by the Oregon Department of Agriculture (ODA), include *Hypochaeris radicata* (cat's-ear), *Ilex aquifolium* (English holly), *Lapsana communis* (nipplewort), *Leucanthemum vulgare* (oxeye-daisy), and *Phleum pratense* (timothy). These species

are common and widespread in disturbed areas in the project area: e.g., roadsides, skid roads, decommissioned roads, landings, and clearcuts. English holly can invade interior forest habitat, but generally only one or a few individuals are present in any given location when found in interior forest.

4.8.5 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. However the slash, woody debris and root wads that result from the temporary road construction associated with this project would be temporarily set aside and used to block the road when logging is completed. There would be no burning of this material.

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

4.9 SCENERY

There are several aspects of the action alternatives that have the potential to affect scenery. Thinning can alter canopy density and texture, stumps remain and red slash remains on the ground or in piles. Bare soil and straight lines can be created at landings, skid trails and skyline corridors. Road construction, reconstruction, closure and decommissioning also have the potential to alter scenery. A plantation is generally no longer considered visually disturbed when the trees reach an average of 20 feet in height (Forest Plan – FW-562).

A designated viewshed is identified in the Forest Plan for this area (Four-110). The primary viewer positions for the viewshed are the south part of the road 1300 loop, Lost Lake, and the Lost Lake Campground. The Pacific Crest Trail follows close to the Hood River watershed divide and is another primary viewer position. Other secondary but popular routes are traveled by publics that are sensitive to scenery. Road 1300 is a popular loop for driving and biking. Road 1310 is the access to Wahtam Lake and the Pacific Crest Trail. Other roads traveled by publics less sensitive to scenery would include all other open local roads used by hunters and other recreators. Some roads such as 1310, 1310.660, 1310.662, 1311, 1320 and 1350 offer dramatic views.

4.9.1 Existing Situation

The plantations 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 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 certain local forest roads with panoramic views. None of the proposed thinning units can be seen from Lost Lake or Lost Lake Campground. None of the proposed thinning units are within the foreground as viewed from the Pacific Crest Trail.

4.9.2 Direct and Indirect Effects

No Action

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. The no-action alternative would not close or decommission any roads therefore more local roads would remain open for viewing plantations and landings close up. Roads that offer dramatic views of the area would remain open.

Alternatives B and C

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, landings, skid trails and skyline corridors that would be relatively open. The rest of each stand would have variable-density thinning. The action alternatives would close and decommission several miles of roads. While they are not considered primary viewer positions, roads 1310.662, 1311, 1320 and 1350 that offer dramatic panoramic views would be closed.

4.9.3 Effects to scenery as seen from road 1300 to Lost Lake (south portion of loop)
Approximately 429 acres of thinning would occur within this viewshed. 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 live trees retained within thinning units, the distance and the viewer angle. No log landings would occur on, or be visible from this section of road 1300. 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. 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 plantations 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.

4.9.4 Effects to scenery as seen from the Pacific Crest Trail

Alterations to scenery if any would be very slight because of a combination of topographic screening, vegetative screening, the density of green trees retained within thinning units, the distance and the viewer angle. The nearest units are approximately 2,500 feet from the trail and are helicopter units. Hikers would not notice any dramatic changes in forest structure or see bare ground or slash. 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 plantations and adjacent mature forest stands.

4.9.5 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 clearer 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. The action alternatives would emphasize the reuse of existing roads, landings and skid trails. Landings, temporary roads, skid trails and skyline corridors and landing slash piles would be noticeable in the short term by people 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. Because the action alternatives includes several miles of road closure and decommissioning, landings and slash along those roads would no longer be seen except by those that walk. When these roads are closed 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.

4.9.6 Cumulative Effects

Since there would be little or no direct effect to scenery there would be no significant cumulative effects.

4.9.7 Forest Plan standards and guidelines

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 & B2-012 Visual Quality Objectives

Management Area or Designated Viewshed	Viewer Position	Fore-ground	Middle-ground	Back-ground
B2- Road 1300 (south part of loop)	Road, Lost Lake and Lost Lake Campground	R	PR	PR
B7- Riparian Reserve	Fish bearing streams	PR	M	M
Pacific Crest Trail	Trail	R/PR	M	M
All other areas	Local Roads	M	M	M

R = Retention
PR = Partial Retention
M = Modification

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.

4.10 RECREATION

Existing Situation

The proposed thinning occurs in areas that are used for various types of recreation. The roads in the project area are used to access a variety of recreational experiences, some of which may be affected by proposed road repairs and road decommissioning. The project area is seen by forest visitors on their way to recreational destinations, and viewing scenery is an important recreational activity. Road 1300 is a popular loop road for driving and biking: the southern portion of the loop is the primary access to Lost Lake and the Lost Lake Campground. The area surrounding Lost Lake is designated as a Scenic Area. Road 1310 accesses Wahtum Lake, the Mark O. Hatfield Wilderness and the Pacific Crest Trail. Road 1300 and 1310 have deteriorated and are in need of repair to allow continued safe use.

Recreational land allocations in the Lake Branch watershed include A2 – Wilderness, A4 – Special Emphasis Areas (scenic area), A6 – Semi-primitive Roaded Recreation, B3 – Roaded Recreation and B12 – Backcountry Lakes. There is also an inventoried roadless area in the vicinity of Lost Lake. There are no thinning units in any of these, but access roads may be affected.

The primary uses where thinning is proposed is dispersed camping and hunting. Fire rings are present at old landings and road junctions.

Road decommissioning and closure has the potential to displace Forest users that rely on motorized access. The project area originally contained 78 miles of maintained system roads but 22 miles have already been decommissioned and some other roads are closed with berms or are overgrown and cannot be used.

4.10.1 Recreation Opportunity Spectrum

The project area crosses land with various recreational objectives. The Recreation Opportunity Spectrum (ROS) is a framework to inventory, plan, and manage recreational opportunities. The ROS objective for most of the project area is Roaded Natural.

The project would not change remoteness, scenic quality, the level of development of facilities, the number or type of social encounters or the degree of naturalness encountered by visitors. The project's primary effect on ROS would be reduced access through road decommissioning and closure.

4.10.2 Direct and Indirect Effects

With no action, the roads needed for recreation access would not be repaired. They would soon reach the point where they would need to be closed to the public because they would become unsafe.

The action alternatives would result in some changes to recreational access. Some roads that access popular recreation areas would be repaired while others would be decommissioned or closed. Approximately 7 miles would be decommissioned and another 20 miles would be closed.

For people with physical disabilities or limited mobility, it is important to drive as close as possible to favorite hunting or camping sites. The project area would have many miles of road that would remain open with the action alternatives but most of these are mainline roads with heavy traffic and not well suited to people that want to camp in a quiet location.

4.10.3 Cumulative Effects

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 Forest is committed to examining all of its watersheds for road decommissioning opportunities. Roaded recreation opportunities would eventually decline Forest-wide as decommissioning and other road closures occur.

4.11 HERITAGE RESOURCES

Surveys have been conducted for this project and are discussed in heritage report number 2009-060606-001. A prehistoric archaeological resource and a historic isolate occur within the project area.

Prehistoric site 666NA0255 is located just outside of unit 422: a culturally modified tree. A 25-foot buffer would be placed around the perimeter of the site and directional felling away from the site is recommended to protect the site during harvesting activities.

Historic site 666IS244 is located near the northeast corner of unit 226: a bench marker. A 25-foot buffer would be placed around the perimeter of the site and directional felling away from the site is recommended to protect the site during harvesting activities.

These measures would adequately protect known heritage resources. The site protection measures were developed in consultation with the Mt. Hood Cultural Resource Program Manager and the Hood River District Archaeologist. Contracts would contain provisions for the protection of sites found during project activities. Based on the proposed protective measures, the project meets the criteria in the Programmatic Agreement for "Historic Properties Avoided" determination (Stipulation III (B) 2).

This action is consistent with Forest Plan goal to protect important cultural and historic resources.

4.12 ECONOMICS – FINANCIAL ANALYSIS

One of the aspects of the purpose and need (s. 2.2.4) 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 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. It would not repair or decommission any roads.

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 purpose and need (s. 2.2.4) is not solely to create jobs but to provide forest

products consistent with the Northwest Forest Plan goal of maintaining the stability of local and regional economies. Jobs are only a part of that equation. Restoration thinning is needed to keep forests healthy and productive to provide wood products now and in the future – people need and use wood products.

The project is a restoration thinning with road repair and decommissioning and as such is not intended to generate income. Cost effectiveness is considered in the design of the thinning and in the road treatments proposed.

The action alternatives would also repair some roads and decommission others. Some of this restoration work is very costly. However, each project is designed with cost effectiveness as a primary objective so that the limited funding available for restoration can be efficiently used to achieve the greatest benefit. In addition to the resource benefits described elsewhere, there are considerable economic values gained by society when wildlife and fish habitats and water quality are restored.

- Commercial and recreational fishing may be enhanced as fish runs are restored.
- Water providers might see cost savings as water quality improves.
- The Forest would spend less for road maintenance on decommissioned roads.

The timber market is currently in a downturn due to reduced housing starts. This situation is likely to be temporary. Based on past experience with thinning similar stands with similar prescriptions, it is likely that there would be sufficient value of timber removed to accomplish restoration thinning. The exception may be with helicopter logging which is very expensive.

- The economic viability of helicopter logging is cost prohibitive given the value of the timber and the high cost of jet fuel. There is a high probability that these helicopter units would receive no bids. A similar helicopter offering prior to the timber market downturn received no bids.
- Helicopter use makes sense on steep slopes or when the resource impacts of other options are too great. It also makes sense when the value of the timber to be removed is greater than the high cost of helicopter operations.
- There is a high probability that helicopter units would receive no bids. If so, the impacts and benefits for those acres would be similar to the no-action alternative.
- Alternative C would have more acres of helicopter than Alternative B.

Alternative B would cost approximately $3,000,000 for the road work. The road costs for Alternative C would be approximately $140,000 less.

4.12.2 Forest Plan standards and guidelines

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.

4.13 TRANSPORTATION

(This section elaborates on Purpose and Need - section 2.2.5)

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.

Temporary roads are roads that are built by contractors 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.

Approximately 22 miles of system roads have previously been decommissioned.

There are no inventoried roadless areas in the project area. No uninventoried roadless areas have been identified.

4.13.1 Existing Situation

Existing temporary roads and decommissioned roads were assessed to determine whether they are needed for the current thinning proposal (s. 2.3.7.7 & s. 2.3.7.8). These roads are closed and in some cases have vegetation, brush and trees growing on them.

Direct and Indirect Effects

4.13.2 Alternative A

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.

4.13.3 Action Alternatives

Sections 2.3.7 and 3.2.1 contain details of the changes to the transportation system. The action alternatives would utilize helicopters. There are existing landings along existing roads that would meet the needs of helicopter operations. A discussion of helicopter feasibility is in s. 2.3.8.1.

With decommissioning, and changing the maintenance level of roads that would be closed, the road network would be sized more in line with available funding for road maintenance. Road repair and stabilization work would facilitate safe use. These actions would reduce the effects that the road system is having on fish and water quality (s. 4.3).

Most of the roads proposed for decommissioning were built by timber sale operators to access harvest units. The resulting plantations need to be accessed from time to time for stand exams, invasive plant treatments, precommercial thinning and restoration thinning. Some of these actions can be accomplished by walking on closed or decommissioned roads at additional cost, but restoration thinning where logs would be removed may or may not be feasible without reopening the road. The discussion of the viability of helicopter logging is in s. 4.12.

Approximately 22 miles of roads have already been decommissioned. These old roads accessed approximately 2,400 acres of plantations. The action alternatives would decommission 7 more miles of roads that access 800 acres of plantations.

The roads proposed for decommissioning also access many more thousands of acres of mature forest and younger stands that are not plantations. These stands may need to be accessed in the future to respond to unforeseen events such as fire suppression, salvage of dead or down timber, or changes in management objectives.

It is possible that a decommissioned road may need to be reopened or reconstructed. Any future change to the status of decommissioned roads would require analysis through the NEPA process including public participation and evaluation of environmental effects.

Road decommissioning may affect the ability of the Forest to suppress wildfires. The project occurs in a fire regime where stand replacement fires would occur if the

conditions are right. While it is not possible to predict the exact size a fire might attain with or without road decommissioning, it is likely that fires would be kept smaller with roads in place resulting in reduced overall impact to resources such as fish, water quality and wildlife habitats.

Alternative B would open some decommissioned roads and use them like any other existing temporary road, s. 2.3.7.8. This alternative would open only those roads that were lightly decommissioned and had no stream crossing culverts to reinstall. They would be treated like old temporary roads: they would be reopened with minimal earth movement without side casting material and they would be obliterated the same way temporary roads are after project completion.

4.13.4

Old Road Number	Length (miles)	Acres Accessed	Notes
1300.640	0.25	36	Berm, moderate surface roughing. No culverts were removed.
1310.620	0.14	12	Berm, some surface roughing, brush, no culverts were removed.
1311	0.2	23	Several large waterbars. No surface roughing. No brush. No culverts were removed.
1311.630	0.46	37	Berm, minor surface roughing, no culverts were removed.
1320	1.3	55	Berm. Concrete bridge left in place. Moderate surface roughing with moderate resloping. No culverts were removed.
1330.630	0.4	33	No berm. Very light surface roughing. No culverts were removed.
1350.012	0.91	61	Berm. Light surface roughing. No culverts were removed.
New Temp	0.24	12	Road to units 422 and 424. First section follows old fire line. Original access crossed wet areas. New road provides better access with less impact to riparian resources.
New Temp	0.27	30	Road to unit 402. Original logging system was down hill skyline on steep slopes. New road would allow access for uphill skyline systems that would create less impact to soils.

4.13.5 Cumulative Effects

The action alternatives would result in little or no direct or indirect negative effect 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.

4.13.6 Forest Plan standards and guidelines

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.

4.14 AIR QUALITY

The following actions have the potential to affect air quality: burning slash, exhaust generated by vehicles, equipment, chainsaws and helicopters and dust created by vehicles that drive on aggregate surface and native surface roads.

The following are areas of concern for smoke and pollution intrusion: Mark O. Hatfield Wilderness and the Columbia River Gorge. The analysis area includes a large airshed that incorporates the north side of the Forest and the area east of the Forest.

4.14.1 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 result in an elevated wildfire risk. The nearest area of concern is the Mark O. Hatfield Wilderness which is directly to the west of the project. The nearest town is Dee approximately 10 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

4.14.2 Exhaust and its pollutants would be created by vehicles and equipment. Helicopters use more fossil fuel that other types of logging equipment. Pollutants would disperse and would not likely cause health concerns for forest users.

4.14.3 Dust from trucks and equipment driving on aggregate or native surfaced roads would drift approximately 300 feet but would not drift toward campgrounds or any other area of popular public use.

4.14.4 Landing slash would be burned. The action alternatives would have dozens of 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.

Health risk is 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 creates 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.

4.14.5 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 Class I airsheds.

4.14.6 Cumulative Effects – The action alternatives would have little or no effect to air quality in the Wilderness or adjacent communities, therefore no cumulative effects analysis is necessary.

4.14.7 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.

4.15 CLIMATE CHANGE

4.15.1 Introduction – A growing body of scientific evidence and climate modeling indicate that climate change is occurring. While there are no specific projections for the project area, the situation would likely be one where the summers are drier and the snow melts earlier in the spring (Bare 2005) (Mote 2003), (Mote 2005), (Dale 2001).

There are some who believe that climate change is not occurring or that it is not human caused. This document is not intended to present arguments on any of these theories because they are well documented elsewhere.

This project was not specifically designed to mitigate or respond to potential climate change. This section addresses aspects of the project that may affect carbon emission or sequestration and how the project may help or hinder the forest's ability to deal with climate change. This analysis will not attempt to quantify carbon emission or sequestration.

4.15.2 Existing Situation

This project involves the thinning of second-growth plantations. Rapidly growing forests are recognized as a means of carbon sequestration (FAO 2007). Forest health and growth issues are discussed in section 4.1.

4.15.3 Direct, Indirect and Cumulative Effects

This project is not likely to have direct localized effects on climate. By its very nature, the discussion of a project's effect on climate change is indirect and cumulative because the effects occur at a different time and place, and because the scale of the discussion is global. Since it is not reasonable to measure a project's global impact, the discussion here focuses on key elements of forest management discussed in the scientific literature.

For this proposal, the following actions have the potential to affect carbon emissions or sequestration:

- Thinning to enhance the health of the residual stand would result in trees that are better able to withstand stresses such as dry summer conditions (Millar 2007) (Spittlehouse 2003). The no-action alternative would result in trees that are stressed by moisture competition.

- Variable density thinning with skips and gaps and the retention of minor species would result in stands that are resilient and better able to respond to whatever changes come in the future (Millar 2007). The no-action alternative would result in uniform crowded stands.

- Fossil fuel is used by equipment such as saws, tractors, skyline yarders, helicopters and log trucks. It is possible for some of this equipment to use biofuels, and it is likely to be used where it is available and price competitive. Helicopters would use more fuel than other yarding options. The no-action alternative would not use fuel.

- Small quantities of debris at landings would be burned, releasing carbon into the atmosphere. Burning at landings would be minimal because most tree

tops and branches of harvested trees would be left scattered in the forest. In moist forests, leaving this debris on the ground would not result in a high fire hazard situation and there is no plan to burn or dispose of this scattered woody material. The no-action alternative would not have any burning.

- Woody debris retained on the ground increases soil carbon sequestration (Millar 2007). The action alternatives would retain existing debris and logs on the ground and would add more in the form of branches and tree tops and trees felled to create large woody debris. The no-action alternative would result in stagnation of trees and some would eventually die and fall to the ground.

- Utilizing trees to create long-lived wood products sequesters carbon. The no-action alternative would not create any long-lived wood products (IPCC 2007) (FAO 2007) (Stavins 2005) (Upton 2007).

To summarize, the alternatives would result in some carbon emissions and some carbon sequestration. The benefits to forest health and resiliency with the action alternatives would allow stands to better respond and adapt to the future climate.

Public comment suggested that certain literature such as the Wilderness Society's paper 'Wood Products and Carbon Storage' (Ingerson, 2009) show that on balance the process of harvesting wood and turning it into products may release more greenhouse gases than sequestering carbon in forests by leaving the trees there. Other literature (Upton 2007) compared the greenhouse gasses emitted and sequestered by wood based housing to alternative building materials and found that wood housing had a lighter impact than the alternatives. The purpose of this analysis is not to resolve this debate. This project was not specifically designed to mitigate or respond to potential climate change and no attempt has been made here to quantify carbon emission or sequestration or to assert that one alternative would emit or sequester more than an other.

4.16 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 towns of Dee, Parkdale and Hood River near the project. Even farther away, but potentially affected is the American Indian community of Warm Springs. There are no known areas of religious significance in the area and the units do not contain key huckleberry habitat. 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. Neither the impacts nor benefits of this project would 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.

4.17 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 action alternatives 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.

5.0 CONSULTATION AND COORDINATION

The Forest Service consulted the following Federal, State, and local agencies and tribes during the development of this environmental assessment:

5.1 FEDERAL, STATE, AND LOCAL AGENCIES

U.S. Fish and Wildlife Service	National Marine Fisheries Service
Oregon Historic Preservation Office	The Dalles Watershed Council
City of The Dalles	Wasco Co. Board of Commissioners
City of Dufur	Hood River County Planning Department
City of Mosier	Wasco County Court
City of Hood River	Oregon DEQ
Oregon State Parks	Oregon Department of Transportation
Oregon Department of Fish and Wildlife	Oregon Department of Forestry
Oregon Marine Board	Oregon Division of Lands
Environmental Protection Agency	

5.2 TRIBES

Confederated Tribes of Warm Springs

5.3 Scoping and Public Involvement

A scoping process to request public input for this project was conducted. A letter describing the proposed project and requesting comments was sent out on October 27, 2008. The Forest publishes a schedule of proposed actions (SOPA) quarterly. The project first appeared in July 2008, and in subsequent issues. A 30-day comment period ended on August 3, 2009. Responses to substantive comments are included in Appendix C. A list of persons and organizations that were sent notice is in the analysis file along with a list of commenters and the complete text of comments.

5.4 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 19 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 15 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 30 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 30 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 29 years in Oregon, Washington and Idaho. She is a specialist in soil science and hydrology.

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 30 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 30 years as a hydrologist for the Forest Service in California and Oregon.

Susan Rudisill - Archaeological Technician. Susan has worked for the Forest Service for 25 years. She has served as an Archaeological Technician for the Forest Service for 19 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.

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 30 years in Washington and Oregon, including 22 years on the Forest.

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