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Environmental Assessment
Rethin

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

The project is located in T.4 S., R.5 E.; T.4 S., R.6 E.; T.5 S., R.7 E.; T.6 S., R.6 E.; T.6 S., R.7 E.; T.6 S., R.8 E.; T.7 S., R.6 E.; T.7 S., R.7 E.; Willamette Meridian.

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An example of post harvest plantation thinning

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1.0 SUMMARY

The Mt. Hood National Forest proposes a restoration thinning project in stands ranging in age from 47 to 73 years old. The project is located in the Clackamas River Ranger District, Mt. Hood National Forest, Oregon.

The purpose of this project is to thin second-growth stands to achieve multiple objectives. These stands have already been thinned once but they have grown to the point where thinning is again appropriate. In these stands, the first thinning was done to a uniform spacing and there is the opportunity to introduce variability in this second thinning. The proposed action is to thin and harvest wood fiber from approximately 2,175 acres of matrix land, late-successional reserves and riparian reserves. This acreage figure represents the sum of all of the stands. It is estimated that approximately 2,072 acres would actually be thinned after subtractions for stream protection buffers that occur in many units. Refer to s. 2.3 for greater detail.

The Forest Service evaluated the no-action alternative and the proposed action.

2.0 INTRODUCTION

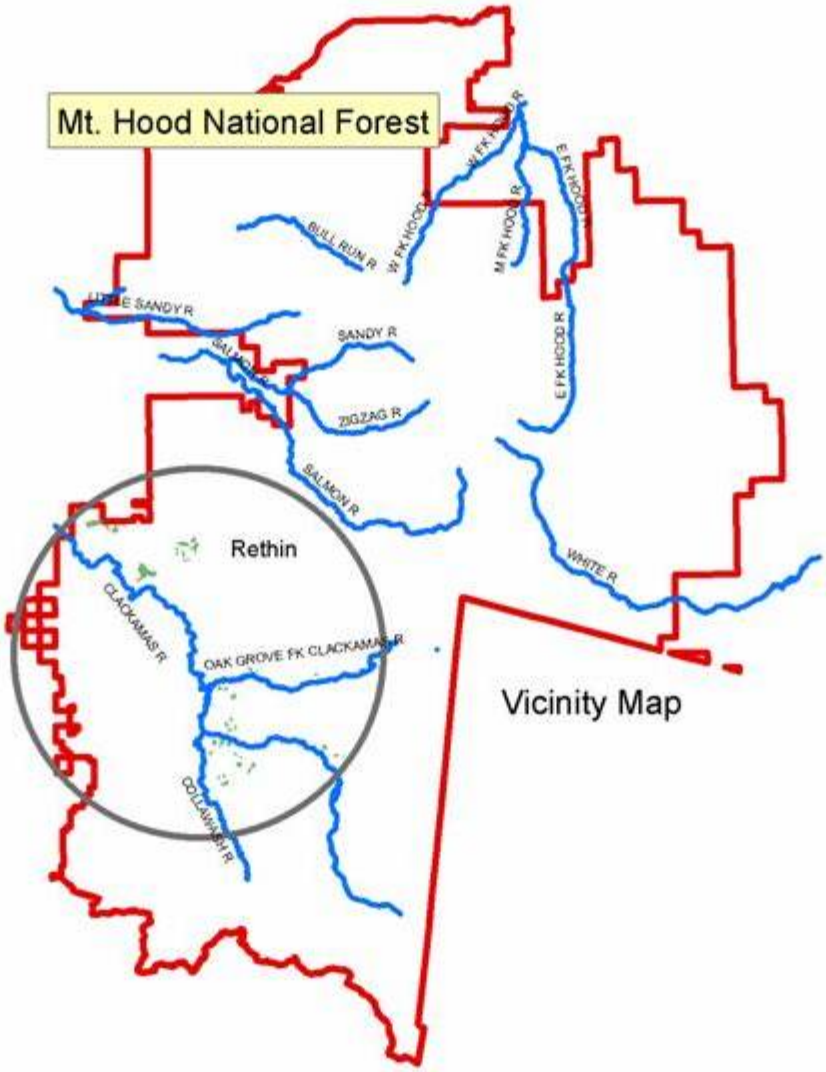
2.1 Document Structure

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

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



2.2 Purpose and Need for Action

The following purposes of this project are derived from the Mt. Hood Forest Plan as amended.

- 2.2.1 Riparian Reserves

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

  This action is needed because these stands occur in riparian reserves and because the current vegetation does not meet the needs of associated aquatic and riparian resources (The Mt. Hood Forest Plan describes this need on p. Four-17 to 20, Northwest Forest Plan Standards and Guidelines p. C-32). In many stands, the riparian reserves were not thinned in the first thinning because watershed analysis had not yet been completed. The watershed analyses have since been completed and recommend thinning young stands in riparian reserves. 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. These stands can be enhanced by thinning to accelerate the development of mature and late-successional stand conditions.

- 2.2.2 Late-Successional Reserves

  One of the purposes of this project is to enhance late-successional reserves.

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

- 2.2.3 Diversity

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

  This action is needed because these stands continue to 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 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 Mt. Hood Forest Plan describes this need on p. Four-67). If no action is taken, over time the stands would become increasingly dense resulting in a period of low structural diversity that could last more than 100 years.

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.

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

- 2.2.5 Forest Products

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

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

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

- The Mt. Hood National Forest Land and Resource Management Plan as amended (USDA 1990b) (referred to as the **Forest Plan**). The Forest Plan contains standards and guidelines applicable to this project. Consistency is addressed in each resource section 4.0.
- The Mt. Hood National Forest Land and Resource Management Plan Final Environmental Impact Statement (USDA 1990a). This document discusses environmental effects for Forest-wide programs 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 4.9.

- The Forest Plan was amended by the 2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines. (USDA, USDI 2001).
- The Forest Plan was amended by the 2004 Record of Decision to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines. Many species were removed from the requirements of the Survey and Manage Standards and Guidelines and placed on sensitive species lists. A subsequent court case set aside parts of the 2004 Record of Decision and reinstated the 2001 Record of Decision except for thinning projects in stands less than 80 years old (October 11, 2006, modified injunction in Northwest Ecosystem Alliance et al. v. Rey et al., Civ. No. 04-844 P (W.D. Wash)). All of the units for this project are less than 80 years old (they are between 47 to 73 years old). Effects to sensitive species are addressed in s. 4.3.9, 4.5.1 & 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). The 2007 Record of Decision was developed to resolve this matter but no ruling has yet been made.

2.2.7 **Maps** – In addition to the vicinity map above, Appendix E contains close-up 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	Units, Comments
Late-Successional Reserves	86	Portions of units 33 and 35
Riparian Reserves and A9 Key Site Riparian	487	Most units have a portion of riparian reserve.
A1 – Wild and Scenic Rivers	18	Portion of unit 29
B2 - Viewsheds	952	Portions of Units 2,3,17,18,19,20,21,22,23, 24,25,26,28,29,30, 31,32,33,34,35,36,38,39,40, 41,42,43,44,45 and 46
B8 - Earthflow	497	Portions of Units 17,21,22,23,25,26,28, 32,33,34,35,36,38,39,42,43 and 46
C1 – Timber Emphasis	1072	Portions of Units 1, 2, 3, 4, 5, 6, 9, 10, 14, 16, 40, 43, 45, 47 and 48

2.2.9 **Watershed Analysis** – The project is covered by several watershed analyses including Upper Clackamas, Collawash/Hotsprings Fork, Oak Grove Fork, Lower Clackamas and North Fork Clackamas.

This project is consistent with the recommendations of the watershed analyses. Portions of the project are delineated as key watersheds (this is not a land allocation).

Riparian Reserves –

This project has adopted the concepts for riparian reserve delineation described in the watershed analyses. The site-potential tree height for this project is 180 feet. Also included in riparian reserves are certain unstable geological features. While streams, rivers, ponds, wetlands and certain unstable geological features were shown on maps in the watershed analyses, 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 analyses maps were found to not be there while other unmapped streams were discovered. There is also newer information about fish presence. 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 analyses or the Northwest Forest Plan but simply a more accurate refinement of the intent of those documents.

2.2.10 **LSR Assessment** – Approximately 86 acres are in late-successional reserves. The North Willamette LSR Assessment (1998) covers these units. The Regional Ecosystem Office (REO) reviewed this project and found it to be consistent with LSR standards and guidelines (RIEC 2008).

2.2.11 **Roads Analysis** – A Forest-wide Roads Analysis was completed in 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 **Mt. Hood Forest Plan (**as amended) that are relevant to this proposal are summarized below.

Health	Forest stands have low levels of disease, damaging insect populations and storm damage. Four-92, FW-382; and Four-292, C1-22.
Growth	Forest stands are healthy and vigorous, and have growth rates commensurate with the 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.
Late-successional Reserves	Late-successional reserves contain sufficient late-successional and old-growth forest ecosystems to meet the habitat needs for species such as the northern spotted owl. NFP page C-11.
Snags & Down Logs	Snags, down logs, and recruitment trees are well distributed across the landscape in sufficient quantity and quality to support species dependent upon these habitats. NFP page C-40.
Deer & Elk	The forest contains a mix of habitats including forage, thermal cover and optimal cover. Four-72, FW-202 to 207.
Landscape Health	Landscapes are healthy and productive and provide a mix of forest and non-forest habitats to support diverse populations of desired plant and animal species. Watersheds provide long-term sustained production of high quality water for fish and for on-Forest and off-Forest water users. Landscapes are actively managed. Four-2 to 5. The project is not within a wildland-urban interface and is not in a high fire hazard landscape.
Invasive Plants	Healthy native plant communities remain diverse and resilient, and damaged ecosystems are being restored. High quality habitat is provided for native organisms. Invasive plants do not jeopardize the ability of the National Forests to provide goods and services communities expect. The need for invasive plant treatment is reduced due to the effectiveness and habitual nature of preventative actions, and the success of restoration efforts. Appendix 1-1, ROD for Preventing and Managing Invasive Plants.
Harvest Levels	Provide forest products consistent with the Northwest Forest Plan goal of maintaining the stability of local and regional economies now and in the future. Timber outputs come primarily from the Timber Emphasis (C-1) portion of the

	Matrix lands, with lesser amounts coming from the "B" land allocations of the Matrix. Minor amounts of timber may also come from restoration thinning in 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 Mt. Hood National Forest proposes a restoration thinning project in stands ranging in age from 47 to 73 years old. These stands have already been thinned once but they have grown to the point where thinning is again appropriate. In these stands, the first thinning was done to a uniform spacing and there is the opportunity to introduce variability in this second thinning. The proposed action is to thin and harvest wood fiber from approximately 2,175 acres of matrix land, late-successional reserves and riparian reserves. This acreage figure represents the sum of all of the stands. It is estimated that approximately 2,072 acres would actually be thinned after subtractions for stream protection buffers that occur in many units.

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.
- 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.
- 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 180 feet for non-fish-bearing streams and 360 feet for fish-bearing streams. 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 without any further thinning. Portions of the riparian reserves would be thinned to achieve a conifer relative density of 30. For stands that are less than one mile up stream of listed fish habitat, this RD would apply to the portion of the stand located between the protection buffer and a line that is 180 feet from the stream. For stands that are greater than one mile upstream of listed fish habitat, this RD would apply to the portion of the stand located between the protection buffer and a line that is 100 feet 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. Other portions of the riparian reserves would be thinned to a relative density of 20 to 35.

Skips & Gaps - The protection buffers along streams may be considered skips. Other skips would be created outside of protection buffers that would vary in size and would make up to 5% of each unit. Gaps and heavy thins 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 and heavy thins would have similar size and distribution but would be 180 feet or farther from listed fish habitat.

2.3.3 Protection Buffers – The width of protection buffers may vary from the following minimum widths based on site conditions: Streams adjacent to listed fish habitat would have 100-foot wide buffers (this applies to unit 29). All other streams would have 50-foot wide buffers. This project is designed to be consistent with the Fisheries Programmatic Biological Assessment. The Fisheries Programmatic Biological Assessment suggests that perennial streams and intermittent streams within one mile of listed fish habitat have 50-foot wide buffers and that intermittent streams farther than one mile of listed fish habitat have 30-foot wide buffers. Even though 30-foot wide buffers on intermittent streams are sufficient to protect riparian resources, water quality and fish, this project has been designed to provide 50-foot wide buffers instead based on public concern.

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 – There are some small seeps and wet areas that are too small to show on maps. Riparian features that are not perennial or intermittent streams such as seeps, springs, ponds or wetlands would be protected by the establishment of protection buffers that incorporate the riparian vegetation. Certain perennially wet features that are habitat for 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. Unstable areas that are part of riparian reserves would not be thinned.

2.3.5 Late-Successional Reserve - In late-successional reserves, the thinning would be designed to accelerate the development of mature and late-successional stand conditions and to enhance diversity. Where riparian reserves overlap late-successional reserves, the relative densities, protection buffers, and skips/gaps as described for riparian reserves would be used. The proposed treatments would be designed to meet the LSR objectives without any future thinning. Trees would be retained at a relative density of 20 to 40. In late-successional reserves, trees would not be cut if they are greater than 20 inches in diameter (at a height of 4.5 feet). If larger trees need to be cut for skyline corridors, skidtrails, landings or temporary roads they would be left in place. (The LSR units contain very few if any trees of that size.) Hardwood trees across a range of size classes would be favored, including large trees that occupy mid-canopy and higher positions.

Skips & Gaps - Skips would be created that would vary in size and would comprise a minimum of 10% of each unit. Skips would be 0.25 to 1.25 acres or larger where appropriate based on site-specific conditions. Where riparian reserves overlap late-successional reserves, the protection buffers adjacent to streams may be counted as skips. Gaps and heavy thins would be created on 3 to 10 % of each unit.

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.

Skips & Gaps - Skips would be created that would vary in size and would comprise up to 5% of each unit. Where riparian reserves cross through matrix, the protection buffers adjacent to streams may be counted as skips. Gaps and heavy thins would be created on up to 3 % of each unit.

2.3.7 Roads –

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, 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.

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

One future project is the designation of OHV routes in the La Dee Flat area. While the OHV plan is not final at this time, the various alternatives deal similarly with the roads needed for the Rethin project. Units 2 and 3 are within the OHV area. They would utilize road 4611.130, which would eventually be converted to an OHV trail and roads 4611.132, 4611.135, 4611.012 and 4611.014 which would eventually be closed to all traffic. These conversions would happen after thinning in units 2 and 3 is completed.

2.3.7.1 **Road Repair and Stabilization**

To facilitate safe use, several roads are in need of repair including deep patch repairs and leveling courses added over poly fabric. In addition, most haul roads would receive road maintenance including ditch and culvert cleaning and brushing. Gravel roads would have rock added in spots and would be bladed and shaped where needed. This work is within the road prism.

2.3.8 Unit Table

Unit	Acres	LSR	Ground Based Acres	Skyline Acres	Helicopter Acres	Existing Temporary Roads (ft.)
1	207.2		159.8	47.4		1690
2	387.7		387.7			
3	47.7		47.7			
4	26.7				26.7	
5	27.2			27.2		
6	20.6		8.1	12.5		
9	109.5		12.7	87.4	9.4	
10	41.8		4.2	28	9.6	950
14	119.2		81.6	38.8		1320
16	50.6			50.6		1426
17	34		18.3	15.8		
18	6.3			6.4		
19	2.8		2.8			
20	23.7			23.7		
21	25.5			25.5		739
22	55.6		42.9	12.7		
23	33.8			33.8		
24	72		72			
25	28.1			28.1		
26	39.4		39.4			
28	34.1		5.9	28.2		422

Unit	Acres	LSR	Ground Based Acres	Skyline Acres	Helicopter Acres	Existing Temporary Roads (ft.)
29	57.1		52.6		4.4	
30	31.9				31.8	
31	6.9			6.9		
32	59.3		45.6	13.6		422
33	50.4	32.1		50.4		
34	11.1			11.1		370
35	55.6	46.6		55.6		
36	39.5		9.9	20.8	8.7	
38	21.2			11.2	10	317
39	23.5		23.5			
40	23		23			
41	15.8			15.8		211
42	4.4			4.4		528
43	57.1		33.5	23.6		
44	39.4			39.4		211
45	51.1			51.1		
46	68.6		21.5	47.1		317
47	51.8		5.4	46.4		
48	83.1		60	23.1		2587
	2174.8		1,155.1	919.1	100.6	11,510

2.3.9 Best Management Practices (BMPs) and Design Criteria

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

1. **Seasonal restrictions**

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

1.2 **Deer and Elk Winter Range:** No harvest operations, road construction, use of motorized equipment or blasting would be permitted in Crucial and High Value winter range areas between December 1 and March 31. The restriction would be waived in the high value zone if snow accumulation levels are less than 12 inches or if it is determined that the area is not being used by elk. Units 1, 17, 21, 22, 23, 25, 26, 29, 30, 47 and 48 are in the crucial zone. Units 32, 33, 34 and 36 are in the high zone.

No log haul or snow plowing would be permitted except on certain "backbone" roads between December 1 and March 31. The only unit that has NO hauling or snow plowing restriction is unit 20. Units 21, 32, 33, 34, 35, 36, 40, 41, 42, 43, 44 and 45 are accessed by roads that cross the high value zone. This restriction may be waived in the high value zone if snow accumulation levels are less than 12 inches along the haul route or if it is determined that the area is not being used by elk. No log haul or snow plowing would be allowed between December 1st and March 31 for the remainder of the units which are accessed by roads that cross the crucial value zone. *This implements Forest Plan standard and guideline FW-211 and a memorandum of understanding with Oregon Department of Fish and Wildlife.*

1.3 **Peregrine Falcon:** No helicopter use would occur in unit 36 between January 1st and September 30th. Other operations in this unit could occur at any time.

In Unit 32, no activities that produce noise would be allowed between January 1st and July 31st.

These restrictions may be waived if the nest site is unoccupied or if nesting efforts fail and there is not possibility of re-nesting. Documentation of nesting failures can be finalized no earlier than June 30th due to the possibility of re-nesting.

2. **Snags & wildlife trees:** To enhance diversity, variable-density thinning would include the retention of snags and wildlife trees.
   - Snags would be retained in all units where safety permits. If snags must be cut for safety reasons they would be left on site.
   - To increase the likelihood that key snags would be retained, they may be included in skips.
   - 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.
   - 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. Two to four

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

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

4. **Erosion:** To reduce erosion from 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.*

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

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

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

5. **Riparian Reserves –** Specific Riparian practices are described in the Alternative section (s. 2.3.2 to 2.3.4). *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 Fisheries Programmatic Biological Assessment. Project specific variances are documented in the Project Biological Assessment.*

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

6.1 Ground based tractors, skidders or mechanical harvesters would not be used on slopes greater than 35%.

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

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

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

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

6.6 Generally landings are not planned near streams. The Fisheries Programmatic Biological Assessment contains detailed guidance for minimum distances from streams for existing and new landings. If landings are needed in riparian reserves, they would be located on existing roadways that do not require expansion of the road prism or on existing landings that may require only minimum reconstruction (clearing vegetation, sloping for drainage, or surfacing for erosion control purposes) to be made suitable for use.

6.7 When skyline yarding over streams, full suspension over the channel and buffer would be achieved. Existing skyline corridors would be used where feasible to minimize tree removal from the protection buffer. The Fisheries Programmatic Biological Assessment contains detailed guidance for protection buffers.

6.8 There are areas of concern for OHV access in units 2 and 3. This design criteria is applicable in these units and is designed to prevent the expansion of OHVs into the units.

- Within units 2 and 3, slash, tree tops, root wads, boulders, logs and other debris would be placed on temporary roads, landings and skid trails that are used by the operator to discourage OHV use.
- The use of landings on roads other than 4611-130 would be encouraged where feasible. Landings on road 4611-130 would only be used where other options are not feasible.
- To protect brush and other vegetation that may deter OHV mobility, no logging equipment would be operated within 40 feet of road 4611-130 except on roads, designated skid trails and landings.
- OHV use patterns would be monitored. If OHV use expands into the units in spite of the above measures, corrective actions would be taken that may include but would not be limited to bringing in additional debris from off-site.

7. **Roads –** *These are BMPs.*

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

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

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

7.4 The Fisheries Programmatic Biological Assessment contains detailed guidance for minimum distances from streams and other specifications for road renovation, reconstruction, maintenance and log haul.

7.5 Temporary roads would normally be constructed, used and obliterated in the same operating season. If this is not possible, due to fire season restrictions or other unforeseen delays, the road would be winterized prior to the end of the

normal operating season by out-sloping, water-barring, effectively blocking the entrance, seeding, mulching and fertilizing.

8. **Invasive species:** *This implements Executive Order 13112 dated February 3, 1999, and standards and guidelines of the Regional Invasive Plants Record of Decision.*
   - All off-road equipment is required to be free of soil, seeds, vegetative matter, or other debris that could contain or hold seeds prior to coming onto National Forest lands. Contracts would include provisions to minimize the introduction and spread of invasive plants. These provisions contain specific requirements for the cleaning of off-road equipment.
   - Gravel or rock used for roads would come from weed free sources.
   - Road blading, brushing and ditch cleaning in areas with high concentrations of invasive plants would be conducted in consultation with invasive plant specialists.

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

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

    Prior to advertisement of a contract, the provisions of the contract and other implementation plans would be checked with this document 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.

2.4 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 December 19, 2007. The Forest publishes a schedule of proposed actions (SOPA) quarterly. The project first appeared in October 2007, and in subsequent issues. A 30-day comment period ended on November 3, 2008. Responses to substantive comments are included in Appendix A. 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

There are some members of the public that have concerns particularly about roads and decadence management. No significant issues were identified that would aid in the formulation of other viable alternatives.

2.4.2 Discussion of Concern about Roads

There is a concern about the total quantity of roads on the landscape and the impacts that those roads are causing to forest resources. The proposed action uses roads to achieve project objectives including the reopening of existing temporary roads. There is a concern about the direct, indirect and cumulative effects of roads. Roads are discussed in the following sections: sediment from road construction (s. 4.3.3), effects to fish stocks of concern (s. 4.3.12), effects to hydrologic stability (s. 4.3.7.1), effects to road density (s. 4.5.3.9). The proposed action would not construct any new roads. Landscape wide analysis of roads is being conducted and included in other restoration assessments.

2.4.3 Discussion of Concern about Decadence

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. 4.1.1.1, 4.1.2.2, 4.1.2.3, 4.1.3.1, 4.1.3.2, 4.1.5, 4.2.3, 4.5.2, and 4.6.10. The proposed action, no action and the other alternatives considered, display the range of effects and benefits for this concern.

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 restoration thinning or other associated actions would be implemented to accomplish project goals.

3.2 Other Alternatives Considered

3.2.1 A comment was received suggesting that an alternative be considered that does not include a traditional commercial timber sale. It would thin gradually over time by felling some trees and leaving them in the stand. Road obliteration and invasive plant removal would also be part of this alternative. There is limited funding for this type of work. 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 project was not designed as a traditional commercial timber sale; it is a restoration thinning.

3.2.2 The LSR Assessment contains a discussion of coarse woody debris. The recommendation was to have 10 to 15 percent of the ground covered by down logs five years after harvest. The existing condition is well below these levels. Achieving these goals with this proposed action is not considered a viable option.

The cost of girdling and felling trees is estimated at up to $3,900 per acre. There would also be a reduced economic viability of the thinning project because up to 75 additional trees per acre would have to be left after thinning. If the strategy of creating all of the down wood at once were adopted, all of the LSR thinning would become unviable and the units would be deleted from the thinning project, defeating the important long-term goal of having large live trees in LSRs. There is limited funding to accomplish this work.

This option was considered but the down wood created would be relatively small. The development of the proposed action considered the balance between providing some down wood and accomplishing variable density thinning.

3.2.3 Public comments suggested that the project be broken up into several EAs instead of one. “The proposed actions encompass several watersheds, and there are differences in elevation of thousands of feet with markedly different vegetation patterns, soil and earth flow conditions, and existing wildlife; these make the ecological and geophysical scope too broad for project issues to be handled by a single document. In addition, the size of this project (2,200 acres spread out over 20 miles) poses problems for the public to effectively comment on or participate in the planning process.”

The units have similarities because they have been thinned before. The aspects of the project described above are similar in scope to other recent thinning EAs such as Cloak and the 2007 Plantation Thinning. The scope of the project was reviewed with the decision

maker early in the planning phase and it was decided to pursue this project with one EA to gain efficiencies and facilitate better cumulative effects analysis.

3.2.4 Public comments suggested that the Forest Service cease logging within one mile of the proposed La Dee Flat OHV area. There is doubt that the OHV plan will work and that roads proposed for closure under the plan would be violated. Units 2 and 3 are within the OHV area. Due to concerns expressed, new design criteria were added (s. 2.9.3.6.8) similar to those used in the recent No Whisky project. The option of deleting these units was considered but the added design criteria would likely work to minimize intrusion of OHVs into the units.

3.3 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.

	No-Action Alternative A	**Proposed Action Alternative B**
Acres of Riparian Reserve Enhanced	0	487
Acres of Late-successional Reserve Enhanced	0	86
Acres with Diversity Enhanced	0	2075
Acres of Stand Growth and Productivity Improved In Matrix	0	1072
Approximate Output (million board feet)	0	20

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. Cumulative effects analysis was guided by 36 CFR 220. The land area and the time scale used for cumulative effects analysis varies by resource.

4.0.2 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 power line construction as well as the growth that has occurred since.

The proposed action involves the thinning of young stands. In recent years, several other thinning projects have been planned. Some of these are under contract but not thinned yet and others are being thinned at the same time the analysis is being conducted. All of these current projects, whether under contract or not are included in the analysis as if they are completed already.

4.0.3 The analysis considers the impact of activities on other ownerships where appropriate. In the vicinity of unit 1 there are lands managed by the Bureau Of Land Management (BLM) and a private timber company.

4.0.4 The Forest is developing a plan to designate road and trail routes for off-highway vehicles (OHV). It would change OHV access through much of the Forest in order to meet the intent of the Travel Management; Designated Routes and Areas for Motor Vehicle Use; Final Rule that was published on November 9, 2005 (70 FR 216). The OHV plan would designate OHV routes within six proposed OHV areas. One of the proposed OHV study areas (referred to as La Dee Flat) overlaps units 2 and 3.

4.0.5 The Proposed Palomar Gasline Transmission Project (PGT) is being evaluated by the Federal Energy Regulatory Commission (FERC). The proposed route crosses east/west through the middle of the Forest. The Forest Service is a cooperating agency on the environmental impact statement (EIS) that is being prepared by FERC. The proposed pipeline would clear a construction easement approximately 120 feet wide. No decision

has yet been made to go forward with this proposal and alternative routes may yet be examined. The proposed route does not cross through any Rethin units.

4.0.6 The Forest is currently working on two road decommissioning EAs. Neither of these efforts overlap the Rethin project. Other future road decommissioning planning efforts may overlap the Rethin project area; however, at this time there are no reasonably foreseeable future road decommissioning proposed actions. There is insufficient site specificity to conduct a useful cumulative effects analysis. When future proposed actions are developed, a cumulative effects analysis would be included in a future EA.

4.07 There are many young plantations across the Forest that may eventually be dense enough to benefit from thinning. In the Rethin project area there are no reasonably foreseeable future actions to thin plantations. There is insufficient site specificity to conduct a useful cumulative effects analysis. When future proposed actions are developed, a cumulative effects analysis would be included in a future EA.

4.1 STAND GROWTH AND PRODUCTIVITY

(This section elaborates on Purpose and Need - section 2.2)

4.1.1 **Introduction –** The proposed action involves the thinning of stands that have been thinned before and are 47 to 73 years of age. The stands have been experiencing rapid growth in recent years but are becoming overcrowded again.

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

4.1.1.2 Thinning generally reduces losses to damaging agents because the vigor and strength of the trees is increased allowing continued growth. However, there are components of thinning activities that may negatively affect growth and productivity. Thinning may temporarily predispose stands to attack by certain agents even while it gradually builds up the resistance of the trees enough to reduce the harmful effects of the same agents. 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 well-spaced trees in the matrix. The proposed thinning is in stands that are at an age and density where they are experiencing some 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).

One term used to describe the degree of crowdedness of individual trees within a stand is Relative Density (RD). It is a scale that ranges from 0 (no trees) to 100 (maximum biological potential) (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 diameters range from approximately 16 to 19 inches, with RDs greater than 60, and trees are experiencing growth suppression and some mortality. The understory vegetation in some stands is prolific while in others it continues to be sparse with some mortality of trees occurring in the intermediate crown class.

Direct and Indirect Effects

4.1.2.2 **Alternative A - No Action -** Trees that have been thinned at uniformed spacing continue to compete for light, growing space, and nutrients as they increase the size of their crowns. As tree competition increases, stems would continue to growth in height, but diameter growth would continue to slow. When trees develop in this manner they are more likely to be susceptible to insects and disease, especially if drought conditions persist.

With no action, the average stand diameters in 40 years would range from 20-25 inches; with stocking at levels where growth suppression and mortality continues to occur (RD would exceed 70).

Failure to maintain tree spacing throughout the life of forest stands would decrease the opportunity for future management options. If no action is taken, the overstocked condition of current stands would result in stands with reduced vigor, increased mortality, and increased susceptibility to stressors such as insects, diseases and weather.

4.1.2.3 **Proposed Action –** 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 stands.

There would be long-term benefits for stand growth and productivity. Average stand diameters in 40 years would range from 23-30 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).

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

Thinning results in several key changes in tree structure and vigor: larger stem diameters, longer and wider live crowns, less cylindrical stem form (reduced height to diameter ratio), and enhanced tree vigor (faster growth and healthier physiological condition). Because growing space made available by thinning is temporarily unoccupied, total tree growth production is reduced proportional to the intensity of the thinning; however, the temporary reduction in mortality can also lead to a higher standing live volume in thinned versus 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 Late-Successional Reserves (LSR)

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

4.1.3.1 Existing Condition

The LSR stands 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 stands are not late-successional and do not meet the needs of late-successional dependent species.

4.1.3.2 Direct and Indirect Effects

No Action

See discussion above in section 4.1.2.1. With no intervention, these stands would remain at maximum density for many decades until natural mortality opens the canopy enough to allow expansion of crowns and understory response from increased light. 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 30-60 years.

Proposed Action

Creating late-successional conditions necessitates density management (Furnish 1997). 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 on matrix units, but LSR units would be more open and would have more skips and gaps.

Eventually trees would be much larger, future snags and down wood would be larger, and there would be greater diversity compared to no treatment. With the proposed action, stands would acquire late-successional characteristics in 20-50 years.

4.1.4 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 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.

4.1.4.1 Existing Condition

The riparian reserve stands 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 stands are not late-successional and do not meet the needs of riparian dependent species. The stands 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.

4.1.4.2 Direct and Indirect Effects

No Action
See discussion above in section 4.1.2.1. With no intervention, these stands would remain at maximum density for many decades until natural mortality opens the canopy enough to allow expansion of crowns and understory response from increased light. 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 30-60 years.

Proposed Action

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 on the matrix portion, 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. With the proposed action, stands would acquire late-successional characteristics in 20-50 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.

4.1.5 Windfirmness and Forest Diseases

Trees that grow at wide spacing and in windy areas can develop resistance to wind by growing strong stems and strong, spreading root systems; this resistance is referred to as windfirmness. Trees with root diseases are more susceptible to being blown over by wind but as the root disease develops they would eventually fall even in the absence of wind.

4.1.5.1 Existing Condition

The current stands appear relatively stable and windfirm. There are some root rot pockets where some trees have fallen. Overall the stands 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 productivity and they result in down wood, some trees with the elements of wood decay and variability of spacing.

4.1.5.2 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. 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 growth in height, but diameter growth would drastically slow.

Thinning results in greater root and stem strength and stability to withstand 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. The stands adjacent to plantations were exposed to wind at the time of the original clear cut and again at the time of the first thin. Trees that remain on these edges have been tested by wind before and it is not likely that the proposed thinning would cause these edges to blow down because the density of leave trees would not result in acceleration of wind.

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.

4.1.6 Cumulative Effects - Stand Growth and Productivity

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

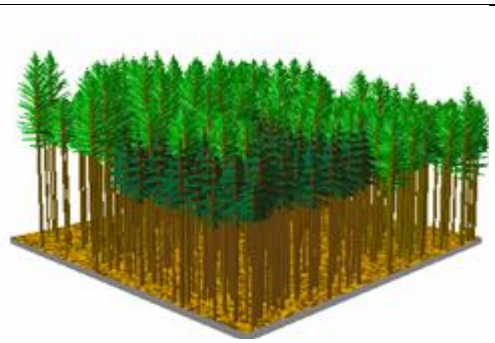
4.1.7 Public Comments

4.1.7.1 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.

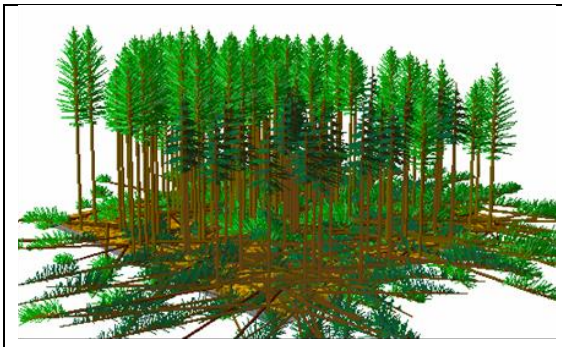
4.1.7.2 A concern was expressed that some of the stands don't look like they need thinning; the trees already seem well spaced. The stands were thinned previously to a uniform spacing. One of the objectives is to introduce variability of leave tree spacing with skips and gaps. Another objective is to thin to increase health and growth. Some of the units may appear widely spaced to the casual observer. However, if we wait until the stands appear to be overcrowded again, it would then be too late to thin effectively. Young stands that have space to grow, quickly close in to the point where growth begins to slow as they compete for nutrients, moisture and sunlight. All of the stands proposed for thinning have been examined by a certified silviculturist, and the analysis of the stand data indicates that they do need thinning both to increase health and growth and to introduce variability. Section 4.1.7.3 contains diagrams illustrating a typical plantation and its response to the first traditional thinning and its response to a second variable density thinning designed introduce diversity. These diagrams come from the Forest Vegetation Simulator (Crookston 1999). The data used to generate these diagrams is typically kept in the analysis file and the analysis is summarized in the EA. The diagrams below are included as visual aids to help readers better understand forest stand dynamics.

A related concern was expressed about how skips would be created in areas already thinned. In a first thinning, skips are areas where no thinning would occur and trees would remain crowded and mortality would occur for the purpose of adding variability. Some skips were created in the first thinning surrounding special areas such as alder patches, seeps and streams: these areas would remain unthinned. Since no skips were created outside of these areas during the previous traditional thinning, it may seem that there is no opportunity to create new skips to get the desired variability. However, as described in the paragraph above, areas that are not thinned a second time would eventually become crowded to the point where they would provide the desired conditions including snags and down logs. The proposed action would create additional skips in appropriate areas based on site-specific conditions such as where in-growth of young trees has occurred, brush has grown, or trees have the elements of wood decay.

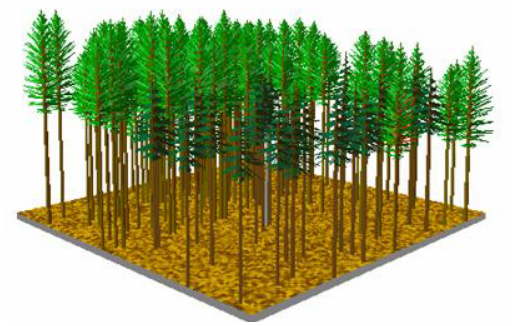
4.1.7.3



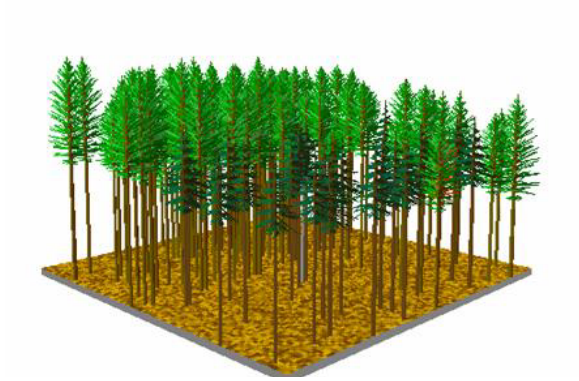
1. Before first thin at approximately age 40. Stand is dense and uniform; little light reaches forest floor.



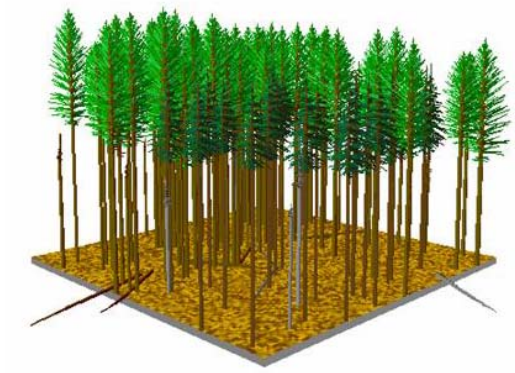
2. During first traditional thin at age 40.



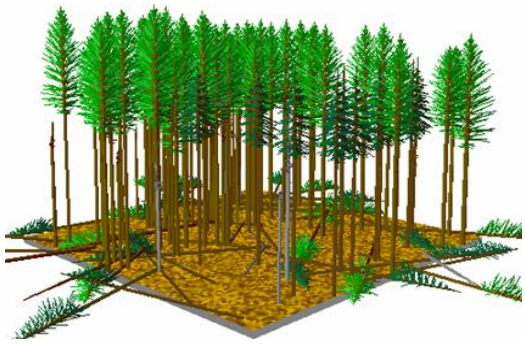
3. After first traditional thin. Trees are evenly spaced to maximize growth with approximately 130 trees per acre.



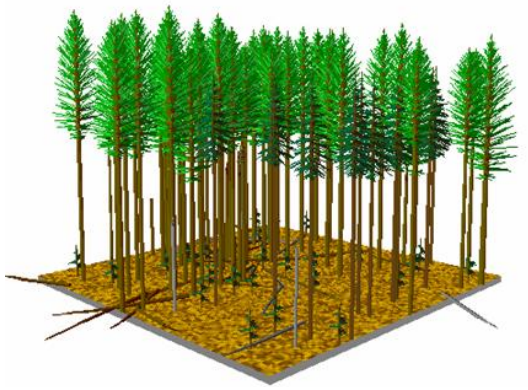
4. Age 50



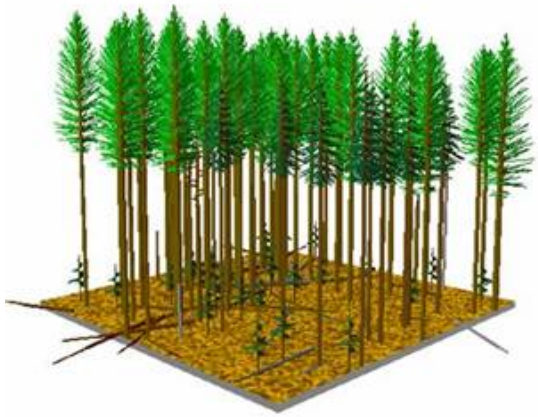
5. Before second thin at age 60. Crowns have begun to close. Some mortality occurs.



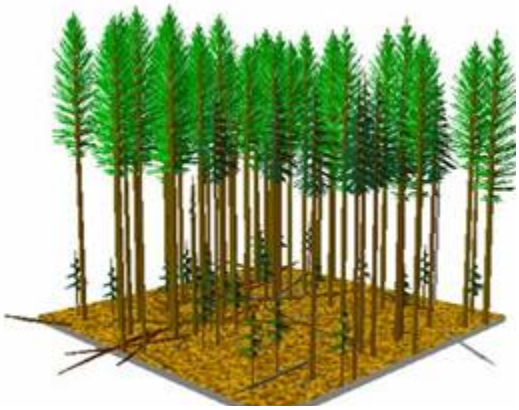
6. During second variable density thin at age 60.



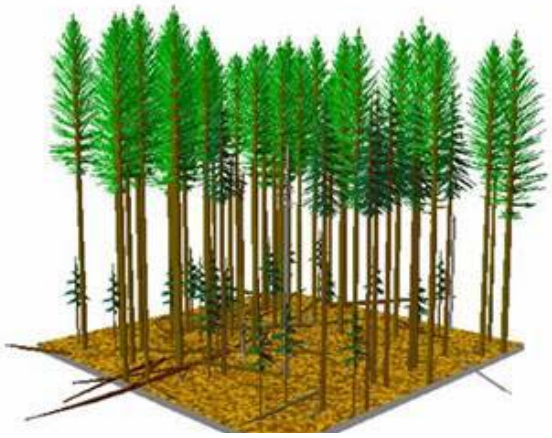
7. Variable density thin has created skips, gaps, down logs and snags. Young trees are seeding into understory. Age 70.



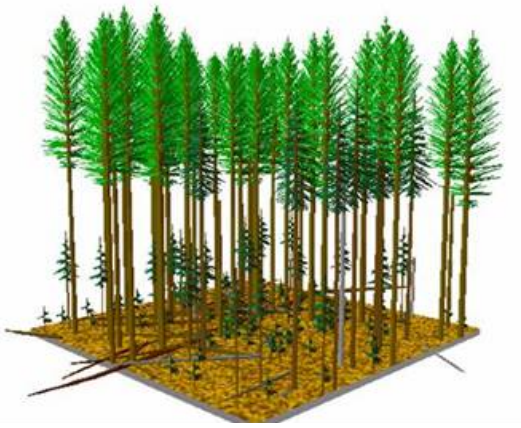
8. Age 80.



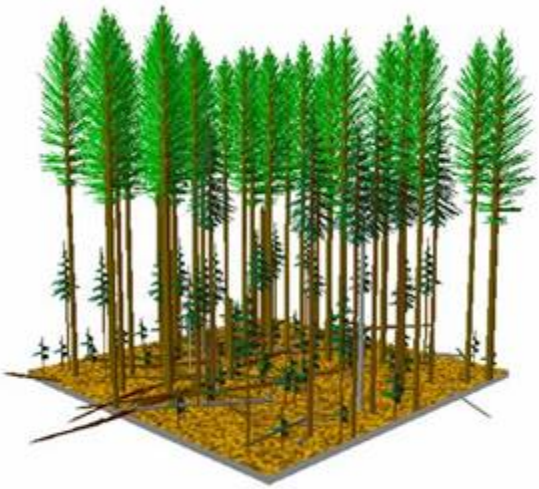
9. Age 90.



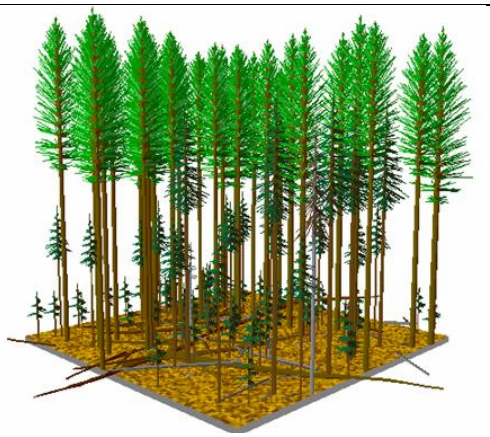
10. Age 100



11. Age 110. A third layer of young trees seeds into understory.



12. Age 120.



13. Age 130. Stand has multi-layered canopy, large trees, snags and down logs.

4.1.7.4 A concern was expressed that in some units there is sometimes variation from one part of the unit to another because of the techniques used in the first thinning. If a single prescription for these units is used it would have drastically different impacts for one half than it would to the other half. There seems to be little information about the thinning prescriptions for each unit.

The previous thinning has been described as uniform or traditional thinning. While this is the case, within each treatment areas there is always a unique prescription that is tailored to the site-specific situation for each project. Rethin is made up from units from 11 different previous thinning timber sales from 8 different EAs. Units were thinned differently the first time because of the differences in resource objectives, stand age, and in some cases restrictions were in place at the time that are no longer applicable. Today the proposal is to introduce variability and diversity into the stands. A site-specific prescription would be prepared as part of project implementation for units or portions of units as needed to accomplish these objectives.

4.1.8 Forest Plan standards and guidelines

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

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

The proposed action is consistent with this standard and guideline.

4.2 LANDSCAPE and STAND DIVERSITY

(This section elaborates on Purpose and Need section 2.2.3)

4.2.1 **Introduction -** Landscape goals include: providing a mix of forest and non-forest habitats to support diverse populations of desired plant and animal species, providing long-term sustained production of high quality water for fish and for on-Forest and off-Forest water users, providing healthy forest stands that are part of a landscape where wildfire risk is minimized, and providing for sustainable uses such as recreation and forest product utilization (s. 2.2.12). 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 have variable density with skips and gaps. Leave trees would include minor species, trees with the elements of wood decay, non-hazardous snags. Some snags and down logs would be created. Some hazardous snags may be lost.

4.2.2 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. There is a need for more sunlight on the forest floor to create greater diversity of ground vegetation.

4.2.3 Direct and Indirect Effects

No Action

The uniformity of previously thinned stands would remain unchanged in terms of species composition, vertical or horizontal structure. Recent studies have indicated that dense, closed-canopy second growth without legacy trees can result in a period of low structural diversity that can last more than 100 years and can have profound effects on the capacity of the forest to develop biocomplexity in the future (Courtney 2004, appendix 5, p. 3-24). The stands contain some small and medium size snags 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.

Proposed Action

The thinning would enhance some elements of diversity that are lacking:

- Leave tree spacing would vary within units and between units.
- Skips and gaps would be created in a variety of sizes.
- 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. Stands 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.

4.2.4 Cumulative Effects

Since there would be little or no negative direct or indirect effects to diversity with the proposed action, 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.

4.2.5 Forest Plan standards and guidelines - Landscape and Stand Diversity

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

The proposed action is consistent with these standards and guidelines. The no-action alternative would not enhance diversity.

FW-148 to 150	The thinning prescriptions retain a diversity of species.
FW-152 to 153	Not applicable
FW-154 &155	The thinning prescriptions retain a diversity of tree species based on site potential and encourage the continued presence of minor forest tree species.
FW-156	No native species would be lost.
FW-157	Alder would be retained as a minor species.
FW-158 to 160	Not applicable
FW-163 to 169	See Wildlife section

4.3 FISHERIES AND WATER QUALITY

4.3.1 **Existing Condition**

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

A Biological Evaluation has been prepared and is summarized in Appendix C. The Rethin project is located within the Upper Clackamas, Middle Clackamas, Oak Grove Fork of the Clackamas River, and the Collawash River 5th field watersheds. The proposed treatment areas are located with 15 drainages within these watersheds. The total area of the drainages associated with the project area is approximately 79,735 acres and includes: Tag Creek, Lower Clackamas River Wards, Lower Clackamas River Tribs, Lower Oak Grove Fork, Middle Oak Grove Fork, Lower Collawash, New Lower Collawash, Pot Creek, Cabin Creek, Austin Segment, Big Bottom Segment, Bedford Creek, Boyer Creek, Winslow Creek, and Lower North Fork of the Clackamas River.

The river corridors of the Upper Clackamas, Middle Clackamas, and Oak Grove Fork along with the Collawash River drainage 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. The Clackamas River is designated as a Scenic and Recreational River under the National Wild and Scenic Rivers Act. It is also designated along with the North Fork of the Clackamas as a State Scenic Waterway. The Wild and Scenic Management Plan describes the outstandingly remarkable values of fish, botany, wildlife, recreation, and cultural resources associated with the Clackamas River.

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

Listed fish habitat (LFH), which is defined as any stream reach potentially occupied by ESA protected fish species, any stream reach designated as Critical Habitat (CH), or any stream reach designated as Essential Fish Habitat (EFH), occurs adjacent to the proposed project area in Pot Creek. LFH also occurs downstream of the project area in the

mainstem Clackamas River, North Fork Clackamas River, Oak Grove Fork, and Collawash Rivers.

The project proposes the thinning of stands ranging in age from 47 to 75 years old that occur in various land allocations including matrix, late-successional reserves, wild and scenic rivers, viewshed, earthflow, and the dry upland portion of riparian reserves. Thinning in riparian reserves is proposed for approximately 487 acres with the proposed action. Of these acres, thinning would occur on approximately 29.6 acres of riparian reserve that is adjacent to LFH.

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.

The average height of the trees within the stands proposed for treatment ranges from 85 feet to 130 feet with a diameter averaging between 12 and 16 inches. The trees are primarily Douglas-fir and western hemlock. The current stocking levels range from 130 to 185 trees per acre.

Direct and Indirect Effects

For this proposal, the following actions have the potential to affect water quality and aquatic species or their habitats: tree felling, road maintenance, log yarding, log haul, and road 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 Alternative A (No Action)

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

If no action were taken in riparian reserves, riparian stands would maintain their mid-seral structure for many decades not reaching the desired late-successional characteristics as quickly as thinned stands. There could potentially be negative long-term effects

because stands would gradually become overcrowded, reducing the capability to produce the size and quantity of coarse woody debris sufficient to sustain in-stream habitat complexity, stream bank stability, and overall health of the riparian reserves. Stands under this condition would be denser, less diverse (structurally), have smaller diameter trees, and less understory development compared to the proposed action.

Alternative B (Proposed Action)

4.3.3 Sediment from Road Reconstruction and Road Maintenance Activities – Road reconstruction 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. There would be no new permanent or temporary roads constructed under the proposed action however it would re-open approximately 2.2 miles of old temporary roads from previous entries to access the stands. These roads do not require reconstruction, but routine blading and brushing to get them ready for use. All re-opened temporary roads would be obliterated and re-vegetated directly following completion of harvest operations to help reduce compaction, increase infiltration rates, minimize surface erosion, and re-establish natural drainage patterns.

Maintenance of the existing system roads prior to hauling would include measures to upgrade the quality of the road bed and to improve road drainage. This includes the placement of new aggregate surfacing where necessary, blading, brushing out encroaching vegetation, and ditch and culvert inlet cleanout where needed. Additionally, deep patch repairs to the roadbed is proposed along some segments of the haul route.

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

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 (6th field) or watershed (5th 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 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. The roads that would be obliterated following harvest activities are on relatively flat terrain and have no direct hydrological connection to any stream source. Project design criteria and associated BMPs for road obliteration would reduce the risk of sediment entering any stream course. The impacts to water quality or fisheries resources caused by sedimentation due to road reconstruction or maintenance, if any, would be short-term and undetectable at the watershed or subwatershed scale.

4.3.4 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 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. This 100 foot no-cut stream protection buffer would apply to unit #29 which proposes riparian thinning adjacent to LFH. A minimum 50 ft. wide no-cut protection buffer would be established along all other perennial and intermittent streams within the project area. 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.

4.3.5 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 outside of riparian reserves, along ridge tops or gentle terrain, and have no hydrological connection to any streams. Road use however would be restricted to periods when road related runoff is not present and as such, little sediment is expected to leave the road bed while haul is occurring.

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

Log hauling would not measurably increase the amount of fine sediment in streams. The roads along the haul route are rocked or paved at stream crossings, and road ditches are well vegetated. Road maintenance prior to log haul would help maintain the design drainage of the road surface which reduces the potential for sediment to runoff into stream courses. Road maintenance and repair would have a beneficial effect on slope stability 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 are no aggregate surfaced stream crossings along the haul route that cross over LFH. All stream crossings where LFH occurs are along asphalt surfaced roads therefore the probability of sediments reaching the stream channels at these crossings is extremely rare.

Any sediment that leaves the road surface due to run-off is expected to disperse over land or be stored within the smaller tributary streams along the haul route. If any sediment is transported downstream it would be during the beginning of the rainy season and would be diluted by a sufficient volume of water where it would be indistinguishable from background levels. It is very unlikely that any measurable amount of sediment produced during log haul would be transported to stream channels where listed fish species occur. If any sediment did enter stream courses from hauling activities, it would be in very small amounts and for a short-term duration. No adverse effect to water quality or fisheries resources is expected to occur from log hauling activities.

4.3.6 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 (180 ft.) from the stream within stands that are adjacent to or within one mile of LFH. In stands adjacent to stream reaches that are greater than one mile upstream from LFH, an RD value of at least 30 would be maintained within 100 ft. from the stream. The thinning prescriptions within riparian reserves would maintain an average 50% canopy closure up to one site potential tree height from all streams in order to retain shade producing vegetation within the secondary shade zone. This design criterion is expected to maintain a canopy closure that provides adequate shade over streams and therefore is unlikely to alter water temperatures.

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 during the hottest time of the year, the designated 50 foot 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.

4.3.7 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 (Christner 1982). 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 off of 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.

4.3.7.1 Hydrologic Recovery

Public comments were received during the 30-day comment period asking for more information about how the cumulative effects analysis was conducted. In particular, people wanted to know how other recent thinning projects were incorporated.

The analysis areas for hydrologic recovery are drainages shown on the map in s. 4.3.7.2.

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. The Rethin units were thinned once and have grown steadily since then.

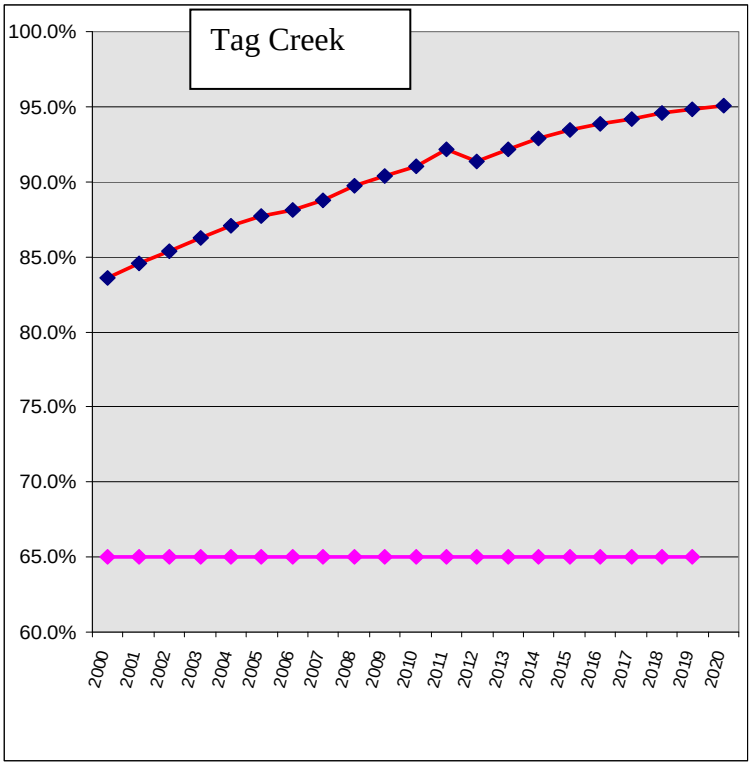
To conduct an analysis of hydrology, all of the stands in the analysis area need to be considered, not just the ones proposed for thinning. Since it is not practical to visit thousands of stands, the condition of current vegetation was derived from a GIS layer: veg2007. This file contains the sizes, shapes, locations and vegetation characteristics for all stands as they have been modified and affected by factors such as past timber harvest, tree growth and fires. Recent timber sales and other projects that have been planned but not yet implemented are also included in the analysis. These planned but not implemented projects are included with their estimated completion date. A computer model in the analysis file contains the spatial data and ages of the stands derived by intersecting the GIS vegetation layer with the drainage layer. Recent timber sales (since 2000) and those not yet completed are tracked by sale name.

Public comments received during the 30-day comment period asked about these specific recent thinning projects. They were included in the analysis where they overlap the same drainages as the Rethin project and are shown in blue on the map in s. 4.3.7.2.

EA Name	Project Name
No Whisky EA	1929 Thin, Cold Thin, Moore Thin, Dry Thin Stewardship, Shay Thin Stewardship
Cloak EA	B Thin, G Thin, M Thin, W Thin, Y Thin, O Thin Stewardship, P Thin Stewardship
2007 Plantation Thinning EA	K9 Thin Stewardship, Hot Thin Stewardship, Pink Thin Stewardship, Reel Thin Stewardship, Rod Thin, Beluga-Orca Thin Stewardship,
Upper Clack EA	Unnamed Stewardship Thinning
Collawash EA	Fan Thin

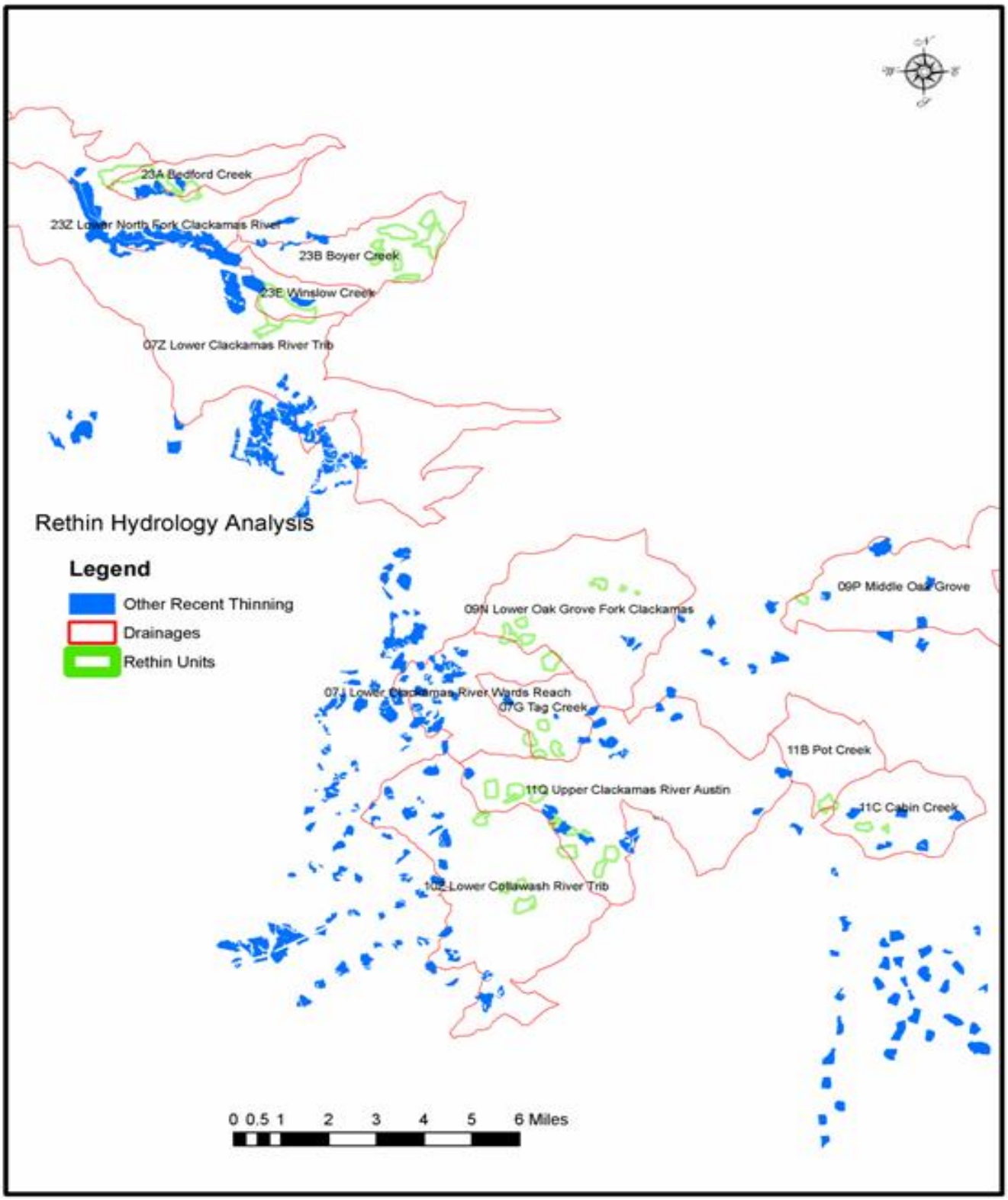
Typically, the GIS files and raw data discussed above are kept in the analysis file and the analysis is summarized in the EA.

The computer model generates a graph for each drainage. This example is typical of the 13 drainages and represents the hydrologic condition for a 20 year period at Tag Creek. The graph represents 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. The dip in the graph represents the cumulative impact of Rethin, B Thin and the proposed Palomar pipe line clearing. The threshold for this drainage is 65%. There hasn't been any regeneration harvest in this drainage for many years and the plantations are growing rapidly.



All of the drainages associated with the proposed action are between 80 and 90% recovered and steadily moving higher as young plantations grow. The proposed action would result in less than 2% change in ARP for these drainages. Since the drainages are well above recovery thresholds, and because 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.

4.3.7.2 Cumulative Effects Map



4.3.7.3 **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 Upper Clackamas, Middle Clackamas, Oak Grove Fork, and Collawash River fifth-field watersheds 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 restoration activities have included many acres of restorative thinning, road decommissioning, replacement of culverts that were passage barriers to Threatened and Endangered fish species, restoring important side channel habitat, and repairing roads that were damaged by floods.

Recent restoration EA's have planned projects have not yet been implemented. These projects include: road decommissioning, road closures, instream large wood and side channel projects, wildlife snag creation and down wood projects, and pre-commercial thinning.

The projects will be implemented over multiple years in a number of different sub-watersheds. 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 proposed 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.

There are other projects that are being developed concurrently with this project. The Forest is developing a plan to designate road and trail routes for off-highway vehicles (OHV). One of the proposed OHV study areas (referred to as La Dee) is near some of the proposed thinning units. Also the Cascade Crest Fuel Break would occur in the Upper Clackamas Watershed. It is above the transient snow zone and would have little effect on hydrology. The Palomar gas pipeline, if it is eventually built would cross the project area. It would result in less than 1% change in hydrologic recovery to the drainages that it crosses. The proposed thinning project would not result in incremental

impacts when added to these current projects, or other past or reasonably foreseeable future actions.

4.3.8 Forest Plan goals, standards and guidelines

Mt. Hood Forest Plan References
Forestwide Riparian Standards and Guidelines - FW-80 to FW-136, page Four-59
Forestwide Water Standards and Guidelines - FW-54 to FW-79, page Four-53
Forestwide Fisheries Standards and Guidelines - FW-137 to FW-147, page Four-64
General Riparian Standards and Guidelines - B7-28 to B7-39, page Four-257
Mt. Hood FEIS pages IV-22, IV-47, IV-155 to IV-167
Northwest Forest Plan - Riparian Reserve Standards and Guidelines – pages C-31 to 38

4.3.8.1 **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.

4.3.8.2 **Aquatic Conservation Strategy**

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

Mitigation measures and project design criteria, such as stream protection buffers and operating restrictions on ground based machinery, were developed to reduce impacts and to maintain the function of key watershed indicators that make up elements of the Aquatic Conservation Strategy. These key indicators for water quality, habitat, flow, channel condition, and watershed condition, would be maintained or enhanced.

4.3.8.3 **Riparian Reserves**

This project is consistent with riparian reserve standards and guidelines. The proposed action is 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 2.2.9 explains refinements made to riparian reserves since the time of the watershed analysis.

4.3.8.4 **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. The Clackamas River has a narrow key watershed designation that does not include the whole watershed. The project would not build any new permanent roads and many miles have already been decommissioned in the key watershed.

4.3.8.5 **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).

4.3.8.6 **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 unless noted otherwise. Project design criteria would provide protection to fisheries and riparian dependent resources while providing some protection from high intensity wildfire. 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.

4.3.9 Aquatic Sensitive, Rare and Uncommon Species

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 Mt. Hood National Forest include:

Interior Redband Trout *(Oncorhynchus mykiss spp.)*
Redband/inland rainbow trout (redband trout) coour 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 Clackamas 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 proposed 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 Mt. Hood National 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 known from Warm Springs Reservation and 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 should consider 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 the three special status aquatic mollusks would not be conducted as part of this project, even though the Columbia duskysnail is known to occur in many streams on the district including those within the proposed project area. Instead of conducting surveys in all adjacent streams, species presence is presumed. Riparian reserve standards and guidelines and project design criteria are sufficient to provide for the habitat needs of this species. Anticipated effects of implementing the proposed action would not significantly affect habitat or species persistence at each site.

The effects determination for the Columbia Duskysnail, Barren Juga, and Purple-lipped Juga and Scott's Apatanian Caddisfly 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 Alternative B.

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

4.3.10 Designated Critical Habitat

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

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

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

2. Freshwater rearing sites with:

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

    b. Water quality and forage supporting juvenile development; and

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

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

Designated critical habitat for Upper Willamette River chinook occurs downstream of the proposed project area in the mainstem Clackamas River, Collawash River, North Fork Clackamas, and the Oak Grove Fork of the Clackamas. Designated critical habitat for LCR steelhead occurs downstream of the proposed project area in the mainstem Clackamas River, Collawash River, Oak Grove Fork, and the North Fork of the Clackamas River. LCR steelhead critical habitat occurs within the project area in Pot Creek. As of this time, critical habitat for LCR coho has yet to be designated but would likely correspond with the critical habitat designation for UWR chinook since they utilize the same habitat within the Clackamas River Basin.

Project design criteria was developed to minimize or eliminate any potential affect that project elements of the proposed action 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.

4.3.11 Essential Fish Habitat

Essential Fish Habitat (EFH) established under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) includes those waters and substrate necessary to ensure the production needed to support a long-term sustainable fishery (i.e., properly functioning habitat conditions necessary for the long-term survival of the species through

the full range of environmental variation). EFH includes all streams, lakes, ponds, wetlands, and other water bodies currently, or historically, accessible to salmon in Washington, Oregon, Idaho, and California. Three salmonid species are identified under the MSA, chinook salmon, coho salmon and Puget Sound pink salmon. Chinook and coho salmon occur on the Mt. Hood National Forest in the Clackamas River, Hood River, and Sandy River basins. Chinook and coho salmon utilize the mainstem Clackamas and Collawash Rivers for migration, rearing, and spawning habitat. They also utilize the lower reaches of the Oak Grove Fork and North Fork of the Clackamas River for 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 Clackamas River.

Implementation of this 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.

4.3.12 Fish Stocks of Concern

The effects of the implementation of this 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 the Clackamas River, Collawash River, Oak Grove Fork, North Fork Clackamas 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, Upper Willamette River chinook salmon, Lower Columbia River chinook, and Lower Columbia River coho salmon. The coastal cutthroat trout is the management indicator species that occurs within or downstream of the project area. Details about ESA listed fish can be found on the National Marine Fisheries website under Recovery Planning.

4.3.13 Effects to Fish Stocks of Concern

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

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

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

4.4 NORTHERN SPOTTED OWL

The Biological Evaluation is summarized in Appendix B and is incorporated by reference. This project is covered by a project specific Biological Assessment (USDA 2009). Formal consultation with U.S. Fish & Wildlife Service is documented in a Letter of Concurrence (USDI 2009).

In May 2008, the U.S. Fish & Wildlife Service released a final recovery plan for the northern spotted owl that identifies criteria and actions needed to stop the owl's decline, reduce threats and return the species to a stable, well-distributed population. This project is consistent with the goals and criteria identified in the recovery plan: It does not occur in Managed Owl Conservation Areas (MOCAs) and does not alter mature forests.

4.4.1 Existing Condition

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 inches. 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 **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 the 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 are used. These are areas that are able to support resident spotted owls (a potential breeding pair) as determined by the USFWS (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 incur 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. 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 or predicted activity center. The proposed project is within the home range of 19 activity centers. Incidental take is presumed to occur when suitable habitat is reduced to 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 is presumed to occur when suitable habitat is reduced to less than 50% of the core.

4.4.1.3 **Existing Condition of Upper Clackamas Late-Successional Reserve 207B:** A portion of this project occurs within Upper Clackamas LSR (207B) and is within the High Cascades Province. This portion of LSR 207 lies in the Upper Clackamas Watershed and has a long narrow band along the Clackamas River and a wider portion near the Olallie Lake area. LSR 207 as a whole (Roaring River and Upper Clackamas combined) has 104,108 acres, of which 86,942 are capable and 46,395 acres are suitable habitat for the spotted owl. The proposed project is in a section of the LSR that is narrow along the Clackamas River. Most of the existing late-successional forest in this complex is within the Western Hemlock Zone associated with the river corridor. This habitat is relatively unfragmented (USDA 1996).

4.4.1.4 **Critical Habitat Units:** The project was previously covered by the batched FY 2007 – 2008 Biological Opinion but due to administrative delays, the signing of the decision notice was delayed and consultation had to be reinitiated. In the expired 2007 – 2008 Biological Opinion, the effects to the original network of Critical Habitat Units was assessed. However, in May 2008, the U.S. Fish & Wildlife Service released a final recovery plan for the northern spotted owl that identified Managed Owl Conservation Areas (MOCAs). These were adopted as Critical Habitat in August 2008. There are no Rethin units in the new network of Critical Habitat.

4.4.1.5 **Existing Condition of Proposed Harvest Units –** All of the stands are second-growth stands that have already been thinned once. They range in age from 47 to 73 years.

All of the units are providing dispersal-only habitat for 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.

The following is a table displaying the amount of dispersal habitat within the LSR affected by the proposed action. Dispersal habitat described below is dispersal-only habitat. No suitable habitat exists in the proposed harvest units.

4.4.1.6 **Acres Affected**

	Total Acres	**Dispersal-Only Habitat**
Total Project Area	2,072	2,072
MATRIX	2,006	2,006
LSR	66	66

Snags and down woody debris are an important component of spotted owl habitat. Field data was collected in the summer of 2007 to determine down wood and snag levels within the LSR portion (units 33 and 35) of the project area. Snag and down woody debris transects were not conducted in the remaining proposed harvest units, all of which are located in the Matrix land allocation. It is predicted that snag and down wood levels in the matrix would be low because the units are managed stands that have been thinned before.

The LSR units within the project area had an average down wood percent cover of 2.2%. Snag levels of 10 inch diameter or greater within the LSR were at 2.3 snags per acre. Most snags are small to medium size. Few large legacy snags exist in the proposed harvest units.

4.4.1.7 **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 known or historic owl activity center. These actions would include thinning, landing creation, trees removed for skid trails or skyline corridors, trees removed for road construction. Some actions are specifically designed to benefit owls and other species: variable-density thinning in LSRs, creating variability in tree spacing, creating skips and gaps, 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 or road repair would not have a meaningful or measurable affect on habitat but would create noise disturbance.

4.4.2 Direct and Indirect Effects

4.4.2.1 Alternative A (No Action)

No short-term effects to the spotted owl would be predicted with this alternative. For the short term, the units would continue to function as dispersal habitat. Snag levels would remain essentially unchanged. Since these stands have already been thinned, the current growth rate of the trees would be somewhat greater than if the stands had never been thinned. Since the stands were thinned, they have grown to the point where growth is again slowing. They would continue to grow at a slow pace for another decade or so. Eventually the stands would attain stocking levels where growth suppression and mortality would begin to occur. The stands would start to differentiate to varying degrees and show an increase in the levels of snags, down wood and understory development. Where these developments occurred, they would likely improve the dispersal habitat characteristics being provided within the stands. Since these stands have been thinned once already, it is likely at least some of the stands would eventually develop nesting habitat characteristics and become suitable spotted owl habitat. However, with no action, it could take as much as 50 to 80 years for these stands to develop into suitable habitat. Refer to Growth and Productivity and Diversity sections of EA for further discussions of the response of trees to no action.

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

Proposed Action

4.4.2.2 Effects to Owl Habitat on a Stand Scale

	TOTAL ACRES	DISPERSAL HABITAT REMOVED (ACRES)	DISPERSAL HABITAT RETAINED (ACRES)
Project Area	2,072	692	1,380
LSR	66	30	36
MATRIX	2,006	662	1,344

The proposed treatments outside the LSR would include a variable density 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 snags and down woody debris; also adding to the potential for increased habitat diversity in the future.

The stands in the LSR would be thinned as described in section 2.3.5. The incorporation of larger and more frequent skips and gaps, and the creation of additional snags and down woody debris would all add to the complexity of the stand and the acceleration toward suitable habitat. Thinning would be varied both within units and between units, adding to

diverse habitat attributes. These silvicultural techniques are more likely to push the stands to an accelerated trajectory that would result in suitable habitat sooner compared to treatments outside the LSR, and much sooner when compared to no action.

The proposed harvest treatments would temporarily degrade approximately 1,380 acres of dispersal habitat. This degradation of habitat would occur as a result of opening up the canopy from its current condition of approximately 70-90% down to 40%; as well as the loss of some snags. The Design Criteria require the retention of all down logs and non-hazardous snags. While the dispersal habitat within these units would be reduced in quality as described above, they would still function as dispersal habitat. They would provide better quality dispersal habitat again approximately 10 to 15 years after harvest.

Due to the intensity of thinning within some of the units, 692 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 overall affect being a temporary loss of dispersal habitat within these stands. There would be a short-term loss of approximately 692 acres of dispersal habitat as a result of project implementation. This temporary loss of dispersal habitat would occur in both the Matrix and LSR. These units would regain dispersal habitat attributes in approximately five years after harvest.

While dispersal habitat would be temporarily removed in the LSR, the benefits of thinning would outweigh this temporary loss. Incorporating variable-density thinning (ranging from RD 25-40) with skips and gaps would create a mosaic of small openings with unthinned, moderately thinned and heavily thinned patches. This prescription helps generate complex structures by promoting tree growth at different rates. It also encourages understory development and diversity. Variable-density thinning with skips and gaps would also improve forest health by increasing resistance to disturbance and improving the stand's ability to recover after disturbance. Thinning would result in stands more quickly growing into late-successional forests than if no treatment occurred. The stands would develop the minimum habitat characteristics necessary for spotted owl nesting habitat within 30 to 60 years.

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

There is suitable habitat adjacent to many of the proposed thinning stands which is currently providing nesting, roosting and foraging habitat. In addition, most 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 traditional commercial 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 effects suggest that traditional commercial thinning in proximity to spotted owl activity centers may have a short-term effect on home-range and habitat-use patterns of individuals. The proposed action is a restoration thinning that would introduce variability.

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 most of the 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 substantially negatively impact the health or resultant survival of any birds residing close to the project area.

4.4.2.4 Effects Due to Noise Disturbance

Based on anecdotal information and effects to other bird species, significant noise, smoke and human presence can result in a disruption of breeding, feeding, or sheltering behavior of the spotted owl such that it creates the potential for injury to individuals. For a significant disruption of spotted owl behavior to occur as a result of disturbance caused by the proposed actions, the disturbance and owl(s) must be in close proximity to one another. 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.

Proposed activities would occur in proximity to several spotted owl activity centers as well as unsurveyed suitable habitat; and have the potential to disturb the normal behavior patterns of individual owls or breeding pairs potentially at the site. In the Central Cascades, 86 percent of owl young fledge by June 30th. Therefore, the spotted owl critical period in this project area is considered to be March 1 through July 15th. After July 15th, it is presumed that most fledgling spotted owls are capable of sustained flight and can move away from harmful disturbances. 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. These activities would not be allowed during the length of the project within these disruptions distances. Although disruption of behavior could still occur, noise from the proposed actions would not harm spotted owls or negatively interfere with nesting, roosting, or foraging behaviors because the activities would occur beyond these

disruption distances. Therefore, these actions **may affect, but are not likely to adversely affect**, nesting northern spotted owls.

4.4.3 Cumulative Effects

Since the Forest has emphasized the thinning of this type of habitat in recent years, a cumulative effects analysis for dispersal habitat has been conducted.

Home ranges are the appropriate analysis area for this analysis. An analysis has been conducted for each of the historic and predicted activity center home ranges. For the purpose of cumulative effects analysis, all land within the home ranges would be included regardless of ownership or land allocation.

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 stands grow, these conditions would be met at approximately age 40. Stands older than this would be considered functioning dispersal habitat unless their canopy has been reduced to less than 40%.

4.4.3.1 Past, Present and Foreseeable Future Projects and Actions

Project Name	Extent, Size, Type, & Distance	Overlap In Time Or Space	Type Of Potential Effect To Dispersal Habitat	Measurable Effect To Dispersal Habitat	Rationale For Inclusion Or Exclusion From Analysis Below
Past – regeneration harvest	Throughout Analysis Area	Yes, all plantations less than 40 years.	Loss of dispersal habitat	Yes	Include. A loss of dispersal habitat has occurred.
Past – older commercial thinning	Throughout Analysis Area	No. Older thinning prescriptions used a light thinning which have recovered to dispersal habitat already.	Short-term loss of dispersal habitat	No	Exclude. Effects no longer evident. Stands have recovered.
Past and Present – recently planned restoration thinning	Throughout analysis area	Yes, recently planned thinning will have a short-term loss of dispersal habitat	Short-term loss of dispersal habitat	Yes	Include. A short-term loss of dispersal habitat has occurred or will soon occur.
Past – rock quarries	Throughout Analysis Area	Yes. Rock quarries are permanent and occur	Permanent loss of dispersal habitat	Yes	Include. A permanent loss of dispersal habitat has occurred.

Project Name	Extent, Size, Type, & Distance	Overlap In Time Or Space	Type Of Potential Effect To Dispersal Habitat	Measurable Effect To Dispersal Habitat	Rationale For Inclusion Or Exclusion From Analysis Below
		throughout the Analysis Area			
Past – Power Line		Yes. Power lines are permanent	Permanent loss of dispersal habitat	yes	Include. Trees that grow under power line are cut for safety before they can become dispersal habitat.
Future pipe line	If the Palomar gas pipeline is built in would remove habitat.	No, does not overlap owl analysis area.			Exclude. Does not overlap analysis area.
Activities on other ownerships	Logging.	Yes	Loss of dispersal habitat	Yes	Include. A loss of dispersal habitat has occurred from past logging. The presumption is that all of the dispersal habitat that remains on private timber lands would soon be harvested.
Future timber harvest	Unknown, but potential for timber harvest such as plantation thinning.	Unknown location	Unknown of intensity of treatments	No	Exclude. No site specificity. Can not be modeled at this time. The appropriate time to conduct a cumulative effects analysis would be in a future EA after a firm proposal is developed.

4.4.3.2 Effects to Owl Activity Centers in the Vicinity of the Project Area

The following table displays the current condition and project effects to the nest stand, core area, and home range of each historic nest site. The "Current" columns have been reduced by all planned projects even if they have not been logged yet (see s. 4.4.3.4). **Incidental take thresholds for suitable habitat are 40% for the home range and 50% for the core.** The **bolded** text indicates the pair is below the threshold. There is no threshold for dispersal habitat. The table also includes data for predicted activity center home ranges.

Owl Pair	Analysis Area	Current Suitable Acres	Percent Suitable	Current Total Dispersal Acres	Proposed Action Dispersal Acres Removed	Proposed Action Dispersal Acres Retained	Total Dispersal After Proposed Action
3011	Nest Stand	68	N/A	68	0	0	No Change
	Core Area	381	76%	435	0	0	No Change
	Home Range	1671	57%	2274	13	27	2261
3320	Nest Stand	41	N/A	41	0	0	No Change
	Core Area	**169**	**34%**	**324**	**23**	**47**	**301**
	Home Range	**1082**	**37%**	**1949**	**41**	**81**	**1908**
3397	Nest Stand	38	N/A	38	0	0	No Change
	Core Area	349	69%	355	0	0	No Change
	Home Range	1434	49%	1923	7	14	1916
3534	Nest Stand	55	N/A	55	0	0	No Change
	Core Area	252	50%	270	0	0	No Change
	Home Range	1423	48%	1704	29	58	1675
3537	Nest Stand	23	N/A	26	0	0	No Change
	Core Area	**233**	**46%**	**279**	**0**	**0**	**No Change**
	Home Range	1468	50%	1931	9	17	1922
3538	Nest Stand	34	N/A	51	0	0	No Change
	Core Area	**223**	**44%**	**363**	**0**	**0**	**No Change**
	Home Range	1244	42%	2118	**69**	138	2049
3645	Nest Stand	58	N/A	58	0	0	No Change
	Core Area	320	64%	405	0	0	No Change
	Home Range	1605	54%	2212	**3**	5	2209
3656	Nest Stand	53	N/A	53	0	0	No Change
	Core Area	287	57%	312	0	0	No Change
	Home Range	1,526	52%	1744	**11**	23	1733
3672	Nest Stand	57	N/A	64	0	0	No Change
	Core Area	300	60%	393	0	0	No Change
	Home Range	1,619	55%	2,358	**35**	69	2323
3676	Nest stand	36	N/A	62	0	0	No Change
	Core Area	**184**	**37%**	**440**	**0**	**0**	**No Change**
	Home Range	**992**	**34%**	**2023**	**15**	**29**	**2,008**
3678	Nest Stand	52	N/A	61	0	0	No Change
	Core Area	388	77%	449	0	0	No Change
	Home Range	1402	47%	2144	3	6	2141
3727	Nest Stand	44	N/A	63	0	0	No Change
	Core Area	323	64%	396	0	44	396
	Home Range	1567	53%	2197	59	163	2138
3804	Nest Stand	43	N/A	43	0	0	No Change
	Core Area	262	52%	371	0	0	No Change
	Home Range	1706	58%	2051	6	13	2,045
3925	Nest Stand	59	N/A	59	0	0	No Change

Owl Pair	Analysis Area	Current Suitable Acres	Percent Suitable	Current Total Dispersal Acres	Proposed Action Dispersal Acres Removed	Proposed Action Dispersal Acres Retained	Total Dispersal After Proposed Action
	Core Area	252	50%	317	0	0	No Change
	Home Range	1493	51%	2,072	2	4	2,070
3970	Nest Stand	67	N/A	67	0	0	No Change
	Core Area	367	73%	423	11	22	412
	Home Range	1636	55%	2,252	57	113	2,195
5300	Nest Stand	9	N/A	54	0	0	No Change
	Core Area	**177**	**35%**	**459**	**0**	**0**	**No Change**
	Home Range	**1161**	**39%**	**2,715**	**18**	**35**	**2,697**
Site #61	Nest Stand	62	N/A	70	0	0	No Change
	Core Area	283	56%	420	4	8	416
	Home Range	1404	48%	2,160	62	125	2,098
Site #15	Nest Stand	70	N/A	70	0	0	No Change
	Core Area	0	0%	451	14	0	437
	Home Range	0	0%	1843	247	0	1596
Site #20	Nest Stand	0	N/A	35	0	0	No Change
	Core Area	64	13%	200	0	0	No Change
	Home Range	600	20%	1617	47	0	1570

Based on current conditions, 5 historic activity centers are currently below take thresholds in either their core area or home range. Within 3 of these owl activity circles, some dispersal habitat would be temporarily removed and some would be temporarily altered in the core and/or home ranges. Since these three pairs are currently lacking in suitable habitat, the impact on dispersal habitat might have a greater effect on these pairs than in the others. However, since suitable habitat would not be impacted, the impacts are still not predicted to be substantial.

Predicted owl sites were delineated for areas that may be able to support resident spotted owls (a potential breeding pair) as determined by the USFWS (2007) northern spotted owl occupancy template. This template located potential owl activity centers in stands that are not currently mapped as suitable habitat. The table above indicates that predicted sites #15 and 20 are below thresholds for suitable habitat due to past forest fires.

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

4.4.3.3 **Effects of Past Actions:**

The landscape pattern of vegetation has been affected by past timber harvest, fires, etc, substantially impacting the habitat for spotted owls. Some ecologically important

features of landscape pattern are: amount of edge habitat, degree of fragmentation of late-successional forest, and amount of interior forest. As fragmentation of a landscape pattern increases, the amount of interior forest habitat decreases and the amount of edge habitat increases. As fragmentation increases, the amount of interior forest habitat decreases, impacting organisms that prefer large patches of interior habitat, such as the spotted owl.

The temporary loss of approximately 692 acres of dispersal habitat and the temporary degradation of approximately 1,380 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 the birds to adequately disperse between suitable habitat blocks and it is unlikely that these actions would substantially impact the health or resultant survival of any birds residing within the analysis area.

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

4.4.3.4 **Methodology**

Public comments were received during the 30-day comment period asking for more information about how the cumulative effects analysis was conducted. In particular, people wanted to know how other recent thinning projects were incorporated.

The analysis area was first determined as discussed in s. 4.4.1.2 and 4.4.3. Home ranges are circles with a 1.2 mile radius around all historic and predicted activity centers. Home ranges that intersect units of the Rethin project were combined to make the project analysis area for northern spotted owls. The map in s. 4.4.3.5 shows the home ranges. Circles were also created for the core area (0.5 mile radius) and the nest stand (300 meters radius).

Generally, suitable habitat is 80 years of age or older, has canopy cover over 60 percent, is multi-storied and has sufficient snags and down wood to provide opportunities for nesting, roosting and foraging. Stands that have a canopy cover greater than 40 percent and diameters greater than 11 inches are considered dispersal habitat for spotted owls. As young stands grow, these conditions would be met at approximately age 40. Stands older than this would be considered functioning dispersal habitat unless their canopy has been reduced to less than 40%.

The condition of current vegetation was derived from a GIS layer: veg2007. This file contains the sizes, shapes, locations and vegetation characteristics for all stands as they have been modified and affected by factors such as past timber harvest, tree growth and

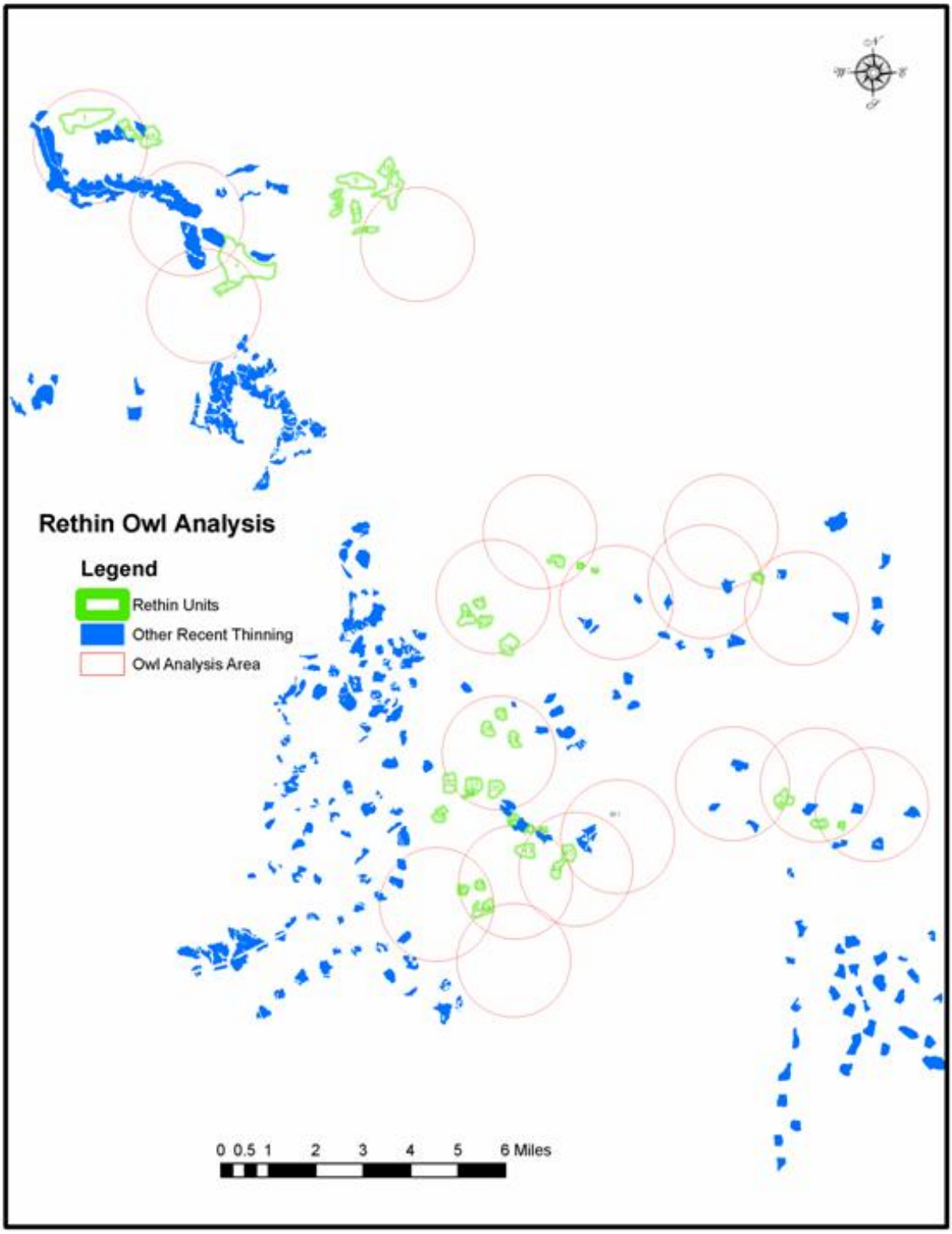
fires. Recent timber sales and other projects that have been planned but not yet implemented are also included in the analysis. These planned but not implemented projects are included as if they are complete. For example, current suitable and current dispersal acres in s. 4.4.3.2 were calculated by intersecting the owl circle map with veg2007 and subtracting all of the recent thinning projects that reduce canopy cover below 40 percent.

Public comments received during the 30-day comment period asked about these specific recent thinning projects. They were included in the analysis where they overlap the same owl home range circles as the Rethin project and are shown in blue on the map in s. 4.4.3.5.

EA Name	Project Name
No Whisky EA	1929 Thin, Cold Thin, Moore Thin, Dry Thin Stewardship, Shay Thin Stewardship
Cloak EA	B Thin, G Thin, M Thin, V Thin, W Thin, Y Thin, O Thin Stewardship, P Thin Stewardship
2007 Plantation Thinning EA	K9 Thin Stewardship, Hot Thin Stewardship, Pink Thin Stewardship
Upper Clack EA	Wall Thin Stewardship and other unnamed projects
Collawash EA	Fan Thin

Typically, the GIS files and raw data discussed above are kept in the analysis file and the analysis is summarized in the EA.

4.4.3.5 Cumulative Effects Map



4.4.4 **LSR Assessment** – The LSR Assessment recommended retaining down wood cover at a rate of 10 to 15%. To achieve this in plantations, most of the trees that need to be cut to achieve thinning objectives would need to be left on the ground. The cost of creating down wood at these rates would not allow for an economically viable project. Since no

other funding source is available to implement the thinning project, the benefits gained in terms of accelerating the development of other late-successional characteristics would not be realized. The proposed action would not meet the down wood levels in the LSR Assessment triggering the need for a review by the Regional Ecosystem Office (REO).

The proposed thinning in the Upper Clackamas LSR would meet the objectives for managing LSRs and is consistent with LSR standards and guidelines. This conclusion was reached in part for the following reasons:

- At the landscape scale, down wood levels are consistent with the objectives for managing LSRs.
- The Upper Clackamas LSR is currently at approximately 45% late-successional habitat, and is below the Desired Future Condition level of 70 percent late-successional habitat in the Western Hemlock Zone (Note: Most of the potential harvest units within the LSR occur within this Zone). Mid-seral stands currently are lacking late-successional characteristics of large trees and multiple stories. This project would move plantations toward the desired future condition for this LSR.
- Thinning these young stands now would result in a size class distribution and canopy structure that more closely resembles the late-successional habitats that meet the Desired Future Conditions identified in the LSR Assessment in a much shorter length of time than if no treatment occurred.

4.4.5 Forest Plan Standards and Guidelines

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

The proposed action is consistent with the following standards and guidelines

NFP C-12	Thinning in LSRs is consistent with LSR standards and guidelines because stands are less than 80 years old and thinning is designed to accelerate the development of late-successional forest conditions. The proposal was reviewed by the Regional Ecosystem Office and found to be consistent (RIEC 2008).
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

Informal consultation with U.S. Fish & Wildlife Service has been completed for this project. A Letter of Concurrence from the U.S. Fish & Wildlife Service has been received (USDI 2009).

4.4.6.1 **Effects to critical habitat –** The proposed action would have an effects determination of "**No Effect**" because it is not in critical habitat.

4.4.6.2 **Effects to spotted owl at the project scale -** The proposed action would have an effects determination of "**May Affect, Not Likely to Adversely Affect**" because of the effect to dispersal habitat. It would have an effects determination of "**May Affect, Not Likely to Adversely Affect**" because of the disturbance associated with noise generating activities near known owl sites or predicted nest patches.

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

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

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

4.5 OTHER WILDLIFE

4.5.0.1 Management Indicator Species

Management Indicator Species for this portion of the Mt. Hood National Forest include northern spotted owl (s. 4.4), pileated woodpecker (s. 4.5.2, s. 4.5.6), pine marten (s. 4.5.6), deer (s. 4.5.3), elk (s. 4.5.3), 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 Mt. Hood 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 Mt Hood Forest Plan as amended by the Northwest Forest Plan provides habitat to maintain viable populations of these species. Land allocations 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) and Summer Range (B11) for deer and elk; and Riparian Reserves (RR) for fish. Of these land allocations, the project overlaps Summer Range (B11), Late-successional Reserves 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.

4.5.1 Effects to Sensitive Species and Other Rare or Uncommon Species

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

4.5.1.1

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

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

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

4.5.1.2 **Terrestrial Mollusks:** The Puget oregonian, Columbia oregonian, evening fieldslug, Crater Lake tightcoil and crowned tightcoil are mollusk species with ranges that include the Clackamas River Ranger District.

The Puget and Columbia Oregonian are found at low to mid-elevations in old-growth forests. There are no known sites for the Puget Oregonian on the district, but a few exist for the Columbia Oregonian. All the proposed harvest units are second-growth stands between 47-73 years old that do not contain the mature structure that is needed for the Puget Oregonian and Columbia Oregonian. No surveys or further analysis required for these species due to lack of habitat.

The evening fieldslug is found within meadow habitats. The Crater Lake and crowned tightcoil are found at mid to high- elevations adjacent to perennial wet areas. No known sites exist on the district for the evening fieldslug or crowned tightcoil, but two exist for the Crater Lake tightcoil. Riparian reserve standards and guidelines would prevent impacts to these habitats. No surveys were conducted for these species due to lack of impact to their habitats.

4.5.1.3 **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 remnant old-growth trees. Due to lack of habitat, it is highly unlikely a red tree vole would be nesting in the stands proposed for thinning. Surveys were not conducted for this species.

4.5.2 Snags and Down Wood

4.5.2.1 **Existing Situation** – Snag and down woody debris transects within the proposed units within the LSR were conducted to determine more accurately the current level of snags and coarse woody debris. Portions of units 33, and 35 occur within the LSR. Snags greater than or equal to 3” diameter were counted.

4.5.2.2 Existing snag and down wood levels in the proposed LSR harvest units within the Project Area. Data taken by Forest Service Field Crews in 2007.

	Proposed Harvest Units within the Upper Clackamas LSR
Snags $\geq$ 10 inches diameter	2.3 snags/acre
Snags $\geq$ 3 inches diameter	4.3 snags/acre
Average Snag diameter	13.6”
Percent Ground Cover	2.2%

Snag and down woody debris transects were not conducted in the remaining proposed harvest units, all of which are located in the Matrix land allocation. It is predicted that snag and down wood levels would be similar to what was found in the LSR. It is predicted that snag and down wood levels would be also be low in these units because the units are managed stands that have already been thinned once.

4.5.2.3 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. The 100% biological potential level is 3.7 snags per acre (Austin 1995). The primary and secondary cavity nesting species for the Pacific silver fir zone are: pileated woodpecker, northern flicker, hairy woodpecker, Williamson's sapsucker, red-breasted sapsucker, and the red-breasted nuthatch. The 100% biological potential level is 4 snags per acre (Austin 1995). The 60% biological potential level is 2.4 snags per acre in the Pacific silver fir zone and 2.2 snags per acre in the western hemlock zone.

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

4.5.2.4 DecAid Advisor

DecAID is a planning tool intended to help advise and guide managers as they conserve and manage snags, partially dead trees and down wood for biodiversity (Mellen 2003). 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.

4.5.2.5 Snags and Down Wood Levels Compared to DecAID Data

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

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 if not all of the units contain snag and down wood numbers at less than the 30% tolerance level.

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

Direct and Indirect Effects –

4.5.2.7 **Alternative A –** The stands would continue to have few snags and down wood. It is presumed that there would continue to be an average of 2.3 snags per acre $\geq$10 inches diameter in the units. This meets the 60% biological potential level (i.e. 2.2-2.4 snags/acres). The units would continue to provide an average of 2.2% down wood cover. In terms of the tolerance levels for snags and down wood within the applicable habitat type and structural condition identified in the DecAID advisor, these areas would continue to be below the 30% tolerance level. Levels would be slightly higher for snags if live trees with elements of wood decay had been included in the surveys.

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

4.5.2.8 Proposed Action

Some snags are difficult to retain during logging because of their inherent instability and danger. It is likely that some snags would need to be cut down during harvest operations due to safety considerations and that some downed logs would be degraded through the process of logging. Approximately 1,130 acres would be tractor logged, 944 acres would be harvested using a skyline logging system, and 101 acres would be helicopter logged. 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.

No new temporary roads would be constructed. Approximately 2.2 miles of old existing temporary roads would be re-opened and utilized. These areas generally lack down wood and snags. Little effect to snags and down wood would occur with use of these old roads.

Snags that are left standing after the project 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.

Implementation of the proposed action would reduce the amount of natural selection that would have occurred through the process of stress and mortality. Some of the snags and downed logs that might have formed in the future from the death of the intermediate and suppressed trees would be removed through harvest. As a result, the proposed action would delay the attainment of moderate-sized snags and down wood through natural process because of the reduction in density of the stands. Although some trees with

elements of wood decay would be left and some snags would be created to provide habitat for snag-dependent species; fewer new snags, trees with elements of wood decay, or large down wood would be created for the short to mid term because of this thinning. However, the proposed action involves leaving the largest trees standing and growing. This would accelerate the growth and size of trees and would eventually provide larger snags. Some would eventually fall naturally to create large coarse woody debris.

4.5.2.9 **DecAID levels for snags and down wood:** Snags and wildlife trees described in Design Criteria #2 are combined for the purpose of determining DecAID levels for the proposed action. Due to the lack of snags and trees with elements of wood decay within these second-growth stands, most would have snag and defective tree densities and size guidelines 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 - 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.

4.5.2.10 **Cumulative Effects –**

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

Past, Present and Foreseeable Future Projects and Actions

Project Name	**Extent, Size, Type, & Distance**	**Overlap In Time Or Space**	**Alteration of snags**	**Meaningful Effect**	**Rationale For Inclusion Or Exclusion From Analysis Below**
Past – regeneration harvest	Throughout Analysis Area	yes	yes	yes	Include. A loss of snags in all size classes has occurred.
Past – commercial thinning	Throughout Analysis Area	yes	yes	yes	Include. A loss of snags, mainly in the small to moderate size classes has occurred.
Past and Present – recently planned restoration thinning	Throughout analysis area	Yes	yes	Yes	Include. A loss of snags, mainly in the small to moderate size classes would occur.
Past – rock quarries	Throughout Analysis Area	Yes. Rock quarries are permanent and occur throughout the Analysis Area	yes	yes	Include. A loss of snags in all size classes has occurred.
Past – Power Line		Yes. Power lines are permanent	yes	yes	Include. A loss of snags in all size classes has occurred.

Project Name	Extent, Size, Type, & Distance	Overlap In Time Or Space	Alteration of snags	Meaningful Effect	Rationale For Inclusion Or Exclusion From Analysis Below
Activities on other ownerships	Timber harvest (Austin)	yes	no	no	Include
Future pipe line	If the Palomar gas pipeline is built in would remove habitat.	yes	yes	yes	Include
Future timber harvest	Unknown, but potential for timber harvest occurs within all parts of the Analysis Area except for Wilderness.	Unknown location	Unknown of intensity of treatments	No	Exclude. No site specificity. Can not be modeled at this time. The appropriate time to conduct a cumulative effects analysis would be in a future EA after a firm proposal is developed.

4.5.2.11 **Snag Habitat** (analysis areas that overlap units)

Snag Analysis Areas	Total Acres	Snags/Ac. 15-21"	Snags/Ac. > 21"	Total Snags/Ac. Existing Condition*	Acres Proposed for Treatment	Post-Implementation Snags/Ac. ≥15" **
Boyer Creek	4675	7.7	0.7	8.4	694	8.2
Cabin Creek	4117	3.5	6.6	10.1	52	10.1
Cot Creek	4665	3.0	4.1	7.0	35	7.0
Middle Oak Grove	5265	5.0	5.6	10.6	23	10.6
Moore Creek	4681	5.1	3.5	8.6	136	8.5
Pint Creek	5146	3.4	5.5	8.9	112	8.9
Pot Creek	5509	3.4	6.1	9.5	43	9.5
Sluice Creek	5970	2.3	3.9	6.2	175	6.1
Switch Creek	4834	4.1	6.1	10.2	351	10.1
Tag Creek	4090	2.2	6.3	8.5	210	8.4
Whisky Creek	4637	7.3	0.6	7.9	338	7.8

* This represents the baseline after all of the projects in s. 4.5.2.10 are incorporated.
** Assuming one snag per acre greater than or equal to 15 inches diameter lost in harvest units.

For purposes of this analysis, it is assumed some snags would need to be felled for safety reasons in this project. Past experience and monitoring indicate that there would likely be some snags remaining afterwards. Within some units, trees have been girdled or felled to create down logs and some have been inoculated. These trees are still relatively sound and would not likely be considered hazardous during logging.

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

The analysis shows that within the snag analysis areas, the snag levels after the past and present harvest activities would still be above the 100% biological potential level. The 100% biological potential would be between 3.7 and 4 snags per acre.

4.5.2.12 **Methodology**

Public comments were received during the 30-day comment period asking for more information about how the cumulative effects analysis was conducted. In particular, people wanted to know how other recent thinning projects were incorporated.

The analysis areas for snags were developed using guidance from the Forest Plan suggesting that analysis areas be approximately 5000 acres in size (Four-74). Drainages similar to those shown in s. 4.3.7.2 were modified to make appropriately sized analysis areas. The analysis map is in Appendix E.

To conduct an analysis for, all of the stands in the analysis area need to be considered, not just the ones proposed for thinning. Since it is not practical to visit thousands of stands, the condition of current vegetation was derived from a GIS layer: veg2007. This file contains the sizes, shapes, locations and vegetation characteristics for all stands as they have been modified and affected by factors such as past timber harvest, tree growth and fires.

Snag numbers derived from the watershed analyses were applied to the appropriate forest types. The initial data was generated from field surveys completed by Forest inventory and ecology crews.

Recent timber sales and other projects such as the Palomar pipe line that have been planned but not yet implemented are also included in the analysis. These planned but not implemented projects are included as if they were completed.

Public comments received during the 30-day comment period asked about these specific recent thinning projects. They were included in the analysis where they overlap the same snag analysis areas as the Rethin project and are shown in blue on the map in s. 4.3.7.2.

EA Name	Project Name
No Whisky EA	1929 Thin, Cold Thin, Moore Thin, Dry Thin Stewardship, Shay Thin Stewardship
Cloak EA	B Thin, G Thin, M Thin, W Thin, Y Thin, O Thin Stewardship, P Thin Stewardship
2007 Plantation Thinning EA	Does not overlap
Upper Clack EA	Unnamed Stewardship Thinning
Collawash EA	Does not overlap

Typically, the GIS files and raw data discussed above are kept in the analysis file and the analysis is summarized in the EA.

Since the analysis areas are well above the threshold set in the Forest Plan, and because the project would result in very small changes to the quantity of snags per acre at the landscape scale, it is very unlikely that the proposed thinning activities would cause adverse effects to species dependent on snags. Effects to snag dependent species would be immeasurable and undetectable within the action area and would not be of sufficient magnitude to affect overall populations.

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

Past experience and monitoring indicate that there would likely be some snags remaining after harvest. Retained wildlife trees with the elements of wood decay and created snags would add to existing snags retained. Neither alternative would achieve the 60% biological potential level considering snags alone but would meet it when wildlife trees and created snags are considered. Currently most of the trees are not large enough to produce snags of the desired size, (22 inches diameter, FW-234) but FW-235 allows the retention of smaller trees if the treated stand is too young to have trees of sufficient size. In these cases, snags and green leave trees retained should be representative of the largest size class present in the stand. Design Criteria #2 would result in additional protection to snags and leaves live trees with elements of wood decay which would provide some habitat in the interim. Snag creation would occur in many of the proposed harvest units, with an emphasis in the late-successional reserve.

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 is being met throughout the entire planning area.

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

FW-219 and FW-223 indicate that stands should have 6 logs per acre in decomposition class 1, 2, and 3 and that they should be at least 20 inches in diameter and greater than 20 feet in length. However, FW-225 and FW-226 indicate that smaller size logs may be retained if the stand is too young to have 20 inch trees. In these, cases, logs representing

the largest tree diameter class present in the stand should be retained. Design Criteria #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, with an emphasis in the late-successional reserve.

4.5.2.14 The proposed action is 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.

4.5.3 Deer and Elk Habitat (Management Indicator Species)

4.5.3.1 **Habitat Characteristics –**

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). Elk moving through areas of high open-road densities moved longer distances; several miles per day was not uncommon.

Deer are generally considered to be wider ranging, more tolerant of human disturbance, and less dependent on riparian areas.

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. 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 or road repair would not have a meaningful or measurable affect on habitat but would create noise disturbance.

4.5.3.2 **Existing Situation –** The harvest units are located within summer (SR) and winter range (WR). Thermal cover for elk is defined as a stand of coniferous trees at least 40 feet tall

with an average crown closure of 70 percent or more. Thermal cover for deer may include saplings, shrubs, or trees at least 5 feet tall with a 75 percent crown closure. Optimal cover is found mainly in multi-storied mature and old-growth stands.

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

4.5.3.3

Deer and Elk Summer and Winter Range	Acres Proposed for Treatment Containing Thermal Cover
Crucial Winter Range	596
High Value Winter Range	130
Moderate Value Winter Range	698
Summer Range	751

Analysis areas for deer and elk were established around topographic features such as ridges and streams as well as the winter/summer boundary.

4.5.3.4 Deer and Elk Analysis Areas (analysis areas that overlap units)

Deer and Elk Analysis Areas	Total Acres	Stands Proposed for Thinning Containing Thermal Cover (Acres)
KW2	5173	18
KW3	3631	305
KW6	4519	79
KW8	3233	177
WR1	2505	24
WR5	4197	28
WR9	5322	91
WR12	1980	25
WR14	6012	337
WR17	6232	482
SR8	4707	7
SR19	3656	227
SR26	4872	21
SR30	5657	349

Direct and Indirect Effects

4.5.3.5 **No Action –** Approximately 2,072 acres of young stands would continue to serve as thermal cover. No cover would be lost and no forage would be gained in this alternative.

Currently lack of forage and high road densities are the two main limiting factors for deer and elk in the area. In the no-action alternative the stands would continue to remain crowded and forage would not increase above current levels. Refer to Growth and Productivity and Diversity sections of EA for further discussions of the response of trees to no action.

4.5.3.6 **Proposed Action**

The proposed action includes thinning of approximately 2,072 acres of young stands within summer and winter range for deer and elk. Portions of the stands in stream protection buffers and skips would be unthinned.

The proposed restoration 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.

Other portions of the stands would include the creation of gaps, landings, helicopter landings, skid trails and skyline corridors and are further discussed in section 2.3. These gaps are areas within the units ranging from 0.1 to 1.25 acres that have 50 trees per acre or less. These areas receiving a gap prescription would be heavily thinned and would no longer provide thermal cover but would promote high quality forage. 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.

As described above, thinning would result in the temporary removal of thermal cover and a temporary increase in forage. The quality of forage created would be greater in the late-successional reserve and riparian reserves because these areas are proposed to receive a heavier thinning treatment and include a greater proportion of the unit in gaps, allowing more sunlight to reach the forest floor.

The loss of thermal cover and increase in forage in the proposed harvest units could alter distribution of deer and elk use of the project area. While there would be an extensive amount of acreage lost in thermal cover, there would also be an increase in forage in these same stands. Because thermal cover is not limiting, the project would likely

increase the quality of deer and elk habitat in the immediate area because of the increased forage provided in the treated stands; especially in the gaps, landings, skid trails and skyline corridors.

The proposed action would temporarily reduce the quality of habitat being provided for deer and elk, especially during the critical winter months (December to March). While there would be an increase in forage in the thinned units as described above, especially in the gaps; much of this gained forage would not occur close enough to cover for it to be fully utilized by deer and elk.

Deer are a ubiquitous species and can easily adapt to the above changes. No impacts predicted to the deer populations in the area. However, the elk are more selective and not as adaptive.

The benefits of gaining some improvement in forage would outweigh the negative impacts due to the loss of thermal cover. Deer and elk populations in the area of the proposed treatments would benefit from the proposed action.

4.5.3.7 **Haul Routes -** There are potential haul routes that go through deer and elk winter range. Design criteria 1.2 describes a seasonal restriction for hauling through winter range that would minimize disturbance to animals.

4.5.3.8 **Disturbance -** The logging and road construction/reconstruction 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 associated activities would be restricted between December 1st and March 31st within all areas designated as crucial winter range.

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

4.5.3.9 **Open-Road Density –**Old existing temporary roads would be reopened 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.

Roads in this area are used for forest management, recreational driving, hunting and fire suppression.

Because the Forest has emphasized the thinning of this type of habitat in recent years, a cumulative effects analysis for thermal cover habitat is included. Since the proposed project would have no effect on optimal cover, no cumulative effects would occur to this deer and elk habitat type. The proposed project would only have very minor impacts on disturbance or harassment.

4.5.3.10 Cumulative Effects

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

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

4.5.3.11 Past, Present and Foreseeable Future Projects and Actions

Project Name	Extent, Size, Type, & Distance	Overlap In Time Or Space	Type Of Potential Effect To Thermal Cover	Measurable Effect To Thermal Cover	Rationale For Inclusion Or Exclusion From Analysis Below
Past – regeneration harvest	Throughout Analysis Area	Yes, all plantations less than 25 years old.*	Loss of thermal cover	Yes	Include. A loss of thermal cover
Past – older commercial thinning	Throughout Analysis Area	Older thinning would be recovered.	none	No	Exclude.
Past and Present – recently planned restoration thinning	Throughout analysis area	Yes	yes	Yes	Include.
Past – rock quarries	Throughout Analysis Area	Yes. Rock quarries are permanent and occur throughout the Analysis Area	Permanent loss of thermal cover	Yes	Include

Project Name	Extent, Size, Type, & Distance	Overlap In Time Or Space	Type Of Potential Effect To Thermal Cover	Measurable Effect To Thermal Cover	Rationale For Inclusion Or Exclusion From Analysis Below
Past – Power Line	Southern portion of Analysis Area	Yes. Power lines are permanent	Permanent loss of thermal cover	Yes	Include. Trees that grow under power line are cut for safety before they can become thermal habitat.
Future pipe line	If the Palomar gas pipeline is built in would remove habitat.	Yes.	Loss of thermal and optimal cover, increase in forage.	yes	Include.
Future timber harvest	Unknown, but potential for timber harvest occurs within all parts of the Analysis Area	Unknown location	Unknown of intensity of treatments	No	Exclude. No site specificity. Can not be modeled at this time.

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

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

4.5.3.12 Thermal Cover and Forage Analysis

Analysis Area	Total Thermal Cover Existing Condition and No Action *		Total Forage Existing Condition		Total Post-Harvest Thermal Cover	
	Acres	%	Acres	%	Acres	%
KW2	3622	70	340	7	18	70
KW3	2497	68	182	5	205	60
KW6	3180	70	302	7	79	69
KW8	2114	65	89	3	177	60
WR1	1875	75	110	4	24	74
WR5	3142	75	253	6	28	74
WR9	4053	76	530	10	91	74
WR12	1613	81	71	4	25	80
WR14	4281	71	54	1	337	66
WR17	3541	57	458	7	482	49
SR8	2821	60	1050	22	7	60
SR19	2498	68	290	8	227	62
SR26	2977	61	754	15	21	61
SR30	4259	75	1044	18	349	69

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

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

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

4.5.3.13 **Methodology**

Public comments were received during the 30-day comment period asking for more information about how the cumulative effects analysis was conducted. In particular, people wanted to know how other recent thinning projects were incorporated.

The analysis areas for deer and elk were developed using guidance from the Forest Plan suggesting that analysis areas be approximately 5000 acres in size (Four-72). Drainages similar to those shown in s. 4.3.7.2 were split into summer and winter range and were further modified to make appropriately sized analysis areas. The analysis map is in Appendix E.

To conduct an analysis for, all of the stands in the analysis area need to be considered, not just the ones proposed for thinning. Since it is not practical to visit thousands of stands, the condition of current vegetation was derived from a GIS layer: veg2007. This file contains the sizes, shapes, locations and vegetation characteristics for all stands as they have been modified and affected by factors such as past timber harvest, tree growth and fires. Trained wildlife biologists categorized the data into Forage, Hiding Cover, Thermal Cover and Optimal Thermal Cover.

Recent timber sales and other projects such as the Palomar pipe line that have been planned but not yet implemented are also included in the analysis. These planned but not implemented projects are included as if they were completed.

Public comments received during the 30-day comment period asked about these specific recent thinning projects. They were included in the analysis where they overlap the same analysis areas as the Rethin project and are shown in blue on the map in s. 4.3.7.2.

EA Name	Project Name
No Whisky EA	1929 Thin, Cold Thin, Moore Thin, Dry Thin Stewardship, Shay Thin Stewardship
Cloak EA	B Thin, G Thin, M Thin, W Thin, Y Thin, O Thin Stewardship, P Thin Stewardship

2007 Plantation Thinning EA	Does not overlap
Upper Clack EA	Wall Thin Stewardship, Unnamed Stewardship Thinning
Collawash EA	Does not overlap

Typically, the GIS files and raw data discussed above are kept in the analysis file and the analysis is summarized in the EA.

Since the analysis areas are well above the thresholds set in the Forest Plan, and because the project would result in very small changes to the quantity of thermal cover at the landscape scale, it is very unlikely that the proposed thinning activities would cause adverse effects to deer or elk. Effects would be immeasurable and undetectable within the action area and would not be of sufficient magnitude to affect overall populations.

4.5.3.13 Forest Plan Standards and Guidelines

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

The following table displays the level of thermal cover and road density within each of the applicable deer and elk summer and winter range analysis areas. There are no Forest Plan standards and guidelines for forage.

The Forest Plan recognizes different categories of summer and winter range: 1/ The entire area used by deer and elk in the winter is often referred to as “inventoried” winter range. 2/ The rest of the Forest is often referred to as “inventoried” summer range. 3/ Special portions of the winter range are referred to as “designated” winter range and these areas have a land allocation (B10), and 4/ Special portions of the summer range are referred to as “designated” summer range and these areas have a land allocation (B11). Standards and guidelines for B10 and B11 only apply to those land allocations while the forest-wide standards and guidelines apply across all portions of the inventoried range.

The project does not overlap any B10 or B11 allocations.

The analysis takes into consideration all the past and present activities shown in the above cumulative effects table.

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

Thermal Cover Analysis Area	Post-Harvest Percentages	Minimum Forest Plan Level for Thermal Cover (%) *
KW2	70	50
KW3	60	50
KW6	69	50

Thermal Cover Analysis Area	Post-Harvest Percentages	Minimum Forest Plan Level for Thermal Cover (%) *
KW8	60	50
WR1	74	40
WR5	74	40
WR9	74	40
WR12	80	40
WR14	66	40
WR17	49	40
SR8	60	30
SR19	62	30
SR26	61	30
SR30	69	30

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

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

There would be no increases in open road densities with this proposed project. The proposed action does not add to the open-road network therefore FW-208 is not applicable.

2.2 miles of old existing temporary roads would be re-opened, and then obliterated 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.

4.5.3.15 The proposed action is 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.
FW-189	Natural meadows and openings are being protected.
FW-190	Logging slash would be left in the units. Experience in similar completed thinning has shown that slash is pressed down by snow and deteriorates quickly. The proposed action would not result in levels of slash that would impede deer or elk movements.
FW-191	Thinning design has incorporated skips and gaps.
FW-192 & 193	Forage areas created would include small gaps and landings which would be within 600 feet of cover.
FW-194 to 197	Not applicable. The proposed action does not involve regeneration harvest.
FW-198 &	Forage would temporarily be increased. Grass and other plants seeded for

199	erosion control would also enhance forage quality.
FW-200 & 201	Not applicable
FW-202 to 212	See detailed analysis above where applicable.

4.5.4 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 stands that range in age from 47 to 73 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

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

There are no applicable standards and guidelines for pine martin or pileated woodpeckers because none of the proposed actions are within B5- Pileated Woodpecker/Pine Marten land allocation. Snags are discussed in section 4.5.2.

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. There would be no benefits to species that prefer thinned stands or negative effects to species that prefer un-thinned stands.

Proposed Action – Research has demonstrated that thinning enhances habitat for a number of migratory species and provides habitat for some species that are rare or absent in un-thinned stands. However, some species of migratory songbirds have been shown to decline following thinning. The effects of thinning in mid-successional stands would most likely have a combination of positive, neutral, and negative impacts on migratory bird use within the stands depending on which species are present. The following migratory species present in the watershed may benefit from thinning: Hammond's flycatcher, warbling vireo, and western tanager. The following migratory species may be negatively impacted by thinning: hermit warbler, Pacific slope flycatcher, black-throated warbler, and Swainson's thrush. This project covers only a very small portion of the migratory songbirds breeding habitat on the Forest. Since relatively young stands 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 4.5.2.

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 watersheds where this analysis area is located. Each soil map unit (number) has been assessed for many risks and hazards called management ratings (e.g. erosion risk, compaction hazard, etc.), which are located in the Mount Hood National Forest Soil Resource Inventory (SRI, Howes, 1979). The SRI is most useful as an initial broad-scale planning tool to identify and display maps of possible soil concerns or sensitive areas. Interpretations are based on observations of soil characteristics at sites thought to best represent the entire soil mapping unit. Soil properties can vary significantly within a mapping unit and on-site investigations are often required to refine or modify interpretations. Qualified soil scientists adjust management interpretations to reflect on the ground conditions and provide resolution to the soil map units at a site-specific scale.

4.6.2 Methodology

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

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

4.6.2.2 **Assessment of existing soil disturbance condition** – Priority stands were chosen based on logging method (with emphasis on ground based systems) for field estimates and study of existing soil disturbance conditions. Soil disturbance condition was based on Howes Disturbance Classes, developed on the Wallowa-Whitman National Forest (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.

All stands that are proposed for treatment were visited during August of 2007. The

proposed treatment stands were assessed in the field for the amount of impact (percentage of area with existing soil disturbance). Initial soil transects were developed from old aerial photos (from the earliest flight flown after the stand was originally clearcut) to provide for the best coverage of past treatment unit activities. Stands included each of the two primary soil types in the planning area – one derived from glaciation and the other on earthflow terrain. The resulting monitored stands provided feedback to calibrate aerial photo estimates, and ultimately were used in the prediction of percentage of detrimental soil condition following logging. Skyline and helicopter stands were included in the detrimental soil condition study, but were not surveyed as intensively because of the relatively small soil impacts resulting from those logging methods as compared to ground based logging.

4.6.2.3 **Areas of concern -** Field notation of specific logging concerns such as proximity to riparian areas or high water tables, and/or unstable areas. Observed and noted concerns are listed in the soils stand survey notes.

4.6.3 Measures

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

4.6.3.1 Erosion

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

4.6.3.2 Soil Disturbance

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

4.6.3.3 **Organic Matter**

Soil fertility and soil biological systems will properly function if certain components are present, such as appropriate levels of organic matter and coarse woody debris. Poor or non-functioning soil biological systems may lead to difficulties in revegetation efforts, or decline in existing desirable vegetation. Soil biology involves complex interactions occurring between organisms and their soil habitats, including physical and chemical characteristics.

4.6.3.4 **Landslide Risk**

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

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

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

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

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

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

that they should be analyzed for inclusion during watershed analysis. The Watershed Analysis did conduct this analysis and did include certain unstable areas as Riparian Reserves. Earthflows vary in terms of their stability and their steepness. 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 earthflows that would be thinned are generally more stable and are considered suitable for timber management. 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 units proposed for thinning. These are appropriate boundaries because actions outside the unit boundaries would have little or no affect to soil productivity within the units, and the actions within the unit boundaries would have little or no affect to soil productivity elsewhere. Actions within the unit boundaries may have an effect on hydrologic properties elsewhere. The analysis of hydrology for earthflows and watersheds can be found in s. 4.3.7.1.

4.6.5 Elements of proposal that could affect soil productivity

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

The analysis also considers restorative actions and the design criteria and best management practices that minimize impact. For example: existing roads, landings and skid trails would be reused where feasible, equipment would be restricted to appropriate slopes, erosion control methods such as water bars, seed and mulch would be used. Refer to section 2.3.9 for details.

4.6.6 Soil Types and Geographic Locations in the Planning Area

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

Earthflow terrain – the units (17, 18, 21, 22, 23, 25, 26, 28, 32, 33, 34, 35, 36, 38, 39, 40, 41, 42, 43, 44, 45 and 46) which overlay this landtype are the most productive of all the

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

Glacially derived soils – the units (1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 19, 20, 24, 29, 31, 47 and 48) which overlay this landtype range spatially throughout the project area. These soils are subdivided into less than 30% slope and greater than 30% slope.

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

	Soil Map Unit	Compaction Hazard	Erosion Risk	
			Surface	Subsurface
Earthflow terrain <30% slope				
	3-4	Moderate-High	Very Slight	Low
	100	High	Moderate-Severe	High
	104	Moderate-High	Slight-Moderate	Moderate-High
Earthflow terrain >30% slope				
	101	High	Severe	High
	102	High	Severe	High
	105	Moderate	Moderate-Severe	High
	106	Moderate	Severe	Moderate
Earthflow terrain >60% slope				
	108	Moderate	Severe	High
	109	Severe	Severe	Moderate
Steep uplands >30% slope				
	1	Low	Severe	Severe
	7	Rock Outcrop	Rock Outcrop	Rock Outcrop
	15	Low	Very Severe	High
Mountain Slopes >60%				
	113	Severe	Severe	Moderate
	201	Sever	Severe	Low
Glacial deposits <30% slope				
	306	Slight	Moderate	Moderate
	312	Moderate	Moderate	Moderate
	315	Moderate	Moderate	Moderate
	317	Moderate	Moderate	Moderate
Glacial deposits >30% slope				
	308	Moderate	Moderate	Moderate
	313	Moderate	Severe	Moderate
	314	Moderate	Severe	Moderate
	316	Moderate	Moderate	Moderate
	317	Moderate	Moderate	Moderate
	319	Moderate	Severe	High
	328	Moderate	Moderate	Low
	329	Moderate	Moderate	Moderate

4.6.7 Direct, Indirect and Cumulative Effects

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

4.6.8 Erosion

No active erosion from previous vegetation management was observed during the field reconnaissance for this project. Ground cover estimates from field transects through proposed treatment units is displayed in s. 4.6.8.1 below. Ground cover is used as an indication of erosion risk. All of the units have well above 90% groundcover.

Alternative A – No Action

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

Proposed Action

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

4.6.8.1 Existing Condition, Direct and Cumulative Effects to Groundcover.

Monitored Unit #	SRI Map Unit(s)	Erosion Risk Rating (surface soil)	Percent of Field Observations with Ground Cover	Predicted Groundcover After Thinning
1	312, 313, 314	Moderate	100%	> 75%
2	3, 7, 312	Slight - Moderate	100%	> 75%
3	200, 312	Moderate- -Severe	100%	> 75%
4	313	Moderate	100%	> 75%
5	319	Moderate	100%	> 75%
6	312, 319	Moderate	100%	> 75%
7	312, 313, 317	Moderate	100%	> 75%
9	312, 313, 317	Moderate	100%	> 75%
10	312, 319	Moderate	100%	> 60%
11	312, 315, 317	Moderate	100%	> 75%
12	315, 317	Moderate	100%	> 60%
13	315, 317	Moderate	100%	> 75%
14	315	Moderate	100%	> 75%

Monitored Unit #	SRI Map Unit(s)	Erosion Risk Rating (surface soil)	Percent of Field Observations with Ground Cover	Predicted Groundcover After Thinning
15	315	Moderate	100%	> 75%
16	313, 316	Moderate	100%	> 60%
17	7, 100, 201	Moderate - Severe	100%	> 60%
18	100, 201	Moderate - Severe	95%	> 60%
19	315	Moderate	100%	> 60%
20	306, 308	Slight - Moderate	100%	> 60%
21	3, 100, 102	Slight - Severe	100%	> 60%
22	3, 100, 101, 102	Moderate - Severe	100%	> 60%
23	100, 101, 316	Moderate - Severe	100%	> 60%
24	3, 315, 316, 317	Slight - Moderate	100%	> 60%
25	4, 100	Slight - Moderate	100%	> 60%
26	100, 101	Moderate - Severe	100%	> 60%
28	100, 101	Moderate - Severe	100%	> 60%
29	306, 308	Slight - Moderate	100%	> 60%
30	306, 308	Slight - Moderate	100%	> 60%
31	308	Moderate	100%	> 60%
32	100, 101	Moderate - Severe	100%	> 60%
33	100, 101	Moderate - Severe	100%	> 60%
34	100, 101	Moderate - Severe	100%	> 60%
35	101, 104, 109	Moderate - Severe	100%	> 60%
36	2, 100, 102	Moderate - Severe	100%	> 60%
38	100, 113,	Moderate - Severe	100%	> 60%
39	2, 100	Moderate - Severe	100%	> 60%
40	101, 104	Moderate - Severe	100%	> 60%
41	104, 105	Moderate	100%	> 85%
42	104	Moderate	100%	> 85%
43	104, 105, 108	Moderate - Severe	100%	> 60%
44	13, 105	Slight - Moderate	100%	> 60%
45	106, 329	Moderate	100%	> 60%
46	104, 105, 108, 113	Moderate - Severe	100%	> 60%
47	312, 313, 314	Moderate	100%	> 75%
48	312, 313, 314	Moderate	100%	> 75%

4.6.9 Soil Disturbance

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

The majority of readily observable ground disturbances in the field were heavily compacted old skid trails, landings, and temporary roads. Also observed were areas where displacement or excess removal of organic material had occurred from historic logging activity. It was observed that all ground-based units visited still show signs of skid trail compaction. There does not seem to have been substantial recovery on skidtrails (especially swing trails) where the old harvest units are located on gentle slopes. Soil Mapping Unit 306 appears to have been especially impacted, probably due to the ease of access for tractor use and finer texture soil properties. Historic disturbance on these soil types mainly attributed to skid trails and landings, still rated as detrimental in nearly all cases.

The percentage of area in a detrimental soil condition varies from stand to stand due to the occurrence, manner, and extent of past timber harvest and fuel treatment activities. All units were clear cut harvested from 1945 to 1975 and subsequent site preparation included broadcast burning or machine piling. Management practices at that time did not restrict machine movement, skid trail density, removal of woody debris or intense burning; therefore existing detrimental impacts to soil are generally higher than allowed under the current Forest Plan standards and guidelines. The existing condition for detrimental soil disturbance is summarized as the estimated percent area of detrimental soil condition in each of the treatment units.

Glacial soils - For glacial soils, detrimental condition in the traversed units ranged from 8% to 40%. Based on this sample, it is estimated that 80% of the area that had been previously logged with ground-based equipment exceed 15% detrimental soil condition. None of the units previously logged with skyline or other cable methods exceed 15%.

Earthflow soils - On earthflow soils, detrimental condition in the sampled units ranged from 5% to 25%. Based on this sample, it is estimated that all units previously harvested with ground-based equipment and almost all units previously harvested with skyline or other cable systems exceed 8 % detrimental soil condition.

4.6.9.1 Alternative A

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

4.6.9.2 Proposed Action

Changes to disturbed soil condition were estimated. It was assumed that existing landings and skid trails would be reused. 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 proposed action. 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.

After logging is complete, where detrimental soil conditions are in excess of the Forest Plan standards, all newly constructed and re-opened roads and landings would be decompacted and revegetated. Restoration of temporary roads and landings by subsoiling and revegetation would initiate recovery of productivity, but is not expected to return the soil to its original condition and productivity.

A net increase in disturbed soil condition is predicted where more skidtrails, yarding corridors, landings and roads would be constructed than already exist.

4.6.9.3 Direct and Cumulative Effects

Terrain type	Compaction Hazard	Slope	Percent Disturbed Soil Condition			Acres in Thinning Units
			Estimated Existing Condition	Estimated Change with the proposed action	Estimated Result for the proposed action	
Glacial	Moderate	< 30%	3% - 34%	2 – 4%	5% - 38%	780
	Moderate	>= 30%	2% - 5%	2%	4% - 7%	515
Earthflow	High	< 30%	0% - 19%	2 – 4%	2% - 23%	533
	High	>= 30%	1% - 8%	2%	3% - 10%	260

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 40% 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.

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

4.6.10 Organic Matter

Alternative A – No Action

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

Proposed Action

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

4.6.11 Landslide Risk

The proposed thinning units have been logged before. The level of stability of the slopes of all the proposed thinning units was therefore "tested" in the past. A conservative approach to evaluating the effects of thinning on slope stability is to identify the areas of the units that show evidence of landslide activity and exclude those areas from any harvest. Areas that remained stable after the original harvest would likely continue to be stable after thinning.

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

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

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

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

4.6.11.1 **Treatment Unit by slope stability category.**

Category	Thinning unit number (the same unit may appear in categories 1 and 2)
1	38
2	22, 33, 35, 38, 40, 43, 45, 46
3	17, 18, 19, 21, 22, 23, 25, 26, 28, 32, 33, 34, 35, 36, 38, 39, 40, 42, 43, 44, 45, 46
4	46

4.6.11.2 There were some mapping inaccuracies in the GIS coverage of landform type ALA and the mapped active landslides. This resulted in some map overlap between the proposed thinning units and the landform type ALA and/or mapped active landslides that did not actually exist on the ground. For this project, riparian reserve maps were refined based on field inspections. This new map is not considered a change to the recommendations put forward in the watershed analyses or the Northwest Forest Plan but simply a more accurate refinement of the intent of those documents.

The units have examined by the Forest stability specialist and a portion of unit 46 has been deleted due to concerns about stability.

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

4.6.11.3 **Direct and Indirect Effects of Alternatives**

No Action

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

Proposed Action

The proposed action would thin areas that are considered to be stable by a slope stability specialist. Known unstable or potentially unstable areas have already been deleted from the proposed thinning units. Additional unstable areas identified during unit layout would be designated as “skips” or otherwise deleted from the unit. The thinning would enhance tree growth and tree root growth over the long term, restoring hill slope stability to original levels. Thinning would not significantly affect hill-slope stability because the roots of leave trees already intermingle with those of cut trees and new root growth would result before the roots of cut trees decay and loose their strength. Existing shallow landslide scars within the project area would be protected and would continue to slowly heal as vegetation on the scars became denser. The level of instability of deeper-seated active landslide areas would be unaffected by the thinning.

Existing system roads that would be used for haul would be maintained and repaired. These actions would greatly reduce the risk of resource damage from these roads.

The proposed 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.

4.6.12 Forest Plan Standards and Guidelines

Mt. Hood Forest Plan References

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

FW-1 to 16	Slope stability concern areas have been identified by the Forest Geologist, and have been deleted from the proposed units.
FW-017 to 019	Most units that were logged with ground-based equipment in the original harvest are not consistent with these standards. See discussion below for exception for FW-018.
FW-020	Most units that were logged with ground-based equipment in the original harvest would be logged similarly this time reusing existing landings and skid trails. See discussion below for exception.
FW-021	Natural drainage features would be maintained or improved.
FW-22 to 23	Most units that were logged with ground-based equipment in the original harvest are not consistent with these standards. See discussion below for exception.
FW-24	Minimization of rutting would be achieved through the provisions in the contract.
FW-25	Ground cover would be maintained at the prescribed levels.
FW-28 to 30	Rehabilitation would be accomplished only on roads and landings used by the operator. Rehabilitative techniques would not restore the soil resource to a level of less than 15% impaired. See discussion below for exception.
FW-31 to 34	Sufficient woody debris would be left on site including existing down logs, tops and branches and trees felled to create coarse woody debris.
FW-037	Many aspects of the project include design features that limit disturbance to the soil's organic horizon: broadcast burning and mechanical fuel treatments would not occur, skyline and helicopter systems are used where appropriate, existing temporary roads, landings and skid trails would be reused where appropriate and mechanical fellers would operate on top of branches and tops.
B8-31 to 32	The proposed action is consistent with these standards for earthflow recovery. These are addressed in section 4.3.7.1
B8-36	Most units that were logged with ground-based equipment in the original

	harvest would be logged similarly this time reusing existing landings and existing skid trails. See discussion below for exception.
B8-40	Most units that were logged with ground-based equipment in the original harvest are not consistent with this standard and guideline. See discussion below for exception.
B8-48 to 49	Road locations have been reviewed by the Forest Geologist.

4.6.13 Exceptions

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

FW-028 & FW-030

This standard and guideline suggests rehabilitation of impacted soils where the cumulative detrimental condition is greater than 15%. While this is proposed for temporary roads and landings that are used by the contractor, it is not proposed for skid trails. 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 proposed action would reuse existing skid trails where appropriate but not all areas that were disturbed in the original logging would be disturbed again because of the requirements of the design criteria and best management practices. The opportunity to mechanically rehabilitate skid trails may come in the future if and when regeneration harvest occurs. In areas not disturbed again, natural recovery would continue to occur as roots and burrowing animals penetrate and break up compacted soils, and as organic matter accumulates.

FW-22

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

B8-36 & FW-020

These standards and guidelines suggest that ground-based yarding of logs should not occur. Ground-based yarding would be used on earthflows where ground-based systems

were used in the original logging. An exception is proposed because examination of the units has found that the use of existing roads, skid trails and landings with restoration would result in minimal impact. The objective of providing for earthflow stability would still be met. One option would be to switch to a skyline system, which would overlay the impact of skyline corridors over an existing network of skid trails and in many cases would result in the need to build new roads and landings to facilitate skyline logging. Another option would be to switch to helicopter logging with its associated increase in cost. These options were adopted in some situations where appropriate but in most earthflow units, the objective of earthflow stability would still be met by thinning to create healthy, productive stands using ground-based methods.

B8-40 & FW-018

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

4.7 SCENERY

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

The primary viewer positions for this project would be the banks of the Clackamas River and Roads 46 and 57. Other viewer positions would include all open local roads.

4.7.1 **Existing Situation**

The stands proposed for thinning currently meet the criteria of being visually recovered. The analysis area is experiencing a period of steady visual recovery because there has been relatively little regeneration harvest in the past two decades and plantations are growing rapidly. On the landscape scale, there are some areas where a “patchwork” pattern exists and observers can see the difference in texture and line between plantations and adjacent mature forest stands. This pattern is subtle as seen from the most sensitive viewer positions

but is much more noticeable from local forest roads. Power lines cross through the area creating a straight line effect. Some of the proposed thinning units are directly adjacent to the power line right-of-way.

4.7.2 Direct and Indirect Effects

Alternative A:

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

Proposed Action

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

4.7.3 **Effects to scenery as seen from sensitive viewer positions:**
Clackamas River and Roads 57 and 46. Alterations to scenery if any would be very slight because of a combination of topographic screening, vegetative screening near the viewer position, the density of green trees retained within thinning units, the distance and the viewer angle. No log landings would occur on, or be visible from the primary viewer positions. These factors combined would result in no noticeable change to the casual observer; the viewer would not notice any dramatic changes in forest structure or see bare ground or slash. Similar 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 proposed action 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 young stands and adjacent mature forest stands. In the long term, the proposed action would result in improved scenery and this improvement would occur much faster with the proposed action than with no action.

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

Some minor changes to foreground views from local open roads would occur with the proposed action. The proposed action would emphasize the reuse of existing roads, landings and skid trails. Log landings, temporary roads, skid trails and skyline corridors that lead to the landings and landing slash piles would be noticeable in the short term by viewer positions at the landings. Landing size would be kept to the minimum size needed

for safety and areas of bare soil would be seeded with grass for erosion control. The thinned forest may have some bare soil, red slash and stumps visible in the short term, but over time this would become less noticeable. From other more distant viewer positions, the thinning would not be evident to the casual observer. In some cases landings occur on closed system roads or on temporary roads. When these roads are reclosed following logging, most of the visual impact would not be seen from open roads except for the berms and the first section of closed road.

When comparing the proposed action 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 young stands and adjacent mature forest stands. In the long term, the proposed action would result in improved scenery.

4.7.5 Cumulative Effects

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

4.7.6 Forest Plan standards and guidelines

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

FW-554 & B2-012 Visual Quality Objectives

Management Area or Designated Viewshed	**Viewer Position**	**Fore-ground**	**Middle-ground**	**Back-ground**
A1 - Clackamas River (Scenic Segment)	River, trails	R	PR	PR
A1 - Clackamas River (Recreational Segment)	River, trails	PR	PR	PR
B2- Roads 46 and 57	Road	R	PR	PR
B7- Riparian Reserve	Stream	PR	M	N/A
All other areas	Local Roads	M	M	M

R = Retention
PR = Partial Retention
M = Modification

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

quality objectives. Similar 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.

4.8 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.

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 proposed action such as road reconstruction or repair 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 and invasive plant species from July 9 to October 25, 2007.

A Botanical Biological Evaluation has been prepared and is summarized in Appendix D.

4.8.1 Existing Situation

No rare or uncommon botanical species were found during the 2007 surveys.

Surveys to detect the presence of many species of fungi are not considered practical because of the variability in fruiting-body (mushroom, truffle) production from year to year. Ten species that have suitable habitat present are assumed to be present.

Direct and Indirect Effects

4.8.2 No-Action Alternative

With no action there would be no ground disturbance to forest soils and plant communities. There would be no direct effect to botanical species.

4.8.3 Proposed Action

Thinning can accelerate development of late-successional stands by reducing tree density and competition for light and nutrients, creating forest gaps and structural diversity, and promoting biological diversity.

The proposal would disturb forest soils and plant communities (e.g., tree falling and skidding). Disturbance to soils and plant communities from restoration thinning may affect fungi species that may be present.

The proposed action **May Impact Individuals and habitat but is not likely to lead to a trend toward federal listing.**

Fungi	**Species Likely Present in Project Area**	**Impact of Project**
Cordyceps capitata	Yes	MII
Cortinarius barlowensis	Yes	MII
Gyromitra californica	Yes	MII
Leucogaster citrinus	Yes	MII
Otidea smithii	Yes	MII
Phaeocollybia attenuata	Yes	MII
Phaeocollybia californica	Yes	MII
Phaeocollybia olivacea	Yes	MII
Phaeocollybia piceae	Yes	MII
Phaeocollybia pseudofestiva	Yes	MII

MII = May Impact Individuals but not likely to lead to a trend toward federal listing.

4.9 MANAGEMENT OF COMPETING AND UNWANTED VEGETATION

This section addresses invasive plants and unwanted vegetation.

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

4.9.1 **Invasive plants** are species not native to a particular ecosystem that may cause economic or environmental harm. They are sometimes informally referred to as “weeds” and are listed in Appendix B of the Preventing and Managing Invasive Plants Final Environmental Impact Statement, 2005. Invasive plants can alter natural ecosystems by displacing native species and by reducing natural biological diversity through the replacement of native communities with invasive weed monocultures.

The following actions have the potential to affect invasive plants: actions that disturb soil such as skidding and yarding of logs, actions that harvest or kill trees, landing creation, temporary road construction, road reconstruction, road repair, road maintenance, road closure, road use by any vehicle and vehicle or equipment transportation to the project area from off-site. Invasive plant species were found along roads, in skid roads and old landings, and in forest openings with ground disturbed by previous timber harvest activities. Also considered in this analysis are the design criteria to minimize the spread of invasive plants (#4 and 8 in section 2.3.9). The proposed action does not involve the use of herbicides.

Invasive plants are spread by people, wild and domestic animals, and natural processes (e.g., wind, water, fire). Vehicles can transport entire plants, parts of plants, or seeds

onto National Forest System lands. Ground-disturbing activities can often expose bare ground where invasive plants can colonize and spread (e.g., timber harvest, road reconstruction). All of these activities/processes can result in the spread of weeds and infestation of previously un-infested sites. Many invasive plant species can be found wherever one travels along roads on the Mt. Hood National Forest.

The Forest has completed a Record of Decision and Final EIS for the treatment of invasive plants entitled *Site-Specific Invasive Plant Treatments, Environmental Impact Statement (EIS) for the Mt. Hood National Forest and Columbia River Gorge National Scenic Area*. The FEIS identifies 208 invasive plant populations/infestations that would be treated manually, mechanically, or chemically (with herbicides). Additionally, the FEIS includes an early detection/rapid response strategy (EDRR) for treating new populations/infestations (i.e., newly discovered sites or not yet inventoried sites on the Forest).

4.9.2 Existing Situation

Many of the roads in the project area contain St. Johns-wort (*Hypericum perforatum*), Canada thistle (*Cirsium arvense*) and Scotch/Scot's broom (*Cytisus scoparius*). These species are listed as noxious weeds by the Oregon Department of Agriculture (ODA 2006). Scotch broom is considered naturalized. Canada thistle and St. John's-wort are common and widespread on the Forest, including in the project area.

Direct and Indirect Effects

4.9.3 No Action

It is expected that invasive plants would continue to invade roadsides, thinning units, burned areas, and other disturbed ground within the project area. People driving the roads in the project area inadvertently transport, introduce, and spread invasive plants. It is expected, for both the short and long term, that invasive plant populations would increase in the project area because of human activities. Increased visitor use is expected as human population growth continues to expand in the Portland metropolitan area and surrounding areas over time. Also, routine road maintenance may spread weeds. For example, mowing roadside vegetation can spread invasive plants such as St. Johns-wort, Canada thistle and Scotch broom. Existing populations would be expected to expand into disturbed habitat because invasive plants are able to outcompete native plant species in disturbed habitats. It is likely that some of the invasive plant populations in the project area would be treated under the *Site-Specific Invasive Plant Treatments EIS for the Mt. Hood National Forest and Columbia River Gorge National Scenic Area*.

4.9.4 Proposed Action

It is highly likely that opportunities for spreading invasive plants across the landscape within the project area would increase. Increased traffic on Forest Service roads due to logging operations would likely spread weeds. Roads are conduits for the spread of

weeds and vehicles are weed-spreading vectors. Construction of landings, and skid roads would provide opportunities and growing space for weeds to colonize. Openings in forest stands with disturbed ground resulting from thinning operations would provide opportunities and growing space for weeds. The magnitude of increase can not be accurately predicted. Forest Service roads in the project area already receive a good deal of traffic from recreation seekers (e.g., sportsmen/hunters, campers, hikers) and Forest Service employees. In general, however, traffic intensity can be expected to increase with logging operations, which create ground-disturbed areas where invasive plants can thrive.

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

4.9.5 Cumulative Effects

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

4.9.6 Forest Plan Standards and Guidelines

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

Standards from the Regional Invasive Plant Record of Decision

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

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

4.9.7 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). Solenoid

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

4.10 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: Portland/ Vancouver Metropolitan Area, Mt. Hood Wilderness, Bull of the Woods Wilderness, Salmon –Huckleberry Wilderness and Mt. Jefferson Wilderness. The analysis area includes a large airshed that incorporates the west side of the Mt. Hood National Forest, the area west of the Forest and the specific listed areas of concern.

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

few miles from the nearest proposed thinning unit. The nearest town is approximately 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.

Proposed Action

4.10.2 **Exhaust** and its pollutants would be created by vehicles and equipment used for all aspects of the proposed action. Helicopters use more fossil fuel that other types of logging equipment. Pollutants would disperse and would not likely cause health concerns for forest users.

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

4.10.4 **Landing slash** would be burned. The proposed action 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. The branches and tops of harvested trees and the felling of trees for woody debris recruitment would increase fuels by approximately 5 tons per acre.

Health risk 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.

4.10.5 **Indirect Effects** – All prescribed burning would be scheduled in conjunction with the State of Oregon to comply with the Oregon Smoke Implementation Plan to minimize the

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

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

4.10.7 **Mt. Hood Forest Plan References**

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

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

4.11 ECONOMICS – FINANCIAL ANALYSIS

One of the aspects of the purpose and need (s. 2.2.5) and one of the dual goals of the Northwest Forest Plan is to provide a sustainable level of forest products for local and regional economies and to provide jobs. The Northwest Forest Plan Final Environmental Impact Statement has an in-depth analysis of the economic basis behind the goal of providing forest products for local and regional economies. It also contains an analysis of the social and economic benefits and impacts of preservation, recreation and other values. To benefit local and regional economies, timber is auctioned to bidders. For contracts to sell they must have products that prospective purchasers are interested in and they must have log values greater than the cost of harvesting and any additional requirements.

The purpose of this analysis is to provide a comparison of the alternatives.

Alternative A would not provide forest products consistent with the Northwest Forest Plan goal of maintaining the stability of local and regional economies now and in the future. The proposed action 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.

Based on past experience with thinning similar stands with similar prescriptions and similar logging systems, it is likely that there would be sufficient value of timber removed to accomplish restoration thinning.

4.11.2 Forest Plan standards and guidelines

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

The proposed action is consistent with Forest Plan goal to efficiently provide forest products.

4.12 TRANSPORTATION

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

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

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

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.

A recent restoration EA planned the decommissioning of many roads.

4.12.1 Existing Situation

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

Existing temporary roads were assessed to determine whether they are needed for the current thinning proposal (s. 2.3.7.1). These existing temporary roads are closed and in some cases have vegetation, brush and trees growing on them.

4.12.2 Direct and Indirect Effects

4.12.3 Alternative A

Because funding is not available to repair roads, they would continue to deteriorate. The impact of unrepaired roads is addressed in the water quality and fisheries section. In the long term, roads would become unsafe and would need to be closed. Closing them would not resolve the water quality issues.

4.12.4 Proposed Action

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

The table in section 2.3.7.2 shows the lengths of roads that would be used. Approximately 2.2 miles of old existing temporary roads would be reopened. They would be obliterated upon completion of the harvest units they access. These roads are on dry stable landforms and do not cross any streams.

Some closed system roads would be temporarily opened. These roads were never decommissioned but were closed with berms or other means to reduce wildlife harassment and reduce road maintenance costs until they were needed again. These roads do not require reconstruction but routine blading and brushing to get them ready for use. These roads would not be open to the public. They would temporarily be used by the loggers, truck drivers and Forest Service personnel. After logging, the roads that were opened would be closed. There would be no increase in the permanent roads open to the public.

Road Repair and Stabilization

To facilitate safe use, several roads are in need of repair including deep patch repairs and leveling courses added over poly fabric. In addition, most haul roads would receive road maintenance including ditch and culvert cleaning and brushing. Gravel roads would have rock added in spots and would be bladed and shaped where needed. This work is within the road prism.

4.12.7 Cumulative Effects

The proposed action 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.

4.12.8 Forest Plan standards and guidelines

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

The proposed action is consistent with Forest Plan goal to efficiently provide transportation.

4.13 HERITAGE RESOURCES

Heritage surveys for the Area of Potential Effects for this project were completed with no new sites located. This project results are discussed in heritage resource report number 2008-060605-006. There are no anticipated effects to any known heritage resources. Contracts would contain provisions for the protection of sites found during project activities. This proposed project meets the criteria in the Programmatic Agreement for "No Historic Properties Affected" determination (Stipulation III (B) 1).

Forest Plan standards and guidelines

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

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

4.14 RECREATION

4.14.1 In the vicinity of the project units there are no campgrounds, trails or other destination recreation features. Recreational uses of the Clackamas River include rafting, kayaking and fishing. None of the thinning units can be seen by viewers along the river. The proposed action would not affect these recreational uses.

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

4.14.3 Under the Wild and Scenic Rivers Act, the Clackamas River has been designated with both recreational and scenic segments. The river corridor has a land allocation (A1) that extends up slope. A portion of unit 29 is in the scenic segment. The river is also a state scenic waterway. The outstandingly remarkable values identified in the River's management plan are Botany/Ecology, Fish, Wildlife, Recreation and Cultural Resources. Scenery was not found to be an outstandingly remarkable value. These resources are addressed in detail elsewhere in this document (see table of contents).

4.14.4 The effects to recreational fisheries would be minimal because fish habitat conditions downstream would not be detrimentally affected. Access to streams for angling would not be altered. The Clackamas River above North Fork dam is designated a wild fish sanctuary and no recreational fishing for salmon or steelhead is allowed. Recreation associated with fishing has decreased since 1999 when this rule was put in place.

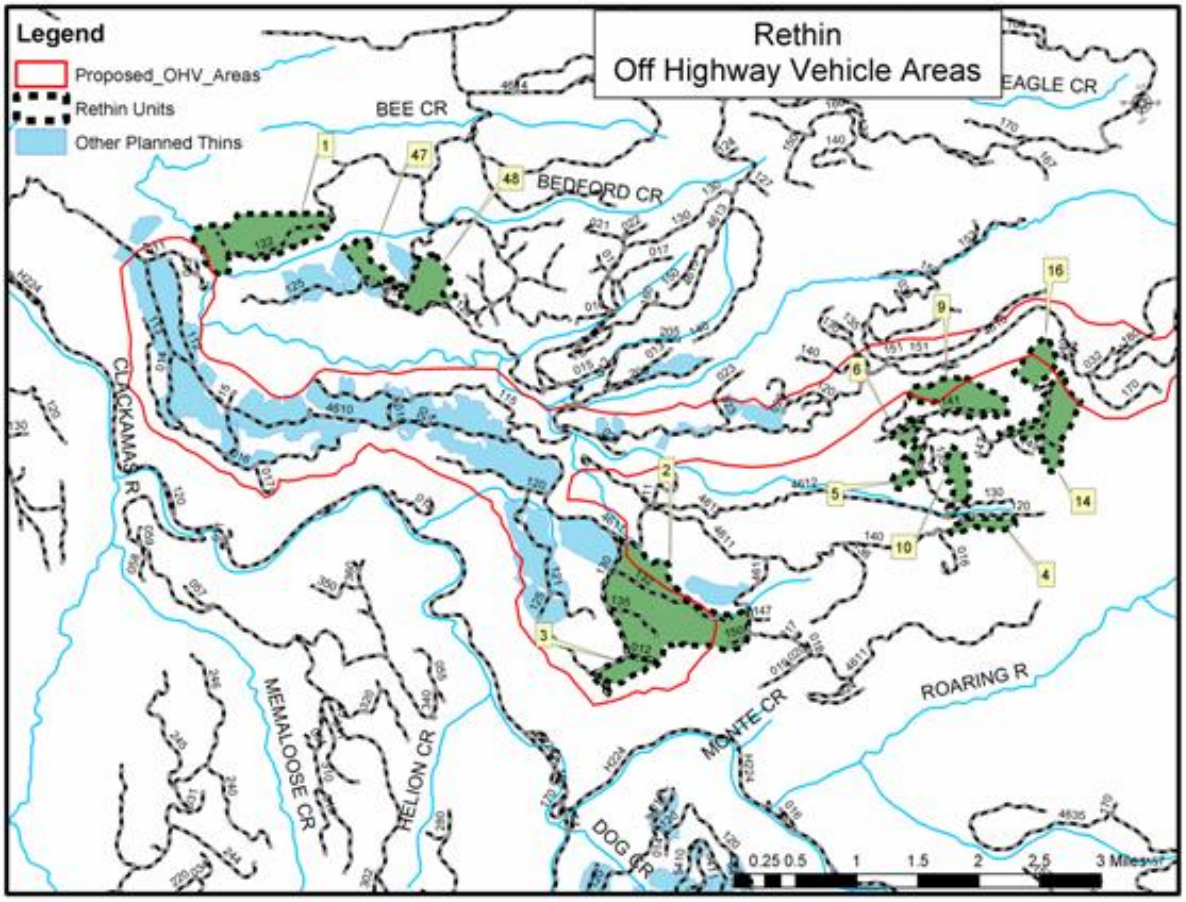
4.14.5 Currently Congress is considering a Wilderness bill. It may create a Wilderness directly adjacent to this project. At this time there does not appear to be a conflict between Wilderness proposal and the proposed thinning. The Wilderness bill language does not require a buffer between the Wilderness and management actions.

4.14.6 The Forest Service is developing an OHV plan for the Forest. An Environmental Impact Statement is being prepared but at this time the draft has not been released. The OHV plan would focus on travel management within six proposed OHV areas. One of the proposed OHV areas (referred to as La Dee Flat) overlaps the project area. La Dee Flat is being considered as an area to allow OHV use on designated roads and trails.

A few miles to the northwest of units 2 and 3, some unauthorized OHV use is occurring. OHV use includes all terrain vehicles, motorcycles and 4-wheel drive trucks some of which occurs on roads and some off roads. Design criteria s. 2.9.3.6.8 would minimize the likelihood of the expansion of user created routes into the units.

4.14.7 Cumulative Effects

Public comments were received during the 30-day comment period asking for more information about cumulative effects. In particular, people wanted to know how the proposed thinning and other recently planned thinning projects would interact with the current and planned OHV situation. The following map shows the overlap between the units and the proposed La Dee Flat OHV area.



The portion of La Dee Flat along road 4610 has experienced intensive public use including unauthorized activities such as garbage dumping, target shooting and off-highway vehicle (OHV) use. In 1998, a legal closure was instituted that restricted vehicle use to certain open roads. However some unauthorized use continues. Also in 1998, efforts were underway to block user created OHV trails in certain high impact areas. Rethin units 2 and 3 are near, but not in the area with the greatest OHV impact. A recent thinning project called "No Whisky" was centered in the highest impact areas. This photo shows some mud puddles created by OHV use in the vicinity of No Whisky. The area is not a wetland; the puddle is filled with rain water and is not connected to a stream. The No Whisky project included many design features to reduce the likelihood that OHV use would expand into new areas, including several that were devised after public comment and during the appeal resolution process. Part of the No Whisky project has

already been implemented and the mud holes in the above photo have been filled in with large rocks.

After considering public comment, some of the applicable design criteria that where developed for No Whisky were incorporated into Rethin. The following measures would be taken to reduce the likelihood that unauthorized OHV would expand into Units 2 and 3:

- Slash, tree tops, root wads, boulders, logs and other debris would be placed on temporary roads, landings and skid trails that are used by the operator to discourage OHV use.
- The use of landings on roads other than 4611-130 would be encouraged where feasible. Landings on road 4611-130 would only be used where other options are not feasible.
- To protect brush and other vegetation that may deter OHV mobility, no logging equipment would be operated within 40 feet of road 4611-130 except on roads, designated skid trails and landings.
- OHV use patterns would be monitored. If OHV use expands into the units in spite of the above measures, corrective actions would be taken that may include but would not be limited to bringing in additional debris from off-site.

These measures are compatible with the Forest OHV proposed action. That proposed action would use 4611-130 as an OHV route and it would decommission the roads that branch off of 4611-130 into units 2 and 3.

One of the reasons the Forest proposed the La Dee Flat area for OHV designation is that the resource risks are relatively low compared to other parts of the Forest. The Environmental Impact Statement for the OHV plan would address the impacts of OHV use, and propose mitigation where necessary. At this time the proposed action does not restrict forest management practices along OHV routes.

The Forest OHV plan would change the way roads and trails are designated for use. Currently it is difficult for law enforcement officers to enforce the rules and it is sometime confusing for OHV users to know what the rules are and where they can ride. The OHV plan would provide hardened designated routes that OHV users could safely use without causing excessive resource impact.

It is likely that OHV users would continue to be tempted to ride in unauthorized areas. However, the Forest OHV plan would make law enforcement efforts more efficient.

To discuss cumulative effects in this context, we would have to assess whether Rethin would exacerbate unauthorized OHV impacts when combined with No Whisky and the proposed Forest OHV plan. Resources such as hydrology, soils, water quality and wildlife could potentially be impacted.

Current efforts build on the restoration work that was begun in 1998. No Whisky, with its design criteria and with the restoration work that is already underway, is likely to result in a situation that improves resource protection while thinning in a way that restores diversity to the landscape. It is likely that the proposed OHV plan would result in reduced impacts to resources compared to the current situation; users would have designated hardened routes and law enforcement officers would have a greater ability to enforce the rules. It is not likely that the proposed Rethin project with its design criteria would result in incremental impacts of sufficient magnitude to affect the overall condition of resources in the area.

4.14.8 Forest Plan standards and guidelines

Mt. Hood Forest Plan References

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

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

A1-CLA-01	There would be no degradation of any of the outstandingly remarkable values.
A1-CLA-03	River characteristics would not be changed.
A1-CLA-04	Recreation opportunity spectrums of roaded natural and semi-primitive motorized would be met by all alternatives.
A1-CLA-28-31	The project is designed to protect or enhance river values. All of the units in A1 land allocation are in late-successional reserves.
A1-CLA-58-59	No new temporary roads would be constructed in A1.
FW-453 to 466	There would be little or no affect to dispersed recreation.

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. There has been no attempt to quantify carbon emission or sequestration.

4.15.2 Existing Situation

This project involves the thinning of second-growth stands. 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:

- 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 west-side 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 proposed action 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).

- Thinning to enhance the growth of the residual stand would sequester more carbon than would occur with no thinning (Millar 2007) (Stavins 2005).

- 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.

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

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 town of Estacada (the nearest community) is approximately 10-30 miles away. Even farther away, but potentially affected are the American Indian communities of Warm Springs and Grande Ronde. There are no known areas of religious significance in the area 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 proposed action and the objectives of Federal, Regional, State laws and local land use plans, or policies.

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

Irreversible and Irretrievable Commitments
The use of rock for road surfacing is an irreversible resource commitment.

5.0 CONSULTATION AND COORDINATION

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

FEDERAL, STATE, AND LOCAL AGENCIES

U.S. Fish and Wildlife Service	National Marine Fisheries Service
Oregon Historic Preservation Office	Bonneville Power Administration
Northwest Power Planning Council	Clackamas River Water
South Fork Water Board	Oak Lodge Water Board
Mt. Scott Water District	Bureau of Land Management
Metro	Clackamas River Basin Council
City of Estacada	City of Gresham
City of Lake Oswego	City of Gladstone
City of Oregon City	City of West Linn
Clackamas County	Oregon Department of Transportation
Oregon State Parks	Oregon Department of Forestry
Oregon Department of Fish and Wildlife	Oregon Division of Lands
Oregon Marine Board	Eagle Creek National Fish Hatchery
Environmental Protection Agency	

TRIBES

Confederated Tribes of Warm Springs
Confederated Tribes of Grande Ronde

OTHERS

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 December 19, 2007. The Forest publishes a schedule of proposed actions (SOPA) quarterly. The project first appeared in October 2007, and in subsequent issues. A 30-day comment period ended on November 3, 2008. Responses to substantive comments are included in Appendix A. 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.

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.

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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.

Jerry Polzin - Logging Systems Specialist. Jerry received a certificate of completion from Missoula Technical Center in 1977. He completed Forest Engineering Institute at Oregon State University in 1981 and Sale Area Layout and Harvest Institute in conjunction with Oregon State University and the University of Idaho in 2002. He has worked in timber sale preparation for the Forest Service for 28 years.

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 Mt. Hood National Forest.

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