United States Department of Agriculture

Forest Service

2008

Preliminary Assessment

Upper Clack Thinning

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

The project is located in T.6S., R.6E.; T.6S., R.7E.; T.7S., R.7E.; T.8S., R.7E.; T.7S., R.8E.; 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 commercial thinning project in plantations ranging in age from 42 to 56 years old. The project is located in the Clackamas River Ranger District, Mt. Hood National Forest, Oregon.

The purpose of this project is to thin second-growth plantations to achieve multiple objectives. The proposed action is to thin and harvest wood fiber from approximately 1094 acres of matrix land, late-successional reserves and riparian reserves. Refer to s. 2.3 for greater detail.

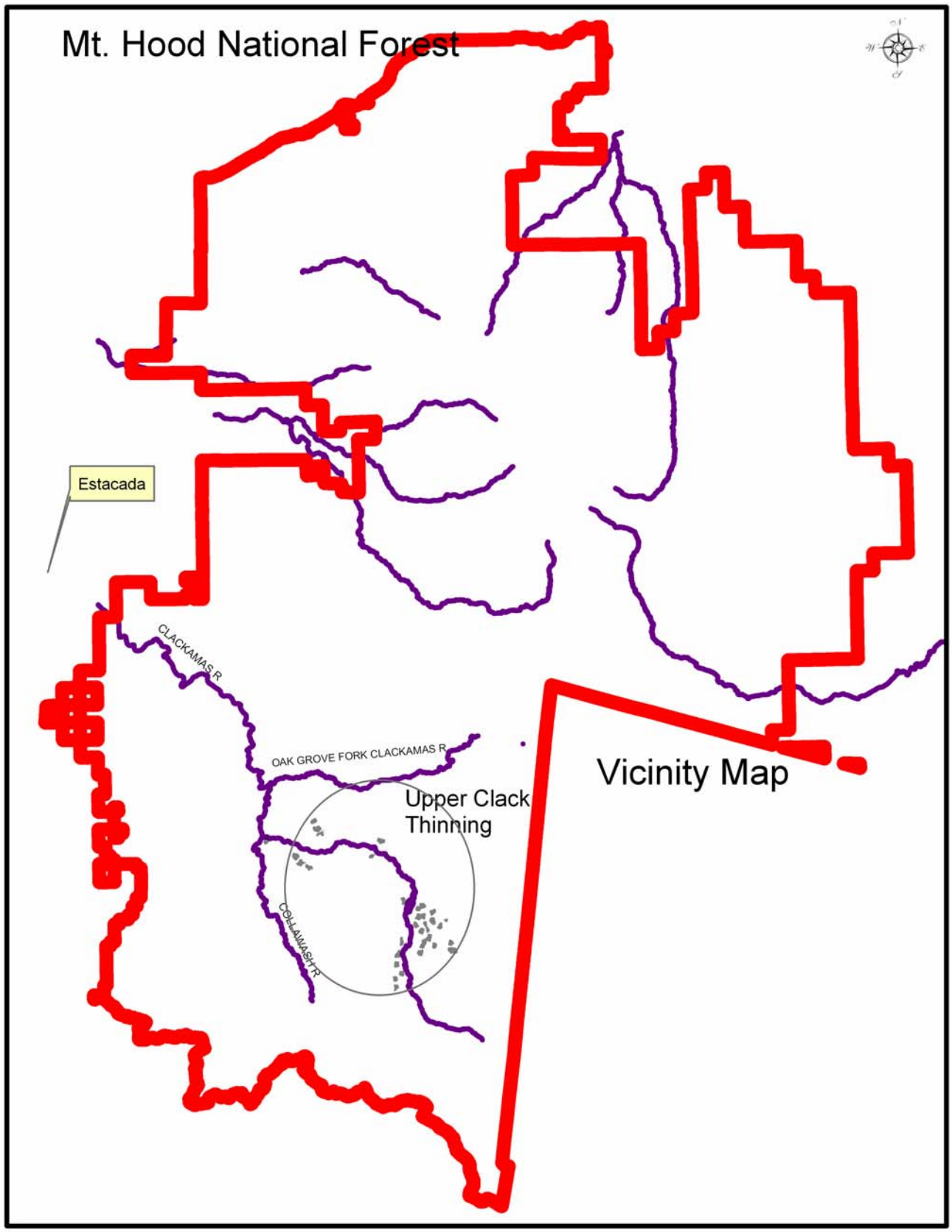
The Forest Service evaluated the no-action alternative and the proposed action.

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


Mt. Hood National Forest
Estacada
CLACKAMAS R
OAK GROVE FORK CLACKAMAS R
Upper Clack
Thinning
COLLAWASH R
Vicinity Map

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

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

- 2.2.3 Diversity

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

This action is needed because these plantations lack certain elements of diversity. They do not have the mix of tree species that were present in the original stand and they are relatively uniform in terms of tree size and spacing. There is a need for greater variability of vertical and horizontal stand structure. There is a need for more sunlight on the forest floor to create greater diversity of ground vegetation and to increase the quantity and palatability of forage plants. (The 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 plantations are experiencing a slowing of growth due to overcrowding and some are experiencing suppression caused mortality (The Mt. Hood Forest Plan describes this need on p. Four-91, FW-372 & Four-292). If no action is taken, this overstocked condition would result in stands with reduced vigor and increased mortality. There is a need for forest stands in the matrix that are healthy and vigorous with low levels of mortality.

- 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 (including the timber sale program) and sets the stage for project level analysis.
- The Forest Plan was amended by the Record of Decision and Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl. (USDA, USDI 1994b) (hereafter referred to as the **Northwest Forest Plan** or NFP). The NFP contains standards and guidelines for Matrix, Riparian Reserves and Late-Successional Reserves. Consistency is addressed in each resource section (s. 4.0).
- The Northwest Forest Plan Final Supplemental Environmental Impact Statement (USDA, USDI 1994a). This document discusses environmental effects for Region-wide programs (including the timber sale program) and sets the stage for project level analysis.
- The Forest Plan was amended by the 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 plantations 42 to 56 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 **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	641	1b, 2a, 7b, 8, 9b, 10b, 14, 15, 16, 17b, 18, 21-28, 32a, 33a, 35-38
Riparian Reserves	252	Virtually all units contain some riparian reserve.
A1 – Wild and Scenic Rivers	127	1b, 14, 15, 16, 36, 38 (all overlap LSR)
B2 - Viewsheds	582	1-5, 7-22, 31, 32a, 35-38
B8 - Earthflow	87	1a, 1b, 2a, 5, 6, 7a, 7b
B10- Winter Range	71	21, 25, 26 (all overlap LSR)
C1 – Timber Emphasis	199	3, 4, 10a, 29, 30, 32b, 32c, 33a, 33b, 34

2.2.8 **Watershed Analysis** – The project is covered by the Clackamas River Watershed Analysis (USDA 1995).

This project is consistent with the recommendations of the watershed analysis. Portions of the project are delineated as key watersheds (this is not a land allocation). The watershed analysis recommends thinning plantations (page 61).

Riparian Reserves –

This project has adopted the concepts for riparian reserve delineation described in the watershed analysis. The site-potential tree height for this project is 180 feet. Also included in riparian reserves are certain unstable geological features (page 68). While streams, rivers, ponds, wetlands and certain unstable geological features were shown on maps in the watershed analysis, they were conceptual based on data available at the time and were not field verified. For this project, maps were refined based on field inspections. For example, some streams shown on the watershed analysis maps were found to not be there while other unmapped streams were discovered. There is also newer information about fish presence and absence. The project areas have been examined by a geologist to determine the presence or absence of landslide prone landforms. All of this field-verified information was used to create a more accurate riparian reserve map. This new map is not considered a change to the recommendations put forward in the watershed analysis or the Northwest Forest Plan but simply a more accurate refinement of the intent of those documents.

2.2.9 **LSR Assessment** – Approximately 641 acres are in late-successional reserves. The North Willamette LSR Assessment (USDA 1998b) covers these units. This assessment recommends thinning plantations (p. 6-16).

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

2.2.11 **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.
Timber Harvest Levels	Provide forest products consistent with the Northwest Forest Plan goal of maintaining the stability of local and regional economies now and in the future. Timber outputs come primarily from the Timber Emphasis (C-1) portion of the

	Matrix lands, with lesser amounts coming from the "B" land allocations of the Matrix. Minor amounts of timber may also come from Riparian Reserves or Late-successional Reserves where harvesting would be used as a tool to enhance resources and move the landscape toward the desired future conditions. Four-86 & Four-289 & NFP ROD pages 2 & 3.

2.3 Proposed Action (Alternative B)

This action is proposed by the Forest Service in collaboration with the Clackamas Stewardship Partners. The intent is to use a stewardship contract to meet the purpose and need. The following sections describe the many ways variability would be introduced into plantations.

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. (Skips are areas where no trees would be removed; Gaps are areas where few or no trees would be retained. In gaps, minor tree species would be retained if present.
- Areas of heavy thinning (50 or fewer trees per acre) would be created in a variety of sizes. Heavy thinning is proposed to benefit many species including spotted owls, deer and elk. (The Forest Service has coordinated with the Oregon Department of Fish and Wildlife biologists to determine the best places to do heavy thinning.)
- 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 with a single thinning entry. Portions of the riparian reserves would be thinned to achieve a conifer relative density of 30. For stands that are less 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 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. Skips would be created outside of protection buffers that would vary in size and would comprise up to 5% of each unit. Gaps would be created within riparian reserves but they would be 100 feet or farther from a stream. Gaps would be 0.1 to 0.25 acre in size and would make up 0-10% of the available riparian component. For units adjacent to listed fish habitat, gaps 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 units 16, 18, 21, 22, 23, 24, 33a, 34 and 38). 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 some intermittent streams are sufficient to protect riparian resources, water quality and fish, this project has been designed to provide 50-foot wide wider 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 the aquatic mollusks *Lyogyrus* n. sp. 1 or *Juga (O.)* n. sp. 2 would be protected by the establishment of 50-foot wide protection buffers. The protection buffers along ponds, seeps and wet areas may be considered skips. 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. The proposed treatments would be designed to meet the LSR

objectives with a single thinning entry. Trees would be retained at a relative density of 20 to 40. Where riparian reserves overlap late-successional reserves, the design features for riparian reserves would take priority in the riparian reserve component. In late-successional reserves, 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 features. 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: Gaps would be 0.1 to 0.25 acre in size would have 6 or fewer trees and heavy thinning (25 to 50 trees per acre) would vary in size from 0.25 acre and larger and would be placed in areas that are predicted to grow quality forage.

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. Adjacent to areas where the LSR is the narrowest, some matrix areas may be managed with relative densities similar to those described in the LSR section.

Skips & Gaps - Skips would be created that would vary in size and would comprise up to 5% of each unit. Where riparian reserves cross through matrix, the protection buffers adjacent to streams may be counted as skips. Gaps would be created within matrix; they would be 0.1 to 0.25 acre in size and would make up 0-3% of each unit's matrix component. In addition to these relatively small gaps, larger forage areas would be created with approximately 40 trees per acre. They would be 3 to 5 acres in size and would be placed in areas that are predicted to grow quality forage.

2.3.7 Roads –

In the following sections, the terms obliteration and decommission are used. For this document, the term obliteration is used for temporary roads to describe the type of closure that is standard practice now. After use, temporary roads 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. In this document, the term decommission, is used for Forest Service system roads to describe the process of removing them from the system. They would be treated similarly as described for temporary roads above. Decommissioning may also include the removal of culverts, but for this project, there are no culverts on the roads proposed for decommissioning. Any future change to the status of obliterated or decommissioned roads would require analysis through the NEPA process including public participation and evaluation of environmental effects.

2.3.7.1 Temporary Roads

Temporary roads are roads that are built by timber operators to access landings and are closed upon completion of logging until they are needed again. They are not considered part of the Forest's system of permanent roads. The units proposed for thinning are plantations, many of which were accessed by temporary roads during the original clear cut logging. Existing temporary roads were assessed to determine whether they are needed for the current thinning proposal. These existing temporary roads are closed and in some cases have vegetation, brush and trees growing on them. Even though all of the proposed units were clear cut logged before, there are cases where it is not feasible or desirable to use the same roads, landings or logging method used before. To protect residual trees, soil and water, in some cases new temporary roads are proposed to access landings where the existing system roads and old temporary roads do not adequately access the ground.

2.3.7.2 **Area Accessed by Temporary Roads and Approximate Cost**

Unit	**Road Type**	**Length Miles**	**Cost**	**Acres Accessed**
2	existing temp	0.07	560	7.7
3	existing temp	0.05	400	4
5	skid temp new temp	0.03 0.01	450 250	10.4
6	skid temp	0.16	1280	8
7a	new temp	0.11	2750	15.6
7b	skid temp new temp	0.06 0.03	900 750	10
9b	existing temp	0.12	960	6.5
15	existing temp	0.17	1360	29.9
17	existing temp	0.1	800	13.2
19	existing temp	0.1	800	15
20	existing temp	0.11	880	10
21	existing temp	0.05	400	22
22	existing temp	0.05	400	10
23	existing temp	0.1	800	19.3
24	existing temp	0.08	640	11.3
25	new temp skid temp	0.05 0.2	1250 3000	16.2
26	skid temp new temp	0.07 0.15	1050 3750	22.2
27	existing temp	0.11	880	8.6
33a	existing temp	0.04	320	10
34	existing temp	0.30	2400	35.7
37a	existing temp skid temp	0.11 0.03	880 450	12.3 6.0
37b	new temp	0.07	1750	4

2.3.7.3 System Roads

Many system roads are closed with berms or other devices until they are needed again. They would be temporarily reopened and would be reclosed upon completion of the harvest units they access. These roads and others needed for the project do not require reconstruction but routine blading and brushing to get them ready for use. The table below lists current system roads that are closed and current system roads that are proposed for decommissioning or closure.

Unit	Road Number	Length	Current Status	Proposal
2a	6310178	0.01	Berm	Use and Berm
6	4640021	0.16	Open	Use and Decommission (berm, scarify, water bar, pile debris)
7a	4640163	1.04	Ineffective guard rail	Use and Berm
11	4650013	0.1	Berm-starting to overgrow	Use and Berm
14	4651120	0.32	Ineffective berm, fixed with restoration EA	Use and Berm
16	4671150	0.22	Berm	Use and Decommission (berm, scarify, water bar, pile debris)
17	4671160	2.7	Ineffective berm near Fawn Creek	Use and Berm past quarry (also closes 170)
22	4200560	0.39	Berm	Use and Berm
26	4200500	1.72	Vandalized guard rail	Use and Berm (also closes 504 & 510)
34	4680019	0.18	Berm with light scarification	Use and Decommission (berm, scarify, water bar, pile debris)
36	4680120	0.97	Berm	Use and Berm
37	4680124	1.17	Gate (also closes 125&126)	Use and Berm (also closes 125&126)
38	4680120	0.44	Berm	Use and Decommission the section past unit 37 (berm, scarify, water bar, pile debris)

Some system roads were decommissioned and were taken off the Forest's data base of system roads. Varying treatments were used based on site specific needs for each road. The table below describes what was done to the roads and what is proposed for this project. When decommissioned roads are reused they would be treated very similarly to the way existing temporary roads are treated.

Unit	Old Road Number	Length	Current Status	Proposal
16	4671140	0.09	Decommissioned (berm, very rough surface)	Treat as temporary road, Use and obliterate (berm, scarify, water bar, pile debris)
29	4680026	0.24	Decommissioned (berm, water bars, light scarification)	Treat as temporary road, Use and obliterate (berm, scarify, water bar, pile debris)
30	4680036 4680038	0.41	Decommissioned (overgrown)	Treat as temporary road, Use and obliterate (berm, scarify, water bar, pile debris)
31	4680021	0.18	Decommissioned (berm, water bars, light scarification)	Treat as temporary road, Use and obliterate (berm, scarify, water bar, pile debris)
32a	4680030	0.46	Decommissioned (berm, water bars, light scarification)	Treat as temporary road, Use and obliterate (berm, scarify, water bar, pile debris)
33a	4680029	0.19	Decommissioned (berm, water bars,	Treat as temporary road, Use and obliterate

Unit	Old Road Number	Length	Current Status	Proposal
			light scarification)	(berm, scarify, water bar, pile debris)
35	4680015	0.18	Decommissioned (overgrown)	Treat as temporary road, Use and obliterate (berm, scarify, water bar, pile debris)

Approximately 1.51 miles of old existing temporary roads would be reopened. They would be obliterated upon completion of the harvest units they access.

Approximately 0.55 mile of temporary roads would be constructed on old existing skid trails. They would be obliterated upon completion of the harvest units they access.

Approximately 0.31 mile of new temporary roads would be constructed. They would be obliterated upon completion of the harvest units they access.

Approximately 1.75 miles of old system roads that were decommissioned would be reopened and treated as temporary roads. They would be obliterated upon completion of the harvest units they access.

Approximately 1 mile of system roads would be used and then decommissioned.

Approximately 6.63 miles of system roads that are opened or have ineffective closures would be used and then closed with effective berms.

2.3.7.4 **Road Repair and Stabilization**

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

4671 Deep patch repairs
4200 Deep patch repairs

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

2.3.8 Unit Table

Unit	Acres	LSR	Ground Based Acres	Skyline Acres	Helicopter Acres
1a	13.2				13.2
1b	14.2	YES			14.2
2a	21.6	YES	7.3	14.3	
2b	2.1				2.1
2c	1.2				1.2
3	22.7		3.1	19.6	

Unit	Acres	LSR	Ground Based Acres	Skyline Acres	Helicopter Acres
4	34.5		20.6	13.9	
5	31		19.7	11.3	
6	33.8		33.8		
7a	31.2		21	10.2	
7b	18.8	YES	3.3	15.5	
8	6.4	YES	4.4	2	
9a	1.8		1.8		
9b	6.3	YES		6.3	
10a	21.7		21.7		
10b	18.9	YES	18.9		
11	18.7		18.7		
14	32.3	YES	17.8	14.5	
15	29.9	YES	29.9		
16	41.1	YES	41.1		
17a	5.1			5.1	
17b	27.3	YES		27.3	
18	29.4	YES	13.9	15.5	
19	25.8		25.8		
20	23.1		5.6	17.6	
21	42.2	YES	42.2		
22	25.6	YES	25.6		
23	15.4	YES	4.2	11.2	
24	13.3	YES	4	9.3	
25	47.8	YES	47.8		
26	35	YES	20.4	14.5	
27	28.8	YES	28.8		
28	6.2	YES	6.2		
29	30.5		30.5		
30	73.1		73.1		
31	27.5		27.5		
32a	31.7	YES	31.7		
32b	3.2			3.2	
32c	1.4			1.4	
33a	38.9	YES	25.8	13.1	
33b	15.2			15.2	
34	35.6		35.6		
35	34.8	YES	34.8		
36	29.1	YES	29.1		
37	25	YES	25		
38	21.4	YES		21.4	
	1093.8	641.4	800.7	262.4	30.7

2.3.9 Best Management Practices (BMPs) and Design Criteria

These are practices that are part of the proposed action. 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 **Peregrine Falcon:** No helicopter use would occur in units 1a and 1b between January 1st and October 31st. Other operations in these units could occur at any time. These restrictions may be waived if the nest site is unoccupied or if nesting efforts fail and there is not possibility of re-nesting. Documentation of nesting failures can be finalized no earlier than June 30th due to the possibility of re-nesting.

1.3 **Deer and Elk Winter Range:** No harvest operations, road construction, use of motorized equipment or blasting would be permitted in Crucial winter range areas between December 1 and March 31. Units 14, 15, 16, 17b, 18, 22, 23, 24, 25, 26, 35, 36, 37 and 38 are in the crucial zone. Unit 1 is in the High Value zone which would be logged between November 1st and December 31st to accommodate the peregrine falcon restriction.

No log haul or snow plowing would be permitted on the portions of roads 4200500, 4200530, 4640, 4650, 4671, 4680 or 6310 in Crucial Winter Range between December 1 and March 31. Some units must use these haul routes, but for other units, alternate haul routes are available including roads 4200, 4600 and 4670 that have no restriction. Plowing and log haul are permitted to access units 1a and 1b and the helicopter landing between November 1st and December 31st. *This implements Forest Plan standard and guideline FW-211 and a memorandum of understanding with Oregon Department of Fish and Wildlife.*

1.4 **Owls:** Except for hauling and the removal of hazard trees to protect public safety, no activity shall take place within the disruption distance of a known activity center during the March 1 to July 15th critical nesting period, unless the habitat is known to be unoccupied or there is no nesting activity, as

determined by survey to protocol. The distance and timing may be modified by the unit wildlife biologist according to site-specific information.

Restrictions on chainsaws or heavy equipment use would only apply to small portions of units 27 and 31.

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 timber sale. This would include the retention of cull logs, tree tops, broken logs and any snags that would be felled for safety reasons.
   - If funding becomes available, some trees would be felled or girdled to provide future habitat. **In the LSR units, 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 timber sale activities, bare soils would be revegetated or covered with slash or other debris. Grass seed and fertilizer would be evenly distributed at appropriate rates to ensure successful establishment. Mulch may be used on slopes greater than 20%. Effective ground cover would be installed prior to October 1 of each year. *This is a BMP and implements Forest Plan standard and guideline FW-025.*

To increase forage for deer and elk, erosion control measures would use palatable forage seed mix. Invasive plant species would not be used. *This implements Forest Plan standard and guideline FW-148 and standard 13 of the Regional Invasive Plants Record of Decision.*

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

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

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

5.1 This project is designed to be consistent with the Fisheries Programmatic Biological Assessment. Project specific variances are documented in the Letter of Concurrence.

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.

6.7 Skyline yarding over streams is not planned. The Fisheries Programmatic Biological Assessment contains detailed guidance for protection buffers.

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.

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

7.5 Generally new temporary roads are not planned near streams. The Fisheries Programmatic Biological Assessment contains detailed guidance for minimum distances from streams and other specifications for road construction, renovation, reconstruction, maintenance, log haul and decommissioning.

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

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

- All off-road equipment is required to be free of soil, seeds, vegetative matter, or other debris that could contain or hold seeds prior to coming onto National Forest lands. Timber sale contracts and service contracts would include provisions to minimize the introduction and spread of invasive plants. These provisions contain specific requirements for the cleaning of off-road equipment.
- Gravel or rock used for roads would come from weed free sources.
- Road blading, brushing and ditch cleaning in areas with high concentrations of invasive plants would be conducted in consultation with invasive plant specialists.

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

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

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

    During implementation, Timber Sale Administrators monitor compliance with the Timber Sale Contract which contains provisions for resource protection including but not limited to: seasonal restrictions, snag and coarse woody debris retention, stream protection, erosion prevention, soil protection, road closure and protection of historical sites.

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

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

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

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 November 13, 2007. The Forest publishes a schedule of proposed actions (SOPA) quarterly. The project first appeared in October 2007, and in subsequent issues. The Forest Service

began a process of collaboration with the Clackamas Stewardship Partners in the summer of 2007 with several meetings and field trips.

2.4.1 Issues

The proposed action is proposed by the Forest Service in collaboration with the Clackamas Stewardship Partners. There are some members of the group that have concerns particularly about roads. But with continued dialogue, it was felt that there was no need to fully develop other alternatives. No comments from outside the group have been received during the scoping process. There are no significant issues that would aid in the formulation of other alternatives.

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 construction of new temporary roads. There is a concern about the direct, indirect and cumulative effects of these new temporary roads. Roads are discussed in the following sections: length of new temporary roads and the acres of thinning accessed by each road (s. 2.3.7.2), 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).

3.0 ALTERNATIVES

This chapter describes and compares the alternatives considered for this project. It includes a description of each alternative considered. This section also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public. The Proposed Action is described in s. 2.3 and is sometimes referred to as Alternative B.

3.1 Alternative A - No Action

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

3.2 Other Alternatives Considered

3.2.1 An alternative was considered that would not construct any new temporary roads. Approximately 78 acres would be switched to helicopter and 1/3 mile of temporary road would not be built. The following is a brief summary of the rationale for not fully developing this option.

- 3.2.1.1 The economic viability of helicopter logging at this time is cost prohibitive given the low value of the timber and the high cost of jet fuel. As with Alternative B, this modified alternative would use a stewardship contract that would use the value of the timber to pay for restoration projects. As with Alternative B, the helicopter units would be separated out into a separate contract so that the high cost of helicopter operations would not negate all of the value available for restoration projects. There is a high probability that these helicopter units would receive no bids. A recent similar helicopter project received no bids.
- 3.2.1.2 This option would result in reduced funds available for achieving important restoration projects.
- 3.2.1.3 Helicopter logging does result in reduced soil impacts compared to ground-based or skyline systems but it can cause other impacts. It would result in increased impacts to snags: snags that might have been considered safe with other logging systems would be felled in a helicopter operation because of the increased hazard of the rotor wash. Helicopters use far more fuel than other logging systems. Helicopter operations are more hazardous that other logging systems. Helicopters are noisier than other logging systems causing disturbance to wildlife and the recreating public. Helicopter operations often use ground-based harvester equipment to fell and bunch the logs for greater efficiency and safety. Harvesters walk on slash most of the time and result in minimal ground disturbance.
- 3.2.1.4 Helicopter use makes sense on steep slopes or when the resource impacts of other options are too great. It also makes sense when the value of the timber to be removed is greater than the high cost of helicopter operations. With the proposed action, a helicopter system was proposed for only 30 acres because there were obstacles to other systems including a wet area and a power line. With this "no new roads" option, an additional 78 acres would be considered for helicopter logging. The proposed action did not use helicopter for these 78 acres because the impacts to resources for the proposed logging systems were found to be minimal.
- 3.2.1.5 There is a high probability that helicopter units would receive no bids. If so, the impacts and benefits for those acres would be similar to the no-action alternative.
    - If helicopter thinning does not happen, the associated riparian reserves 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. The plan to accelerate the development of plantations into mature and late-successional stand conditions would not happen.
    - If helicopter thinning does not happen, the associated late-successional reserves (52 acres) would be delayed in their acquisition of desired habitat characteristics. The plan to accelerate the development of plantations into mature and late-successional stand conditions would not happen.
    - If helicopter thinning does not happen, 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 and species such as deer and elk that require more open stands for foraging would decline. The plan to create diversity in plantations would not happen.

- If helicopter thinning does not happen, the overstocked condition in plantations would result in stands with reduced vigor and increased mortality. The plan to increase health and growth that results in larger wind-firm trees would not happen.
- If helicopter thinning does not happen, no forest products would be removed and there would be no benefit to local and regional economies.

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

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

3.2.3 A comment was received suggesting that all snags be protected. All snags would be protected unless they pose a safety hazard. Most of the snags in the plantations are small planted trees that died and these would not likely be considered hazardous.

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	252
Acres of Late-successional Reserve Enhanced	0	641
Acres with Diversity Enhanced	0	1094
Acres of Stand Growth and Productivity Improved In Matrix	0	360

	No-Action Alternative A	Proposed Action Alternative B
Approximate Timber Output (million board feet)	0	11
Miles of Road Decommissioning	0	1
Miles of Road Closures	0	6.63

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 the June 2005 Memorandum on cumulative effects from the Council on Environmental Quality.

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

4.0.3 This action is proposed by the Forest Service in collaboration with the Clackamas Stewardship Partners. The intent is to use a stewardship contract to meet the purpose and need. In a stewardship contract the thinning is designed to be restorative and the value of the timber removed would be used to fund restoration projects. Some of the restoration projects are included as connected actions in this document such as snag creation and road

decommissioning. However, there is likely to be sufficient funds generated to pay for additional projects elsewhere that are covered by other NEPA documents.

4.0.4 The following is a summary of restoration that has occurred or is planned in the Upper Clackamas 5th field watershed:

- 55 miles of roads have already been decommissioned.
- Approximately 2500 acres have been thinned.
- Several side channels have been restored.
- Roads that were damaged by flooding have been repaired.
- Culverts that were impediments to fish passage have been replaced.
- Recent restoration EAs have planned projects that have not yet been implemented:
  - 4.5 miles of decommissioning.
  - 50 miles of roads with ineffective road closures would have new berms installed.
  - Many acres of snag and down wood creation.
  - Many acres of precommercial thinning.

4.0.5 Within the Clackamas Watershed another project that is being planned is the Cascade Crest Fuel Break. It is 1.5 miles from the nearest thinning unit. It is a shaded fuel break along roads 4220 and 4230 with the objective of aiding in the suppression of wildfires.

4.0.6 The Forest is developing a plan to designate road and trail routes for off-highway vehicles (OHV). It will 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 and designate areas where motorized access to dispersed (undeveloped) camping would be permitted in the Forest. One of the proposed OHV study areas (referred to as Peavine) is near some of the proposed thinning units.

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 plantations. The plantations range from 42 to 56 years of age. Stand exam data was gathered for these plantations. The plantations have been experiencing rapid growth in recent years but are becoming overcrowded.

4.1.1.1 A concern was expressed during scoping that thinning to increase health and growth and to create larger trees in riparian reserves and late-successional reserves would result in stands that had no snags or disease. Healthy ecosystems need healthy trees and a component of dead trees and disease. The goal is not to eliminate all things that would kill trees or cause decay: that would not be possible. The project has been designed to enhance diversity and provide snags and down woody debris. These elements are also discussed in detail in the Diversity, Wildlife and Soils sections.

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

4.1.1.3 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 wind-firm trees in the matrix in. The proposed thinning is in plantations that are at an age and density where they are beginning to experience suppression mortality and a slowing of their growth due to overcrowding. It is important to maintain the health and productivity of forests to sustainably provide future forest products in the matrix (Smith 1986).

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 diameter is approximately 13 inches, with RDs greater than 70, and trees are experiencing growth suppression and some mortality. The understory vegetation is generally suppressed, and mortality of some trees in the suppressed and intermediate crown classes is occurring.

Direct and Indirect Effects

4.1.2.2 **Alternative A - No Action -** Trees that have been uniformly spaced during planting and then precommercial thinned interact differently when developing through inter-tree competition of the stem-exclusion phase compared to natural stands seeded in after a fire or other stand-replacement disturbance. Trees have less of a chance to express dominance when they have been planted from genetically similar seed sources and maintained at relatively even spacing. Therefore, when these stands reach density levels in which individual trees are competing with each other for growing space it may take longer for individuals to express dominance. As tree competition increases, stems would continue to growth in height, but diameter growth would drastically slow. These trees would become more dependent on neighboring trees for support. When trees develop in this manner they are more likely to blow down in large groups or if drought conditions persist, be more susceptible to insects and disease.

With no action, the average stand diameters in 40 years would range from 13-16 inches; with stocking at levels where growth suppression and mortality continues to occur (RD would exceed 90). The understory vegetation would also continue to be suppressed.

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

4.1.2.3 **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 young stands.

There would be long-term benefits for stand growth and productivity. Average stand diameters in 40 years would range from 15-20 inches. At that time, tree size and stocking levels would begin to approach the stocking levels where growth suppression and mortality would occur (with RD of 50 to 55). Understory vegetation would have developed without suppression from the overstory conifers.

Stands in the matrix would be thinned to improve stand growth, individual tree growth and to provide variability. The thinning prescription would employ a range of relative densities (25 – 35) to achieve stand growth 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 than unthinned stands at a later equivalent age (Maquire 1996). A thinning to RD 35 would result in more trees available to put on more volume and diameter growth, sustaining health of the stand over a longer period of time while allowing for future management and silvicultural options.

4.1.3 **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 plantations are overstocked and have relatively uniform tree size and distribution, have low to moderate amounts of small diameter coarse woody debris, lack understory development and have low levels of snags. These plantations are not late-successional and do not meet the needs of 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 60-100 years.

Proposed Action

Creating late-successional conditions necessitates altering plantations through 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 things are also proposed on matrix units, but LSR units would be more open and would have more skips and gaps.

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, plantations would acquire late-successional characteristics in 30-50 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 in plantations does not meet the needs of associated aquatic and riparian resources. The water quality and fisheries section contains discussions of the effects to riparian reserves. Timber production is not the objective in riparian reserves; this section focuses on tree growth and when desired riparian conditions might develop.

4.1.4.1 **Existing Condition**

The riparian reserve plantations are overstocked and have relatively uniform tree size and distribution, have low to moderate amounts of small diameter coarse woody debris, lack understory development and have low levels of snags. These plantations are not late-successional and do not meet the needs of riparian dependent species. The plantations provide some shade to streams but they do not produce the size and quantity of coarse woody debris sufficient to sustain physical complexity and stability of the riparian reserves and associated streams. They do not have mature and late-successional stand conditions.

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 60-100 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 things 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, plantations would acquire late-successional characteristics in 30-50 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**

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

4.1.5.1 **Existing Condition**

The current plantations appear relatively stable and windfirm. There are some root rot pockets where some trees have fallen. Overall the plantations currently have the strength to withstand the types of wind events that are typical in the project area.

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

4.1.5.2 **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. Trees have less of a chance to express dominance when they have been planted from genetically similar seed sources and maintained at relatively even spacing. Stands eventually reach density levels in which individual trees are competing with each other for growing space. As tree competition increases, stems would continue to

growth in height, but diameter growth would drastically slow. These trees would become more dependent on neighboring trees for support. When trees develop in this manner they are more likely to blow down in large groups or if drought conditions persist, be more susceptible to insects and disease.

Thinning results in greater root and stem strength and stability during typical wind events. Variable-density thinning, minor species retention, and the incorporation of skips and gaps would add clumpiness and an element of variability to stands to both slow wind speed and lessen potential effects. In areas with shallow soils or root disease, the potential exists for an increase in incidental amounts of scattered windthrow. These amounts would contribute to the down woody debris component and enhance structural diversity within the stands.

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

4.1.6 **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 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 and the no-action alternative is not.

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.

All of the stands are relatively dense, and generally limit sunlight penetration to the forest floor. Snags that are present in the stands are small planted trees that have died from tree competition or disease. The plantations were planted primarily with Douglas-fir in the lower elevations; in some areas other species were planted. Some tree species are either present because they survived the clearcutting and burning or because they seeded in from stand edges.

4.2.3 **Direct and Indirect Effects**

No Action

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

Proposed Action

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

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

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

4.2.4 **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 (5^{th} field) or subwatersheds (6^{th} field). In standard and guideline FW-064, the new terminology for subbasin is now drainage (7^{th} field watershed).

The project proposes the thinning of plantations that are between 42 and 56 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 within approximately 253 acres.

The Upper Clack Thin is located within the Upper Clackamas River 5^{th} field watershed. The watershed includes the headwaters of the mainstem Clackamas River and all its tributaries downstream to the confluence of the Collawash River. The Upper Clackamas watershed is 100,380 acres in size and contains 62 miles of anadromous streams, 82 miles of resident fish bearing streams, and approximately 332 miles of non fish-bearing streams. Approximately 94,794 acres of the watershed is within the Mt. Hood National Forest. About 5,600 acres lie within the Confederated Tribes of the Warm Springs Reservation of Oregon, and approximately 150 acres at Austin Hot Springs are privately owned.

The river corridor of the Upper Clackamas River watershed is designated as a Tier 1 key watershed in the Record of Decision for the Northwest Forest Plan. Tier 1 watersheds have been identified as having crucial refugia for at-risk fish species. The Clackamas River is also designated as a Scenic and Recreational River under the National Wild and Scenic Rivers Act and 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 proposed treatment area is located within nine drainages of the Upper Clackamas River. The total area of the drainages associated with the project is 52,259 acres and includes: Pinhead Creek, Last Creek, Big Bottom, Upper Clackamas River Austin, Pot Creek, Upper Clackamas Headwaters, Lowe Creek, Rhododendron Creek, and the Fawn Creek drainages.

The Upper Clackamas River watershed currently provides 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 Pinhead Creek, West Pinhead Creek, Last Creek, Rhododendron Creek, and Fawn Creek. LFH also occurs downstream of the project area in the mainstem Clackamas River. Thinning would occur on approximately 77.5 acres that are 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.

Direct and Indirect Effects

For this proposal, the following actions have the potential to affect water quality and aquatic species or their habitats: timber felling, road construction, log yarding, log haul, and road decommissioning and obliteration. These actions are of concern because they

could affect stream temperature, levels of sediment in streams, peak flows, and future in-channel large wood recruitment.

4.3.2 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 timber falling, yarding, road construction/maintenance, road decommissioning, or log haul, there would be no potential for any increase in surface erosion/sedimentation, or peak flows. Since no timber harvest would occur within riparian reserves, there would be no 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 compared to 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 Construction, Road Decommissioning, and Road Maintenance Activities** – Road construction and road maintenance activities have the potential to indirectly introduce fine sediment into stream channels. Road maintenance prior to log haul would help maintain the design drainage of the road surface which reduces the potential for larger sediment inputs to runoff that eventually enters stream courses. The proposed action would re-open old temporary roads from previous timber sales and temporarily re-open system roads that have been closed with berms or other devices. Additionally, the proposed action also proposes to construct approximately 0.55 mile of temporary road previously disturbed land on old existing skid trails and 0.31 mile of new temporary road to access the stands.

Maintenance of the existing system roads prior to hauling would include measures to upgrade the quality of the road bed and to improve road drainage. This includes the placement of new aggregate surfacing where necessary, blading, brushing out encroaching vegetation, removing berms, and ditch and culvert inlet cleanout where needed. Aggregate road surfacing greatly minimizes the amount of fine sediment from road surfaces entering streams following log haul, especially during and following rainfall events. Additionally, deep patch repairs to the roadbed and converting asphalt to aggregate surface is proposed along some segments of the haul route.

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

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

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

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

Decompacting the road surface during decommissioning or obliteration activities loosens the soil, thus making it more likely to be mobilized during the first significant run-off period unless the road is on relatively flat terrain, not near streams, or sufficient ground cover (mulch, woody debris, etc.) is provided. The roads that would be decommissioned 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 and decommissioning would reduce the risk of sediment entering any stream course. The impacts to water quality or fisheries resources caused by sedimentation due to road construction, reconstruction, maintenance, or road decommissioning, if any, would be short-term and undetectable at the watershed 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 soil 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 displaced soil particles produced from timber harvesting would travel short distances before being trapped by duff, woody materials, and other obstructions. The probability of overland surface runoff on uncompacted soil surfaces is also low for the soils in the project planning area.

Project design criteria would incorporate no-cut stream protection buffers a minimum of 100 feet wide along all perennial streams where LFH occurs. A minimum 50-foot wide no-cut protection buffer would be established along all other perennial and intermittent streams within the project area. 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 wider buffers instead based on public concern. 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 two aggregate surfaced stream crossings along the haul route that cross over LFH at Pinhead Creek and West Pinhead Creek. Both crossings are located along road 4680140. Pinhead Creek flows intermittent at one of the crossings during dry times of the year. The other crossing is located at West Fork Pinhead Creek and has a perennial flow regime. In order to reduce the risk of road related sediment from entering LFH, haul would not be allowed over these crossings when conditions exist (e.g. during intense or prolonged rainfall) that may cause generation of road related runoff to streams. All other 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 drainages with many recent regeneration harvests, peak flow increases can result from rapid snow melt during rain-on-snow events. Peak flow increases can also result from efficient routing of water to streams by road drainage ditches. During intense rainfall events, surface erosion can occur on soils disturbed during treatment activities prior to vegetation being re-established and if there is a hydrologic connection to a stream, sediment can be transported. Stream temperature increases can result from the loss of stream shading following land treatment activities.

The analysis of cumulative effects looks at the existing condition of vegetation as it has been affected by past and current timber sales, roads, rock quarries, power lines, fires and activities on private land.

4.3.7.1 **Hydrologic Recovery**

The Aggregate Recovery Percentage (ARP) index is often used to estimate the potential for adverse cumulative effects related to past, present and foreseeable future timber harvest activities. It is also a tool to determine compliance with Forest Plan standards and guidelines pertaining to cumulative watershed and earthflow effects (Forest Plan, FW-061 to FW-065, B8-031 & B8-032). By measuring the percent of an area in a hydrologically recovered condition, the ARP model evaluates the risk of increased peak flows from rain-

on-snow events. In stands with little or no forest canopy cover within the transient snow zone, more snow accumulates than beneath a partially or fully hydrologically recovered forest. As a result, more runoff can be expected from non-hydrologically recovered stands when there is rapid melting during periods of rain in the transient snow zone (Christner 1982). The ARP model ranks recovery from 0 to 100 with 100 being fully recovered. The Forest Plan often refers to watershed impact area or threshold of concern which are the inverse of ARP with 0 being fully recovered.

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.

The stands proposed for thinning are currently hydrologically recovered. All of the drainages are between 80 and 90% recovered and steadily moving towards full hydrologic recovery as young plantations grow. There has been relatively little regeneration harvest in the past two decades and young plantations are growing rapidly.

The effect of changes in estimated hydrologic recovery (ARP) are not measurable acre by acre or unit by unit, and therefore direct effects to peak flows or stream channel stability, if any, are not predicted with this model. The units of this project are well dispersed over a wide landscape; they overlap parts of 11 drainages. The proposed action would result in less than 1% change in ARP for these drainages. There are two small earthflows: Austin and Switch. They are also well above the recovery thresholds and would remain above the thresholds after thinning. Since the drainages are currently at 80 to 90% recovered, it is very unlikely that the proposed thinning activities would cause stream channel instability, earthflow instability or increases in peak flows during rain-on-snow events. After thinning, trees would grow rapidly and canopy cover would increase. Thinning would result in healthy stands with good root strength and broad crowns that would contribute to hydrologically stable drainages. Effects to hydrology in terms of peak flow changes, if any, would not be considered meaningful or measurable.

4.3.7.2 **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 River fifth-field watershed include timber harvest, pre-commercial thinning, and various restoration projects that have focused on improving fish passage, stream function, decreasing road densities, and restoring off-channel habitat and floodplain connectivity. Over the past several years, 2,500 acres of restoration thinning has occurred, 55 miles of roads have been decommissioned, culverts that were passage barriers to Threatened and Endangered fish species were replaced, important side channel habitat was restored, and roads that were damaged by floods were repaired.

Recent restoration EAs have planned projects have not yet been implemented. These projects include: 4.5 miles of road decommissioning, 50 miles of road closures with berms, instream large wood and side channel projects, wildlife snag creation and down wood projects, and pre-commercial thinning.

The projects would be implemented over multiple years in a number of different subwatersheds. 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 short-term 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 Peavine) 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 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 aquatic resources at the local level and the fifth-field watershed level over the long term. Details on conditions for the fifth-field watersheds are described in biological evaluation. 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 2004).

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**

Columbia Duskysnail (*Lyogyrus* n. sp. 1)
This species of aquatic mollusk has been found across the Forest during surveys conducted over the past several years (Mt. Hood National Forest, unpublished data). Habitat requirements for this species are fairly specific: cold well oxygenated springs, seeps, and small streams, preferring areas without aquatic macrophytes. Individuals have not been found in larger streams and rivers, or glacial streams.

Surveys for the Columbia duskysnail have been conducted at sites across the Forest for a wide range of projects. This mollusk has been found in many areas across the Forest and

is likely to be present in seeps, springs, and smaller streams near and within the proposed project area.

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

Line officers have flexibility to survey or not survey after seeking specialists' recommendations to help determine the need for a survey based on site-specific information. The line officer considered the probability of the species being present on the project site, as well as the probability that the project would cause a significant negative effect on the species habitat or the persistence of the species at the site.

The line officer has decided not to survey for the two rare aquatic mollusks for 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 and Basalt Juga (if this species is present on Forest) would be **"No Impact" (NI)** for Alternative A, and **"May impact individuals or habitat but will not likely contribute to a trend towards federal listing" (MIIH)** for 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 within or downstream of the proposed project area in Pinhead Creek, West Pinhead Creek, Last Creek, Lowe Creek, and the mainstem Clackamas River. Designated critical habitat for LCR steelhead occurs within or downstream of the proposed project area in Pinhead Creek, West Pinhead Creek, Last Creek, Lowe Creek, Rhododendron Creek, Fawn Creek, and the mainstem Clackamas River. 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 River for migration, rearing, and spawning habitat. They also utilize the lower reaches of Pinhead Creek, West Pinhead Creek, Last Creek, and Lowe Creek 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 the 2007 Plantation Thinning project would **Not Adversely Affect** essential fish habitat for chinook or coho salmon. This activity would not jeopardize the existence of any of the species of concern or adversely modify critical habitat and would not adversely affect Essential Fish Habitat as designated under the 1996 Amendment to the Magnuson-Stevens Act.

4.3.12 **Fish Stocks of Concern**

The effects of the implementation of the Upper Clack Thin Project on fish stocks of concern is based on populations of ESA listed fish species and resident fish populations that are classified as management indicator species in the Mount Hood Land and Resource Management Plan (LRMP). These species occur within and downstream of the project area in Pinhead Creek, West Pinhead Creek, Last Creek, Rhododendron Creek, Lowe Creek, Fawn Creek, Fall Creek, Wall Creek, and the mainstem Clackamas River.

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

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 (THREATENED)

Some of the units occur within a late-successional reserve (LSR, Upper Clackamas – RO 207B) and critical habitat units (CHU, OR-10 and OR-11).

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". 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 2003). Since there are no recent surveys for spotted owl 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. The analysis will examine effects to spotted owls from alternation of their home ranges and core areas.

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 activity center. The proposed project is within the home range of 15 historical pairs. Incidental take would be presumed to occur when suitable habitat is removed from a home range and if suitable habitat is less than 40% of the home range.

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

Out of the 15 historical pair's home range circles, 5 are currently considered to be below take thresholds by the U.S. Fish and Wildlife Service.

In addition to the analysis of home range and core areas, an analysis will be displayed for LSRs, CHUs.

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 Upper 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.

Road 46 runs along the Clackamas River. This creates a barrier for some species and a hazard for others. It is especially a concern where the LSR narrows along the river corridor.

4.4.1.4 **Existing Condition of Critical Habitat Units OR-10 and OR-11:** Spotted owl critical habitat units serve to identify lands that are considered essential for the conservation and recovery of the spotted owl. The functional value of the critical habitat is to preserve options for species recovery.

CHU OR-10 occurs on the Mt. Hood National Forest and BLM Cascades Resource area. It was designated to maintain and provide essential NRF habitat and support a cluster of owl pairs. CHU OR-10 provides an important link to the north-south continuum of owl habitat between CHUs OR-12 and OR-2 to the south and OR-9 and OR-1 to the north as well as within the Western Cascades province as a whole. Approximately 57% of this CHU overlaps the LSR (RO207). This CHU consists of 88,821 acres; 39,289 acres of which is considered suitable habitat for owls. Approximately 44 percent of the capable lands in this CHU are providing nesting/roosting/foraging habitat for spotted owls.

CHU 11 occurs on the Clackamas River Ranger District and borders the western edge of the Warm Springs Indian Reservation on the crest of the Cascade Range. This CHU is designed to provide for essential nesting/roosting/foraging habitat and to support clusters of owl pairs. It is in an area believed to lack sufficient connection for maintaining a range-wide distribution of owl nesting habitat. For this reason the Olallie Lake area of concern was designated. (The proposed thinning is not in the area of concern.) The CHU consists of 50,189 acres; 21,469 acres of which is considered suitable habitat for owls. Approximately 43 percent of the capable lands in this CHU are providing nesting/ roosting/foraging habitat for the spotted owls.

4.4.1.5 **Existing Condition of Proposed Harvest Units –** Approximately 1,094 acres are proposed for harvest. All of the stands are managed plantations and range in age from 42 to 56 years.

Approximately 357 acres within units 5, 10, 15, 16, 17, 18, 19, 20, 29, and 30 are considered non-habitat for the spotted owl due to their young age and small trees. The remaining 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 and CHUs affected by the proposed action. Dispersal habitat described below is dispersal-only habitat. No suitable habitat exists in the proposed harvest units. Capable habitat (i.e. habitat that usually has the potential to become suitable in the future) for this area has been designated as forested habitats generally below 4500 feet in elevation.

4.4.1.6 **Acres Affected**

	Total Acres	**Dispersal Habitat**	**Capable Habitat (i.e. non-habitat)**
Total Project Area	1094	746	348
LSR	644	498	146
CHU OR-10	34	34	0
CHU OR-11	761	511	250

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 project area. The units within the project area had an average down wood percent cover of 4.2% in the LSR and 3.6% cover in the Matrix. Snag levels of 10" diameter or greater within the LSR and Matrix were at 2.1 and 1.2 trees per acre, respectively. Most snags are small to medium size. Few large legacy snags exist in the plantations.

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, road repair or road closures 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 that are currently providing dispersal habitat would continue to function as dispersal habitat. Snag levels would remain essentially unchanged. In the long term (20-40 years), the stands would start to differentiate to varying degrees and show an increase in the levels of snags, down wood and understory development. Where these developments occurred, they would improve the dispersal habitat characteristics being provided within the stands. The quality of dispersal habitat would improve only slightly in some stands while improving much more in others. Most of the stands currently providing capable habitat would become dispersal habitat in the next 10-20

years. Some of the stands may eventually develop nesting habitat characteristics and become suitable spotted owl habitat. However, with no action, it could take as much as 60 to100 years for these stands to develop into suitable habitat. Refer to Growth and Productivity and Diversity sections for further discussions of the response of trees to no action.

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

Proposed Action

4.4.2.2 Effects to Owl Habitat on a Stand Scale

	TOTAL ACRES	DISPERSAL HABITAT REMOVED (ACRES)	DISPERSAL HABITAT DEGRADED (ACRES)
Project Area	1094	171	575
LSR	644	78	420
Non LSR	450	93	155

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 these young managed plantations 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 plantations 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. In addition, a variable density thin would occur both between trees in the units and between stands, adding to the potential that the units would eventual provide diverse habitat attributes. These silvicultural techniques are more likely to push the stands to an accelerated trajectory that would result in suitable habitat sooner compared to treatments outside the LSR, and much sooner when compared to no action.

The proposed harvest treatments would temporarily degrade approximately 575 acres of dispersal habitat. This degradation of habitat would occur as a result of opening up the canopy from its current condition of 80-100% down to 40-55%; as well as the loss of some snags. The Design Criteria require the retention of all down logs and non-hazardous snags. Although the dispersal habitat within these units would be reduced in quality as described above, they would still function as dispersal habitat. It is estimated that these units would again provide quality dispersal habitat in approximately 10 to 15 years after harvest.

Due to the intensity of thinning within some of the units, 171 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 171 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 habitat within 40 years and they would become quality spotted owl habitat within 60 years.

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

There is suitable habitat adjacent to the many of the proposed thinning stands and it is currently providing nesting, roosting and foraging habitat. In addition, most of the units are within the mean home range (1.2 mile radius) of historic activity centers. Research has shown that activity centers that have been utilized in the past are likely to continue to be utilized in the future. All the proposed harvest units, except units 6, 7, and 8, are within the home range of a historic spotted owl activity center. Two units are within 200 meters of activity centers.

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

The loss of dispersal habitat would 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**

Disturbance to spotted owls is negatively related to stimulus distance and positively related to noise level. Substantial noise, smoke and human presence can result in disruption of breeding, feeding, or sheltering behavior of the spotted owl such that it creates the potential for injury to the individuals (i.e. incidental take in the form of harassment). For a significant disruption of spotted owl behavior to occur as a result of disturbance caused by the proposed actions, the disturbance and 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 owl 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.

The proposed actions for this project that generate noise above local ambient levels are heavy equipment and chainsaw use. Disruption distances of 35 yards for heavy equipment use and 65 yards for chainsaw use have been set by the Fish and Wildlife Service. If disturbance were to occurred during the critical breeding period (March 1 – July 15th) near a nest site, breeding could be adversely affected. However, none of the historic activity centers occurs within these disruption distances.

Restrictions on chainsaws or heavy equipment use would only apply to small portions of units 27 and 31. It is likely that harvester equipment would be used instead of chainsaws in these units. Less than one acre in each unit would be affected by equipment restrictions.

Because recent surveys have not been conducted, there is the possibility that new activity centers are present close enough to thinning units to be disturbed by noise. Using the best available information, some of the assumptions used to evaluate the effects of the proposed action (disturbance only) on spotted owls include:

- Suitable habitat is likely to be occupied at a rate of only one occupied nest site per 4,754 acres. The project area is almost entirely covered by historic home ranges, indicating that the available habitat may be fully occupied.
- Effects would only be adverse if the proposed activity occurred during the critical breeding period near an active spotted owl nest, and within the applicable disturbance distance for the activity. If noise did occur during the breeding period, adult owls would be able to distance themselves from the disturbances but the survival of eggs or young birds may be affected.

It is not likely that nesting owls would be disturbed by noise. While adverse effects are possible, they are not reasonably certain to occur.

Some of the units occur within this disturbance distance of either unsurveyed suitable habitat or an historic owl activity center. In terms of disturbance, the proposed project **may affect, but is not likely to adversely affect 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. The proposed project would have no effect on suitable habitat, and therefore, no cumulative effects analysis is necessary for this habitat type.

Home ranges are the appropriate analysis area for this analysis. An analysis has been conducted separately for each of the historic activity center home ranges as well as an analysis that combines all of the home ranges into one analysis area. 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 plantations grow, these conditions would be met at approximately age 40. Stands older than this would be considered functioning dispersal habitat and would not enter into this analysis unless their canopy has been reduced to less than 40%.

4.4.3.1 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 – other commercial thinning	Throughout Analysis Area	No. Older thinning prescriptions used a light thinning which have recovered to dispersal habitat already.	Loss or degradation of dispersal habitat	No	Exclude. Effects no longer evident. Stands have recovered.

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 – road construction	Throughout Analysis Area	Yes. roads occur throughout the Analysis Area	Permanent loss of dispersal habitat	Yes. Many acres of dispersal habitat has been converted to roads	Include. A permanent loss of dispersal habitat has occurred.
Past – rock quarries	Throughout Analysis Area	Yes. Rock quarries are permanent and occur throughout the Analysis Area	Permanent loss of dispersal habitat	Yes	Include. A permanent loss of dispersal habitat has occurred.
Past – Power Line		Yes. Power lines are permanent	Permanent loss of dispersal habitat	yes	Include. Trees that grow under power line are cut for safety before they can become dispersal habitat.
Past – road decommissioning	Throughout Analysis Area	Yes	Trees begin to grow in road	No	Exclude. No detrimental effect to dispersal habitat. Benefits too far off.
Past and present watershed restoration projects	Culvert replacement, road repairs, etc.	Yes.	None	No	Exclude. No effect to dispersal habitat.
Activities on other ownerships	Past logging. Austin property already clearcut. No known foreseeable future logging.	Yes	Loss of dispersal habitat	Yes	Include. A loss of dispersal habitat has occurred from past logging.
Future timber harvest	Unknown, but potential for timber harvest 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.
Off highway vehicle use	Minimal dispersed use throughout the Analysis Area	Yes	Compaction and disturbance	No	Exclude. No effect to dispersal habitat.

* Regeneration harvest occurring more than 40 years ago would likely have already grown into dispersal habitat.

4.4.3.2 The following table shows the quantities of habitats before active management, now, and after fuel break implementation.

Spotted Owl Habitat Type	Acres of Owl Habitat in Analysis Area Prior to Active Management	Current Condition of Owl Habitat in Analysis Area	Condition of Owl Habitat in Analysis Area Post-Harvest
Suitable	30,491 acres (92%)	16,998 acres (51%)	No Change
Total Dispersal	31,899 acres (97%)	20,014 acres (59%)	19,869 acres (59%)

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

There are 15 historic owl activity centers whose home range (1.2 mile radius) overlaps 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. 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.

Owl Pair	Analysis Area	Current Suitable	Current Dispersal	Dispersal Post-Harvest Acres Removed	Dispersal Post-Harvest Acres Degraded
3058	Nest Stand	100%	100%		
	Core Area	60%	60%		
	Home Range	**31%**	31%	47	64
3116	Nest Stand	80%	80%		
	Core Area	65%	70%		
	Home Range	49%	59%		
3131	Nest Stand	54%	54%		
	Core Area	**45%**	45%		
	Home Range	47%	57%	18	
3145	Nest Stand	32%	32%		
	Core Area	57%	61%		
	Home Range	55%	58%		
3286	Nest Stand	56%	100%		10
	Core Area	68%	68%		35
	Home Range	46%	51%	42	194
3320	Nest Stand	70%	70%		

Owl Pair	Analysis Area	Current Suitable	Current Dispersal	Dispersal Post-Harvest Acres Removed	Dispersal Post-Harvest Acres Degraded
	Core Area	**32%**	63%		
	Home Range	**32%**	54%		
3538	Nest Stand	46%	46%		
	Core Area	**44%**	67%		
	Home Range	**41%**	66%	18	
3557	Nest Stand	100%	100%		
	Core Area	88%	95%		
	Home Range	65%	70%	57	94
3656	Nest Stand	79%	79%		
	Core Area	56%	63%		
	Home Range	52%	56%		19
3660	Nest stand	92%	92%		
	Core area	81%	81%		
	Home Range	64%	69%		
3670	Nest Stand	63%	77%		
	Core Area	69%	78%		
	Home Range	64%	69%	32	85
3677	Nest Stand	82%	82%		
	Core Area	74%	78%		
	Home Range	65%	68%		
3681	**Nest Stand**	**0%**	100%		18
	Core Area	**24%**	24%	13	28
	Home Range	**39%**	41%	95	140
3727	Nest Stand	75%	100%		
	Core Area	64%	73%		
	Home Range	54%	65%		31
5354	Nest Stand	34%	34%		
	Core Area	61%	66%		
	Home Range	51%	58%		27

Based on current conditions, 5 pairs are currently below take thresholds in either their core area or home range. Within 2 of these owl activity circles, dispersal habitat would be removed and degraded. Since these two 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.

The proposed action could have an effect of 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.

4.4.3.4 **Effects of Past Actions:**

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

Past management actions and previous wildfires have reduced the amount of dispersal habitat within the analysis area by approximately 11,885 acres. Currently there is still adequate dispersal habitat for spotted owls.

The temporary loss of approximately 171 acres of dispersal habitat and the temporary degradation of approximately 575 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.

4.4.4 **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 timber sale. 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 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.
FW 170 & 171	This standard and guideline is not applicable to individual projects.
FW-174	Habitat for threatened, endangered and sensitive species has been identified and managed in accordance with the ESA (1973), the Oregon ESA (1987), and FSM 2670.
FW-175	Habitat for threatened, endangered and sensitive species is managed at the landscape scale. This standard and guideline is not applicable to individual projects.
FW -176	A Biological Evaluation has been prepared.
FW 177 & 178	Consultation with USFWS has been completed.
FW-179	The creation of Species Management Guides is not applicable to individual projects.
FW-180	The maintenance of lists of threatened, endangered and sensitive species is done but this standard is not applicable to individual projects.
FW-181	This document does not include location information.

4.4.6 Endangered Species Act Compliance

The Upper Clackamas Thin Project is covered by the 2007_2008 Programmatic Biological Assessment.

Project Effects to Dispersal Habitat within Critical Habitat Unit OR-10 and OR-11

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

4.4.6.1 Proposed Treatments as Related to Critical Habitat Units OR-10 and 11.

Critical Habitat Units	Proposed Total Acres Treated	Proposed Total Acres Treated in Dispersal Habitat	Proposed Acres Treated in Non-Habitat
CHU OR-10	34	34	0
CHU OR-11	761	511	250
Total Acres Treated	795	545	250

4.4.6.2 Existing condition and effects to Critical Habitat Units

Critical Habitat Unit	Dispersal Habitat (Includes Suitable and Dispersal-only habitat)					Total Remaining Acres
	Total Acres of Habitat	Total Acres Removed	percent of habitat Removed	Acres Degraded	Percent Acres Degraded	
OR-10	55,902	0	0	34	0.06%	55,902
OR-11	25,329	122	0.5%	389	1.5%	25,207

4.4.6.3 Effects to critical habitat -

The effect determination for the proposed action on northern spotted owl critical habitat units OR-10 is, "**May Affect, Not Likely to Adversely Affect"**. Approximately 34 acres of dispersal habitat would be degraded. No loss of dispersal habitat would occur. Within OR-11, the effects call is "**May Affect, Likely to Adversely Affect."** This determination is due to the removal of currently functional dispersal habitat. The proposed harvest treatments would open up the canopy cover to just less than 40% in some areas, making them temporarily unsuitable for dispersing owls. Within this CHU, the proposed action would in the short-term add cumulatively to the decline of dispersal habitat, a primary constituent element of northern spotted owl critical habitat.

However, the resultant spotted owl habitat within CHU OR-11 as a whole after project completion would be sufficient to provide spotted owl nesting and dispersal. The proposed action would not appreciably diminish the functionality of this CHU to provide habitat conditions that support the recovery of the northern spotted owl. Long-term effects would be beneficial because the proposed thinning would eventually improve the quality of dispersal habitat in many of the units and speed up the succession of these stands within this CHU into suitable habitat.

4.4.6.4 **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.

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

The United States Fish and Wildlife Service (USFWS) issued a Biological Opinion that included the Upper Clack Thin (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.

4.4.6.6 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 in this Report was the barred owl and the species' expansion into northern spotted owl territory from northeastern Canada since about 1900 and its subsequent movement into Washington, Oregon and Northern California; in some cases displacing spotted owls. Barred owls may be expanding their range because of changes

to forest structure from logging, wildfire or climate change. Barred owls are known to be present on the District. By casual observation and incidental surveying since 1994, barred owls do appear to be more common on the district than they were since surveying began on 1979. Since routine surveys have not been completed for owls since approximately 1994, it is unknown as to what extent there presence has affected the population of spotted owls on the District.

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

4.5 OTHER WILDLIFE

4.5.0.1 Management Indicator Species

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

Management Indicator Species for this portion of the 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 which is incorporated by reference and found in Appendix B.

4.5.1.1

Species	Suitable Habitat Presence	Impact of Proposed Action*	Impact of No Action*
Oregon Slender Salamander	No	NI	NI
Larch Mountain Salamander	No	NI	NI
Cope's Giant Salamander	Yes	MII-NLFL	NI
Cascade Torrent Salamander	No	NI	NI
Oregon Spotted Frog	Yes	MII-NLFL	NI
Painted Turtle	No	NI	NI
Northwestern Pond Turtle	No	NI	NI
Horned Grebe	No	NI	NI
Bufflehead Duck	No	NI	NI
Harlequin Duck	No	NI	NI
American Peregrine Falcon	Yes	MII-NLFL	NI
Gray Flycatcher	No	NI	NI
Baird's Shrew	No	NI	NI
Pacific Fringe-tailed Bat	Yes	NI	NI
California Wolverine	No	NI	NI
Puget Oregonian Snail	No	NI	NI
Columbia Oregonian Snail	No	NI	NI
Evening Fieldslug	Yes	MII-NLFL	NI
Dalles Sideband Snail	No	NI	NI
Crater Lake 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, obliteration, log haul, snag creation, and down woody debris creation.

4.5.1.2 **Terrestrial Mollusks:** The Puget Oregonian, Columbia Oregonian, evening fieldslug and Crater lake tightcoil are mollusk species with ranges that include the Clackamas River Ranger District. The Puget Oregonian 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 young managed plantations and 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 and the Crater lake tightcoil is found at mid to high- elevations adjacent to perennial wet areas. No known sites exist on the district for the evening fieldslug, 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 all young managed plantations that contain no remnant old-growth trees. Due to lack of habitat, it is highly unlikely a red tree vole would be nesting in the plantations proposed for thinning. So surveys were conducted for this species.

4.5.2 Snags and Down Wood

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

Snag and down woody debris transects within the proposed units were conducted to determine more accurately the current level of snags and coarse woody debris. While transects were implemented throughout the project area, emphasis was put on the units within the Upper Clackamas LSR. Snags greater than or equal to 3" diameter were counted.

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

	Upper Clackamas LSR	**Outside LSR**
Snags ≥ 10 inches diameter	2.1 snags/acre	1.2 snags/acre
Snags greater than 3 inches diameter	5.6 snags/acre	4.2 snags/acre
Average Snag diameter	12.5"	14.2"
Percent Ground Cover	4.2%.	3.6%.

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.

All of the Upper Clack units currently contain snag and down wood numbers that are 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 plantations would continue to have few snags and little down wood. It is presumed that there would continue to be an average of 1.8 snags per acre $\geq$10 inches diameter in the units. This is below the 60% biological potential level. In terms of the tolerance levels for snags within the applicable habitat type and structural condition identified in the DecAID advisor, these areas would continue to be below the 30% tolerance level. Levels would be slightly higher if live trees with elements of wood decay had been included in the surveys.

The units would continue to provide an average of 4.0% down wood cover.

In the future, these stands would continue to increase in size and density and start to become increasingly more susceptible to damaging agents such as insects and diseases. These natural processes would create new snags and down logs, mainly from the smaller intermediate and suppressed trees. The attainment of large diameter snags and down woody debris would be delayed with the no-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 801 acres would be tractor logged, 262 acres would be harvested using a skyline logging system, and 31 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.

Approximately 0.31 mile of new temporary road would be constructed with this alternative. This would result in a slight additional loss of snags and damage to the coarse woody debris. Approximately 3.81 miles of roads would be re-opened and utilized on old existing temporary roads, skid trails and decommissioned roads. 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 timber sale would be more prone to wind damage and snow breakage than they would have been without thinning. There would likely be some loss of the remaining snags within 10 years after harvest. These would become down wood.

Certain live trees would be selected as leave trees that are defective or have the elements of decay as described in the DecAID advisor. Hollow structures are created in living trees by heartrot decay organisms over many years. These hollow structures in living trees provide especially valuable habitat for a variety of wildlife, including cavity users. Trees that have heartrot decay present may include features such as openings in the bole, broken boles with bayonet tops, large dead tops or branches, punk knots, flattened stem faces, old wounds on the bole, crooks in the bole signifying previous breakage, and the presence of fruiting bodies. Defective trees with deformities such as forked tops, broken tops, damaged and loose bark or brooms caused by mistletoe or rust can also provide important habitat for a number of species.

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

Currently tree sizes within the potential harvest units average 13 inches in diameter. 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 the timber 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 all these young managed plantations, 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, just 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 – road construction	Throughout Analysis Area	Yes. roads occur throughout the Analysis Area	yes	yes	Include. A loss of snags in all size classes has occurred.
Past – rock quarries	Throughout Analysis Area	Yes. Rock quarries are permanent and occur throughout the Analysis Area	yes	yes	Include. A loss of snags in all size classes has occurred.
Past – Power Line		Yes. Power lines are permanent	yes	yes	Include. A loss of snags in all size classes has occurred.
Past – road decommissioning	Throughout Analysis Area	Yes	yes	No	Exclude. No meaningful loss of snags would occur.
Past and present watershed restoration projects	Culvert replacement, road repairs, etc.	Yes.	yes	No	Exclude. No meaningful loss of snags would occur.

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 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.
Fuel Break	A small portion of the fuel break overlaps the Pinhead analysis area	yes	Snags would be removed from the fuel break	yes	Include

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

For purposes of this analysis, it is assumed some snags would need to be felled for safety reasons in the Upper Clack Thin. Past experience and monitoring indicate that there would likely be some snags remaining afterwards.

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

Snag Habitat (analysis areas that overlap Upper Clack Thin units)

Snag Analysis Areas	Total Acres	Snags/Ac. 15-21"	Snags/Ac. > 21"	Total Snags/Ac. Existing Condition*	Plantations Proposed for Treatment (Acres)	Proposed Action Snags/Ac. ≥15" **
Granite	4181	5.8	6.2	12	19 acres	12
Pot	5509	3.4	6.2	9.6	42 acres	9.6
Pinhead	6279	2.2	3.8	6.0	256 acres	5.9
Last	6670	3.1	5.8	8.9	42 acres	8.9
Dyke	4982	3.0	6.9	9.9	283 acres	9.8
Lowe	4118	4.0	8.4	12.4	30 acres	12.3
Rhododendron	4104	3.1	5.9	9.0	17 acres	9.0

Fawn	2900	5.2	11.6	16.8	126 acres	16.7
Hunter	4151	4.3	8.9	13.2	9 acres	13.2
Switch	4834	4.1	6.1	10.2	240 acres	10.1
Kansas	5882	3.2	6.4	9.6	33 acres	9.6

* This represents the existing situation 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.

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.

4.5.2.12 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 #2 would result in additional protection to down woody debris which would protect some of this habitat in the interim. Down woody debris creation would occur in many of the proposed harvest units, with an emphasis in the late-successional reserve.

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

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). The study mentioned above also reported that elk within or moving through areas of high open-road densities moved longer distances; several miles per day was not uncommon.

For this proposal, the following actions have the potential to affect deer and elk (both positively and negatively): actions that remove or kill trees to a level below 70% canopy cover would reduce thermal cover but would also increase forage availability. Activities that make noise may potentially affect deer and elk. These actions would include thinning, landing creation and trees killed for snags and down wood. Some actions specifically designed to benefit deer, elk and other species including the creation of skips and gaps and closing roads to public access. While these elements are designed to have long-term benefits they may result in short-term impacts. Other actions such as log haul, road reconstruction, road repair or road closures would not have a meaningful or measurable affect on habitat but would create noise disturbance.

4.5.3.2 **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	Acres Proposed for Treatment Containing Thermal Cover
Crucial Winter Range	15,050	366
High Value Winter Range	4,496	27
Moderate Value Winter Range	6,685	56
Summer Range	37,659	645

4.5.3.4 The Hunter Creek and Peavine elk herds utilize the project area. Both of them winter in this area as well, especially in the Big Bottom vicinity adjacent to the Clackamas River. Elk herds in the Clackamas drainage exhibit a close association with riparian habitat in areas of gentle terrain.

However, the Big Bottom area provides good cover and forage in the winter for these herds due to the presence mature/old growth stands within the riparian areas associated with the Clackamas River. Optimal cover appears to be utilized more by the Hunter and Peavine elk than in other elk herds found at lower elevations (Fiedler 1994).

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

4.5.3.5 Deer and Elk Analysis Areas (analysis areas that overlap Upper Clack Thin units)

Deer and Elk Analysis Areas	Total Acres	Plantations Proposed for Thinning Containing Thermal Cover (Acres)
Key WR 8	3,233	43
Key WR 6	4,519	310
WR 7	2,635	96
SR 6	5,768	98
SR 8	4,707	41
SR 12	4,151	288
SR 19	3,656	101
SR 20	6,571	30
SR 23	3,122	85

Direct and Indirect Effects

4.5.3.6 **No Action –** Approximately 1094 acres of young managed plantations would continue to serve as thermal cover. No cover would be lost and no forage would be gained in this alternative. In addition, no roads would be closed or obliterated. Currently lack of forage and high road densities are the two main limiting factors for deer and elk in the area. In the no-action alternative the stands would continue to remain crowded and forage would not increase above current levels. Road densities would remain unchanged from current conditions. Refer to Growth and Productivity and Diversity sections for further discussions of the response of trees to no action.

4.5.3.7 **Proposed Alternative**

The proposed action includes thinning and building temporary roads within approximately 1094 acres of young plantations within summer and winter range for deer and elk. Portions of the stands in stream protection buffers and skips would be unthinned.

The proposed commercial thinning would temporarily remove the thermal cover from the stands. This habitat would be downgraded to non-cover for deer and elk. These areas would incur 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 is predicted to 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 proposed harvest treatments in these areas could potentially cause a temporary slight reduction in herd size. No change in numbers for the Tag or Ripplebrook herds is expected with these proposed actions.

Although there is the possibility that herd sizes would be reduced to a small degree, these effects are not predicted to last long. Once some of the habitat regains its thermal cover characteristics, in about 15 years; these core winter range areas utilized by the three herds are predicted to once again to provide adequate winter habitat for elk.

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

4.5.3.8 **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 is not predicted to cause a measurable reduction in the current local population size for either deer or elk.

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

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

This alternative proposes road decommissioning and road berming. These road closures would improve the deer and elk habitat being provided in the area of the proposed road closures. They would reduce the disturbance to deer and elk in summer and winter as well as reducing the likelihood of poaching due to reduced accessibility of the areas. These road closures are likely to compensate for the short-term loss of thermal cover with the proposed treatments. No reduction in herd numbers would occur.

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

4.5.3.10 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 plantations grow, these conditions would be met at an age of approximately 25 years. Stands older than this would be considered functioning thermal cover and would not enter into this analysis unless their canopy cover has been reduced.

4.5.3.11 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 – road construction	Throughout Analysis Area	Yes. Most roads built for timber sales, power lines and recreation are permanent and occur throughout the Analysis Area	Permanent loss of thermal cover	Yes	Include
Past – regeneration harvest	Throughout Analysis Area	Yes, all plantations less than 25 years*	Loss of thermal cover	Yes	Include. A loss of thermal cover
Past – commercial thinning	Throughout Analysis Area	Any loss of thermal cover would have recovered by now. Most forage benefits would also be back to pre-harvest conditions. However, increase in road densities might still be present	Loss of thermal cover	No	Exclude. Effects no longer evident for thermal cover
Past – rock quarries	Throughout Analysis Area	Yes. Rock quarries are permanent and occur throughout the Analysis Area	Permanent loss of thermal cover	Yes	Include
Past – Power Line	Southern portion of 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.
Past – road decommissioning	Throughout Analysis Area	Yes	Trees begin to grow in road and allows forage and eventually thermal cover to develop. Road densities decrease	No	Include. No detrimental effect to thermal cover, but road densities decrease

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 and present watershed restoration projects	Culvert replacement, road repairs, etc.	Yes.	None	No	Exclude. No detrimental effects to thermal. No effects to road densities.
Future timber harvest	Unknown, but potential for timber harvest occurs within all parts of the Analysis Area	Unknown location	Unknown of intensity of treatments	No	Exclude. No site specificity. Can not be modeled at this time.
Off highway vehicle use	Minor dispersed use throughout the Analysis Area	Yes	Disturbance	No	Exclude. No effect to thermal cover

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

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

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

4.5.3.12 **Thermal Cover and Forage Analysis**

Analysis Area	Total Thermal Cover Existing Condition and No Action (acres and percent) *	Total Forage Existing Condition (ac. and %)	Total Post-Harvest Thermal Cover (acres and percent)
Key WR6	3549 acres (79%)	303 acres (7%)	3239 acres (72%)
Key WR8	2275 acres (70%)	90 acres (3%)	2232 acres (69%)
WR7	2267 acres (86%)	56 acres (2%)	2171 acres (82%)
SR 6	3702 acres (64%)	994 acres (17%)	3604 acres (62%)
SR 8	2965 acres (63%)	1047 acres (22%)	2924 acres (62%)
SR 12	2278 acres (55%)	1038 acres (25%)	1990 acres (48%)
SR 19	2672 acres (73%)	291 acres (8%)	2571 acres (70%)
SR 20	4158 acres (63%)	920 acres (14%)	4128 acres (63%)
SR 23	1963 acres (63%)	750 (24%)	1878 acres (60%)

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

The reduction in thermal cover as compared to the amount present is displayed in the above table. Within most of the winter and summer range analysis areas, the level of thermal cover only changes by a few percentage points. However, there is a substantial drop in thermal cover levels in WR 6.

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. 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 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 Upper Clackamas Thinning project has approximately 70 acres that occurs within the B10 land allocation.

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 (%) *
Key WR 6	72%	40%
Key WR 8	69%	40%
WR 7	82%	40%
SR 6	62%	30%
SR 8	62%	30%
SR 12	48%	30%
SR 19	70%	30%
SR 20	63%	30%
SR 23	60%	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.

Only approximately 0.86 mile of temporary roads would be built. They would be open for only a short time and would be obliterated after their use. A portion of these new temporary roads would occur on old existing skid trails. An additional 1.51 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.

The proposed action includes many additional road closures that would reduce current road densities in the area upon completion. Approximately 1 mile of system roads that would be used for the timber sale and decommissioned afterwards: 0.16 mile is currently open and 0.84 mile is currently closed with a berm. The decommissioning of this 1 mile of road after project completion would include berming, scarification, water bars and possibly piling debris on the road prism. In addition, approximately 6.63 miles of system roads that are currently open or have ineffective closures would be used for the timber sale and then closed afterwards with more effective berms.

The end result would be that approximately 6.79 miles of road that is currently open to vehicular traffic would be effectively closed, reducing the potential disturbance to deer and elk. It would also increase the habitat effectiveness for these species. An additional 0.84 mile would be more effectively closed, so that the potential for breech by motor vehicles would be much less than what it currently is.

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 plantation 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 & 199	Forage would temporarily be increased. Grass and other plants seeded for erosion control would also enhance forage quality.
FW-200 & 201	Not applicable
FW-202 to 212	See detailed analysis above where applicable.

4.5.4 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 document focuses on certain key species and does not specifically address common species except to the extent that they are represented by management indicator species.

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

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

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

None of the proposed harvest units provide habitat for these species. All the stands proposed are young managed plantations and range in age from 42 to 56 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 plantations on

the district are very common, any loss of habitat would not result in any measurable population change of the species, only a redistribution of the individuals affected.

Cumulative Effects

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

Snags are discussed in section 4.5.2.

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 (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 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 have plantation thinning 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 plantations proposed for thinning. These are appropriate boundaries because actions outside the plantation boundaries would have little or no affect to soil productivity within the plantations, and the actions within the plantation boundaries would have little or no affect to soil productivity elsewhere. Actions within the unit boundaries may have an effect on hydrologic properties elsewhere. The analysis of hydrology for earthflows and watersheds can be found in s. 4.3.7.1.

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 decommissioning, and decompacting temporary roads and landings.

The analysis also considers restorative actions and the design criteria and best management practices that minimize impact. For example: existing roads, landings and skid trails would be reused where feasible, equipment would be restricted to appropriate slopes, erosion control methods such as water bars, seed and mulch would be used. Refer to section 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 – units 1- 9. They are the most productive of all the soils mapped in this analysis area. These soils are subdivided into less than 30% slope, between 30% and 60% slopes, and greater than 60% slope. Soils tend to become coarser textured as slope increases.

Glacially derived soils – units 10a thru 38. 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
Earthflow terrain >60% slope			
108	Moderate	Severe	High
Steep uplands >30% slope			
1	Low	Severe	Severe
15	Low	Very Severe	High
Glacial deposits <30% slope			
304	Slight	Moderate	Moderate
306	Slight	Moderate	Moderate
315	Moderate	Moderate	Moderate
323	Slight	Moderate	Moderate
Glacial deposits >30% slope			
307	Moderate	Moderate	Moderate
308	Moderate	Moderate	Moderate
317	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 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
1A	100, 101	Moderate - Severe	100%	> 75%
1B	101	Severe	100%	> 75%
2A	101, 104	Moderate- -Severe	100%	> 75%
2B	101	Moderate - Severe	100%	> 75%
2C	101	Moderate - Severe	100%	> 75%
3	101, 103, 104	Moderate - Severe	100%	> 75%
4	15,101,104, 105	Moderate - Severe	100%	> 75%
5	104	Moderate	100%	> 75%
6	4, 315	Slight - Moderate	100%	> 60%
7A	102, 315	Moderate - Severe	100%	> 75%
7B	102, 315, 317	Moderate-Severe	100%	> 60%
8	100, 108	Moderate-Severe	100%	> 75%
9A	100,108,316,317	Moderate	100%	> 75%
9B	100,108,316, 317	Moderate	100%	> 75%
10A	304	Slight	100%	> 60%
10B	304, 323	Slight	100%	> 60%
11	306	Slight	93%	> 60%
12	306	Slight	100%	> 60%

Monitored Unit #	SRI Map Unit(s)	Erosion Risk Rating (surface soil)	Percent of Field Observations with Ground Cover	Predicted Groundcover After Thinning
13	306, 307	Slight - Moderate	100%	> 60%
14	306, 307	Slight - Moderate	100%	> 60%
15	306	Slight	100%	> 60%
16	3, 306	Slight	100%	> 60%
17A	306	Slight	100%	> 60%
17B	306, 307	Slight - Moderate	100%	> 60%
18	306, 307	Slight - Moderate	100%	> 60%
19	306, 307	Slight - Moderate	100%	> 60%
20	306, 307	Slight - Moderate	100%	> 60%
21	306	Slight	100%	> 60%
22	306, 308	Slight - Moderate	100%	> 60%
23	306, 307, 308	Slight - Moderate	100%	> 60%
24	306, 307, 308	Slight - Moderate	98%	> 60%
25	4, 306	Slight	100%	> 60%
26	306, 308	Slight - Moderate	100%	> 60%
27	4, 306	Slight	100%	> 60%
28	308	Moderate	100%	> 60%
29	306	Slight	100%	> 60%
30	304, 308	Slight - Moderate	100%	> 60%
31	306	Slight	100%	> 60%
32A	1, 15	Severe	100%	> 85%
32B	1, 15, 306, 307	Slight - Severe	100%	> 85%
32C	306	Slight	100%	> 60%
33A	15, 308	Moderate - Severe	100%	> 60%
33B	307	Moderate	100%	> 60%
34	306	Slight	100%	> 60%
35	1, 308	Moderate - Severe	100%	> 75%
36	1, 308	Moderate - Severe	100%	> 75%
37	306, 307	Slight - Moderate	95%	> 60%
38	307, 308	Slight - Moderate	100%	> 60%

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 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 part of 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	**Direct Effect for Proposed Action**	**Cumulative Effect**	
Glacial	Moderate	< 30%	8% - 40%	2 – 4%	10% - 44%	634
	Moderate	>= 30%	3% - 8%	2%	5% - 10%	251
Earthflow	High	< 30%	5% - 25%	2 – 4%	7% - 24%	92
	High	>= 30%	8% - 17%	2%	13% - 19%	75

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**

All the proposed thinning units are plantations that were regeneration harvest units (clear cuts) in the past. The removal of all the trees in an area has a much greater impact on the slope stability of that area than a thinning would. The level of stability of the slopes of all the proposed thinning units was therefore "tested" in the past by that original harvest. A conservative approach to evaluating the effects of thinning on slope stability is to identify the areas of the original harvest units that show evidence of landslide activity and exclude those areas from any harvest. Areas that remained stable after the original regeneration harvest would continue to be stable after thinning.

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

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

1. all units that contained mapped active landslides
2. all units that contain a steep area within or near landform type ALD

3. all units reported to have a landslide by other resource specialists

The following table displays the units that fell into one or more of the above three 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 more than one category)
1	4, 7b, 9a
2	1a, 1b, 2a, 2b, 2c, 3, 4, 5, 6, 7a, 8, 9a, 9b
3	4, 7b, 10b

4.6.11.2 There were some mapping inaccuracies in the GIS coverage of landform type ALA and the mapped active landslides. 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 analysis or the Northwest Forest Plan but simply a more accurate refinement of the intent of those documents.

The boundaries of four proposed thinning units were modified to exclude from thinning those areas that were judged to be unstable or potentially unstable: 4, 7b, 9a, and 9b.

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 Alternative**

No Action

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

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

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.

The construction of temporary roads on stable ground would have no perceptible effect on slope stability. These roads would be obliterated after use. Existing system roads that would be used for timber haul would be maintained and repaired. These actions would greatly reduce the risk of resource damage from these roads.

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 BT6.6 and CT6.6 provisions in the Timber Sale Contract.
FW-25	Ground cover would be maintained at the prescribed levels.

FW-28 to 30	Rehabilitation would be accomplished only on roads and landings used by the operator. Rehabilitative techniques would not restore the soil resource to a level of less than 15% impaired. See discussion below for exception.
FW-31 to 34	Sufficient woody debris would be left on site including existing down logs, tops and branches and trees felled to create coarse woody debris.
FW-037	Many aspects of the project include design features that limit disturbance to the soil's organic horizon: broadcast burning and mechanical fuel treatments would not occur, skyline and helicopter systems are used where appropriate, existing temporary roads, landings and skid trails would be reused where appropriate and mechanical fellers would operate on top of branches and tops.
B8-31 to 32	These are addressed in section 4.3.7.1
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 in plantations. 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 plantations that have detrimental soils above 15% have similar growth rates compared to nearby similar plantations 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 earthflow plantations where ground-based systems were used in the original logging. An exception is proposed because examination of the units has found that the use of existing roads, skid trails and landings with restoration would result in minimal impact. The objective of providing for earthflow stability would still be met. One option would be to switch to a skyline system, which would overlay the impact of skyline corridors over an existing network of skid trails and in many cases would result in the need to build new roads and landings to facilitate skyline logging. Another option would be to switch to helicopter logging with its associated increase in cost. These options were adopted in some situations where appropriate but in most earthflow units, the objective of earthflow stability would still be met by thinning to create healthy, productive stands using ground-based methods.

B8-40 & FW-018

These standards and guidelines suggest that cumulative detrimental soil condition should not exceed 8% on earthflows. Many units already exceed this level. Even though there was no standard for long-term soil productivity or earthflow stability when the original clearcuts were logged, the stands continue to grow well and are projected to continue to grow well after the proposed thinning. The 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 plantation is generally no longer considered visually disturbed when the vegetation within it reaches an average of 20 feet in height (Forest Plan – FW-562).

The primary viewer positions for this project would be the banks of the Clackamas River and Road 46. 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 plantations and mature forest would become less evident but plantations 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 construction, landings, helicopter landings, skid trails and skyline corridors that would be open. The rest of each stand would have variable-density thinning.

4.7.3 Effects to scenery as seen from sensitive viewer positions:

Clackamas River and Road 46. The proposed thinning units can not be seen from any of these viewer positions. Alterations to scenery if any would be very slight because of a combination of topographic screening, vegetative screening near the viewer position, the density of green trees retained within thinning units, the distance and the viewer angle. No log landings would occur on, or be visible from the primary viewer positions. These factors combined would result in no noticeable change to the casual observer; the viewer would not notice any dramatic changes in forest structure or see bare ground or slash. Similar plantation thinning has been implemented in other viewsheds and the results there

confirm that this type of treatment has very little if any affect to scenery. 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 plantation 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 plantation 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- Road 46	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 plantation thinning has been implemented in other viewsheds and the results there confirm that this type of treatment has very little if any effect to scenery.

4.8 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 June and July 2007.

The following is a summary of the Botanical Biological Evaluation in Appendix D.

4.8.1 **Existing Situation**

Rare or uncommon botanical species were either already documented to occur within or adjacent to the project area or were found during the 2007 surveys.

The lichen *Peltigera pacifica* (Fringed Pelt) is on the Regional Forester's Sensitive Species list and is considered regionally rare (in the Northwest Forest Plan area) but may be uncommon, rather than rare, on the Mt. Hood National Forest. Field surveys over the last few years have found a large number of sites (>100) scattered in young forests proposed for commercial thinning on the Clackamas River Ranger District and in old forests in the summer home tracts on the Zigzag Ranger District. **Fourteen sites were found in the proposed project area.** *P. pacifica* is a foliose (leaf-like) lichen that grows on soil, moss, rocks, logs, and tree bases (McCune and Geiser 1997). Like other *Peltigera* species, *P. pacifica* contains cyanobacteria that fix atmospheric nitrogen. *Peltigera* species thereby provide a valuable ecosystem service by adding nitrogen to forest soils. Ground disturbance or alteration of stand microclimate (opening of the stand) resulting from commercial thinning may affect the survival of *P. pacifica*.

The clubmoss *Diphasiastrum complanatum* (Ground Cedar) is on the Regional Forester's Sensitive Species list and is considered rare. It grows in open forest habitat. Sites for ground cedar have been found on Tom, Dick, and Harry Ridge (high-elevation meadows above Ski Bowl) on the Zigzag Ranger District and nearby the proposed project area on the Clackamas River Ranger District. No individuals or sites were found during surveys in the project area but it may be present in or adjacent to units.

The grass-like iris *Sisyrinchium sarmentosum* (Pale Blue-Eyed Grass) is on the Regional Forester's Sensitive Species list and is considered rare. It grows in meadows. Sites for pale blue-eyed grass have been found at Little Crater Meadow and in meadows near the project area on the Clackamas River Ranger District. No individuals or sites were found during surveys in the project area but it may be present in or adjacent to units.

Direct and Indirect Effects

No-Action Alternative

With no action there would be no ground disturbance to forest soils and plant communities. Self-thinning would eventually occur in plantations, creating canopy gaps and structural diversity that, would eventually promote biological diversity and complexity. The proposed action, on the other hand, would accelerate development of young stands to late-successional stands.

There would be no direct effect to botanical species.

Proposed Action

The proposal would disturb forest soils and plant communities (e.g., tree falling and skidding). Disturbance to soils and plant communities from commercial thinning are generally short-term (lasting for years to a few decades), but repeated timber harvest entries in an area over time may have cumulative detrimental effects on soil productivity and plant communities (e.g., reduction in soil organic matter, soil compaction, increase in

invasive alien plant species, reduction in biological diversity). Mechanized 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.

Thinning activities may harm or damage *Peltigera pacifica* sites in the proposed project area through ground disturbance or alteration of stand microclimate. Thinned stands, for example, may not possess the temperature and moisture (humidity) requirements needed by the rare lichen species to survive; however, *Peltigera pacifica* appears to be adaptive to disturbance and may even be a "pioneer" species (an early colonizer of disturbed sites) given its presence in young stands. Short and long-term monitoring of sites following thinning disturbance would be needed to assess the persistence and health of *P. pacifica* individuals and populations. Skips would be placed around the 14 known locations of this species. Even with this precaustion, the proposed action **May Impact Individuals and habitat but is not likely to lead to a trend toward federal listing.**

Diphasiastrum complanatum (Ground Cedar) - No individuals or sites were found during surveys in the project area but it may be present in or adjacent to units. The proposed action **May Impact Individuals and habitat but is not likely to lead to a trend toward federal listing.**

Sisyrinchium sarmentosum (Pale Blue-Eyed Grass) - No individuals or sites were found during surveys in the project area but it may be present in or adjacent to units. The proposed action **May Impact Individuals and habitat but is not likely to lead to a trend toward federal listing.**

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. Seventeen species that have suitable habitat present are assumed to be present.

Biological Evaluation Summary

Species	**Habitat present?**	**Species present?**	**Conflict?**
Vascular Plants			
Agoseris elata	Yes	No	No Impact
Arabis sparsiflora var. *atrorubens*	Yes	No	No Impact
Aster gormanii	Yes	No	No Impact
Botrychium minganense	Yes	No	No Impact
Botrychium montanum	Yes	No	No Impact
Botrychium pinnatum	Yes	No	No Impact
Carex livida	Yes	No	No Impact
Castilleja thompsonii	Yes	No	No Impact
Cimicifuga elata	Yes	No	No Impact
Coptis trifolia	Yes	No	No Impact
Corydalis aquae-gelidae	Yes	No	No Impact
Diphasiastrum complanatum	Yes	No, but nearby	MII

Lycopodiella inundata	Yes	No	No Impact
Montia howellii	Yes	No	No Impact
Ophioglossum pusillum	Yes	No	No impact
Scheuchzeria palustris var.*americana*	Yes	No	No Impact
Sisyrinchium sarmentosum	Yes	No, but nearby	MII
Taushia stricklandii	Yes	No	No Impact
Wolfia boralis	Yes	No	No Impact
Wolfia columbiana	Yes	No	No Impact
Bryophytes			
Rhizomnium nudum	Yes	No	No Impact
Schistostega pennata	Yes	No	No Impact
Scouleria marginata	Yes	No	No Impact
Tetraphis geniculata	Yes	No	No Impact
Lichens			
Chaenotheca subroscida	Yes	No	No Impact
Dermatocarpon luridum	Yes	No	No Impact
Fuscopannaria rubiginosa	Yes	No	No Impact
Fuscopannaria saubinetii	Yes	No	No Impact
Hypogymnia duplicata	Yes	No	No Impact
Leptogium burnetaie var. *hirsutum*	Yes	No	No Impact
Leptogium cyanescens	Yes	No	No Impact
Lobaria linita	Yes	No	No Impact
Peltigera neckeri	Yes	No	No Impact
Peltigera pacifica	Yes	Yes	MII
Usnea longissima	Yes	No	No Impact
Fungi			
Bridgeoporus nobilissimus	Yes	No	MII
Cordyceps capitata	Yes	Assumed Presence	MII
Cortinarius barlowensis	Yes	Assumed Presence	MII
Cudonia monticola	Yes	Assumed Presence	MII
Gomphus kauffmanii	Yes	Assumed Presence	MII
Gyromitra californica	Yes	Assumed Presence	MII
Leucogaster citrinus	Yes	Assumed Presence	MII
Mycena monticola	Yes	Assumed Presence	MII
Otidea smithii	Yes	Assumed Presence	MII
Phaeocollybia attenuata	Yes	Assumed Presence	MII
Phaeocollybia californica	Yes	Assumed Presence	MII
Phaeocollybia oregonensis	Yes	Assumed Presence	MII
Phaeocollybia piceae	Yes	Assumed Presence	MII
Phaeocollybia pseudofestiva	Yes	Assumed Presence	MII
Phaeocollybia scatesciae	Yes	Assumed Presence	MII
Ramaria amyloidea	Yes	Assumed Presence	MII
Ramaria gelatiniaurantia	Yes	Assumed Presence	MII

Sowerbyella rhenana	Yes	Assumed Presence	MII

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

4.9 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.

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 decommissioning, road use by any vehicle and vehicle or equipment transportation to the project area from off-site. Invasive plant species were found along roads, in skid roads and old landings, and in forest openings with ground disturbed by previous timber harvest activities. Also considered in this analysis are the design criteria to minimize the spread of invasive plants (#4 and 8 in section 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 building, reconstruction and decommissioning). All of these activities/processes can result in the spread of weeds and infestation of previously un-infested sites. Many invasive plant species can be found wherever one travels along roads on the Mt. Hood National Forest.

The Forest 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).

4.9.1 Existing Situation

Many of the roads in the project area contain tansy ragwort (*Senecio jacobaea*), St. Johns-wort (*Hypericum perforatum*), Canada thistle (*Cirsium arvense*), bull thistle (*Cirsium vulgare*), Scotch/Scot's broom (*Cytisus scoparius*), cats-ear (*Hypochaeris radicata*), and oxeye daisy (*Leucanthemum vulgare*). These species also can be found within forests in the project area, especially in forest openings where ground disturbance has occurred. English holly (*Ilex aquifolium*) was found scattered within forests in the project area.

Direct and Indirect Effects

4.9.2 No Action

It is expected that invasive plants would continue to invade roadsides, timber harvest units, burned areas, and other disturbed ground within the project area. People 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 Japanese knotweed, spotted and diffuse knapweed, tansy ragwort, St. Johns-wort, Canada thistle, bull thistle, Scotch broom, oxeye daisy, and cats-ear. All of these species, except for oxeye daisy and cats-ear, are listed as noxious weeds by the Oregon Department of Agriculture (ODA 2006). Existing populations would be expected to expand into disturbed habitat because invasive plants are able to outcompete native plant species in disturbed habitats. It is likely that some of the invasive plant populations in the project area will be treated under the *Site-Specific Invasive Plant Treatments EIS for the Mt. Hood National Forest and Columbia River Gorge National Scenic Area*.

4.9.3 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 new system or temporary roads, landings, and skid roads would provide opportunities and growing space for weeds to colonize. Openings in forest stands with disturbed ground resulting from thinning operations would provide opportunities and growing space for weeds. The magnitude of increase 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.

Scotch broom is considered naturalized, but is still listed as a noxious weed by the ODA. Canada thistle, bull thistle, tansy ragwort, and St. John's-wort are common and widespread on the Forest, including in the project area, and are also listed as noxious weeds by the ODA. There are approximately eight small populations of spotted and diffuse knapweed on the Clackamas River Ranger District. These populations have been treated manually and chemically by the ODA in the past, and ODA continues to treat them manually and monitor them. Both knapweed species are listed as noxious weeds by the ODA, are highly invasive, and especially problematic in drier eastside forest and range lands. Oxeye daisy and cats-ear are common and widespread on the Forest, including in the project area, but are not listed as noxious weeds by the ODA.

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. If new sites develop, the early detection/rapid response strategy would be applied where appropriate.

4.9.4 **Cumulative Effects**

Past actions have resulted in the presence of invasive plants discussed in the existing situation section. All recently planned and future actions would use similar design criteria to limit the spread of invasive plants. Several foreseeable future actions are the implementation of the practices outlined in the Regional Invasive Plant EIS 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.

4.9.5 **Forest Plan Standards and Guidelines**

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

Standards from the Regional Invasive Plant Record of Decision

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

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

4.9.6 **Other Competing and Unwanted Vegetation**

There are no issues with brush competition for this project. Fuels treatments in thinning projects are exempt from the requirements of the Record of Decision and Mediated Agreement (MA) for the "Managing Competing and Unwanted Vegetation" Final Environmental Impact Statement (FEIS) (USDA 1998a). Slash treatments associated with road construction is included. However the slash, woody debris and root wads that result from the temporary road construction associated with this project would be temporarily set aside and used to block the road when logging is completed. There would be no burning of this material.

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

4.10 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 20 miles away.

Direct and Indirect Effects

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

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 fund several restoration projects.

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, 4, 6 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. Other road decommissioning is included in this document.

4.12.1 Existing Situation

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

The units proposed for thinning are plantations, many of which were accessed by temporary roads during the original clearcut logging. 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.

Upper Clack Roads Analysis

The analysis area is the northern portion of the upper Clackamas drainage and is 55,860 acres or 87.28 square miles.

Within this area, 29.8 miles of old system roads have already been decommissioned.

289 miles of system roads remain and the analysis area has a total road density of 3.3 mi. / sq mi.

Forest-wide Roads Analysis - (summarized for this analysis area)

Total resource risk scores (Map 16)

	miles
Low	184
Moderate Low	56
Moderate	28
Moderate High	16
High	5

Total resource risk scores by maintenance level

Total Resource Risk	Objective Maintenance Level	Miles
Low	1	114
Low-Mod	1	25
Mod	1	14
Mod-High	1	5
High	1	0
		158
Low	2	52
Low-Mod	2	23
Mod	2	9
Mod-High	2	3
High	2	1
		87
Low	3	18

Low-Mod	3	6
Mod	3	2
Mod-High	3	1
High	3	0
		27
Low	4	0
Low-Mod	4	2
Mod	4	3
Mod-High	4	7
High	4	4
		17

Maintenance Levels

- **Level 1** - Assigned to roads of intermittent service during the period that they are closed to vehicular traffic. Basic custodial maintenance is performed to keep damage to adjacent resources to an acceptable level and to perpetuate the road to facilitate future management activities. Emphasis is normally given to maintaining drainage facilities and runoff patterns. Planned road deterioration may occur at this level.

- **Level 2** - Assigned to roads open for use by high-clearance vehicles. Passenger car traffic is not considered. Traffic is normally minor, consisting of one or a combination of the following: administrative, permitted, dispersed recreation, or other specialized uses. Log haul may occur at this level.

- **Level 3** - Assigned to roads open and maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities. Roads at this maintenance level are typically low-speed, single-lane with turnouts and aggregate surfacing.

- **Level 4** - Assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most roads are double lane and dust abated or paved. However, some roads may be single lane.

- **Level 5** - Assigned to roads that provide a high degree of user comfort and convenience. These roads are normally double lane, paved facilities. Some may be aggregate surfaced and dust abated.

Forest-wide Roads Analysis Summary

The project area does not have as many urgent needs as other portions of the Forest. Most of the high risk mileage is on Road 46; the primary access to this portion of the Forest.

No roads in the analysis area are listed as “high risk – low access needs.” (figure 19 page 44 of Forest-wide Roads Analysis)

Open road density for the analysis area is approximately 2 mi. / sq. mi.

Foreseeable Future Actions

4.5 miles of decommissioning was included in the recent Clackamas Restoration EA.

40 miles of road berming was included in the recent Clackamas Restoration EA.

Oregon Wild submitted a list of roads to consider for decommissioning. The recommendations that fall in this project's analysis area are addressed below. These actions are not part of any proposal at this time but may be considered in a future restoration EA.

Roads 4671120, 4671130, 4671150 were included in the Clackamas Restoration EA and will be decommissioned.

The first part of road 4650120 access the power line and is needed for line maintenance, but 0.54 mile of road past the power line could be considered for decommissioning. It does not access any plantations.

Roads 4600043 and 4600044 could be decommissioned. These roads do not access any plantations. These roads are in an area being considered for Wilderness designation.

Road 4651130 could be decommissioned. This road does not access any plantations. It has a large culvert on a fish bearing stream. Gravel should be removed. This road is in an area being considered for Wilderness designation.

Road 4651155 accesses popular dispersed camping area. This road is in an area being considered for Wilderness designation.

4.12.2 **Direct and Indirect Effects**

4.12.3 **Alternative A**

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

4.12.4 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 1.51 miles of old existing temporary roads would be reopened, approximately 0.55 mile of temporary roads would be constructed on old existing skid trails and approximately 0.31 mile of new temporary roads would be constructed. 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. Another 1.75 miles of old system roads that were decommissioned would be reopened and treated as temporary roads. They would also be obliterated upon completion of the harvest units they access.

Approximately 1 mile of system roads would be used and then decommissioned.

Approximately 6.63 miles of system roads that are opened or have ineffective closures would be used and then closed with effective berms.

In addition, approximately 5.5 miles of 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.

4671 Deep patch repairs
4200 Deep patch repairs

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

4.12.7 Cumulative Effects

The proposed action would result in little or no direct or indirect negative effect to the transportation system. The proposal would help maintain roads that are to remain open, and would close roads that are not needed in the near future and would decommission roads that are no longer needed as system roads. 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

Surveys conducted for this project located no new sites. This project is discussed in heritage resource report numbers 2008-060605-002. There would be no anticipated effects on heritage resources. Contracts would contain provisions for the protection of sites found during project activities. Documentation of this information has been forwarded to the State Historic Preservation Office.

Forest Plan standards and guidelines

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

The 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 Road closure would reduce some opportunities for dispersed recreation. While some people advocate the reduction of open-road density to benefit wildlife, there are others that object to road closures. Some road closures that are short and do not access any special places are usually not a problem, but the closure of long roads that access a relatively large landscape or roads that go to special dispersed recreation sites are often objected to. While there are many miles of open roads available for camping, hunting and other forms of recreation elsewhere on the Forest, many of those roads may also be considered for closure in the near future. The project area and adjacent areas have

already had many road closures: In the Upper Clackamas watershed, 55 miles of roads have already been decommissioned

Alternative A would not close roads that are currently open.

4.14.4 Under the Wild and Scenic Rivers Act, the Clackamas River has been designated with both recreational and scenic segments. The river corridor has a land allocation (A1) that extends up slope. Portions of units 1b, 14, 15, 16, 36, 38 are in scenic and recreational segments. The river is also a state scenic waterway. The outstandingly remarkable values identified in the River's management plan are Botany/Ecology, Fish, Wildlife, Recreation and Cultural Resources. Scenery was not found to be an outstandingly remarkable value. These resources are addressed in detail elsewhere in this document (see table of contents).

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

4.14.8 The Forest Service is in the early stages of developing an OHV plan for the Forest. At this time there is no proposed action for the OHV plan. The OHV plan would focus on travel management within six proposed OHV areas and motorized access to dispersed (undeveloped) camping. One of the proposed OHV areas (referred to as Peavine) is adjacent to the project area.

Within the project area, minor levels of unauthorized OHV use is occurring. The project area does not get anywhere near as much unauthorized use as other areas on the Forest and damage to resources is minimal. OHV use includes all terrain vehicles, motorcycles and 4-wheel drive trucks some of which occurs on roads and some off roads. It is not likely that the proposed thinning would conflict with the proposed nearby OHV area. The new temporary roads are more than 2 miles from the proposed OHV area. When completed, they would be closed with debris and boulders and would be usable by OHV.

4.14.9 **Cumulative Effects**

There would be no meaningful or measurable direct or indirect effect to recreation; therefore no cumulative effects analysis is warranted.

4.14.10 **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	Timber harvest is designed to protect or enhance river values. All of the units in A1 land allocation are in late-successional reserves.
A1-CLA-58-59	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 will likely be one where the summers will likely be drier and there will likely be earlier spring snow melt (Bare 2005). 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 respond to potential climate change. This section will address aspects of the project that may affect or mitigate climate change and how the project may help or hinder the forest's ability to deal with climate change.

4.15.2 **Existing Situation**

This project involves the thinning of second-growth plantations. Rapidly growing forests are recognized as an excellent 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 will focus on key elements of forest management discussed in the scientific literature.

For this proposal, the following actions have the potential to contribute to or mitigate climate change:

- 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 smaller trees and some would eventually die and fall to the ground.

- Roads that are decommissioned would begin to grow trees and other plants resulting in some carbon sequestration. With the no-action alternative, these roads would remain compacted and they would have minimal vegetation.

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

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

- 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). 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 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. 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.

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