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Environmental Assessment

South Fork Thinning

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

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

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

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1.0 SUMMARY

The Mt. Hood National Forest proposes a commercial thinning project in plantations. The project is located in the western portion of the Clackamas River Ranger District, Mt. Hood National Forest, Oregon. The trees in the plantations are 40 to 60 years old.

The purpose of this project is to thin young forest stands to achieve multiple objectives. The proposed action is to thin and harvest wood fiber from approximately 423 acres of matrix land and approximately 74 acres of riparian reserves.

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

2.0 INTRODUCTION

2.1 Document Structure

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

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

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

2.2 Purpose and Need for Action

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

The purpose of this project is to:

- Provide forest products

  Action is needed to supply forest products consistent with the Northwest Forest Plan goal of maintaining the stability of local and regional economies (s. 4.11). There is a need to keep forests healthy and productive to sustainably provide forest products in the matrix in the future. Not only are forest products needed by society, but also the employment created is important to local and regional economies. (Northwest Forest Plan ROD p. 26, Mt. Hood Forest Plan p. Four-26)

- Increase health and vigor and enhance growth that results in larger wind firm trees on 423 acres of matrix in the project area

  This action is needed because these second-growth plantations are experiencing a slowing of growth due to overcrowding and some are experiencing suppression caused mortality (Mt. Hood Forest Plan p. Four-90, Four-292). If no action is taken, this overstocked condition would result in stands with reduced vigor, increased mortality, reduced diversity, and increased wind damage susceptibility. There is a need for forest stands in the matrix that are healthy and vigorous with low levels of mortality and wind susceptibility (s. 4.3).

- Enhance diversity on 497 acres in the project area

  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. (Mt. Hood Forest Plan p. Four-67) If no action is taken, over time the stands would become increasingly dense resulting in a period of low structural diversity that could last more than 100 years. (s. 3.2.1 & 4.3, 4.4.3)

- Enhance riparian reserves on 74 acres in the project area

  This action is needed because these plantations occur in riparian reserves and because the current vegetation does not meet the needs of associated aquatic and riparian resources (Mt. Hood Forest Plan p. Four-17 to 20, Northwest Forest

Plan Standards and Guidelines p. C-32). If no action is taken in these riparian reserves, stands would have reduced capability to produce the size and quantity of coarse woody debris sufficient to sustain physical complexity and stability of the riparian reserves and associated streams. Plantations can be enhanced by thinning to accelerate the development of mature and late-successional stand conditions. (s. 3.2.2, 4.2.6 & 4.3.3)

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

- The Mt. Hood National Forest Land and Resource Management Plan as amended (USDA 1990b) (referred to as the **Forest Plan**)
- The Mt. Hood National Forest Land and Resource Management Plan Final Environmental Impact Statement (USDA 1990a)
- 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 Northwest Forest Plan Final Supplemental Environmental Impact Statement (USDA, USDI 1994a)
- 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 Clarify Provisions Relating to the Aquatic Conservation Strategy. (USDA, USDI 2004a)
- The Forest Plan was amended by the 2005 Record of Decision for Preventing and Managing Invasive Plants (USDA 2005)

2.2.3 The South Fork Thinning project is located within the following **land allocations**: C1 Timber Emphasis and Riparian Reserves. Refer to Map in section 3.2.5. See Appendix E for documentation of riparian reserve standards.

Watershed Analysis - The project area overlaps several watersheds. The Upper Clear Creek Watershed Analysis was completed in 1995 and the South Fork Clackamas River Watershed Analysis was completed in 1997. The purpose and need is consistent with the recommendations of these analyses. Portions of two units (26 acres) are in the Milk Creek watershed of the Molalla River, which has no watershed analysis. The units in the Milk Creek watershed are matrix and have no riparian reserves.

2.2.4 **DESIRED FUTURE CONDITION**

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

Health	Forest stands have low levels of disease, damaging insect populations and storm damage. Four-92, FW-382; and Four-292, C1-22.
Growth	Forest stands are healthy and vigorous, and have growth rates commensurate with the sites potential (at a rate at which the mean annual increment has not culminated). Four-5, #44; and Four-86, FW-306; and Four-91, FW-372; and Four-90, FW-361.
Riparian & Aquatic	Riparian reserves contain the level of vegetative and structural diversity associated with mature and late-successional stand conditions. They supply coarse woody debris sufficient to sustain physical complexity and stability. They provide connectivity within and between watersheds. The riparian reserves connections provide unobstructed routes to areas critical to fulfilling life history requirements of aquatic and riparian-dependent species. NFP page B-11.
Snags & Down Logs	Snags, down logs, and recruitment trees are well distributed across the landscape in sufficient quantity and quality to support species dependent upon these habitats. NFP page C-40.
Deer & Elk	The forest contains a mix of habitats including forage, thermal cover and optimal cover. Four-72, FW-202 to 207.
Landscape Health	Landscapes are healthy and productive and provide a mix of forest and non-forest habitats to support diverse populations of desired plant and animal species. Watersheds provide long-term sustained production of high quality water for fish and for on-Forest and off-Forest water users. Landscapes are actively managed. Four-2 to 5. The project is not within a wildland-urban interface and is not in a high fire hazard landscape.
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 where harvesting would be used as a tool to enhance resources and move the landscape toward the desired future conditions. Four-86 & Four-289 & NFP ROD pages 2 & 3.

2.3 Proposed Action

The action proposed by the Forest Service to meet the purpose and need is a timber sale that would thin and harvest wood fiber from approximately 497 acres (423 acres of matrix land and 74 acres of the dry upland portion of riparian reserves). On areas proposed for thinning in the matrix, approximately 178 acres would be fertilized. Thinning would be designed to enhance diversity by applying variable density prescriptions. (See Alternatives section for greater detail.) The proposal would begin as soon as possible.

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 in May 2002. The Forest publishes a schedule of proposed actions (SOPA) quarterly. The project first appeared in the fall 2001 issue, and in subsequent issues. Comments have been received periodically since then. Other formal and informal public involvement efforts have occurred including field trips with interested groups to visit the proposed units. On 10/27/05 a preliminary analysis was made available for a 30-day public comment period. Two letters were received. This Environmental Assessment (EA) includes a response to the substantive comments (Appendix A).

2.5 Issues

Many comments were received during the scoping process. Using the comments from the public, other agencies, local water providers and local environmental organizations, the interdisciplinary team developed the following list of issues. The substantive comments relate to the discussions of water quality and fish. Refer to the Response to Substantive Comments in Appendix A.

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

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

Issue statement: Temporary road construction may pose a risk to water quality and fish by contributing sediment to streams. A qualitative assessment of sediment input would be used to describe impacts to water quality and fish.

2.5.2 **Other Issues:**

Riparian Reserve Management

The proposed action involves thinning in the dry upland portions of riparian reserves. There is support among a wide range of agencies, scientists, and environmental groups that thinning in the upland portion of riparian reserves is desirable to benefit riparian dependent resources. However there are some that are concerned that the alteration of riparian reserves may cause erosion that may harm water quality and fish.

Fertilization
The proposed action involves the aerial application of fertilizer. There is a concern that fertilizer may run off into streams or leach through the soil, harming water quality and fish. There is also a concern that fertilizer may harm soil organisms and interfere with nutrient cycling processes.

3.0 ALTERNATIVES

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

3.1 Alternative A - No Action

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

3.2 Action Alternatives

To achieve the purpose and need, the action alternatives would thin and harvest wood fiber from approximately 497 acres (423 acres of matrix land and 74 acres of the dry upland portion of riparian reserves). A silvicultural diagnosis has been developed including variable density thinning designed to enhance diversity. Thinning would generally leave approximately 80 to 140 variably spaced trees per acre (variations are described below); the average cut tree size would be approximately 10 to 15 inches in diameter. Design criteria describe the retention of snags and other wildlife trees as well as down logs. Fuels treatment would be minimal: where a mechanical harvester is used, branches would be crushed under the equipment. Elsewhere there would be no fuels treatment except the piling and burning of incidental quantities of slash and debris at landings.

3.2.1 Variability – Thinning would generally remove the smaller trees, but the objective is to introduce structural and biological diversity through variable spaced thinning. Diversity and variability would be introduced in several ways. This list is a summary of practices that are described in the design criteria and elsewhere in this document.

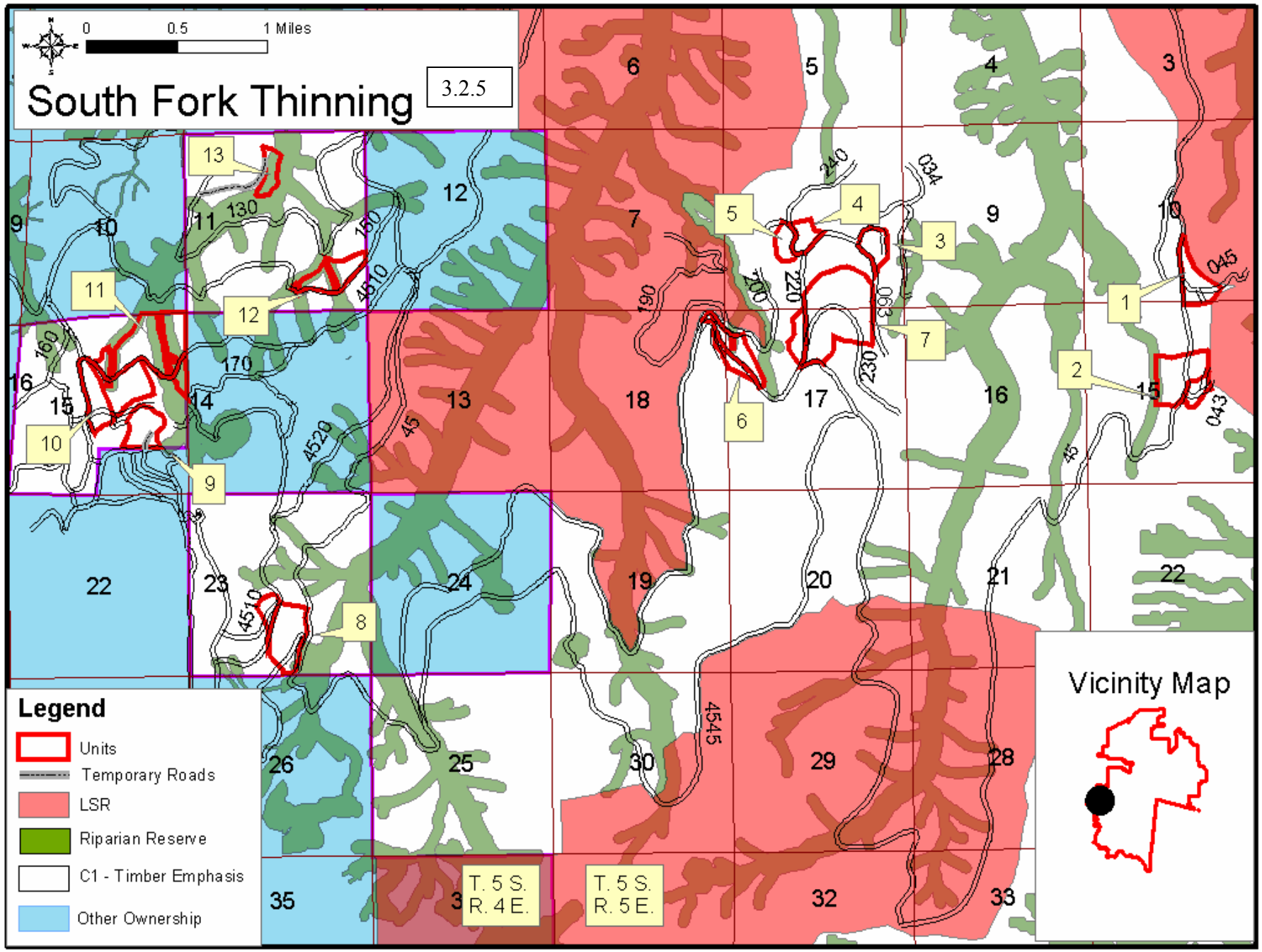
- Leave tree spacing would vary from 80-140 trees per acre
- Leave trees would include minor species
- Small gaps and skips would be created
- Leave trees would include trees with the elements of wood decay
- Leave trees would include some live trees where their crowns touch certain key snags

- All non-hazardous snags would be retained
- All existing down logs would be retained and key concentrations of woody debris in the older decay classes would be protected

3.2.2 Riparian - On areas proposed for riparian reserve thinning, a wider leave tree spacing would be used. The intention is to enhance riparian reserves by accelerating the development of mature and late-successional stand conditions. Wider spacing would also mean that one thinning entry would create the desired conditions (compared to the matrix thinning spacing where multiple thinning entries would likely occur). Riparian thinning would generally remove the smaller trees, leaving approximately 80 of the largest trees per acre, variably spaced throughout the reserve. For this project, riparian reserve widths are 180 feet for non-fish-bearing streams and 360 feet for fish-bearing streams. Design criteria discuss no-harvest buffers of approximately 30 to 50 feet along streams. There are some small seeps and wet areas that are too small to show on the maps below. These areas would be excluded from harvest.

3.2.3 Fertilization – Fertilizer would be applied with a helicopter at a rate of 200 pounds of nitrogen per acre on approximately 178 acres of second-growth conifer plantations within the matrix. Fertilization is proposed in units 1, 3, 4, 5 and 7. (Fertilization is not made necessary by thinning; it is a supplemental treatment to enhance growth. Fertilization is contingent upon funding availability. If funding is not immediately available, the thinning of plantations without fertilization is a viable option.) Fertilization would not occur in riparian reserves.

3.2.4 Roads - There are road repairs that would be accomplished with this project to facilitate safe access and log haul. Two deep patch repairs would be needed on road 45; from mile posts 1.75 to 1.95 and from mile posts 9.0 to 9.25 as measured from the Memaloose bridge. The legal description for these repairs is S.½ of section 21 of T. 5 S., R. 5 E., and the N.½ of section 32 of T. 4 S., R. 5 E. Repairs would be within the road prism and are outside of riparian reserves. In addition, approximately 10,950 feet of bermed system roads would be temporarily opened and reclosed upon completion. Also some old temporary roads would be opened and obliterated upon project completion. Refer to the map in section 3.2.5 and maps and details found in Appendix E.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South Fork Thinning
3.2.5
Legend
Units
Temporary Roads
LSR
Riparian Reserve
C1 - Timber Emphasis
Other Ownership
Vicinity Map
T. 5 S. R. 4 E.
T. 5 S. R. 5 E.

3.2.6 Alternative B

With Alternative B, logging systems were selected based on economic viability and primarily used the same or similar systems that were used in the original logging 40 to 60 years ago.

Unit Table For Alternative B

Unit #	Estimated Acres	Ground Based (Ac.)	Sky line (Ac.)	Heli-copter (Ac.)	Reuse Old Temp Roads (ft.)	New Temp Roads (ft.)
1	25	25				
2	50	11	39			
3	16	16				
4	13	13				
5	12	12				
6	28	8	20			
7	112	99	13			
8	48	9	39			
9	25	25			800	
10	25	25			600	
11	105	40	65		600	
12	25		25			
13	13		13			
TOTAL	497	283	214		2000	

3.2.7 Unit specific discussion

Refer to detailed maps in Appendix E.

Units 11D, 11E and 9 – A ground-based logging system would be used even on steep slopes. Existing landings and skid trails would be reused.

Unit 13 – A skyline system would be used to log the unit and a tractor swing would be used to move the logs from skyline landings to Road #130, which is 2300 feet away.

3.2.8 Mitigation – Alternative B would be implemented with the list of Best Management Practices and Design Criteria found in section 3.6. These are standard practices that implement Forest Plan standards and guidelines. No resource impacts were found that would require mitigation for Alternative B.

3.2.9 Some documents including Biological Assessments refer to South Fork Thinning units using stand exam numbers. This crosswalk table shows current EA numbers and the corresponding stand exam numbers.

3.2.9					
Unit #	**Stand Exam #**	**Unit #**	**Stand Exam #**	**Unit #**	**Stand Exam #**
1	526	5	5	9	524
2	527	6	6	10	522
3	3	7	7	11	521
4	4	8	14	12	525
				13	74

3.3 Alternative C

With Alternative B, logging systems were selected based on economic viability and primarily used the same systems that were used in the original logging. Alternative C would be similar to B except where differences are described below. In some units, a new logging method and road system would be proposed. Since future thinning or other forest management is likely to occur in plantations, the new logging method and/or road system would be designed and located to serve long-term management and transportation needs. Units with changed logging systems or roads are highlighted in s. 3.3.1.

3.3.1 Unit Table For Alternative C

Unit #	Estimated Acres	Ground Based (Ac.)	Sky line (Ac.)	Heli-copter (Ac.)	Reuse Old Temp Roads (ft.)	New Temp Roads (ft.)
1	25	25				
2	50	11	39			
3	16	16				
4	13	13				
5	12	12				
6	28	8	20			
7	112	99	13			
8	48	9	39			
9	25		25			500
10	25	25			600	
11	105		98	7	600	
12	25		25			
13	13		13			2300
TOTAL	497	218	272	7	1200	2800

3.3.2 Unit specific discussion

Refer to detailed maps in Appendix E.

Unit 9 - The unit was previously tractor logged and some of the slopes are 30 to 45 percent. To switch this unit to skyline would require the construction of 500 feet of temporary road with new landings.

Unit 11 - Portions of the unit (11D and E) were previously tractor logged and some of the slopes are 30 to 45 percent. Unit 11D would be helicopter logged. Unit 11E would be skyline logged uphill to road 161. Some of the skyline corridors would be outside the unit going through a younger plantation. Existing landings would be used.

Unit 13 – Alternative B would use a tractor swing to move the logs from skyline landings to road #130, which is 2300 feet away. Alternative C would construct a temporary road (2300 ft.) from road #130 to the skyline landings.

3.3.3 Mitigation – Alternative C would be implemented with the list of Best Management Practices and Design Criteria found in section 3.6. These are standard practices that implement Forest Plan standards and guidelines. No resource impacts were found that would require mitigation for Alternative C.

3.4 Alternative D

Alternative D would be similar to C except it would eliminate new road construction. In units affected by the deletion of road construction with this alternative, the units would be logged using helicopter or other logging systems. Units with changed logging systems or roads are highlighted in s. 3.4.1.

3.4.1 Unit Table For Alternative D

Unit #	Estimated Acres	Ground Based (Ac.)	Sky line (Ac.)	Heli-copter (Ac.)	Reuse Old Temp Roads (ft.)	New Temp Roads (ft.)
1	25	25				
2	50	11	39			
3	16	16				
4	13	13				
5	12	12				
6	28	8	20			
7	112	99	13			
8	48	9	39			
9	25	17		8	800	
10	25	25			600	
11	105	0	98	7	600	
12	25		25			
13	13			13		
	497	235	234	28	2000	

3.4.2 Unit specific discussion

Refer to detailed maps in Appendix E. Except where discussed below, the logging systems and roads would be the same as with Alternative B.

Unit 9
With this alternative, the unit would be logged using ground-based systems on the gentler portions of the unit with helicopter being used on the steeper parts. An existing non-system road would be used (800 ft.). The road was never closed or obliterated and would require only minor work to make it useable. Existing landings would be used.

Unit 11
This unit would be logged the same as proposed with Alternative C.

Unit 13
Helicopter would be used to log this unit and no roads would be constructed. Existing landings would be used.

3.4.3 Mitigation – Alternative D would be implemented with the list of Best Management Practices and Design Criteria found in section 3.6. These are standard practices that implement Forest Plan standards and guidelines. No resource impacts were found that would require mitigation for Alternative D.

3.5 Alternatives Considered But Not Fully Developed

3.5.1 **Restoration:** An alternative was submitted by the public that would delete the timber sale aspect of this project and that it be reformatted into a restoration only EA that would decommission roads. This alternative was not developed because it would not meet the objectives outlined in the purpose and need.

3.5.2 **Thin Without Logging:** An alternative was submitted by the public that would thin dense stands by cutting trees and leaving them on the ground and chipping the limbs. It was not developed because it would not meet the objective of providing forest products consistent with the Northwest Forest Plan goal of maintaining the stability of local and regional economies now and in the future. Since there is no source of funding for this type of operation it would be similar to the no-action alternative.

3.5.3 **Fertilization:** An alternative was considered that would fertilize all of the units. It was not fully developed because of the logistics and operational safety of aerially fertilizing steep slopes while avoiding intermixed riparian areas. The units that would be fertilized by the action alternatives would not have this concern.

3.5.4 **Delete Helicopter:** Comments were received that helicopter logging would be expensive and that the helicopter units should be dropped. This alternative was considered but not fully developed because the stands are in need of thinning. If the proposed timber sale does not receive bids, options would be considered to enhance the projects viability, such as including the helicopter units from this project with those of another to create an economically viable contract package.

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

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 it implements Forest Plan standards and guidelines FW-022 and FW-024.*

2. **Snags, wildlife trees, skips and gaps:** To enhance diversity, variable density thinning would include the retention of snags and wildlife trees and the creation of skips and gaps. *This implements Forest Plan standards and guidelines as amended.*
    - Snags would be retained in all units where safety permits.
    - To increase the likelihood that snags would be retained, green trees would be marked as leave trees where their live crowns touch certain key snags.
    - Certain live trees would also be selected as leave trees that have the "elements of wood decay" as described in the DecAid advisor. This may include trees with features such as dead tops, broken tops and heart rot. Five live trees per acre with "elements of wood decay" would be retained where available. They should be in the largest size class available.
    - Gaps would be created by skyline corridors. Some natural root rot gaps are present.
    - Skips would be created by leaving small portions of the units un-thinned. They would be centered around special microhabitat sites where available such as snags, wildlife trees, concentrations of large down wood, patches of deciduous shrubs, small seeps and springs, or uncommon tree species. Skips would be up to 1/5 acre in size.

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. *This implements Forest Plan standards and guidelines as amended.*

4. **Erosion:** To reduce erosion from timber sale activities, bare soils would be revegetated. 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 it implements Forest Plan standard and guideline FW-025.*

   Native plant species would be used to meet erosion control needs and other management objectives such as wildlife habitat enhancement. Appropriate plant and seed transfer guidelines would be observed. Non-native species may be used if native species would not meet site-specific requirements or management objectives. Non-native species would be gradually phased out as cost, availability, and technical knowledge barriers are overcome. Undesirable or invasive plants would not be used. *This implements Forest Plan standard and guideline FW-148.*

   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 State of Oregon listed noxious weeds. *This implements Forest Plan standard and guideline FW-148.*

   When **straw** is 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 State of Oregon listed noxious weeds. *This implements Forest Plan standard and guideline FW-148.*

5. **Riparian Reserves –** 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 **Perennial streams** - Establish a minimum 50 ft. no-harvest buffer along the active channel of all perennial streams. Larger buffer widths may be needed on a site-specific basis to prevent any increase in sediment delivery rates or a decrease in stream shading. 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. Falling trees for skyline corridors would be avoided, but where necessary the material would be left as woody debris. Falling any trees within the no-harvest buffer would only be allowed if it would cause no increase to sediment or decrease in stream shading.

The no-harvest buffer would be designed to meet stream temperature goals by avoiding harvest in the primary shade zone and by retaining 50% canopy closure in the secondary shade zone.

5.2 **Intermittent streams** (as defined in NWP) – Establish a minimum 30 ft. no-harvest buffer along the active channel of all intermittent streams. Smaller buffer widths would be allowed if it is determined on a site specific basis that there would be no increase in sediment delivery rates or a decrease in stream shading which would alter stream temperatures. 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. Falling trees or any equipment use within the no-harvest buffer would only be allowed if it would cause no increase to sediment or decrease in stream shading.

5.3 Within 50 feet of perennial or intermittent stream no-harvest 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 no-harvest buffer 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.

5.4 Thinning in riparian reserves would emphasize the development of vegetative and structural diversity associated with mature and old-growth stand conditions. Thinning would leave approximately 80 or more trees per acre. While thinning in the riparian reserve may have short-term effects, the thinning would contribute to maintaining or restoring the fifth-field watershed over the long term. Thinning in riparian reserves would increase tree size, adequately protect the zone of shade influence along streams, and minimize the potential for sediment delivery to streams. This prescription would maintain water temperature, large woody debris, disturbance regime, and riparian reserve indicators.

5.5 **Other Riparian Areas** – Other riparian features that are not perennial or intermittent streams such as seeps, springs, ponds or wetlands would be protected by the establishment of no harvest buffers that incorporate the riparian vegetation. Certain perennially wet features that are habitat for the aquatic mollusk *Lyogyrus* n. sp. 1 would be protected by the establishment of a 50 ft. no-harvest buffer.

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

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

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

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

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

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

7. **Roads –** *These are BMPs.*

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

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

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

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

7.5 No road construction is proposed within riparian reserves.

7.6 Temporary roads would normally be constructed, used and obliterated in the same operating season. If this is not possible, due to fire season restrictions or

other unforeseen delays, the road would be winterized prior to the end of the normal operating season by out-sloping, water-barring, effectively blocking the entrance, seeding, mulching and fertilizing.

8. **Invasive species:** 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. *This implements Executive Order 13112 dated February 3, 1999 and the 2005 Record of Decision for Preventing and Managing Invasive Plants (USDA 2005.*

9. **Fertilizer Application –** *These are BMPs.*
   a. Fertilizer would not be applied in the riparian reserves.
   b. Application would not take place under adverse weather conditions: i.e. wind speeds in excess of 10 miles per hour, dense fog, snow, or heavy rain.
   c. Fertilizer spills would be immediately contained and cleaned up. Prior to application, safety, accident and spill plans would be prepared.
   d. Soil conditions would be moist and approximately ½ inch of rainfall should occur within 4 days following application. Application should not be made on more than one inch of snow or during heavy rainfall where there would be a chance of overland flow of fertilizer in solution.

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

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

    Prior to advertisement of a timber sale, a crosswalk table would be prepared to check the provisions of the Timber Sale Contract and other implementation plans with this EA 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.

Water quality would be monitored for the aerial fertilization project. Adjustments in application rate, location and timing would be made where needed.

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

3.7 Comparison of Alternatives

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

	Alternative A No Action	**Alternative B**	**Alternative C**	**Alternative D**
Issue #1 Affect of Roads on Water Quality and Fish	No road construction. No impacts to water quality from road construction.	No road construction. No impacts to water quality from road construction.	Construction of 2800 feet of temporary roads. Vegetative buffers would act as an effective barrier to any sediment being transported into streams by surface erosion. Adverse impacts eliminated or substantially reduced by use of BMPs.	No road construction. No impacts to water quality from road construction.
Approximate Timber Output (million board feet)	0	4.3 mmbf	4.3 mmbf	4.3 mmbf
Acres of Stand Growth and Productivity Improved In Matrix	0	423	423	423
Acres with Diversity Enhanced	0	497	497	497
Acres of Riparian Reserve Enhanced	0	74	74	74
Economic Viability Benefit/Cost ratio	0	2.7	2.46	2.4

4.0 ENVIRONMENTAL CONSEQUENCES

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

4.1 Cumulative Effects

4.1.1 A discussion of cumulative effects is included 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 affect on a given resource, a more detailed cumulative effects analysis is not necessary to make an informed decision.

4.1.2 The land area and the time scale used for a cumulative effects analysis would vary by resource. The analysis for each affected resource would look at the condition of the resource considering effects from past timber sales, road construction, fires, wind, and other disturbances.

4.1.3 The time scale includes the effects of all past activities beginning in approximately 1940 when the first timber harvest and road construction projects occurred. 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. The analysis includes the administrative activities at the District's seed orchard. The analysis also includes other recently completed timber sales that overlap the analysis area including Clack, Clear, Fork, Guard and Orchard. The analysis would include other projects approved by other EAs such as the Forest-wide Restoration EA, but in the South Fork area there are no restoration projects approved by other EAs except the creation of snags and down logs discussed in the Wildlife section.

4.1.4 The analysis considers the impact of activities on other ownerships. In this area the Bureau of Land Management (BLM) manages several interspersed checkerboard sections. There are adjacent private timber company lands and farther downstream there are residences and farmlands. In this area the Hillock Timber Sale and Clear-Dodger Timber Sale on BLM is a foreseeable future action (USDI 2004).

4.1.5 Section 4.4.1 describes the likely future scenario for thinning on National Forest lands. Similarly, the management of BLM lands and private lands is likely to continue in the future using current strategies. Young stands on BLM lands are likely to be thinned when their age and condition warrant thinning and stands on private forest lands are likely to be regeneration harvested. This anticipated harvest pattern would continue to provide a wide variety of habitat and resource conditions. These activities are discussed in general terms since they lack sufficient site specificity to be included in a numerical analysis.

4.2 WATER QUALITY AND FISHERIES

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

Consultation with NOAA Fisheries is not required for this project because there would be no effect to threatened or endangered fish. Recently, NOAA Fisheries listed critical habitat for several fish species, none of which occurs in the project area.

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

4.2.0.1 **Issue #1:**

There is a concern about the effects of **temporary road construction** on water quality and fisheries. *The effects to sediment can be found in section 4.2.3. Also refer to design criteria #1, 5, 6 and 7. Section 4.2 summarizes the Biological Evaluation found in Appendix C. Alternatives B and D do not include any road construction but would reopen approximately 2000 feet of existing old temporary roads. For Alternative C the rationale for proposed road construction can be found in section 3.3.2. Alternative C would construct approximately 2800 feet of new temporary roads and would reopen approximately 1200 feet of existing old temporary roads. The analysis shows that the impact, if any, would be short-term and undetectable at the watershed scale. The chance that measurable amounts of fine sediment would enter any stream as a direct result of logging activity is negligible. This is because the proposed roads are located on stable landforms, do not cross steams and would be obliterated. The Biological Evaluation found that there would be No Effect on threatened fish species.*

Other related comments:

4.2.0.2 There is a concern that the roads themselves and the effects of these roads are not temporary and that obliterating such roads is not entirely successful and the soil effects can last for decades. *The proposed roads are called temporary roads because it is a contractual term and refers to roads that experience temporary use, only for timber harvesting, and are obliterated by the operator when harvesting is completed. The obliteration of a temporary road is done to prevent use and to improve infiltration rates.*

The Forest has considerable successful experience with obliterating temporary roads on similar terrain. Since the temporary roads are located where they serve the long-term transportation needs of the area, it is likely that they would be reopened and used again in the future. See section 4.12.

4.2.0.3 There is a concern about the effects of **thinning in riparian reserves** on water quality and fisheries. *Support for active management of riparian reserves to restore them to a condition where they can grow into maturity is growing among a wide range of agencies, scientists, and environmental groups. The effects to sediment can be found in section 4.2.3 and the effects to riparian resources can be found in section 4.2.6. Also refer to design criteria #5 & 7. Section 4.2 summarizes the Biological Evaluation found in Appendix C. The no-harvest 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 water quality impacts. Seasonal restrictions would further reduce the risk of soil disturbance and run-off. The chance that measurable amounts of fine sediment would enter any stream as a direct result of logging activity is negligible. Thinning in riparian reserves would result in long-term benefits because thinning would develop the type of mature forest that is desired in riparian reserves. It would result in larger healthy trees with the increased capability to produce large coarse woody debris that would eventually fall into streams creating desirable diversity. Alternative A does not include any riparian thinning.*

4.2.0.4 **Purpose and need discussion**

One of the aspects of the purpose and need (s. 2.2.1) is to enhance riparian reserves. All of the action alternatives would equally meet this objective while the no-action alternative would not. A discussion of riparian resources is in section 4.2.6. A general discussion of stand health and growth in section 4.3.1 and 4.3.3 are also relevant to trees growing in riparian area.

4.2.1 Water Quality and Fisheries Existing Situation

The South Fork Thinning Project proposes to thin and commercially harvest wood fiber in young plantations within the Middle Clackamas, Lower Clackamas, and the Milk Creek fifth-field watersheds. Milk Creek is a tributary of the Molalla River. The 5th field watersheds are subdivided into subwatersheds. The subwatersheds that are within the South Fork Thinning Project area include: South Fork and Upper Clear Creek watersheds of the Clackamas River and the Canyon Creek subwatershed of Milk Creek. These watersheds are non-Key Watersheds under the Northwest Forest Plan. The South Fork and Clear Creek watersheds support populations of spring and fall chinook salmon, winter steelhead, and coho salmon. Winter steelhead and coho salmon occur in Canyon Creek. These anadromous species all occur downstream of the project area. Resident cutthroat and rainbow trout along with non-native brook trout inhabit most of the perennial stream reaches that flow through the project area.

The stands within the South Fork Project range in age from 40 to 60 years. The average tree height ranges from 60 feet to 90 feet with diameters averaging between 10 and 16

inches. The timber to be harvested is primarily Douglas-fir and western hemlock, as well as small amounts of western red cedar, silver fir and noble fir. The current stocking levels range from 190 trees per acre to 361 trees per acre. The management strategy is for a one-time entry into the Riparian Reserves. The objective of this action is to hasten tree growth to achieve a mature forest that is structurally diverse and to accelerate future large woody debris recruitment potential and snag habitat production. Currently the stands identified for thinning have low levels of structural diversity and are overcrowded, causing reduced growth and the potential for increased mortality.

The stands proposed for thinning are located within the Memaloose Creek, Lower South Fork, Upper South Fork, Little Clear Creek and Upper Clear Creek subwatersheds. Approximately 26 acres of two proposed units are located within the upland headwater region of the Canyon Creek subwatershed. There are no riparian reserves associated with this area of the watershed. There are no 303(d) listed water bodies in the project area.

The South Fork watershed consists of 0.4 miles of anadromous streams, 24 miles of resident fish bearing streams and 69 miles of non-fish bearing streams. A 70-foot falls on the South Fork Clackamas River at river mile 0.4 is a migration barrier for anadromous fish. Native populations of cutthroat and rainbow trout occupy both South Fork and Memaloose Creek as well as major tributaries such as the East Fork of the South Fork, Oscar Creek, Elbow Creek and Cultus Creek. Brook trout introduced into the South Fork watershed by lake stockings have proliferated throughout the drainage and may be a competitive concern for resident trout. The anadromous portion of the South Fork Clackamas has been considered a crucial spawning area to late-run coho because of its location as a low elevation tributary.

The Upper Clear Creek watershed contains 29.1 miles of fish bearing streams, including 4.0 miles of streams that support anadromous fish. Resident cutthroat trout are present throughout the watershed. Anadromous species that utilize the watershed include winter steelhead, coho salmon, fall chinook, cutthroat trout, and pacific lamprey. Barrier falls located at the confluence of Clear Creek and North Fork Clear Creek, approximately one mile upstream of the mouth of Little Clear Creek, is the upstream limit of anadromous species. Little Clear Creek is the downstream boundary of the Upper Clear Creek watershed. The Clear Creek watershed downstream of Little Clear Creek contains approximately 24 miles of anadromous streams.

The Canyon Creek watershed is 3,288 acres and contains approximately 7.5 miles of fish bearing streams including 3.5 miles of stream that supports anadromous fish species. The anadromous species that utilize the watershed include winter steelhead and coho salmon. Resident cutthroat trout occur throughout the fish bearing section of Canyon Creek. This section is located outside of Forest Service land.

There are no fish species listed under the Endangered Species Act (ESA) in the vicinity of proposed thinning units. Resident cutthroat trout, rainbow trout, and non-native brook trout occur within the perennial fish bearing streams that flow through the project area. ESA listed fish species that occur downstream of the project area include Lower

Columbia River (LCR) steelhead, Upper Willamette River (UWR) chinook salmon, and Lower Columbia River (LCR) coho salmon. These species occur in the lower 0.4 miles of the South Fork of the Clackamas River. Lower Columbia River fall chinook occur within the lower 2 miles of Clear Creek while and LCR coho occur in Clear Creek up to RM 24. Upper Willamette River (UWR) steelhead and coho salmon occur within the Canyon Creek subwatershed. This stock of coho originates from a hatchery stock that and is not a listed species under the ESA. The nearest occurrence of listed fish species to the project area is over four miles.

Project elements of the action alternatives that could potentially impact aquatic species or their habitats include timber harvest, road construction, yarding, log haul, and road decommissioning or obliteration. Potential effects to listed, proposed, candidate, or sensitive fish species and their habitat from the proposed project include direct, indirect and cumulative effects. An example of direct effects may include increased levels of fine sediment in local streams generated during road building, logging, and hauling. Increased levels of sediment in streams could reduce feeding efficiency during times of increased turbidity. Fish rely on sight to feed so feeding success could be hampered during those times turbidity is increased. Increased sediment loads could also cause increased stress or mortality to fish by abrasion of the gills during episodes of high turbidity. An example of indirect effects may include increased amounts of fine sediment downstream in rivers or at the intake of municipal water providers, due to erosion from harvest units and roads. Potential impacts from increased amount of fine sediments are degradation of spawning habitat and a reduction in rearing habitat caused by sediments filling in pools.

Cumulative effects associated with the South Fork Thinning Project include an analysis of peak flows resulting from vegetation management. Cumulative effects have been evaluated at more than one scale. For example, watershed analysis was conducted to take a watershed scale look at resources. During the consultation process, the regulatory agencies considered the entire range of a species of concern. At the local scale, subwatersheds are used to evaluate risks of rain-on-snow events.

4.2.2 Effects

Alternative A

In terms of sediment, water quality and temperature, there would be no short-term effects to water quality or fisheries resources from road construction or harvest. If no action were taken in riparian reserves, there could be negative long-term effects because 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.

Alternatives B, C and D

4.2.3 Sediment

Sediment from road construction – Included is potential sediment from temporary road construction with Alternative C and from the reopening of old temporary roads and road work along the haul route with all of the action alternatives. Refer to detailed maps in Appendix E. Road related ground disturbing activities have been designed to minimize the risk of erosion and the potential for sediment to be transported to streams. Road work would be restricted to the dry season between June 1 and October 31. This restriction would reduce the risk of any surface erosion due to ground disturbance. The proposed new temporary roads are located on dry ground, would not cross any stream channels, and would have no hydrologic link to any water source. These roads would be constructed on relatively flat terrain along ridgetops, which would avoid an increase in the drainage network. Because of the distance of the proposed new temporary roads and the old temporary roads that would be reopened 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 reopened temporary roads would be obliterated and revegetated directly following completion of harvest operations to help reduce compaction and increase infiltration rates. Some road work is needed along the haul route to make the roads serviceable for log haul. This includes blading the road surface, cleaning the ditches, removing berms, and removing encroaching brush. Of the action alternatives, the risk of sediment from road sources would be least with Alternative D and greatest with Alternative C. Impact to water quality or fisheries resources caused by sedimentation due to road construction, reconstruction, maintenance or obliteration, if any, would be short-term and undetectable at a watershed scale.

Sediment from logging - Thinning, particularly within riparian reserves, is a ground disturbing activity that has the potential to cause a temporary reduction in water quality by allowing sediment to enter the stream channel from surface erosion or run-off. No-cut buffers, a minimum of 50 ft. wide, along perennial streams and a minimum buffer width of 30 ft. along intermittent channels, have been established for the South Fork Project. Buffer width design would take into account the stream influence zone, steepness of slope, size and location of trees, orientation of the site to the sun (aspect), slope stability, and stream bank stability. No-cut areas would include any buffer of hardwood vegetation occurring along the stream bank. No-cut buffers would generally be at the top of slope breaks on steeper ground and would circumvent all wet areas to maintain canopy cover along riparian areas. 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. These buffer widths would allow soil infiltration between the unit and any water source. The use of skyline or helicopter yarding systems on steeper ground within riparian reserves would minimize ground disturbance. Seasonal restrictions on ground-based operations would further reduce the risk of soil disturbance and run-off. Even if some soil movement occurred, the

vegetated buffer strips along every perennial or intermittent channel would act as an effective barrier.

Of the action alternatives, the risk of sediment from logging system sources would be least with Alternative D and greatest with Alternative B. Alternative B would utilize ground-based systems on steep ground, while the other alternatives would use skyline and helicopter systems instead. Helicopter systems would use existing landings. 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.

Sediment from road use – (similar effect for all action alternatives). Log hauling and other traffic 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. The potential for sediment input into streams along the haul routes would be minimized by permitting haul only when conditions would prevent sediment delivery to streams. Any sediment that would enter a stream during haul activities would be at crossings along aggregate surfaced roads. The majority of these crossings are at small streams that would not be flowing, or would have very little flow, during the normal season of operation (June 1 to October 31). Any sediment that leaves the road surface due to run-off is expected to disperse over land or be stored within these small channels. It is very unlikely that any measurable amount of sediment produced during log haul would be transported to stream channels where fish species occur. There are no listed fish species that occur immediately downstream of any aggregate surfaced stream crossing along the haul route. If any sediment did enter stream courses from hauling activities, it would be in very small amounts and for a short-term duration. No adverse affect to fish or their habitat would occur from hauling logs.

Sediment cumulative effects – Other potential sediment sources include OHV use, normal road use, and other timber sales listed in s. 4.1.3 & 4.1.4. The anticipated impact of the project to sediment is so small that it would not likely result in a significant incremental effect to streams.

4.2.4 Temperature

Effects would be similar for all action alternatives. The design criteria for the primary and secondary shade zones along perennial streams would insure that the majority of shade producing vegetation would remain. Since the streams within the project area are relatively small (3-10 ft. width), the no-cut buffers would provide adequate canopy cover and sufficient stream shading to maintain stream temperatures. Intermittent streams within the project area only carry water during wet times of the year (winter and spring) when temperatures are cooler, and 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. The Oregon Department of Environmental Quality has recognized that the Northwest Forest Plan Temperature TMDL Implementation Strategies (9/9/05) as a mechanism to meet the Clean Water Act in terms of temperature.

4.2.5 Fertilization

Effects would be similar for all action alternatives. Fertilization of the commercially thinned stands would hasten the recovery of forest canopy to pre-harvest conditions. Fertilization would only occur in the matrix and not in Riparian Reserves. This would minimize the risk of fertilizer contaminating any water supply. Fertilization would be with forestry grade urea at an application rate of 200 lbs. Nitrogen/acre. Aerial application of urea fertilizer has the potential to enter the aquatic environment by direct application, drift, overland flow and subsurface drainage, which may result in increased nitrogen levels in streams. Small amounts of fertilizer in streams would likely have little affect on fish and may encourage increased productivity of algae and periphyton.

Urea can be used by plants directly to some extent, but is more commonly used after converting to ammonia or nitrogen. After converting, it becomes readily soluble and subject to leaching, but ammonification considerably reduces the leaching losses. Ammonia is more likely to volatilize, rather than leach, due to the ionic attractions of organic matter and clay fractions within the soil. Soil texture can be an important determinant of the level of nitrate that reaches the groundwater. Coarser soils would have faster movement of dissolved nitrate and lower rates of uptake by vegetation. The soil types in the project area have relatively fine textures and consequently, nitrate leaching to the groundwater is not likely.

Direct application poses the greatest risk to water quality and the aquatic environment, but can be prevented by adequate buffer strips around streams and wet areas. Design criteria have been incorporated to minimize the risk of fertilizer entering streams. No fertilizer would be applied within Riparian Reserves or wet areas. And units that have multiple streams or steep slopes making helicopter application in the matrix portion difficult, have not been considered for fertilization. Buffers where no fertilizer would be applied would be two-site potential tree heights along fish bearing streams and one-site potential tree height along other streams and wet areas. These buffer widths would prevent the introduction of fertilizer into streams by direct application, overland flow and subsurface drainage. Drift would be avoided by limiting aerial application to days with little or no wind. Application of fertilizer would not take place under adverse weather conditions such as: when wind speeds are in excess of 10 miles per hour, dense fog, snow, or heavy rain. Fertilization would only occur when soil conditions are moist and approximately 0.5 inch or less of rainfall is forecast within 4 days following application. Application of fertilizer would not be made on more than one inch of snow or during heavy rainfall where there would be a chance of overland flow of fertilizer in solution. Adherence to design criteria #9 would insure that very little, if any fertilizer would enter any stream course and would substantially negate any adverse effects to fish species or water quality.

Other projects also involve the use of fertilizer including the projects from the Cloak EA in the Upper Clackamas and Oak Grove drainages and restoration projects across the Forest that apply fertilizer near streams for erosion control. The Forest also adds fish carcasses to rivers to boost nutrient levels. As carcasses decay they benefit fish and other aquatic organisms and they release nitrogen and other nutrients into the water. Because of the precautions described

above, and considering other potential sources of aquatic nutrients, the South Fork fertilization project would not significantly add to the downstream nutrient levels.

4.2.6 Riparian Reserve Stand Structure

Refer to section 4.3.1 for a discussion of health and growth of plantations and a discussion of relative density. The current stand structure within the upland portions of the riparian reserves has an average stand diameter of 11 to 16 inches, and stocking is at levels where growth suppression and mortality is occurring (with relative densities (RD) exceeding 55).

Alternative A - Without thinning, the live crowns of trees would be reduced because of shading. Stands would experience increased loss of productivity. Growth would decline, mortality would increase and crown size and density would decline. This condition would increase the physiological stress level of the forest, thereby, increasing the susceptibility of these stands to disturbances such as pests, fire or wind damage. Stands would also maintain their mid-seral structure for many decades. Stands under this condition would be denser, less diverse (structurally), have smaller diameter trees with few larger diameter trees, shorter crowns positioned higher on the stem, and less understory development compared to the action alternatives. Without thinning, the average stand diameters in 40 years would range from 16 to 21 inches, with stocking at levels where growth suppression and mortality continues to occur (with RD exceeding 55). The understory vegetation would continue to be suppressed.

Alternatives B, C and D would result in long-term benefits because thinning would develop increased capability of stands to produce the size and quantity of coarse woody debris sufficient to sustain physical complexity and stability of the riparian reserves and associated streams. Average stand diameters in 40 years would range from 22 to 30 inches. At that time, tree size and stocking levels again begin to approach the stocking levels where growth suppression and mortality would occur (with RD of 50 to 55). Understory vegetation would have developed for 40 years without suppression from the overstory conifers.

4.2.7 Comparison of Alternatives

The potential effects to water quality and fisheries for Alternative B and D would be less than that of Alternative C because they do not include any new temporary road construction; therefore there would be no risk of erosion or sediment entering streams due to the construction of temporary roads. There would be slightly less risk of erosion from harvest operations under alternatives C and D since helicopter logging would be used instead of ground based or skyline yarding systems on parts of some units. Because of less ground disturbance, the chance of sediment reaching the stream channel is even less likely than Alternative B. With Alternative B, long skidding distances would be used for unit 13. This would result in many passes of equipment over a mainline skid trail, which when completed would have a very similar affect to that of a temporary road.

4.2.8 Fish Stocks of Concern

This summarizes the Biological Evaluation in Appendix C. The effects of the implementation of the South Fork Thinning Project on fish stocks of concern would be based on local populations of resident cutthroat and rainbow trout which are classified as management indicator species in the Mt. Hood Forest Plan and populations of listed fish species downstream of the project area in the South Fork of the Clackamas River, Clear Creek, Canyon Creek, and the mainstem Clackamas River. There are no threatened, proposed, candidate, or sensitive fish species that occur within any of the proposed units of the project area.

ESA listed species that occur downstream of the project area are Lower Columbia River steelhead, Upper Willamette River chinook salmon, Lower Columbia River chinook, and Lower Columbia River coho salmon. The closest occurrence of these species to the project area is within the lower South Fork of the Clackamas River and lower Clear Creek over four miles downstream of any proposed harvest unit.

The **no-action** alternative would have ratings of "No Effect" for fish stocks of concern. The following effects determinations would apply to the **action alternatives**.

Columbia River Bull Trout *(Salvelinus confluentus)* - (Threatened) Bull trout were once prolific in the Clackamas River system. At present, they are believed to be extinct. Adult bull trout that occurred in the Clackamas River exhibited a fluvial life history character, maintaining residence in the main river and larger tributaries. It is quite likely that adult bull trout in the Clackamas River migrated to the Willamette and Columbia Rivers prior to construction of River Mill Dam. Adult bull trout would reside in the mainstem and larger tributaries until their spawning period during mid-August through September, at which time they would migrate upstream to smaller tributaries to spawn.

U.S. Forest Service fisheries biologists conduct fisheries sampling on an annual basis on many streams throughout the Clackamas River watershed upstream of North Fork Reservoir. To date, these sampling efforts have never yielded capture of bull trout. After several years of intensive sampling, U.S. Forest Service fisheries biologists believe that bull trout in the Clackamas River are considered to be "functionally extinct." Since bull trout are not present in the Clackamas River system the effects determination for this species is "No Effect" (NE) for the South Fork Thinning Project.

Lower Columbia River Steelhead (*Oncorhynchus mykiss*) - (Threatened) Adult steelhead migrate into the waters of the Clackamas River drainage above North Fork Dam primarily during April through June with peak migration occurring in May. Spawning occurs during the months of April through June in the Upper Clackamas River and during the months of March through June in the Oak Grove Fork. Steelhead use the majority of the mainstem Clackamas and major tributaries such as the South Fork of the Clackamas River, Fish Creek, Roaring River, Oak Grove Fork, Collawash River, and the Hot Springs Fork of the Collawash as spawning and rearing habitat. Winter steelhead

fry emerge between late June and late July and rear in freshwater habitat for one to three years. Smolt emigration takes place March through June during spring freshets.

LCR steelhead do not occur in any of the streams that flow within proposed units of the South Fork Project. The nearest occurrence of LCR steelhead is over 4 miles downstream. Because of the distance of the project area to any presence of Lower Columbia River steelhead or its habitat the effects determination for this species is "No Effect" (NE).

Upper Willamette River Steelhead (*Oncorhynchus mykiss*) - (Threatened) Upper Willamette River steelhead occur in the Willamette River and its tributaries upstream from Willamette Falls. Adults migrate into the Upper Molalla drainage during late January through the end of April. Spawning occurs from February through May in tributary streams such as Milk Creek, lower Canyon Creek, the North Fork Molalla River, Table Rock Fork Molalla River and the mainstem Molalla River. Smolt emigration takes place March through July.

UWR steelhead do not occur in any of the streams that flow within proposed units of the South Fork Project. The nearest occurrence of UWR steelhead is over 4 miles downstream within Canyon Creek. Because of the distance of the project area to any presence of Upper Willamette River steelhead or its habitat the effects determination for this species is "No Effect" (NE).

Upper Willamette River Spring Chinook (*Oncorhynchus tshawytscha*) - (Threatened) Upper Willamette River spring chinook salmon occur in the Clackamas River. The ESU consists of both naturally spawning and hatchery produced fish. These spring chinook enter the Clackamas basin from April through August and spawn from September through early October with peak spawning occurring the 3rd week in September. These fish primarily spawn and rear in the mainstem Clackamas River and larger tributaries.

Adults in the lower Clackamas drainage spawn in lower Clear Creek, Deep Creek, and Eagle Creek, below River Mill Dam and between River Mill and Faraday diversion dams. Spawning in the upper Clackamas drainage has been observed in the mainstem Clackamas from the head of North Fork Reservoir upstream to Big Bottom, the Collawash River, Hot Springs Fork of the Collawash River, lower Fish Creek, Roaring River, and the first 0.4-mile of the South Fork Clackamas River.

Upper Willamette River chinook do not occur within any of the streams that flow within the South Fork units. The nearest occurrence of UWR chinook to any proposed unit within the Clackamas River, South Fork Clackamas, or Clear Creek watershed is over 4.0 miles. Because of the distance of the project area to any presence of Upper Willamette River chinook or its habitat, the effects determination for this species is "No Effect" (NE).

Lower Columbia River Fall Chinook (*Oncorhynchus tshawytscha*) (Threatened)
The fall chinook within the Clackamas Subbasin are thought to originate from "tule" stock which was first released into the subbasin in 1952 and continued until 1981. Since 1981 no fall chinook have been released into the Clackamas River. However some adult fall chinook released as juveniles above Willamette Falls may have strayed into the Clackamas River.

Historically fall chinook spawned in the mainstem Clackamas River above the present site of the North Fork Dam before its construction. Currently the "tule" stock of fall chinook spawn in the mainstem Clackamas River below River Mill Dam and in the lower reaches of Clear Creek. Fall Chinook spawn late August through September. These fish primarily spawn and rear in the mainstem Clackamas River and larger tributaries and are not found above River Mill Dam. Because of the distance of the occurrence of fall chinook from the project area (greater than four miles) the effects determination for this species is "No Effect" (NE).

Lower Columbia River Fall Chum (*Oncorhynchus keta*) (Threatened)
Fall chum historically have inhabited the lower portion of the Clackamas River but no current records are available to confirm any chum presence within the Clackamas River. The effects determination for this species is "No Effect" (NE).

Lower Columbia River Coho Salmon (*Oncorhynchus kisutch*) (Threatened)
The Clackamas River contains the last important run of wild late-run winter coho in the Columbia Basin. Coho salmon occupy the Clackamas River and the lower reaches of streams in the Upper Clackamas watershed including the lower two miles of the Oak Grove Fork. Adult late-run winter coho enter the Clackamas River from November through February. Spawning occurs mid-January to the end of April with the peak in mid-February. Peak smolt emigration takes place in April and May.

Coho salmon occur in the mainstem Clackamas River and in the lower reaches of the South Fork of the Clackamas River and Clear Creek. The anadromous portion of the South Fork Clackamas has been considered a crucial spawning area to late-run coho because of its location as a low elevation tributary. The nearest occurrence of LCR coho salmon to the South Fork Project area is over four miles downstream of any proposed thinning unit. Because of the distance of the project area to any presence of Lower Columbia River coho salmon or its habitat, the effects determination for this species is "No Effect" (NE).

Southwestern Washington/Columbia River Cutthroat Trout (*Oncorhynchus clarki*). (Management Indicator Species)
Searun cutthroat have historically existed in the Clackamas River below River Mill Dam. Cutthroat have been observed going downstream over the dam complex by PGE biologists, but never observed migrating upstream. It is not known whether the Clackamas River above the hydro-complex was part of their historic range.

Coastal cutthroat trout exhibit diverse patterns in life history and migration behaviors. Populations of coastal cutthroat trout show marked differences in their preferred rearing environments (river, lake, estuary, or ocean); size and age at migration; timing of migrations; age at maturity; and frequency of repeat spawning. Resident coastal cutthroat trout inhabit the Clackamas and Molalla Rivers and their tributaries including the South Fork of the Clackamas, Clear Creek, and Canyon Creek.

Because of the presence of resident coastal cutthrout trout in the streams within and downstream of the project area the effects determination for Southwestern Washington/Columbia River cutthroat trout is "May impact individuals or habitat but will not likely contribute to a trend towards federal listing" (MIIH) for all of the action alternatives. The no-action alternative would have a rating of "No Impact." (NI).

4.2.9 Designated Critical Habitat

Critical habitat for twelve Evolutionary Significant Units (ESUs) of West Coast salmon and steelhead listed under the Endangered Species Act of 1973 (ESA) was designated on September 2. 2005. The ESUs that have designated critical habitat occurring within the watersheds associated with the South Fork Thinning Project include: UWR Chinook, UWR steelhead, LCR Chinook and LCR steelhead. 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.

There is no critical habitat that occurs within the South Fork Project area. Designated critical habitat occurs downstream of the project area in the mainstem Clackamas River (UWR Chinook, LCR Chinook, and LCR steelhead), South Fork Clackamas River ((UWR Chinook and LCR steelhead), Lower Clear Creek (UWR Chinook, LCR Chinook, and LCR steelhead), Milk Creek (UWR Chinook and UWR steelhead), and Canyon Creek (UWR steelhead). Because the distance of the project area to any designated critical habitat is over three miles the effects determination for the South Fork Thinning Project on Designated Critical Habitat is "No Effect" (NE) for all of the project alternatives.

4.2.10 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 in the Mt. Hood National Forest in the Clackamas River, Hood River, and Sandy River basins. Chinook and coho salmon utilize the Clackamas River, the South Fork Clackamas River, and Clear Creek for rearing and spawning habitat. The proposed project is located approximately 4 miles above any habitat that could be utilized by chinook or coho. Implementation of the South Fork Thinning project would have **No Effect** on essential fish habitat for chinook or coho salmon. The proposed project would not have any affect on water or substrate essential to the life history of coho, chinook, or chum salmon that occur within the watersheds where the project would take place.

This activity would not jeopardize the existence of any of the species of concern or adversely modify critical habitat and would not adversely affect Essential Fish Habitat as designated under the 1996 Amendment to the Magnuson-Stevens Act.

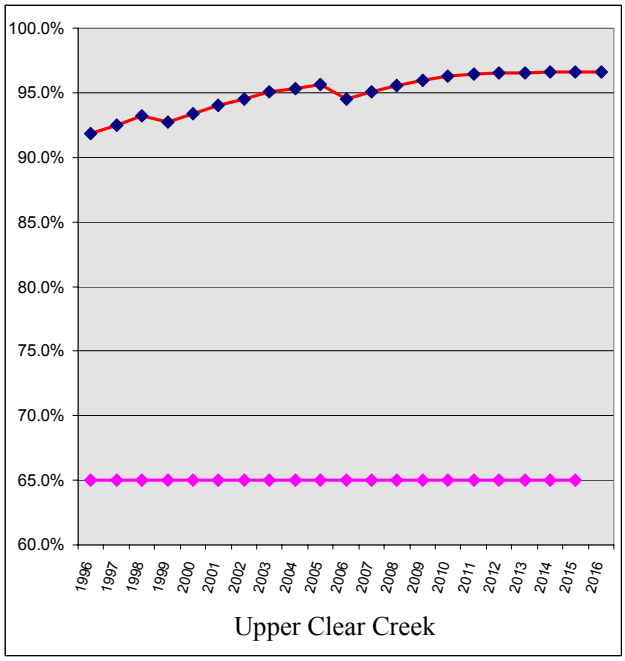
4.2.11 Other Aquatic Species - The aquatic mollusk (*Lyogyrus* n. sp. 1) is both a survey and manage species and a sensitive species. This mollusk has been found in many areas across the Forest and is highly likely to be present in the streams near this project. For this reason, instead of conducting surveys in all adjacent streams, species presence is presumed. According to the latest Management Recommendations (Aquatic Mollusks v. 2.0) it is important to maintain cool, clean water that is well oxygenated and to maintain and/or restore native plant communities. It also indicates that in most cases, the riparian reserve standards and guidelines will be sufficient for management of this species.

The riparian reserve standards and guidelines and project design criteria are sufficient to provide for the habitat needs of this species. This project will have 50 foot no-cut buffers around perennial streams and other features that are considered habitat in the Management Recommendations. This will maintain the native plant communities and will result in sufficient shade to maintain cool water temperature. This buffer plus the other design criteria would minimize the risk of erosion and sedimentation. Because the habitat for this species is being protected, this project would not cause a significant negative effect on the species habitat or persistence of the species at the site.

4.2.12 Other Cumulative Effects – Watershed Impacts to Streams, Water Quality and Fish

The Aggregate Recovery Percentage (ARP) index is often used to calculate cumulative effects of past and future harvest activities. It is also a tool to determine compliance with Forest Plan standards and guidelines. It evaluates the risk of increased peak flows from rain-on-snow events. In stands with little or no canopy, within the transient snow zone, snow accumulation on the ground is subject to rapid melting during periods of rain.

Several subwatersheds are affected. This graph shows the 20-year trend for ARP for Upper Clear Creek (upper line) with the effect of the proposed thinning and all past and foreseeable future projects. The threshold of concern from the Forest Plan is 35% for these watersheds (B6-020, page Four-249), which corresponds to an ARP level of 65% (lower line). The threshold of concern was established based on the sensitivity of landforms to potential cumulative watershed effects such as changes in peak flows caused by harvest activities. In relative terms, these watersheds are more stable and are not affected by rain-on-snow events to the extent of some other watersheds within the Clackamas drainage that have thresholds of concern as low as 18% (ARP level of 82%).



This subwatershed is displayed because it has the greatest change in ARP with the action alternatives. The data for the other subwatersheds similarly show that with all past, current and reasonably foreseeable future actions, the subwatersheds are either quite stable or are experiencing a period of steady hydrologic recovery.

The following table shows the range of possible ARP values. All alternatives are well above 65%.

ARP Value in 2006

Subwatershed	Alternative A	Alternatives B&D	Alternative C
Upper Clear Creek	95.8	94.4	94.3
Little Clear Creek	95.5	95.1	95.1
Canyon Creek	95.0	94.0	94.0
Memaloose Creek	84.5	84.3	84.3
Lower South Fork Clackamas River	95.3	95.0	95.0
Upper South Fork Clackamas River	78.4	78.2	78.2

The ARP analysis looks at the existing condition of vegetation as it has been affected by past timber sales, fires, wind, and other disturbances. These disturbances are tracked by stand age (Data source – GIS data from Veg2004.shp and Roads.shp). The analysis also includes other planned timber sales that overlap these subwatersheds including Clack, Clear, Fork, Guard and Orchard. The analysis includes the effect of roads and permanent openings such as rock quarries. The analysis includes the effects of the proposed harvest and the effects

of constructing roads and reopening old roads. The resulting effects are so small that there is no measurable difference between the action alternatives.

The ARP figures displayed above indicate that the South Fork Thinning would have little or no affect on the hydrology of the subwatersheds.

The above analysis is conducted for the purpose of demonstrating compliance with Forest Plan standard and guideline FW-64 and applies only to National Forest lands and does not include other ownerships such as BLM or private lands. The watershed analyses for South Fork Clackamas River and Upper Clear Creek that do include all ownerships indicate that the watersheds are stable in terms of hydrology (South Fork p. 2-21, Upper Clear p. 64). As discussed in section 4.1.5, young stands on BLM lands are likely to be thinned when their age and condition warrant thinning and stands on private forest lands are likely to be regeneration harvested. A numerical cumulative effects analysis that would include BLM and other private lands is not necessary in this case because the incremental affect of South Fork Thinning would still be negligible regardless of what management were to occur on other lands. It is clear that the South Fork Thinning would have no direct, indirect or cumulative detrimental affect to forest hydrology. The anticipated impact of the project to forest hydrology is so small that it would not likely result in a significant incremental affect to the watershed as a whole. Thinning would result in long-term health of the watersheds by increasing health and vigor and enhancing growth that results in larger wind firm trees.

4.2.13 Aquatic Conservation Strategy

This project would be designed to contribute to maintaining or restoring the fifth-field watershed over the long term, even if short-term effects may be adverse. Appendix E contains documentation of consistency with Riparian Reserve standards and guidelines and summaries of existing conditions for the fifth-field watersheds.

4.2.14 The Clean Water Act and Best Management Practices

Sections 208 and 319 of the Clean Water Act of 1972, as amended (1977 and 1987), acknowledge land treatment measures as being an effective means of controlling nonpoint sources of water pollution and emphasizes their development. These land treatment measures are known as Best Management Practices (BMPs). BMPs are used to control or prevent nonpoint sources of pollution from resource management activities, and to ensure compliance with the Forest Plan, as amended, the Clean Water Act, as amended, the Oregon Administrative Rules (OAR Chapter 340-41-0004,0028, and 0036), Department of Environmental Quality (DEQ), and the Memorandum of Understanding between the Oregon DEQ and the USDA, Forest Service.

General BMPs are described in the document General Best Management Practices, USDA Forest Service, Pacific Northwest Region (11/88). The BMPs are flexible in that they are tailored to account for diverse combinations of physical and biological environmental circumstances. The Forest has documented typical BMPs and assessed their effectiveness

(USDA 2004a). A project specific assessment is in the analysis file and the following is a summary of the items applicable to the South Fork project.

Project Specific BMPs for the action alternatives

- **Design Criteria –** Design criteria 1, 4, 5, 6, 7, 9 and 11 are specifically designed to protect water quality. They are specific to this proposed action and are tailored to site-specific conditions.

- **Project Design -** The project was designed from its inception to avoid potential water quality related impacts.
  - Road construction if any, would be outside of riparian reserves.
  - Temporary road construction if any, would be on gentle terrain and would be closed and revegetated upon completion.
  - Logging systems appropriate to the specific terrain of each unit were designed to avoid water quality impacts.
  - During unit and road placement, certain areas were avoided such as sensitive soil types and landforms. Harvest areas were dispersed across the landscape.
  - Road reconstruction along haul routes is designed to reduce erosion and repair damaged sections.

- **Standard and Special Provisions of the Timber Sale Contract –** Several sections of the timber sale contract implement BMPs. CT6.34 Sanitation and Servicing and BT6.341 Prevention of Oil Spills both deal with the prevention of pollution. The following list of contract provisions require practices such as constructing waterbars to divert water from skid trails and spreading grass seed: CT6.315 Sale Operation Schedule, BT6.42 Skidding and Yarding, CT6.42 Yarding/Skidding Requirements, BT6.422 Landings and Skid Trails, BT6.5 Streamcourse Protection, BT6.6 Erosion Prevention and Control, CT6.6 Erosion Control and Soil Treatment by the Purchaser, BT6.62 Wetlands Protection, BT6.63 Temporary Roads, BT6.64 Landings, BT6.65 Skid Trails and Fire Lines, BT6.66 Current Operating Areas, and BT6.67 Erosion Control Structure Maintenance. The contract provisions CT5.1 Temporary Road and Landing Construction, CT5.31 Road Maintenance Requirements, and CT5.32 Road Maintenance Deposit Schedule, ensure that roads are appropriately maintained.

  Adherence to the provisions of the timber sale contract is ensured by the continual inspections of trained and certified Sale Administrators and is backed up by contract provisions such as BT9.1 which requires a performance bond to guarantee faithful performance of the above requirements.

The project as designed, including the avoidance of critical areas, standard design criteria and the provisions of the Timber Sale Contract, implement BMPs and result in providing clean water.

Monitoring implementation of project specific BMPs is ongoing during project layout and sale administration. After the harvesting operations are complete, these projects would be included in the pool of Forest-wide projects available for monitoring the effectiveness of the BMPs. Past monitoring of similar projects types has been documented in the Mt. Hood Monitoring and Evaluation Reports.

The Project Specific BMPs and practices listed above are standard operating procedures and they have been implemented in many previous projects. Past experience, research and monitoring indicate that these practices are implementable and effective.

After analyzing the affect of the alternatives with design criteria and BMPs, no significant impacts were found that would require further mitigation to protect water quality.

4.3 STAND GROWTH AND PRODUCTIVITY

This section addresses the health and growth purpose and need and the effects and benefits to trees and other vegetation from the alternatives. The Silvicultural Diagnosis (found in Appendix E) is incorporated by reference and summarized below.

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 - References Matrix Standards - page C-44

4.3.0.1 **Purpose and need discussion**

One of the aspects of the purpose and need (s. 2.2.1) is to increase health and vigor and enhance growth that results in larger wind-firm trees. All of the action alternatives would equally meet this objective while the no-action alternative would not. The following section elaborates on the objectives of health and growth.

4.3.1 **Plantations**

The term plantation is used informally to describe managed stands that were logged using the regeneration harvest method and were subsequently reforested by a combination manual planting of trees and trees that seeded in from adjacent live trees.

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 (Smith 1962). In general, thinning tends to improve the overall vigor, growth, health and architecture of trees. Thinning can directly maintain forest health by maintaining growth rates of young stands. Variable density thinning that retains minor species components and retains some trees with the elements of wood decay would still meet health and growth objectives while enhancing diversity.

Thinning provides growing space, which gives the trees with the best competitive advantage the opportunity to quickly take advantage of this growing space for the longest practical time, while fully utilizing the ability of the trees to expand their crowns into the growing room provided by the removal of neighboring trees (Oliver 1996). Failure to maintain tree spacing while they are young can have consequences lasting the life of the timber stand (Smith 1962). Most of the South Fork plantations were precommercially thinned at approximately 15 to 20 years of age. They are now between 40 and 60 years of age, young enough to benefit from thinning and old enough to provide a commercial product. In most units, another thinning would be desirable in 15 to 30 years; it would be sooner in stands that had closer spacing in the first thinning and later in stands thinned to a wider spacing.

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. The second response is an allocation of carbohydrate to diameter growth and finally, to the tree's defense system (Oliver 1996). Thinning can improve the resistance of some trees to some pathogens by manipulating the structure and species composition of a young stand.

Thinning increases windfirmness and stability of second-growth stands. Wind can damage trees by uprooting them, by causing them to snap off and by defoliation or severe injury to their crowns. Trees that have been exposed to winds when they are young and rapidly growing are less likely to suffer severe damage at a later age than those that have grown in tight stands initially. The bending of the stem by wind causes stimulation of the cambial layer in both the stem and roots of the tree. This increased growth aids the tree in resisting the forces of the wind. Increased root growth, especially in the short stout horizontal roots on the leeward side of the tree, improves the anchoring in the soil. Increased stem growth at the base of the tree improves the shape and bending resistance of the stem (Smith 1962). Thinning at a young age helps trees maintain more crown. Trees with larger crowns have greater taper, that is, the base of the tree is relatively large compared with trees that have small short crowns (Smith 1962). Trees with more taper are less likely to suffer stem breakage. Large crowns also are more likely to recover from defoliation than a tree that has a short restricted crown. The plantations proposed for thinning have been precommercially thinned in the past. As a result, they have strong stems and root systems at this time. Thinning would add to their continued stability in the wind.

Several forest diseases are present in the South Fork 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. Thinning to enhance tree growth is one way to give trees the advantage they need to resist these diseases or delay mortality. Wind is usually the mechanism that causes root diseased trees to fall but they would eventually fall in the absence of wind.

Relative Density (RD) is a measure of how crowded a forest is. The scale ranges from 0 (no trees) to 100 (maximum biological potential). When a stand reaches or exceeds a RD of 55, suppression, mortality and stand decline would be expected.

The current stand structure in the units has an average stand diameter of 11 to 16 inches, and stocking is at levels where growth suppression and mortality is occurring (with RD exceeding 55). The understory vegetation is generally suppressed, and mortality of some trees in the suppressed and intermediate crown classes is occurring.

Alternative A - Without thinning, the average stand diameters in 20 years would range from 14 to 19 inches, with stocking at levels where growth suppression and mortality continues to occur (with RD exceeding 55). The understory vegetation would continue to be suppressed.

Alternatives B, C and D would result in long-term benefits for stand growth and productivity. Average stand diameters in 20 years would range from 17 to 23 inches. At that time, tree size and stocking levels again begin to approach the stocking levels where growth suppression and mortality would occur (with RD of 50 to 55). Understory vegetation would have developed for 20 years without suppression from the overstory conifers.

4.3.2 **Fertilization**

Plantations in the matrix would be fertilized to raise productivity. The objective of forest fertilization is to improve the nutrient status of soils by adding readily available sources of nutrients over the short or long-term (Daniel 1979).

A response period of ten years or less can be expected after a single application of nitrogen fertilizer. For trees to respond well to nitrogen fertilization, they need to be able to build more crown. Younger stands or well-spaced stands respond better, at least until crown closure occurs. Fertilization early in the rotation is important because the time before canopy closure is when greatest demands are made on the available nutrient capital of the site (Daniel 1979).

A typical result of fertilizer application, particularly in lower-quality sites, is to increase growth rates and competition causing a faster expression of dominance. Fertilization in combination with thinning provides an additive effect (Scanlin 1979) in terms of a greater and faster growth response from the stand. Stands experience an increase in crown densities, root systems, overall vigor, and vigor in their defense systems. This response allows desired objectives (forest health, larger diameters, timber production, increased site productivity, crown closures) to be met sooner than if allowed to occur naturally.

Stand selection for fertilization is based on stand and site characteristics that indicate a probable increase in growth with the addition of nitrogen fertilizer. Past monitoring studies in the Clackamas River Ranger District have shown a 30% increase in basal area

growth in unthinned and fertilized stands compared to a 70% increase in basal area growth in thinned and fertilized stands on Ladee Flat.

4.3.3 **Riparian Reserves**

Some riparian reserves would be thinned to a wider spacing than would be optimal for timber productivity. However, riparian objectives would be better served by a wider spacing where leave tree size would be maximized and the need for a future thinning entry would be avoided. Refer to section 4.2.6 for a discussion on riparian reserve stand structure.

4.4 LANDSCAPE HEALTH AND DIVERSITY

Section 4.3 addresses stand dynamics and the effects of thinning or not thinning at the stand scale. This section addresses the landscape scale situation and the diversity purpose and need.

Mt. Hood Forest Plan References
Forest Management Goals - #6, 7, 8, 11, 12, 13, 19 and 44, page Four-2
Forestwide Wildlife Standards and Guidelines – FW-194 to 197, page Four-71
Northwest Forest Plan - Aquatic Conservation Strategy Objectives - page B-11

4.4.0.1 **Purpose and need discussion**

One of the aspects of the purpose and need (s. 2.2.1) is to enhance diversity. All of the action alternatives would equally meet this objective while the no-action alternative would not. Section 4.4.3 elaborates on diversity.

4.4.1 **Long-term Thinning Opportunities -**

As young stands grow they eventually reach an age where thinning would enhance growth and prevent stand stagnation that might otherwise occur where trees are overcrowded. As stands mature they reach an age at which thinning may not result in the same growth response that would be expected in younger stands. Age is only one consideration in the potential timing of thinning. Species composition, elevation, site quality, presence of root rot and other diseases, and accessibility also affect the feasibility and timing of thinning.

For plantations, precommercial thinning (small trees are cut and left on site) is often considered desirable at age 15 to 20. Commercial thinning (using a timber sale to achieve the desired stand condition) requires cut-trees to be of sufficient size, value and quantity per acre to be economically viable. Compared to timber sales of mature timber, thinning is often economically marginal because trees are smaller and of lower value and volume per acre is low. Within the Clackamas River Ranger District there is a wide range of site productivity based on soils, elevation and the environment. A first commercial thinning for plantations at lower elevations is often considered desirable at

age 40 to 50 while higher elevations may not be ready for thinning until age 60. Refer to the section 4.3 for more detail on health and growth. As plantations grow and become ready for thinning, stand exams are conducted and if they are found to need thinning, and are economically viable they are put into the planning program. The following table displays the approximate acres of plantations created each decade and natural second growth at the landscape scale.

Second Growth on Clackamas River Ranger District (Acres)

Plantations (All Land Allocations) Acres of Regeneration Harvest by Decade						Natural Second-Growth Stands and Older Plantations (Matrix)
1990-present	1980s	1970s	1960s	1950s	1940s	All ages
17,000	35,000	26,000	26,000	10,000	730	14,000

The Clackamas River Ranger District has been increasing the level of thinning timber sales over time, beginning in the 1970s. In the early 1990s the planning and implementation of thinning timber sales became an emphasis. Since that time approximately 1500 acres of young plantations and 5800 acres of natural second-growth stands and older plantations have been commercially thinned. Planned commercial thinning projects would add another 2400 acres of plantations and 2700 acres of natural second-growth and older plantations. The table above indicates that thinning opportunities would increase in the coming decades as stands grow.

4.4.2 **Landscape Health –**

The South Fork and Upper Clear Creek Watershed Analyses both recommended thinning (South Fork Watershed Analysis p. 5.1, Upper Clear Creek Watershed Analysis p. 78).

In reaching this recommendation, the agency considered the long-term health of ecosystems, watersheds, habitats and human needs. The proposed action is part of a long-term thinning program designed to meet the following landscape-level goals: providing long-term sustained production of high quality water, providing forage for deer and elk, providing an appropriate mix of plant and wildlife habitats, providing healthy forest stands that are part of a landscape where wildfire risk is minimized, and providing timber outputs to meet human needs consistent with NFP goals and providing for the health and productivity of forest stands for future wood product needs. The no-action alternative would not meet these goals or move the landscape in that direction. The action alternatives do move the landscape toward these goals.

4.4.3 **Diversity –** Diversity can be considered at many scales but for the purpose of this project it is discussed at the landscape scale and at the stand scale. Diversity is the distribution and abundance of different 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.

The action alternatives would thin plantations. At the stand scale, plantations are generally considered to be lacking in diversity because they may not have the mix of tree species present in the original stand and/or because they tend to be relatively uniform in terms of tree size and spacing. The trees are very close to the same age and the stands are dense; and generally limit sunlight penetration to the forest floor. While every stand has slight variations, the above generally describes the plantations of South Fork.

The action alternatives would thin to provide for health and growth and to provide forest products. While accomplishing this, the thinning prescription would incorporate many features that would enhance some elements of diversity that are lacking in plantations.

Leave trees would be left at variable spacing. Instead of trees being uniformly spaced and uniformly sized they would be variable. In some areas two trees might be left that are very close to each other and nearby there might be a place where two leave trees are 25 feet apart.

Leave trees would include minor species such as western hemlock, western red cedar and red alder. The plantations were planted primarily with Douglas-fir and noble fir in this area and other species either are present because they survived the clear cutting or because they seeded in from the edge. Thinning would remove the more common tree species.

Small gaps and skips would be created. Gaps are openings in the canopy that are created by landings, skyline corridors. In this project there would be no gaps specifically created for forage enhancement. Skips are areas where no trees are removed. Skips would be created by marking leave trees around special sites up to 1/5 acre in size.

Leave trees would include trees with the elements of wood decay such as forked trees or trees with dead tops. These trees would become important as they age and develop cavities.

The units are plantations and do not contain large snags because they were cut down when the area was clear cut. There are some small second-growth snags and some short crumbled remnants of old large snags. These types of snags are not generally hazardous but if they are hazardous to the logging operation they would have to be felled. All non-hazardous snags would be retained, and some live trees would be marked to leave where their crowns touch certain key snags to increase the likelihood that they would be retained. Also all existing down logs would be retained.

The No-action Alternative would not affect snags but it would also not change the stands uniformity, species composition, or the 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 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).

4.5 WILDLIFE

Mt. Hood Forest Plan References
Forestwide Wildlife Standards and Guidelines – FW-187 to 247, page Four-71
Northwest Forest Plan - Matrix Standards and Guidelines - page B-39

The South Fork Biological Evaluation is located in Appendix B and is incorporated by reference and summarized below. The South Fork Project is covered by a Programmatic Biological Assessment (USDA 2004) and is referred to as the "South Fork Timber Sale" within Appendix C of the Biological Assessment. Formal consultation with U.S. Fish & Wildlife Service has been completed for this project. The Biological Opinion written by U.S. Fish & Wildlife Service is dated March 29, 2005 (USDI 2005). This Biological Assessment and Biological Opinion remain valid for decisions signed before January 1st, 2007. The units are not in a late-successional reserve or a critical habitat unit.

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

4.5.1 Northern Spotted Owl (Threatened)

Existing Situation – The landscape pattern of vegetation has been affected by historic and recent timber harvest activities and fire suppression, thus 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.

Late-seral habitat is limited and connectivity of late-seral habitats is poor in all three watersheds (USDI 1995, USDA 1997, and USDI 1999). A combination of the loss of suitable habitat and increase in fragmentation has substantially reduced the amount of suitable habitat for spotted owls currently present within these watersheds.

Dispersal habitat is adequate in the project area, but is potentially limited in adjacent areas outside the Forest in the Clear Creek and Molalla River watersheds due to their land-base being predominantly in private ownership.

The barred owl has been expanding into northern spotted owl territory from northeastern Canada since about 1900, moving into Washington, Oregon and Northern California and in some cases has been displacing spotted owls. Barred owls are known to be present in the Forest. Barred owls may be expanding their range because of changes to forest structure from logging, wildfire or climate change.

Effects – Including Direct, Indirect and Cumulative Effects

4.5.2 **Alternatives A:** No direct effects to the owl would be predicted with this alternative. For the short term, the units that are considered dispersal-only habitat (units 4-13) would continue to function as dispersal. It is estimated that the units currently providing no habitat for the owl (units 1-3) would obtain dispersal habitat characteristics in approximately eleven years (4 years slower than in the action alternatives). In 20-30 years dispersal habitat would improve a little in all units, but not substantially due to projected low growth rates of these stands (see s. 4.3.1). Mortality would occur, improving a little on the dispersal habitat characteristics.

4.5.3 Alternatives B, C and D

Effects to Dispersal Habitat on a Local and Landscape Scale

The proposed action would have an affect on dispersal-only habitat. Dispersal habitat is defined as forested stands with average diameters of 11 inches or greater and with average canopy cover of 40% or more. Ten of the proposed units (406 acres) within the South Fork Environmental Assessment are considered dispersal-only habitat. The remaining three of the harvest units (91 acres) are considered non-habitat (or capable habitat) for the spotted owl. Dispersal habitat described below is a combination of nesting/roosting/foraging (NRF) and dispersal-only habitat (i.e. All NRF habitat meets the requirements of dispersal habitat).

The spotted owl analysis area (20,041 acres) includes BLM and other ownerships. It comprises all of the South Fork Clackamas Watershed and small portions of Clear Creek and Molalla Watersheds. The analysis area is 62% dispersal habitat. The project would degrade (reduce in quality) less than 4% of that total.

Although the dispersal habitat characteristics within units 4 through 13 would be reduced in quality, they would still function as dispersal habitat for the owl. No loss of dispersal habitat would occur.

Since current spotted owl surveys have not been completed for the area, it must be assumed that all suitable habitat has the potential to contain spotted owl activity centers.

Since there is no adequate suitable habitat adjacent to the proposed thinning stands that are currently providing dispersal habitat, there is no potential for adverse impacts to any active spotted owl activity center.

Although the dispersal habitat characteristics of units 4-13 will be reduced in quality, they will still function as dispersal habitat for the owl. No loss of dispersal habitat will occur. It is estimated that these units would again provide the same quality of habitat in approximately nine years after harvest. Units 1, 2 and 3 are currently providing no habitat for the spotted owl and will benefit the most from this proposed treatment by hastening their attainment as dispersal habitat. It is estimated that these units currently providing capable habitat would become dispersal habitat in about seven years (e.g. four years quicker than no action). All of the units would provide for better quality dispersal habitat within approximately 15-20 years after thinning compared to no action. The action alternatives would have an effects determination of "May Affect, Likely to Adversely Affect" because of the affect to dispersal habitat.

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

The United States Fish and Wildlife Service (USFWS) issued a biological opinion for the South Fork Timber Sale (USDI, 2005). The conclusion reached after considering the cumulative effects of this and other projects is that all the projects are not likely to jeopardize the continued existence of the spotted owl and are not likely to destroy or adversely modify designated critical habitat for the spotted owl.

4.5.5 Effects to spotted owl in 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 South Fork project is not within late-successional reserves. The South Fork project 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).

The information does not reveal effects concerning the impacts of the South Fork thinning proposal in a manner or extent not previously considered.

4.5.6 Cumulative Effects

Dispersal habitat is potentially limited in adjacent areas outside the Forest in the Clear Creek and Molalla River Watersheds due to their land base being predominantly in private ownership. The spotted owl analysis area for this project has adequate dispersal habitat for spotted owls. See table in s. 4.5.7 for a display of cumulative effects. The more likely limiting factor for spotted owl occupancy in the analysis area, is the lack of spotted owl suitable habitat and lack of connectivity between these suitable habitat blocks. Foreseeable future actions that are likely to occur within this spotted owl analysis area are the BLM Hillock and Clear-Dodger Timber Sales which proposed to degrade dispersal-only habitat and other Forest Service projects listed in s. 4.1.3. Considering past actions and these foreseeable actions, the incremental effect on dispersal habitat from the South Fork Project would still be minor, mainly because overall only a small percentage of dispersal habitat would be affected and it is not likely the limiting factor for owls in the analysis area. There would be no effect to suitable owl habitat.

4.5.7 Current Condition of Spotted Owl Dispersal and Suitable Habitat as Compared to Historical Conditions

Analysis Scale	**Dispersal Habitat**		**Suitable Habitat**	
	Historic Level (1940)	Level Before & After Proposed Timber Harvest	Historic Level (1940)	Level Before & After Proposed Timber Harvest
South Fork Thinning Analysis Area (20,041acres)	86%	62%	85%	35%

4.5.8 Northern Bald Eagle (Threatened)

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

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

Although bald eagles are commonly seen along the South Fork of the Clackamas River late summer through early fall, this river and other parts of the watershed do not appear to contain adequate foraging habitat for the species (USDA 1997). Prey availability may also to be the limiting factor for bald eagles within the Clear Creek Watershed. According to the Hillock Environmental Assessment (USDI 2005), bald eagles have never been observed in the Hillock Area. No further analysis needed due to lack of habitat.

4.5.9 Sensitive Species and Survey and Manage Species

The following table summarizes effects from the Biological Evaluation, which is incorporated by reference.

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

*These are Survey and Manage species and are also Sensitive species on the Region 6 Regional Forester's Sensitive Species list for the Mt. Hood National Forest.

** Impact abbreviations

"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, fertilization, fuels treatment, road construction, reconstruction, obliteration and log haul.

Surveys have been competed using the Survey and Manage protocol for terrestrial mollusks. No species that require the management of known sites occur within the affected area. Surveys were not conducted for the red tree vole, Larch Mountain salamander and great gray owl because habitat for these species is not present within the project area.

One of the proposed actions is to apply nitrogen fertilizer (i.e. urea) at a rate of approximately 200 lbs. per acre to approximately 178 acres within the matrix. Research has shown some effects to aquatic organisms such as amphibians from exposure to

nitrogen fertilizer, especially indirect effects as a result of reduced water quality from non-point source pollution from fertilizers (Johnson and O'Neil 2001). Application would not occur within the riparian reserves or in other locations where riparian dependent species may be found. There has been little evidence to suggest that application of nitrogen at the rates proposed would have serious detrimental effects to terrestrial organisms outside of riparian areas.

4.5.10 Snags and Down Wood

Existing Situation – The snag and down woody debris density and conditions found within the South Fork Clackamas River watershed is based on the 1987 Forest Inventory data for unmanaged stands, 1992 Forest Inventory data in managed stands for the mid seral stages, and 1992 contract data for the early seral stands.

According to this data, managed stands similar to the South Fork timber sale units within the South Fork Clackamas River watershed have approximately 0.1 medium snags (>15" DBH) per acre and approximately 0.1 large snags (>21" DBH) per acre. The down woody debris density in these managed stands that are most similar to the South Fork units within this watershed were found to be approximately 2 hard down logs per acre and 4 soft logs per acre.

The South Fork timber sale units within the Clear Creek watershed are also deficient in snags and down logs. The areas that have been surveyed indicate that the quantity and quality of snags and down logs present are very low. The last century has seen the forested portions of the watershed become less diverse with the removal of snags, down logs, cull and suppressed trees through wildfire, harvesting and land clearing operations (USDI 1995).

Walk-through surveys for all units were completed in September 2005 and confirm the above analyses of snags and down wood. All the units contain few if any snags $\geq$15" diameter. Down wood of saw log size is scattered and mostly in decay classes 4 and 5. Occasionally there is a piece of down wood in decay class 3, and few if any pieces in decay class 1 & 2.

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

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

DecAid Advisor

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

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

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

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

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

Snags and Down Wood Levels Compared to DecAid Data

Appendix E of the EA contains an analysis that compares the snag data to the tolerance levels for the different wildlife habitat types and structural conditions identified in the DecAID advisory tool. Units 1, 2, 3, 4, 5, 6, 12, and 13 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." Units 7, 8, 9, 10 and 11 are located in the Montane Mixed Conifer Forests and vegetative condition of "small/ medium trees."

Within the Westside Lowland Conifer-Hardwood Forests and vegetation condition of small/medium trees noted above, the DecAID advisor identifies the 30% tolerance level

for these mid-seral stands (small/medium trees) as 5.3 snags per acre greater than 10 inches with almost 5 per acre greater than 20 inches in diameter. The 50% tolerance level for these mid-seral stands would be 18.6 snags acre greater than 10 inches with 8 per acre greater than 20 inches in diameter. Within the Montane Mixed Conifer Forests and similar vegetative condition noted above, the DecAid advisor identifies the 30% tolerance level for mid-seral stands as 10 snags per acre greater than 10 inches with 2.7 per acre greater than 19.7" in diameter. The 50% tolerance level for these stands would be 16.6 snags per acre greater than 10 inches with 4.2 per acre greater than 19.7" inches in diameter.

DecAID advisor identifies the down wood 30% tolerance level for Western Lowland Conifer-Hardwood Forest mid-seral stands as up to 4.5% cover of down wood (including all decay classes) with sizes of pieces averaging 8-12 inches in diameter. The 50% tolerance level for these mid-seral stands would be up to 10% cover of down wood with sizes of pieces averaging 8-12 inches in diameter. The down wood 30% tolerance level for Montane Mixed Conifer Forest mid-seral stands is 2.5% cover for down wood with sizes of pieces greater than 4.9 inches in diameter. The 50% tolerance level for these mid-seral stands would be 4% cover of down wood with sizes of pieces greater than 4.9 inches in diameter.

All the units within the South Fork timber sale currently contain snag numbers that are much less than the 30% tolerance level for snag density and size based on the analyses discussed above. These units also contain down woody debris densities that range from much less than 30% tolerance level to just below the 50% tolerance level.

Effects - Alternative A - The plantations would continue to be deficient in snags and down wood. Based on the data discussed above, it is presumed that there would continue to be on average approximately 0.1 large and 0.1 medium snags per acre for the units within the South Fork project. This is well below the level of snags required for 60% biological potential. In terms of the tolerance levels for snags within the applicable habitat type and structural condition identified in the DecAID advisor, these areas are well below the 30% tolerance level. Levels would be slightly higher if live trees with the elements of wood decay were included.

Based on Forest Inventory surveys, the units within the South Fork project would continue to provide approximately 2 hard and 4 soft down logs per acre.

In the future, these stands would likely start to become increasingly more susceptible to damaging agents such as insects and diseases creating new snags and down logs from the smaller intermediate and suppressed trees. This is already beginning to occur in unit 5.

Alternative B

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. Due to the creation of corridors involved in skyline logging, this method usually involves a greater loss of snags than in ground-based logging. Approximately 283 acres would be logged using a ground-based system and 214 would be harvested using a skyline logging system.

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. Another result of the timber sale would be the reduction of any natural selection that would occur 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 smaller intermediate and suppressed trees would be removed through the timber harvest.

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

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

In the South Fork planning area, the standard and guideline from the Forest Plan (FW-215) for harvest units is 60% of the full biological potential, which translates into 2.2 snags per acre in the mid and late-seral stages for the units within the western hemlock stands and 2.4 snags per acre in the Pacific silver fir stands. Past experience and monitoring indicate that there would likely be some snags remaining after harvest. Design Criteria #2 would result in additional protection to snags. Forest Plan standard and guideline FW-215, would likely not be met in South Fork timber sale units.

There are few if any medium or large snags in the units. Some small suppressed planted trees have died but they are not large enough to provide much snag habitat and they do not last long. None of the alternatives, including no-action, would achieve the 60% biological potential level in plantations in the short term. An exception to Forest Plan standard FW-215 is proposed because the stands are not capable of achieving those levels

in the short term. Design Criteria #2 results in leaving live trees with the elements of wood decay which would provide habitat in the interim until trees grow large enough to produce snags of the desired size, (greater than 22 inches diameter, FW-234). When these trees with elements of wood decay die they would provide small snags that would benefit some snag dependent species. Additionally, there is potential for an enhancement project that would create additional medium snags, if funded. The action alternatives would accelerate the growth and size of plantation trees and would eventually provide large snags. The objective of providing long-term snag habitat would be met with the action alternatives.

Logs existing on the forest floor would be retained. Prior to harvest, contract administrators would approve skid trail and skyline locations in areas that would avoid disturbing key concentrations of down logs or large individual down logs where possible. The harvesting operations would also add large and small woody debris 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.

Based on the design criteria and previous experience, the units would have down wood at approximately the 30% tolerance level (2.5 to 4.5 percent cover from all decay classes). 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 ground-based system. Project implementation would add some small size woody debris of the size class of the cut trees; and in the long term, it would result in larger trees that could eventually produce coarse woody debris of the desired size class (greater than 20 inches diameter and greater than 20 feet in length). (Northwest Forest Plan p. C-40 and Forest Plan p. Four-74). The proposed action involves leaving the largest trees standing and growing. Some would eventually fall naturally to create coarse woody debris.

These predicted tolerance levels for both snags and down wood would be maintained or slowly increase in the units as they progress over time.

Alternative C - The effects would be similar to Alternative B except that only 218 acres would utilize a ground-based system (65 acres less than in alternative B). These 65 acres would be harvested instead utilizing a skyline logging system (58 acres) or via helicopter (7 acres). Helicopter logging typically results in a loss of snags greater than in both ground based and skyline logging and typically has less effect on the existing down wood. The 58 acres that would be skyline logged instead of using a ground-based system would result in a decrease in the loss of snags and resultant damage in down woody debris.

Approximately 2800 feet of temporary road would be constructed to access units 9 and 13 with this alternative. The stands affected consist of stand types with snag and down wood levels similar to the proposed harvest units. This would likely result in a loss of a few snags and some down wood.

Taking all the above in consideration, the predicted tolerance levels for down wood cover

and snags would similar to Alternative B.

Alternative D – The effects would be similar to Alternative C except that only 234 acres of skyline harvest would occur (38 acres less than in alternative C). These acres would be harvested instead using helicopter and ground-based logging systems. As described above, helicopter logging typically results in a loss of snags greater than in both ground based or skyline logging and typically has less effect on the existing down wood.

No new road construction would occur with this alternative.

Taking all the above in consideration, the predicted tolerance levels for down wood cover and snags would similar to Alternative C.

4.5.11 Cumulative Effects –Snags are utilized by species that have medium size home ranges so appropriate size analysis areas (subwatersheds) are used to calculate cumulative effects for snags.

Acres and snag numbers in s. 4.5.12 were generated from field surveys. (Snag data by stand type and plant association was based on surveys completed by Forest inventory and ecology crews. Weighted averages include the entire land base including all forest types, as well as all non-forest areas within the analysis area. For cumulative effects, the standard for landscapes is 40% of biological potential, which equates to about 1.5 in the western hemlock zone and 1.6 snags per acre in the Pacific silver fir zone. The 100% biological potential would be between 3.7 and 4 snags per acre, respectively.

The analysis of snag habitat within the snag analysis areas includes all past, present, and foreseeable future projects including South Fork. For purposes of this analysis, it is assumed some snags would need to be felled for safety reasons in the planned sales. Past experience and monitoring indicate that there would likely be some snags remaining and past timber sales have had projects to create snags afterward.

There is potential for an enhancement project to create snags and down woody debris, if funded. Snags could be created by heart rot inoculation or by topping with explosives or chainsaws. Down woody debris could be created by girdling or felling. Since funding for this enhancement project is not certain, the snag and down wood numbers were not added to the analysis below. If the projects are funded the actual figures would be slightly higher.

4.5.12 **Snag Habitat** (analysis areas that overlap South Fork units)

Snag Analysis Area →	Memaloose		East Fork of South Fork		Upper Clear Creek		Oscar	
Total Acres	4686		5428		2316		6215	
Type of Snag*	L	M	L	M	L	M	L	M
Total snags removed by past regeneration harvest	12386	6302	19165	9125	9289	3851	13799	4671
Snags/ac. Today	4.7	2.5	2.9	1.4	0.2	5.2	2.1	5.3
Acres in South Fork Thin	140		48		194		115	
Snags/ac. After South Fork Thin	4.7	2.5	2.9	1.4	0.2	5.2	2.1	5.3

*L = Large snags > 21”
M = Medium snags > 15” and < 21”

The analysis shows that within the snag analysis areas, the snag levels after the past, present and foreseeable future harvest activities occur would still be above the 100% biological potential level for all alternatives. This exceeds the Forest Plan standard of 40% biological potential (FW-216).

4.5.13 Deer and Elk Habitat (Management Indicator Species)

Existing Situation – The harvest units are located within summer range (SR). Forest Plan Standards and Guidelines have minimum requirements for optimal cover and thermal cover habitat components but no specific level for hiding cover or forage. (Data source for this analysis – GIS data from Veg2004.shp and Roads.shp, summarized in open road density and cover spread sheets in analysis file.)

Existing Condition for Deer and Elk Management Areas (analysis areas that overlap South Fork units) Forest Plan standards FW-203, 205 & 208

Analysis Area	Acres	Current Optimal Cover (%)	Minimum Level for Optimal Cover (%)	Current Total Thermal Cover (%) *	Minimum Level for Total Thermal Cover (%) *	Current Forage	Current Road Density (mi./sq. mi.)	Forest Plan Road Density (mi./sq. mi.)
SR54	6684	42	20	52	30	18	1.9	2.5
SR55	7738	25	20	51	30	12	3.5	2.5

The project overlaps two analysis areas: SR54 is the summer range portion of the Memaloose Creek subwatershed and SR55 is the summer range portion of South Fork and Clear Creek drainages.

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

Deer and elk are known to occur throughout this area, although the elk population is considerably smaller and more scattered than the deer population. Forage is widely available within the analysis area displayed above, 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 in the District is considered the limiting factor for elk and possibly deer within the project area. See Landscape Health section.

Based on a projected long-term trend of declining forage, there is expected to be a commensurate decline in deer and elk populations (USDA 2004c, p. 72). Forage in the area is declining by approximately 1% per year.

Effects – Including Direct, Indirect and Cumulative Effects

Alternative A – Approximately 497 acres of plantations would continue to serve as thermal cover. No cover would be lost and no forage would be gained in this alternative.

Alternative B - Approximately 497 acres of thermal cover would be downgraded to non-habitat. This would result in a thermal cover decrease of approximately 171 acres for SR 54 and 326 acres for SR55. This would bring the total thermal cover to 49% for SR54 and 47% for SR55, still above the minimum cover requirement of 30%, see table above and unit table s. 3.2.6. The table above includes all past, present and foreseeable future actions. The 497 acres would return to thermal cover when the canopy cover reaches 70%, in about 10 years.

The loss of thermal cover could alter distribution of deer and elk use of the area in the summer, but is not predicted to cause a reduction in deer and elk numbers utilizing the area due to the abundant remaining thermal cover in summer range available.

On the 497 areas proposed for thinning, a moderate increase in forage for deer and elk in these areas would occur. The increase in forage would be caused by increased sunlight reaching the forest floor as a result of the thin. This forage created by the thinning is predicted to be low to moderate in quality, and be most abundant in the small gaps created by the harvest. Canopy closure is expected to eventually increase to the point in which all forage benefits are lost, in approximately 9 years. Consequently forage levels would return to pre-harvest levels at this time. Even considering the loss of thermal cover, this alternative would benefit deer and elk for approximately 9 years, since forage and not thermal cover is considered one of the limiting factors for deer and elk herds.

Road Density – Approximately 2000 feet of old existing temporary roads would be reopened to access several of the units. In addition, approximately 10,950 feet of bermed roads would be opened. These roads would not be open to the public and the only disturbance occurring as a result of these roads being opened is their use by the loggers, truck drivers and associated Forest Service personnel required to accomplish the logging operations. After logging, the roads that were opened would be closed and open road density would be back to the current level. There would be no increase in the long-term

harassment of deer and elk with this alternative; effects would be short term only. There would be no increase in the permanent roads open to the public, and therefore no increase in open road density with this alternative.

The closure of currently open system roads is not part of the South Fork proposed action. An exception to Forest Plan standard and guideline FW-208 is proposed as described in FW-210. Roads in this area are used by several owners for forest management, recreational driving, hunting and fire suppression and to access the telecommunications towers at Goat Mountain.

Haul Routes - There are potential haul routes that go through deer and elk winter range. Hauling and snow plowing is permitted on certain "backbone" roads including road 45, which is the primary haul route for this project.

Disturbance - The logging and road re-opening activities could potentially disturb animals that happen to be in the area at the time of implementation. The project area is summer range and disturbance that occurs during the spring/summer/fall could potentially displace animals, and may have the potential to affect the health of individuals if the disturbance occurs near active calving sites.

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 noticeable reduction in the current local population size.

Alternative C – Effects would be similar to Alternative B except that 2800 feet of new temporary roads would be built, creating an additional temporary increase in disturbance that is discussed in Alternative B. Approximately 1200 feet of old existing temporary roads would be reopened to access several of the units. Refer to unit table s. 3.3.1. Approximately 10,950 feet of bermed roads would be opened. After logging, the roads that were built or 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. There would be increased wildlife disturbance over the level of Alternative B with 7 acres of helicopter logging. At the time of helicopter use, disturbance to deer and elk would increase in the area due to the noise and activity of the helicopter. This disturbance would be short term, lasting only as long as the helicopter was in flight. This additional disturbance that occurs during the spring/summer/fall could potentially displace animals, and may affect the health of individuals if the disturbance occurs near active calving sites.

Alternative D – Effects would be similar to Alternative B. 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. There would be increased wildlife disturbance over the level of Alternatives B or C with 28 acres of helicopter logging. Refer to unit table s. 3.4.1. At the time of helicopter use, disturbance to deer and elk would increase in the area due to the noise and activity of the helicopter. This disturbance would be short-term in nature, lasting only as long as the helicopter was in flight. This additional disturbance that occurs during the spring/summer/fall could potentially displace animals, and may affect the health of individuals if the disturbance occurs near active calving sites.

4.5.14 Pine Marten & Pileated Woodpecker (Management Indicator Species)

Existing Situation - The status and condition of management indicator species are presumed to represent the status and condition of many other species. This EA focuses on certain key species and does not specifically address common species such as bear, bobcats or squirrels except to the extent that they are represented by management indicator species. None of the proposed harvest units provide habitat for these species. These animals rely on older forest structure, while the pileated woodpecker also relies on snags and live trees with the elements of wood decay. None of the harvest units contain the stand structure or adequate snags to provide habitat for these species.

No further analysis necessary due to lack of habitat

4.5.15 Migratory Birds

Existing Situation – Close to 30 species of migratory birds occur within the South Fork Clackamas River, Clear Creek, and Molalla River watersheds, some of which are likely present within the South Fork project area during the breeding season. Some species favor habitat with late-seral characteristics while others favor early-successional habitat with large trees.

Effects – Including Direct, Indirect and Cumulative 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.

Action Alternatives – Research has demonstrated that thinning enhances habitat for a number of migratory species and provides habitat for some species that are rare or absent in un-thinned stands. However, some species of migratory songbirds have been shown to decline following thinning. The effects of commercially thinning 497 acres of young plantations would most likely have a combination of positive, neutral, and negative impacts on migratory songbird use within the stands depending on which species are present. An example of some migratory species present in the watershed that would benefit from thinning is as follows: Hammond's flycatcher, warbling vireo, and western tanager. The following are species could be negatively impacted by thinning in the Mt. Hood National Forest: 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 in the Clackamas River Ranger District. Since young managed plantations in the district are very common, this loss of habitat would not result in any measurable population change of the species, only a redistribution of the individuals affected.

4.6 SOILS

This section addresses soil impacts. A soil report (found in Appendix E) is incorporated by reference and summarized below.

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
Fire and Fuels Management Standard and Guideline - page C-48

4.6.1 Existing Situation

The soil interpretations and recommendations were developed from field visits in 2004 and 2005, office interpretation of aerial photos with flights in 1946, 1958, 1959, 1961, 1972, 1995, and 2004, topographic maps, and the Soil Resource Inventory (SRI) for the Mt. Hood National Forest (Howes, 1979) containing a general map of the soils associated with landforms in the Southfork project area. Field verification reveals that the SRI soil mapping of this area is generally accurate.

Suitability –Areas unsuitable for timber management would include wet areas, soils that are excessively rocky and unstable areas. These areas would be excluded from harvest. Some are too small to show on the map in section 3.2.5.

Detrimental Conditions - Appendix E contains a description of the analysis methodology and tables that show soils conditions. The table to the right displays the existing detrimental conditions by unit.

4.6.2	
Unit #	Existing Condition
1	12.5 %
2	9.3 %
3	13.7 %
4	11.9 %
5	14.0 %
6	13.0 %
7	16.1 %
8	15.2 %
9	18.8 %
10	23 %
11	9.1 %
12	9 %
13	8 %

All of the South Fork units were logged before. The percentage of each unit in a detrimental soil condition was determined through aerial photo interpretation and field reconnaissance. Detrimental condition varies from stand to stand due to the occurrence, manner, and extent of past timber harvest, road construction and fuel treatment activities and the sensitivity of soils.

Forest Plan standard and guideline FW-022, is designed to protect long-term soil productivity, and sets a 15% level for cumulative impacts. Due to past management practices that included tractor logging, landing construction, site preparation and fuels treatment, three units exceed 15% and one exceeds 20%

(See s. 4.6.2).

Soils that are compacted take time to recover; tree roots and burrowing animals eventually penetrate hardened soil. There is the opportunity to speed the recovery process by using machines such as subsoilers that fracture compacted soils. Landings and temporary roads are good candidates for mechanical treatment. Skid trails in plantations pose a dilemma for mechanical treatment because tree roots have penetrated the skid trails. Mechanical treatment in these cases may cause excessive root damage that would lead to reduced growth, and increased root disease and tree mortality.

Organic Matter/Soil Fertility - Duff layers are relatively thin in the plantation units due to clearcutting and subsequent slash burning or piling treatments. Duff layers range from ¼ to 1½ inches with an average of ½ inch on units. Large down logs are also lacking in plantations due to past logging practices.

Soil Erosion - In the South Fork area, surface soil erosion potential varies from slight to moderate. Existing surface erosion is mainly confined to exposed soil on skidtrails, unpaved road surfaces, road cutbanks, and ditches. Heavy Off Highway Vehicle (OHV) use of old skidtrails and roads in the Goat Mountain area has resulted in ongoing erosion. Where subsurface water flow has been intercepted by skidtrails and roads, gullies have formed.

4.6.3 Effects

Potential impacts such as soil compaction caused by ground-based harvest and fuels treatment are measured by percent of harvest area in detrimental soil condition. This is a cumulative measurement that includes soil compaction, puddling, displacement, and severe burning, and their relationship to erosion and long-term site productivity. To provide for long-term site productivity the Forest Plan states detrimental soils should not exceed 15% (FW-022) of project activity areas. Soils and long-term productivity are also protected by standards and guidelines for the retention of woody debris, ground cover, and live trees. All of these standards and guidelines protect soil structure and macropore space and soil organisms such as mycorrhizal fungi.

4.6.4 Alternative A

Short-Term Effects
There would be no impact or benefit to soil productivity. Detrimental soil condition would remain unchanged. There would be no change to surface erosion rates from the existing condition. Four units would remain above the 15% level for detrimental soil conditions (See s. 4.6.2).

Long-Term Effects
Soils impacted in the past would continue to develop through physical and biological processes. The percent of detrimental soil condition would slowly decline as areas recover. Forest organic litter input, duff layer development and soil fauna and microbe activity

would continue and tree roots and burrowing animals would eventually penetrate hardened soils. As unthinned stands age, some trees would eventually die and fall over. In the absence of large scale disturbances such as widespread insect, disease, wind or fire events, these stands would eventually produce large trees and large down logs. This would take much longer than would occur with the action alternatives.

4.6.5 Alternative B

Units would be thinned using a combination of ground based and skyline logging systems. Ground-based systems have the greater potential to impact soils. Mechanical felling equipment may be used in many units, depending on slope. Existing roads, skid trails and landings would be reused where appropriate to minimize additional compaction. Mechanical decompaction would occur on landings and re-opened temporary roads that are used by the contractor (Design Criteria #6).

Short-term Effects

Bare soil would be exposed where machines travel over the ground surface and where logs are dragged. Approximately 21 acres of roads, skid trails, skyline corridors and landings would be exposed. These areas would have potential increased erosion. Disturbed areas could be potential sources of erosion until they are successfully revegetated. Most of the 21 acres exposed would be from existing old roads, skid trails, skyline corridors and landings that had been revegetated or covered with duff or debris.

The suspension of logs during skyline operations and designated skid trails in ground-based yarding operations would minimize duff layer disturbance. Soil microbial populations would likely be reduced initially until soil organic matter and litter layer builds back up. Even though trees would be removed that represent potential future nutrient input (when they die and become down wood), branches, treetops and needles would be left on site, which should help maintain carbon and nutrient levels. Leaving large woody debris would benefit soil fauna and microbes, and decomposer organisms. The design criteria for coarse woody debris and snags, would increase the amount of moderate-sized woody debris in the short term until larger diameter trees develop and return naturally or artificially onto the forest floor.

Long-Term and Cumulative Effects

The harvest units are used to conduct cumulative effects analysis for soil productivity. The analysis looks at the ground disturbance created by past timber sales and other disturbances. The time scale includes the effects of all past activities beginning in approximately 1940 when the first timber harvest and road construction projects occurred.

A net increase in detrimental soil condition is predicted where more skid trails, yarding corridors, landings and

4.6.6 Alt. B detrimental soil condition			
Unit #	Existing (%)	Direct effect (%)	Cumulative Effect (%)
1	12.5	2.5	15.0
2	9.3	1.9	11.2
3	13.7	2.3	16.0
4	11.9	2.5	14.4
5	14.0	2.0	16.0
6	13.0	1.8	14.8
7	16.1	1.4	17.5
8	15.2	2.0	17.2
9	18.8	0.3	19.1
10	23.0	-0.3	22.7
11	9.1	2.3	11.4
12	9.0	2.3	11.3
13	8.0	5.5	13.5

roads would be constructed than already exist. Refer to table 4.6.6 (a negative number under direct effect indicates improved soil conditions).

Existing temporary roads, landings and skid trails would be reused and restored (Design Criteria #6).

The detrimental soil condition would slowly decline as compacted areas recover due to physical and biological processes. Surface erosion rates would decline as exposed soils become revegetated. Soil microbial populations would slowly increase as soil organic matter and the litter layer build back up.

Six units would be above 15% detrimental soil condition with the action alternatives. The highest unit would actually decline because of post harvest decompaction efforts. Exceptions to Forest Plan standards and guidelines FW-022 and FW-028 are proposed. FW-028 suggests rehabilitation of impacted soils. While this is proposed for temporary roads and landings that are used by the contractor, it is not proposed for skid trails in plantations. Mechanical treatment in these cases may cause excessive root damage that would lead 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.

The objective of maintaining long-term site productivity would still be met. 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 exam data displayed in the table below show that plantations that have detrimental soils above 15% have similar growth rates compared to nearby similar plantations that are below 15%. Mean annual increment is a measure of growth taken from stand exam data: a larger number indicates greater growth.

Unit #	Existing Soil Disturbance	Mean Annual Increment (board feet per acre per year)
13	8.0	362
2	9.3	480
9	18.8	500
10	23.0	541

The incremental effect of the proposed action would result in some additional degradation of soils. No significant reductions of growth and productivity were found nor are they expected. Some scarification of landings and roads would take place where appropriate but in other areas, soils would continue to develop and recover from detrimental conditions caused by past harvesting through physical and biological processes.

Alternative C

New roads (2800 ft.) would be constructed with this alternative. Helicopter yarding would occur on 7 acres. Soil would be exposed on approximately 13 acres of roads, skid trails, skyline corridors and landings. These areas would have potential increased erosion. Refer to table 4.6.7 (a negative number under direct effect indicates improved soil conditions).

4.6.7 Alt. C detrimental soil condition			
Unit #	Existing (%)	Direct effect (%)	Cumulative Effect (%)
1	12.5	2.5	15.0
2	9.3	1.9	11.2
3	13.7	2.3	16.0
4	11.9	2.5	14.4
5	14.0	2.0	16.0
6	13.0	1.8	14.8
7	16.1	1.4	17.5
8	15.2	2.0	17.2
9	18.8	2.3	21.1
10	23.0	-0.3	22.7
11	9.1	2.2	11.3
12	9.0	2.3	11.3
13	8.0	6.3	14.3

Short-Term Effects
The effects of this alternative would be similar to Alternative B, except for road and skyline corridor disturbance. This alternative would reduce the amount of soil disturbed from harvesting activities and reduce the risk for erosion.

Long-Term and Cumulative Effects
Cumulative effects would be similar to Alternative B. Most of the units would have very similar percentage of detrimental soil condition. Six units would be above 15% detrimental soil condition with the action alternatives. The highest unit would actually decline because of post harvest decompaction efforts.

Alternative D

This alternative is similar to C but would eliminate the road construction and would have more helicopter logging. Refer to table 4.6.8 (a negative number under direct effect indicates improved soil conditions).

4.6.8 Alt. D detrimental soil condition			
Unit #	Existing (%)	Direct effect (%)	Cumulative Effect (%)
1	12.5	2.5	15.0
2	9.3	1.9	11.2
3	13.7	2.3	16.0
4	11.9	2.5	14.4
5	14.0	2.0	16.0
6	13.0	1.8	14.8
7	16.1	1.4	17.5
8	15.2	2.0	17.2
9	18.8	-0.5	18.3
10	23.0	-0.3	22.7
11	9.1	2.2	11.3
12	9.0	2.3	11.3
13	8.0	2.3	10.3

Short-Term Effects
The effects of this alternative would be similar to those of Alternative B.

Long-Term and Cumulative Effects
Cumulative effects would be similar to Alternative C and B except that units 9 and 13 would have reduced impacts. Six units would be above 15% detrimental soil condition with the action alternatives. The two highest units would actually decline because of post harvest decompaction efforts.

4.7 SCENERY

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

This analysis considers past timber harvest and road construction as well as concurrently planned timber sales and reasonably foreseeable future actions that have occurred or may occur in the area seen from the South Fork Thin viewer positions.

4.7.1 Existing Situation

The project cannot be seen from any primary viewer positions such as heavily traveled highways, rivers or campgrounds. The Visual Quality Objective (VQO) assigned to this area is Modification. The primary concern is how the area appears as seen from less traveled open backcountry roads. Under the modification VQO, human activity may dominate the characteristic landscape but would utilize naturally established form, line, color, and texture. The viewer positions would be from local roads that are traveled by the recreating public. Most of the local roads were built by timber operators to access past timber sales, but they are now used by a wide range of forest visitors. Currently, the local landscape near harvest units meets the VQO of modification. The forest visitor would experience older second-growth stands and mature forest without obvious straight lines or high levels of vertical contrast. The proposed harvest areas are surrounded by other second growth forest stands; therefore there is not much vertical or horizontal contrast.

Effects

4.7.2 **Alternative A:**

Changes in scenery would come slowly from forest growth. Stands would continue to have unbroken uniformity.

4.7.3 **Effects to scenery as seen from local roads for the action alternatives:** Some minor changes to foreground views from local open roads would occur. Log landings, temporary roads, landing slash piles and skid trails and skyline corridors that lead to the landings 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. The units would meet the VQO of modification from these viewer positions.

4.8 BOTANY

This section addresses effects to threatened or endangered botanical species including species proposed for listing. It also addresses botanical sensitive and survey and manage species. The South Fork Thinning Botany Biological Evaluation (found in Appendix D) is incorporated by reference and summarized below.

Mt. Hood Forest Plan References
Forestwide Threatened, Endangered and Sensitive Plants and Animals Standards and Guidelines - FW-170 to FW-186, page Four-69
See FEIS pages IV-76 and IV-90
Northwest Forest Plan - Appendix J2

There are no Proposed, Threatened or Endangered botanical species affected by the proposed action.

Surveys were conducted for Sensitive botanical species in 2004, in the proposed units and in similar habitats (e.g. streams) if immediately adjacent to the proposed units. Several fungi that have potential habitat in the South Fork area are not considered practical to detect with field surveys with the exception of Bridgeoporus nobilissimus. It is assumed that these species are present. The following list contains the species that have potential habitat for this project. One fungus was found during surveys in an adjacent riparian area.

NI = No Impact
MIIH = May Impact Individuals but would not lead to a trend toward federal listing.

Species	Group	Impact
Aster gormanii	Vascular Plant	NI
Botrychium minganense	Vascular Plant	NI
Botrychium montanum	Vascular Plant	NI
Botrychium pinnatum	Vascular Plant	NI
Cimicifuga elata	Vascular Plant	NI
Corydalis aquae-gelidae	Vascular Plant	NI
Montia howellii	Vascular Plant	NI
Ophioglossum pusillum	Vascular Plant	NI
Sisyrinchium sarmentosum	Vascular Plant	NI
Rhizomnium nudum	Bryophyte	NI
Schistostega pennata	Bryophyte	NI
Tetraphis geniculata	Bryophyte	NI
Chaenotheca subroscida	Lichen	NI
Hypogymnia duplicata	Lichen	NI
Leptogium burnetiae var. hirsutum	Lichen	NI
Leptogium cyanescens	Lichen	NI
Lobaria linita	Lichen	NI
Pannaria rubiginosa	Lichen	NI

Species	Group	Impact
Peltigera neckeri	Lichen	NI
Peltigera pacifica	Lichen	NI
Ramalina pollinaria	Lichen	NI
Usnea longissima	Lichen	NI
Bridgeoporus nobilissimus	Fungi	NI
Cordyceps capitata	Fungi	MIIH
Cortinarius barlowensis	Fungi	MIIH
Gomphus kauffmanii	Fungi	MIIH
Gyromitra californica	Fungi	MIIH
Leucogaster citrinus	Fungi	MIIH
Mycena monticola	Fungi	MIIH
Otidea smithii	Fungi	MIIH
Phaeocollybia attenuata	Fungi	MIIH
Phaeocollybia californica	Fungi	MIIH
Phaeocollybia olivacea	Fungi	MIIH
Phaeocollybia oregonensis	Fungi	MIIH
Phaeocollybia piceae	Fungi	MIIH
Phaeocollybia pseudofestiva	Fungi	MIIH
Phaeocollybia scatesiae	Fungi	MIIH
Ramaria amyloidea	Fungi	MIIH
Ramaria gelatiniaurantia	Fungi	MIIH
Sowerbyella rhenana	Fungi	MIIH

Surveys have been competed to the Survey and Manage protocol. No species that require the management of known sites occur within the affected area.

4.9 MANAGEMENT OF COMPETING AND UNWANTED VEGETATION

This section addresses invasive plants and unwanted vegetation. A report has been generated by the team botanist titled "The South Fork Thinning Risk Assessment and Recommendations to Minimize the Introduction and Spread of Invasive Plants for South Fork Commercial Thinning." It is included in the analysis file and is incorporated by reference and summarized below.

Mt. Hood Forest Plan References

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

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

The use of herbicides is not being proposed for any of the activities associated with the South Fork Thinning project. Fuels treatments are exempt from the requirements above in thinning projects. Slash treatments associated with road construction is included.

Invasive plants are species not native to a particular ecosystem that may cause economic or environmental harm, or harm to human health. They include, but are not limited to, the Oregon Department of Agriculture (ODA) Noxious Weed list. Invasive Plants may disrupt natural ecosystems by displacing native species and reducing natural diversity through the replacement of native communities with invasive monotypic weed stands.

The noxious weeds of concern (Oregon Department of Agriculture "B" rated weeds) are located along roads that lead into and adjacent to the proposed project. They are *Cytisus scoparius,* Scotch broom; *Hypericum perforatum,* St. John's wort; *Senecio jacobea,* tansy ragwort; *Circium arvense,* Canada thistle and *Circium vulgare,* bull thistle.

The action alternatives would have a risk ranking of high but the design criteria (#4 and 8) would be followed to reduce the chances of these weeds spreading to new areas. Bio-control insects are established and are the primary means of control for Scotch broom and St. John's wort. With the shade provided by the forest canopy, these weeds are not likely to spread into the stands. Equipment cleaning would prevent weeds from spreading along roads to new uninfested sites.

The following analysis covers the proposed treatment of slash from temporary roads and landings. Appropriate design criteria would be incorporated into project work to minimize potential adverse impacts to the environment, project workers, and public.

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

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

Expected Site Conditions

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

For road projects, the correction strategy is selected when the damage thresholds are exceeded. The following methods would be used where needed: Lop and Scatter - this

method would entail manually cutting the slash or brush with chain saws and then scattering it outside the road prism. Piling and Burning - this method would use mechanical equipment to pile the slash. The piles would then be burned under a set of prescribed weather conditions.

The potential effects of the above treatments that have been considered include soil compaction, puddling, surface erosion, consumed coarse woody debris, removal of surface organic matter, overheating the soil, scorch or death of reserve trees, air quality degradation and the potential for an "escape" becoming a wildfire.

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

4.10 AIR QUALITY

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.

Existing Situation – Air quality may be affected by burning of slash. Currently the harvest units have slash accumulations of approximately 5-10 tons per acre.

Effects – Including Direct, and Indirect and Cumulative Effects

Alternative A would not change air quality.

Action Alternatives

Dust from vehicles would not likely affect air quality**.** Dust from these roads would not drift toward campgrounds or any other area of popular public use.

Landing slash would be burned. Burning has the potential to degrade 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. In addition to existing slash, the branches and tops of harvested trees would increase fuels by approximately 5 tons per acre.

Indirect Effects – The following are areas of concern for smoke intrusion: Portland/ Vancouver Metropolitan Area, Mt. Hood Wilderness, Bull of the Woods Wilderness, Salmon –Huckleberry Wilderness and Mt. Jefferson Wilderness. To protect visibility in these Class I areas, prescribed burning would be restricted from July 4th weekend to

September 15. 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. Burning would be conducted when smoke dispersion conditions are favorable to minimize the potential for adverse effects.

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

Cumulative Effects - The areas of highest concern for possible impacts to air quality discussed above are far from the project. The project is outside Class I airsheds.
The area of analysis is a large "airshed" which encompasses much of the Forest as well as adjacent forest, farm and urban areas. The Forest's contribution to the air pollution of the region is only partially controllable or predictable due to the wildfire situation. When prescribed burning associated with South Fork or any other timber sale in the Forest, or other burning projects is scheduled in conjunction with the State of Oregon to comply with the Oregon Smoke Implementation Plan, smoke dispersion conditions would be favorable and potential cumulative effects would be minimized. Any time fuels are reduced whether by prescribed burning or other means, the potential for wildfire smoke intrusion into high concern areas is reduced. The incremental effect of the proposed action is negligible therefore there would be no discernable cumulative effect.

4.11 ECONOMICS – FINANCIAL ANALYSIS

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

4.11.1 Purpose and need discussion

One of the aspects of the purpose and need (s. 2.2.1) is to provide forest products. In terms of volume outputs, all of the action alternatives would equally meet this objective while the no-action alternative would not. In terms of the economic viability, each alternative would be slightly different as shown below.

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.

There is often a concern about the viability of thinning timber sales that often have small low-valued logs and high logging costs when compared to other types of timber sales. In the future it is likely that timber values would fluctuate with market conditions and logging costs may also change with fluctuations in fuel prices. The purpose of this analysis is to approximate the economic feasibility of timber sales, estimate the potential value generated and to provide a comparison of the alternatives.

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

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

Costs and Benefits

	Alternative A	Alternative B	Alternatives C	Alternative D
Present Value - Benefits	0	$2,814,500	$2,706,250	$2,701,920
Present Value - Cost	0	$1,043,432	$1,098,924	$1,125,696
Present Net Value	0	$1,771,068	$1,607,326	$1,576,224
Benefit/Cost Ratio	NA	2.7	2.46	2.4

Present Value - Benefits: This is the present day value based on delivered log prices (estimated at $652/mbf).

Present Value - Cost: This is the present day value of the cost associated with harvesting (estimated harvesting cost is $190/mbf for mechanical, $290/mbf for skyline and $450/mbf for helicopter).

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

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

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

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

4.12 TRANSPORTATION

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

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 2003a). 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 in 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 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 the South Fork project are #2 and 7.

Existing Situation

There are no inventoried roadless areas or other unroaded areas in the South Fork Thinning project. The South Fork project can be accessed from road 45, the primary haul route. Roads in this area are used for forest management, recreational driving, hunting and fire suppression and to access the telecommunications towers at Goat Mountain. An administrative site (seed orchard) is accessed by road 4500-220. The western portion of

the project area has a "checker board" ownership pattern with BLM and private management. Road management in this area is guided by agreements between the various land managers.

There are road repairs that are needed on road 45 to facilitate safe access for the public and for log haul. During the original road construction, root wads and other debris were buried in the road fill that have since rotted and settled causing cracking of the pavement. The cracking has lead to water penetration into the subgrade which has caused further deterioration. Two deep patch repairs would be needed on the paved section of road 45; from mile posts 1.75 to 1.95 and from mile posts 9.0 to 9.25 as measured from the Memaloose bridge. The legal description for these repairs is S.½ of section 21 of T. 5 S., R. 5 E., and the N.½ of section 32 of T. 4 S., R. 5 E. Repairs would be within the road prism and are outside of riparian reserves.

Alternative A

No roads would be built or repaired.

Alternative B and D

Refer to detailed maps in Appendix E. Approximately 2000 feet of old existing temporary roads would be reopened to access several of the units. These roads are on dry stable landforms and do not cross any streams. In addition, approximately 10,950 feet of bermed system roads would be opened. These roads are also on dry stable landforms and do not cross any streams. 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.

The closure of currently open system roads is not part of the South Fork proposed action. An exception to Forest Plan standard and guideline FW-208 is proposed as described in FW-210. Roads in this area are used by several owners for forest management

There are road repairs and improvements that would be accomplished with all of the action alternatives. Approximately $280,000 would be needed for deep patch repairs on road 45.

Alternative D would require the use of helicopter landings. There are existing landings along existing roads that will meet the needs of helicopter operations.

Alternative C

Alternative C would be similar to B except that new temporary roads would be constructed (2800 feet) to access landings. The new temporary roads are located on dry stable landforms and do not cross any streams. Alternative C would require the use of

helicopter landings. There are existing landings along existing roads that will meet the needs of helicopter operations.

4.13 HERITAGE RESOURCES

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

Surveys conducted for this project located no new sites. This project is discussed in heritage resource report numbers 2003-06-06-05-0001. 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.

4.14 ENVIRONMENTAL JUSTICE – CIVIL RIGHTS

Executive Order 12898 directs agencies to identify and address disproportionately high and adverse human health or environmental effects of projects on certain populations. This includes Asian Americans, African Americans, Hispanics, American Indians, low-income populations and subsistence uses. The Civil Rights Act of 1964 prohibits discrimination in program delivery and employment. An analysis detailing Environmental Justice and Civil Rights issues is in the analysis file and is summarized here. There are communities with minorities and low-income populations that may be affected by the South Fork Project. The town of Estacada (the nearest community) is approximately 12 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 South Fork area. There are no known special places for minority or low-income communities in the South Fork area. Individuals may work, recreate, gather forest products or have other interests in the South Fork area. The report found that impacts and benefits of the South Fork Thinning would not fall disproportionately on minorities or low-income populations. No adverse civil rights impacts were identified.

4.15 RECREATION

Mt. Hood Forest Plan References
Forestwide Timber Management Standards and Guidelines - FW-453 to FW-466, page Four-98
See FEIS page IV-127

In the vicinity of the South Fork units there are no campgrounds, trails or other destination recreation features. The South Fork area is used for dispersed camping, Off Highway Vehicle (OHV) riding, hunting and for gathering special forest products such as mushrooms. Fire rings are present at old landings and road junctions. Based on inspection of fire rings and other recreation indicators, the South Fork area does not seem to receive more dispersed recreation than any other similarly remote portion of the Forest. With the action alternatives, there may be short-term movement of individuals or groups

during project implementation. Even with this temporary displacement, the availability of dispersed recreation opportunities on a landscape level would not be negatively affected. Many thousands of acres are available for camping and other forms of recreation and the South Fork Timber Sale units do not represent a special or unique recreational opportunity that is not available elsewhere. The no-action alternative would not have these effects.

The effects to recreational fisheries would be minimal because fish habitat conditions downstream would not be detrimentally affected and because the roads in the project are not used by fishers to access fish bearing streams. Access to streams for angling is not altered by any of the action alternatives.

4.16 OTHER

Farm And Prime Range Land
There would be no effect upon prime farmland or prime rangeland. None are present.

Flood Plains Or Wetlands
No flood plains or wetlands are affected by the alternatives.

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

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

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

5.0 CONSULTATION AND COORDINATION

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

FEDERAL, STATE, AND LOCAL AGENCIES

U.S. Fish and Wildlife Service	National Marine Fisheries Service
Oregon Historic Preservation Office	Bonneville Power Administration
Northwest Power Planning Council	Clackamas River Water
South Fork Water Board	Oak Lodge Water Board
Mt. Scott Water District	Bureau of Land Management
Metro	Clackamas River Basin Council

City of Estacada	City of Gresham
City of Lake Oswego	City of Gladstone
City of Oregon City	City of West Linn
Clackamas County	Oregon Department of Transportation
Oregon State Parks	Oregon Department of Forestry
Oregon Department of Fish and Wildlife	Oregon Division of Lands
Oregon Marine Board	Eagle Creek National Fish Hatchery
Environmental Protection Agency	

TRIBES

Confederated Tribes of Warm Springs
Confederated Tribes of Grande Ronde
Yakima Indian Nation Tribal Council

OTHERS

A scoping process to request public input for this project was conducted. A letter describing the proposed project and requesting comments was sent out in May 2002. The Forest publishes a schedule of proposed actions (SOPA) quarterly. The project first appeared in the fall 2001 issue, and in subsequent issues. Comments have been received periodically since then. A 30-day comment period ended on 11/28/2005. Responses to substantive comments are included in Appendix A. A list of persons and organizations that were sent notice is in the analysis file along with a list of commenters and the complete text of comments.

Other formal and informal public involvement efforts have occurred including field trips with interested groups to visit the proposed units. The Clackamas River Stewardship Partners is a collaborative group that is assisting with the recommendation of potential thinning projects to include in stewardship contracts.

List of Preparers

Glenda Goodwyne, - Forester, Certified Silviculturist. Glenda has B.S. Forest Management from Oregon State University, 1985 and an A.A.S. Forest Management from Tuskegee University, 1980. She completed Silviculture Institute at Oregon State University/University of Washington in 1998, and is certified as silviculturist and most recently re-certified in 2003. Glenda has worked as a forester with the Forest Service for 25 years in Oregon, Washington, and California.

Bob Bergamini – Fisheries Biologist. A.A. Fisheries Technology, Mt. Hood Community College, B.A. Biology, University of Connecticut. He has worked for the Forest Service for 16 years.

Sharon Hernandez - Wildlife Biologist. Sharon graduated from Michigan State University in 1992 with a B.S. in Wildlife Management. She has worked as a biologist for the Forest Service for 12 years in Washington and Oregon.

Jim Roden - Writer/Editor. Jim has a B.S. in Forest Management from Northern Arizona University. He has worked as a forester for the Forest Service for 26 years in Wyoming, California, Idaho and Oregon. He is a specialist in timber sale planning, geographic information systems and economic analysis.

James Rice – Supervisory Forester. Jim has a B.S. in Forest Science from Humboldt State University. He has worked for the Forest Service for 27 years in Southern California, Northern California and Oregon. He was a certified silviculturist in Region 5 and is currently a certified silviculturist in Region 6.

Gwen Collier - Soil Scientist. Gwen has a B.S. in Biology and Environmental Science from Willamette University and a B.S. in Soil Science from Oregon State University. She has worked for the Forest Service for 27 years in Oregon, Washington and Idaho. She is a specialist in soil science and hydrology.

Mike Redmond - Environmental Analysis Review - Mike has a B.S and a M.S. degree in Forestry from the University of Illinois. Mike has worked for the Forest Service for 28 years. He is a specialist in the preparation of environmental documents under the National Environmental Policy Act.

Carol Horvath - Botanist. B.S. Community Health from Oregon State University in 1975 and B.S. in Biology with a Botany emphasis from Portland State University in 1994. Worked summer 1991 for The Nature Conservancy and as a Co-op Education Student for the Forest Service during the summers of 1992 and 1993. She has worked for the Mt. Hood National Forest since 1994.

Ivars Steinblums - Forest Hydrologist. Ivars has a B.S. in Forestry from Humboldt State University (1973), and a M.S. in Forest Engineering (Watershed Management) from Oregon State University (1977). He has worked 2 years as a timber appraiser for county government in Northern California, and 28 years as a hydrologist for the Forest Service in California and Oregon.

Jerry Polzin - Logging Systems Specialist. Jerry received a certificate of completion from Missoula Technical Center in 1977. He completed Forest Engineering Institute at Oregon State University in 1981 and Sale Area Layout and Harvest Institute in conjunction with Oregon State University and the University of Idaho in 2002. He has worked in timber sale preparation for the Forest Service for 25 years.

Burnham Chamberlain – Road System Manager. Burnham received a B.S. degree from Western Carolina University in 1976. He has worked on the Mt. Hood NF for 26 years as a forestry and engineering technician.

Susan Rudisill - Archaeological Technician. Susan has worked for the Forest Service for 21 years. She has served as an Archaeological Technician for the Forest Service for 15 years in Oregon. Training: Archaeology at Mt. Hood Community College, Anthropology at Clackamas Community College, Lithic Analysis at The University of Nevada, Reno. She has also received the following training sessions through the Forest Service: Rec. 7, Federal Projects and Historic Preservation Laws.

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Other References

The following data sources and analyses (compact disc format) were referenced and are in the project analysis file:

GIS shape files:	Snag	(snag data)
	Veg2004	(timber type and age data, elk habitat data, owl habitat data)
	Roads	(road data)
Spreadsheets:	arp.xls	(Aggregate Recover Percentage model)
	List of Past Projects – South Fork List of Past Projects.xls	
Text Documents:	Wildlife BA.doc - Programmatic Biological Assessment for Projects with the Potential to Modify the Habitats of Northern Spotted Owls and/or Bald Eagles or Modify Critical Habitat of the Northern Spotted Owl Willamette Province - FY 2005-2006	
	Wildlife BO.doc - Biological Opinion and Letter of Concurrence for Effects to Bald Eagles, Northern Spotted Owls and Northern Spotted Owl Critical Habitat from the U.S. Department of the Interior; Bureau of Land Management, Eugene District and Salem District, the U.S. Department of Agriculture; Mt. Hood National Forest and Willamette National Forest And the Columbia River Gorge National Scenic Area, Calendar Years 2005-2006, Habitat Modification Activities within the Willamette Province	
	Environmental Justice.doc	
	BMP.doc	
	Preliminary Assessment.pdf	
	Lynx Effects Determination memo December 3 of 2003.doc	
	Letters and e-mail documents from commenters	
	Mailing list	

ONRC

ONRC is generally supportive of young stand thinning. We're glad that you proposed some real alternatives to the proposed action that include not building any new roads, and we're also happy to see that you are adopting some variable density thinning techniques to help build a more diverse future forest. Please consider the following comments before issuing the final EA and decision, and **please provide a comment period on the full EA <u>BEFORE</u> making the decision**. *The regulations concerning comment and appeal have been followed (Decision Notice).*

1. Road Building Issues

We have a number of concerns over the proposed reuse of old temporary roads and the building of new temporary roads. Roads harm wildlife, promote spread of invasive species and diseases, damage soil resources, and adversely impact aquatic systems.

As you have heard from us many times, the impacts of temporary roads are far from temporary in nature. Research results, published in *Restoration Ecology,* shows there is nothing temporary about temporary roads, and that ripping out a road is NOT equal to never building a road to begin with.

> The saturated hydraulic conductivity of a ripped road following three rainfall events was significantly greater than that of the road surface before ripping... most saturated hydraulic conductivities after the third rainfall event on a ripped road were in the range of 22 to 35 mm/hr for the belt series and 7 to 25 mm/hr for the granitics. *There are no granitic soils in the project area (s. 4.6).* These conductivities are modest compared to the saturated hydraulic conductivity of a lightly disturbed forest soil of 60 to 80 mm/hr." id. Even this poor showing of restoring pre-road hydrologic effects worsened with repeated rainfall. "Hydraulic conductivity values for the ripped treatment on the granitic soil decreased about 50% with added rainfall ($p(K1=K2)=0.0015$). This corresponded to field observations of soil settlement and large clods of soil created by the fracture of the road surface dissolving under the rainfall... The saturated hydraulic conductivity of the ripped belt series soils also dropped from its initial value. Initially, and for much of the first event, the ripped plots on the belt series soil showed no runoff. During these periods, run-off from higher areas flowed to low areas and into macropores.... Erosion of fine sediment and small gravel eventually clogged these macropores... Anecdotal observations of roads ripped in earlier years revealed that after one winter, the surfaces were nearly as solid and dense as the original road surfaces." Id. Even though ripped roads increase water infiltration over un-ripped roads, it does not restore the forest to a pre-road condition. "These increases do not represent "hydrologic recovery" for the treated areas, however, and a risk of erosion and concentration of water into unstable areas still exists." *The use of the term "temporary road" does not imply that the effects are temporary. The term is used in timber sale contracts for roads that are built by the operator, and obliterated by the operator upon completion. The South Fork analysis does not claim hydrologic recover immediately after obliteration. The analysis uses a model of hydrologic recovery that would show recovery of a temporary road in approximately 35 years (s. 4.2.0.1, s. 4.2.0.2, s. 4.2).*

While you do disclose some of the impacts anticipated from building new temporary roads, we also have concerns about **reusing old temporary roads** that were put in when the stands were originally logged. Your preliminary analysis says nothing about the impacts of reopening/rebuilding these roads. Please disclose information about these roads: Were they located appropriately when built? Are there

any stream crossings, etc? How will reopening and repairing these roads impact soil and water resources? Please disclose how this work will be done and what impacts it will have. *The impacts have been disclosed. There are no stream crossings and the roads have been selected for reuse because they were located in appropriate locations and serve the long-term transportation needs of the area (s. 4.2.0.1, s. 4.2.3).*

2. Thinning Suggestions

Thinning must be done very carefully (and in many cases avoided) in order to avoid, minimize, and mitigate logging's numerous adverse ecological effects including: (1) removal of large trees that are disease and fire resistant (Frost 1999); (2) increased levels of fine fuels and short term fire hazard (Weatherspoon 1996, Huff et al. 1995, Wilson & Dell 1971, Fahnestock 1968); (3) increased mortality of residual trees due to pathogens and mechanical damage to boles and roots (Filip 1994, Hagle & Schmitz 1993); (4) damage to soil integrity through increased erosion, compaction, and loss of litter layer (Harvey et al. 1994, Meurisse & Geist 1994); (5) creation of sediment that may eventually be delivered to streams and harm fish (Grant & Wolff 1991, Beschta 1978); (6) retention of insufficient densities of large trees and woody debris to sustain viable populations of cavity-nesting and woody debris dependent species (DellaSala et al. 1996); and (7) reduced habitat quality for sensitive species associated with cool, moist microsites or closed canopy forests (FEMAT 1993, Thomas et al. 1993). *The units are plantations with no large trees (s. 4.3.1). Where applicable these issues have been addressed in the EA.*

One of your evaluation criteria should be whether any short-term degradation of ACS objectives is off-set by long-term benefits brought about by the proposed action. *The ACS objectives would be met (s. 4.2.13, EA Appendix E).* For example, sediment caused by culvert work will generally be off-set by better fish passage and or better accommodation of high flows. And some insolation, weeds, and soil disturbance from logging can be off-set by enhanced understory diversity and increased growth of conifers brought about directly by the canopy reduction. However, extensive road construction or road reconstruction will not be justified by a small restoration thinning effort. And ground-based logging that allows heavy equipment off of roads may cause significant soil disturbance that will not be offset by any intended benefits to the vegetation. *In addition to the restoration element that would be applicable to riparian reserves, the project has other objectives including health and growth, and providing forest products that also require road use. The EA documents effects to these resources and I have found that the effects are not significant (Decision Notice).*

Again, we like the variability you are starting to regularly build in to your thinning prescriptions. We especially like your plan to treat riparian reserves to create increased diversity and promote future course woody debris, and then leave them alone.

We hope you will design the planned “skips” and “gaps” to protect the few legacy features that are in these stands and the seeps/wetlands that are present but not part of the riparian reserves. *Seeps and wetlands are riparian reserves. Many larger seeps and wetlands are mapped and included in GIS maps of riparian reserves but some are too small to locate accurately or were unknown at the time GIS maps were created. Skips are used to protect the small isolated wet areas that are sometimes found in harvest units (3.6.2).* We also wish you would leave more or all of the minor species in the stands to help promote diversity. *EA s. 3.2.1*

Regarding your specific logging system plans, we feel it would be better NOT to do GB yarding in units 9 and 11 (as proposed in Alt B) due to steep ground. If you do choose Alt C to avoid this, perhaps you could consider dropping the 7 acres in unit 11 to be done with helicopter logging, as this raises the project costs significantly for such a small area. Also in Alt C, 2300 feet of new road to reach 13 acres (unit 13) is far too much. Why not keep tractor swing proposed in Alt B for this unit or drop it altogether? As you might guess, Alt D with no roads is our preferred alternative, but we ask you to still consider the tractor swing proposed in Alt B for unit 13 to drop the cost of doing that unit with helicopter. What is the probability of Alt D being bid on with the helicopter logging in place? Our major concern with Alt D is the reuse/rebuilding of the old roads. Until we see an analysis of their impacts we can not be completely comfortable with this alternative. *The effects of reusing old roads is included in the EA s. 4.2.3, s. 4.5 and s. 4.6. Our analysis shows that helicopter is an expensive logging system. I choose to keep the helicopter options, in part to show the trade-offs between alternatives.*

3. Protect Soil and Water Quality

Soil disturbance caused by logging, road building, skid trails, and pile burning causes erosion that adversely impacts both soil and water resources. Mass failures from roads and logged areas are more frequent, larger, travel farther, contain less wood, and damage a far greater percentage of stream channels in a watershed than do those from mature forests.[1] *Mass failures have not occurred in this area in the past due the stable nature of the landforms and the proposed thinning is not likely to trigger new mass failures (EA s. 4.6).*

Scarification, ripping, and subsoiling does not alleviate the following negative impacts, therefore not completely mitigating:

- compaction of soil and alteration of the soil ecosystem;
- alteration of hydrology, water storage, flow, timing, from soil compaction;
- alteration or loss of native plant communities, and tendency to create conditions which favor noxious weeds or other non-native plants;
- disruption of soil foodweb and biotic communities that serve important soil functions and processes such as aeration, nutrient cycling,

Soil productivity must be zealously guarded in order to protect our forests for future generations. Use of ground-based logging equipment almost always compacts soil causing reduced site productivity, drastically altered soil food web relationships, reduced infiltration, and increase surface runoff. Ground-based logging causes higher incidences of root damage and scarring of residual trees (compared to skyline systems)[2].

Ground-disturbing activities in RR can be extremely detrimental to soil and water resources. While some of the ground in the RR here has probably been previously impacted, please take every precaution to keep ground-disturbance to a minimum in riparian areas so they can continue to recover from management activities.

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[1] May, C.L., 2002. Debris flows through different forest age classes in the central Oregon Coast Range. J. Amer. Water Resour. Assoc., 38: 1097-1113.

[2] Kellog, L., Han, H.S., Mayo, J., and J. Sissel, "Residual Stand Damage from Thinning— Young Stand Diversity Study," Cascade Center for Ecosystem Management.

Even with subsoiling of temporary roads and landings, there will still be impacts to soil resources. I have found that these impacts are not significant (EA s. 4.6 & Decision Notice).

As noted above, we'd also like to see you protect seeps and wetlands more explicitly. *EA s. 3.3.3, & s. 3.6.2.*

We have some concerns with the proposed aerial fertilization near the riparian reserves as well. To minimize chances of drift and spread of the fertilizer into riparian areas, please look at expanding your buffer of these areas. *EA s. 3.6.9. The units proposed for fertilization are not near riparian reserves..*

5. Create more CWD and Snags

Bats, martens, woodpeckers, bears, amphibians, invertebrates, and many other species are dependant upon snags and down wood. Snags and down wood also serve several crucial ecosystem functions related to site productivity, nutrient storage & cycling, hydrology, geomorphology, disturbance, and habitat (terrestrial, riparian and aquatic). Current direction for protecting and providing snags and down wood tend sot be focused on a small subset of the full spectrum of values provided and does not ensure the continued operation of these ecosystem functions or meet the complete lifecycle needs of the many species associated with this unique and valuable habitat component. Please consider all the many values of snags and down wood presented in C.L. Rose, et al's 2001 paper.[3] *EA s. 3.6.2, & s. 4.5.10*.

It seems that you will try to protect any legacy features, and as we've noted above we hope you can do this, if necessary, by using the "skips" and "gaps" built into the prescription. However, there aren't many snags or large down logs here, right? The PA mentions potential for snag and down wood creation in the units. If you can find the money to do this, we hope you will make this a priority, especially in the riparian reserves, where you don't anticipate further treatment.

Ferranti

Roads

- Are there uninventoried roadless areas over 1000 acres in this project? *No.* Is there planned logging or road building within them? This needs to be avoided.
- If a subwatershed exceeds the Mt. Hood National Forest Land Resource Management Plan's (LRMP) standards for road density – no new roads should be constructed or reconstructed. The guidelines of the LRMP were certainly written with logging in mind, so the idea that you need to exceed the LRMP to log is logically absurd. Since the system roads don't take into account the rogue roads, the total road density in this area is even more extreme than is likely to be admitted. *Forest Plan standard and guideline FW-208 refers to OPEN road density for deer and elk and FW-210 specifically suggest that exceptions may occur based on local circumstances. The project is not creating any new system roads or any other road that would*

[3] Rose, C.L., Marcot, B.G., Mellen, T.K., Ohmann, J.L., Waddell, K.L., Lindely, D.L., and B. Schrieber. 2001. Decaying Wood in Pacific Northwest Forests: Concepts and Tools for Habitat Management, Chapter 24 *in* ***Wildlife-Habitat Relationships in Oregon and Washington*** (Johnson, D. H. and T. A. O'Neil. OSU Press. 2001) http://www.nwhi.org/nhi/whrow/chapter24cwb.pdf

remain open to the public. EA s. 4.5.13. Public comment has suggested that we not combine timber sales and restoration projects in one EA. Alternatives A, B and D do not construct new roads. Where old roads are being reused - there are no stream crossings and the roads have been selected for reuse because they were located in appropriate locations and serve the long-term transportation needs of the area. The Clear Creek area has checkerboard ownership with roads that cross National Forest lands and access BLM and private lands. We have an obligation to adjacent owners to honor their access rights. Road density in other areas such as Fish Creek have been reduced far lower that the Forest Plan standard level in part to compensate for other areas where road density would remain higher (EA s. 4.12).

- Landings attract illegal dumping. This is a particular problem in this area. With the large number of landings planned, and the FS unable to address the current illegal dumping problem, this project will just act to aggravate a problem that is intractable at this time. *Since the units have been logged before, existing landings are available to use again.*
- Any economic analysis of this project needs to include the costs of added law enforcement for new illegal dumping sites (as many landing traditionally become. *It is not likely that this project would attract new illegal activity that is not already occurring. Past sales in the area such as Guard and Clear have not caused additional dumping.*

Looking for more clarity on local history

- The area is described as "plantations" though unit 12 appears to be primarily hemlock and silver fir. Has the Forest Service been creating plantations of silver fir? Just to be sure that there is no misunderstanding on my part it would be helpful if it is confirmed that "plantation" is being used to describe active planting of the trees done under the authority of the USFS rather than passive reseeding by adjacent stands. *The term "plantation" is used for stands that have been clearcut and planted to distinguish them from other stands that have not had intensive management. It is common for non planted species to also occur in plantations mixed in with the planted trees. Some silver fir trees can continue to survive from before the clearcut and silver fir, hemlock and other species often seed in from the edge. There are also planted noble fir trees that can sometimes be confused with silver fir. All of the units in South Fork Thinning are plantations: Old aerial photographs from 1960 are on file at the District office that clearly show the units as created clearcuts; and stand records also show the dates of clear cutting and planting (EA s. 4.3.1).*

- Local old-growth density number is not cited or backed-up with historical data. I would expect this type of data to be important when trying to set some sort density targets for the Riparian Reserves. *The target post thin density numbers are not intended to replicate "old-growth" stand density conditions. The intent is to reduce the stand densities so that the dominant trees are capable of maintaining high diameter growth rates, which mimic the early growth rates of many late-successional trees. Research indicates that this strategy would most likely develop future forest stands that replicate late-successional forests (EA s. 4.2.6).*
- Do the density numbers take into account local "old-growth" conditions that change with watershed, elevation, slope aspect, riparian reserve, dominant species, etc.? *See above. Local factors and future events such as insect damage or tree diseases would help to create the future late-successional characteristics.*
- Are current dbhs different between riparian and upland? *No.*
- Are current densities different between riparian and upland? *No.*

Purpose and Need

- How can the FS cite under the Purpose and Need "enhance and restore diversity" when the thinning is going to remove the smallest diameter trees thereby reducing the structural diversity within the stands? *EA Section 3.2.1 & 4.4.3 describe how variability will be achieved.*

Prescription

- Clearcuts for deer should be done in pre-commercial thins, doing it in mid-seral stands is a deceitful way of clearcut logging without public awareness. *No clearcuts are proposed.*
- Any assertion that forage areas need development need to include analysis of private timber lands. With the significant amount of clearcutting done on those adjacent lands, the assertion that more forage is needed within the project area is suspect. *The project does not include the creation of forage areas.*
- Any assertion that forage areas need development need to include analysis of BLM lands. Logging on those BLM adjacent lands may have already created the forage that is needed within the project area is suspect. *The project does not include the creation of forage areas.*
- Fertilization is unnecessary because, as noted, these stands are growing so well that they need to be thinned. *Fertilization is not necessary. It is a proposed action that will enhance the growth and health of stands (EA s. 3.2.3).*
- How will even the full Riparian Reserves be able to block transmission of the fertilizer at all? The mobile nitrogen fertilizer is unlikely to respect the different Riparian Reserve (i.e., perennial vs. intermittent) widths, never mind the non-existent reserve widths for ephemeral streams (termed wetlands under 1 acre) which could act quite effectively in delivering the nitrogen load downstream. *EA. s. 3.6.9, 4.2.5. The units considered for fertilization are not near riparian reserves.*
- Thinning smallest trees leaves units more homogenous not less homogenous. *The trees in the plantations are very similar in size and are part of one canopy layer. See EA s. 3.2.1 & 4.4.3 for a description of variable thinning.*

Riparian

- Heavy Riparian Reserve logging has unknown consequences for how well the Riparian Reserves will continue to function as connectivity corridors. What are the references and citations for this approach? *Proposed thinning in riparian reserves would be designed to meet riparian reserve objectives of enhancing late-successional characteristics (EA s. 4.2.6). Silvicultural diagnosis is in Appendix E.*
- Any patches of laminated root rot that occur in riparian areas should be left untouched since they naturally act to create canopy openings. Not only do they create these openings, but the disease acts to enhance deciduous growth (very important to creating more diversity within conifer forests) by targeting confers (deciduous maple and alder are immune). *Totally avoiding root rot patches is not feasible because there are no clear lines delineating where the fungus is present and where it is absent in the forest. If the fungus has reduced stocking in a patch to a level less than the prescribed leave tree density then no additional thinning would occur.*
- Any patches with native tree disease in addition to laminated root rot that occur in riparian areas should be left untouched since they naturally act to create canopy openings and increase structural heterogeneity. *See above.*
- Unit 12 just "leaks," in a simple transect I found numerous wetlands under 1 acre. What provisions are there for protecting this diversity? *Seeps and springs may be excluded from the unit boundary or may be protected by marking leave trees around the perimeter (EA s. 3.2.2).*

- The concept that intermittent streams don't need as large a no-cut buffer as perennial streams is logically flawed. Air-borne dust, rain, and rain-on-snow events – primary non-catastrophic mechanisms for sediment transport into local streams operate equally well for both perennial and intermittent streams. Simply put, intermittent streams (streams with enough water flow that they show either annual deposition or scour) are running when you get either rain or rain-on-snow and need the same level of protection as the perennial streams. Airborne dust from summer road travel deposits in intermittent stream beds and on the surrounding vegetation – this dust will mobilize when it rains and the intermittent streams flows again. There is little difference in terms of sediment transport between perennial and intermittent streams and the use of the smaller -or zero- no-cut buffer appears illogical and poorly reasoned. *The no-harvest buffers for perennial streams are wider to provide additional shade.*
- Under no circumstances are landings appropriate in riparian reserves. *EA s. 3.6.7. The design criteria were developed with input from NOAA Fisheries to provide adequate protection to aquatic resources.*
- Fertilization is a danger since it is so mobile the changes are that it will end up in the local waterways adding to the nitrogen loading in local streams. *EA. s. 3.6.9, 4.2.5. The units considered for fertilization have gentle slopes and no direct connection to streams.*

Soil

- Forest plan standards on detrimental soil conditions were written with logging in mind. If the area exceeds LRMP then there should be no further disturbance in those areas until they are recovered to the LRMP standard. *The Forest Plan gives direction for "should" standards and guidelines. The no-action alternative was considered. See Decision Notice and EA s. 4.6.*
- It is reasonable for the ARP to include past, present, and future BLM and private land use planning, since this information would be required for both FS and FWS to adequately address the impact of the sale on ESA listed species (e.g., northern spotted owl, various anadromous species). Since it is reasonable to assume that the FS has this information, it is reasonable to assume that any ARP numbers that are run include them. *The ARP analysis to document consistency with Forest Plan standards and guidelines applies to National Forest lands (EA s. 4.2.12). The watersheds contain both BLM and private lands. The anticipated impact of the project to forest hydrology is so small that it would not likely result in a significant incremental effect to the watershed as a whole (Decision Notice).*

SOUTH FORK ENVIRONMENTAL ASSESSMENT
BIOLOGICAL EVALUATION

FOR THOSE WILDLIFE SPECIES LISTED AS THREATENED, ENDANGERED, OR PROPOSED UNDER SECTION 4 OF THE ENDANGERED SPECIES ACT & SENSITIVE SPECIES UNDER THE REGIONAL FORESTER'S LIST

DATE: January 5, 2006

Clackamas River Ranger District
Mt. Hood National Forest

/S/ ***Sharon Hernandez*** **January 5, 2006**

Written by: _____ **Date:** _____

Sharon Hernandez, Supervisory Wildlife Biologist

EXECUTIVE SUMMARY

Forest management activities that may alter the habitat for threatened, endangered, sensitive or proposed species are required to undergo review in a Biological Evaluation (FSM 2671.44 and FSM 2670.32) as part of the National Environmental Policy Act process. The Biological Evaluation process (FSM 2672.43) is intended to document that proposed management actions will not jeopardize the continued existence or cause adverse modification of habitat for listed or proposed species, or (for sensitive species) lead towards the likelihood of Federal Listing.

The attached Executive Summary serves as documentation to display the effects of the 2005 South Fork Thin on threatened, endangered, and Forest Service Regional Forester's sensitive species that are documented or suspected to occur within the Mt. Hood National Forest. A more detailed analysis of project effects to species can be found in the body of this biological evaluation. (Note: No wildlife proposed or endangered species exists on the Mt. Hood National Forest.)

Table 1: Executive Summary: 2005 South Fork Commercial Thin

Listed or Regional Forester's Sensitive Species	Field Review – Presence of Suitable Habitat for Species	USFWS Consultation Requirements	Preferred Alternative Effects/ Impacts Call
Threatened			
Northern Spotted Owl (threatened)	*Yes*	Consultation Required	May Affect, Not Likely to Adversely Affect
Northern Bald Eagle (threatened)	*No*	None Required	No Effect
Sensitive			
Oregon Slender Salamander (sensitive)	*No*	None Required	No Impact
Larch Mountain Salamander (sensitive)	*No*	None Required	No Impact
Cope's Giant Salamander (sensitive)	*Yes*	None Required	No Impact
Casacade Torrent Salamander (sensitive)	*Yes*	None Required	No Impact
Oregon Spotted Frog (sensitive)	*Yes*	None Required	No Impact
Painted Turtle (sensitive)	*No*	None Required	No Impact
Northwestern Pond Turtle (sensitive)	*No*	None Required	No Impact
Horned Grebe (sensitive)	*No*	None Required	No Impact
Bufflehead (sensitive)	*No*	None Required	No Impact
Harlequin Duck (sensitive)	*No*	None Required	No Impact
American Peregrine Falcon (sensitive)	*No*	None Required	No Impact
Gray Flycatcher (sensitive)	*No*	None Required	No Impact
Baird's Shrew (sensitive)	*No*	None Required	No Impact
Pacific Fringe-tailed Bat (sensitive)	*Yes*	None Required	No Impact
California Wolverine (sensitive)	*No*	None Required	No Impact
Puget Oregonian*	*No*	None Required	No Impact
Columbia Oregonian*	*No*	None Required	No Impact
Evening Fieldslug*	*Yes*	None Required	May Impact Individuals, but not Likely to Cause a Trend to Federal Listing or Loss of Viability to the Species
Dalles Sideband*	*No*	None Required	No Impact
Crater Lake Tightcoil*	*No*	None Required	No Impact

*These species were formerly Survey and Manage Species and are currently classified as a Sensitive species on the Region 6 Regional Forester's Sensitive Species list for the Mt. Hood National Forest.

PROJECT BACKGROUND AND ALTERNATIVE SUMMARY

This timber sale is located within the Clackamas River Ranger District of the Mt. Hood National Forest. The stands occur within the South Fork Clackamas River, Clear Creek, and Molalla River watersheds. The proposed action (Alternative B) is to thin and harvest wood fiber from approximately 425 acres of matrix land and approximately 76 acres of riparian reserves.

The harvesting operation would utilize a variable density thinning prescription and generally remove the smaller trees, leaving approximately 80 to 140 variably spaced trees per acre. The average cut tree size would be approximately 10-15 inches in diameter. Legacy trees would be retained. (Legacy trees are scattered large mature trees that have survived a stand initiating wildfire or that have been retained in a plantation).

On the areas proposed for riparian reserve thinning, the prescription would be adjusted to create a wider spacing of leave trees. The intention is to enhance riparian reserves by accelerating the development of mature and late-successional stand conditions.

For this project, riparian reserve widths are 180 feet for non-fish-bearing streams and 360 feet for fish-bearing streams. A Design Criteria within the South Fork Environmental Assessment discusses no-harvest buffers of approximately 30 to 50 feet along streams. There are some small seeps and wet areas that would also be excluded from harvest.

If funding becomes available, 200 pounds of nitrogen per acre would be aerially applied to approximately 178 acres of second-growth plantations within the matrix. Fertilization is proposed in units 1, 3, 4, 5, and 7. Fertilization would not occur within riparian reserves.

When temporary roads are proposed to access landings they would be obliterated and revegetated after completion of the project. Where existing decommissioned or overgrown roads are proposed to be reopened they would also be obliterated. Other roads have berms or driveable waterbars that would also be temporarily removed. Upon project completion, the roads that were opened would be returned to their pre-project condition.

The following gives a brief description of the alternatives:

ALTERNATIVE A: Under the no-action alternative, current management plans would continue to guide management of the project area. No timber harvest would be accomplished under this proposal.

ALTERNATIVE B: This alternative would thin plantations by using the same logging method used for the original harvest. Old roads, landings and skid trails would generally be reused. In this alternative 295 acres would be logged using ground-based systems and an additional 202 acres would be skyline logged. Approximately 12,950 feet of old, overgrown roads would be re-opened. No new temporary roads would be built.

ALTERNATIVE C: In some instances, using the same logging methods and roads may result in impacts that could be alleviated by planning a different logging system. Alternative C would be similar to B in units where there are few resource concerns. In other units a new logging method and road system would be proposed. Since future thinning or other forest management is likely to occur in plantations, the new logging method and/or road system would be designed and located to serve long-term management and transportation needs. This alternative proposes 255 acres of ground-based logging, 235 acres of skyline, and 7 acres of helicopter logging. Approximately 12,950 feet of old, overgrown road would be re-opened and 2,300 feet of new temporary road constructed.

ALTERNATIVE D: Alternative D would be similar to C except in units where certain new temporary road construction (from alternative C) would raise the level of concern based on their length, terrain or cost. Short lengths of road construction may be included but long roads would not. In units affected by the deletion of road construction with this alternative, the units would either be logged using the original logging method, or would use helicopter or some other non-traditional method. This alternative proposes 255 acres of ground-based logging, 222 acres of skyline harvest and 20 acres of helicopter logging. Approximately 12,950 feet of old, overgrown roads would be re-opened. No new temporary roads would be constructed.

SPECIES SPECIFIC DISCUSSIONS

Northern Spotted Owl
(*Strix occidentalis caurina* – threatened)

A. HABITAT

Old growth coniferous forest is the preferred nesting, roosting and foraging habitat of spotted owls in Oregon. Old growth habitat components that are typical for spotted owls are: multilayered canopies, closed canopies, large diameter trees, abundance of dead or defective standing trees, and abundance of dead and down woody material.

Habitat for the owl is further 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 this habitat is 80 years of age or older, multi-storied and has sufficient snags and down wood to provide opportunities for nesting, roosting and foraging. The canopy closure generally exceeds 60 percent. Dispersal habitat for the owl generally 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 dbh of 11". Spotted owls use dispersal habitat to move between blocks of suitable habitat; juveniles use it to disperse from natal territories. Dispersal habitat may have roosting and foraging components, enabling spotted owls to survive, but lack structure suitable for nesting.

B. FIELD REVIEW

Habitat available on the district
The last time extensive field surveys were conducted on the District was from 1979 to approximately 1994; in which the Regional protocol per Regional Forester's direction of March, 1993 was followed. During that time period there had been many documented sightings of adults and young produced on the District. (Historic records are on file at the District office). However, none of these surveys are considered current and valid for project planning effects analysis. Current management direction is to assume that all suitable (nesting/ roosting/foraging) habitat for spotted owls is currently occupied and to manage the site accordingly.

Habitat available within the project area
Yes. Approximately 406 acres are dispersal-only habitat for the spotted owl. This habitat can be found in units 4 through 13. The remaining 91 acres in units 1 through 3 are considered capable habitat for the spotted owl (e.g. Stands that are not currently providing habitat for the spotted owl but which have the potential to grow into dispersal habitat in the future). There is no nesting/roosting/foraging (i.e. NRF or suitable) habitat proposed for harvest.

C. ANALYSIS OF DIRECT/INDIRECT EFFECTS

Alternative A (No action)
No direct effects to the owl would be predicted with this alternative. For the short term, the units that are considered dispersal-only habitat (4-13) would continue to function as dispersal. It is estimated that the units currently providing no habitat for the owl (1-3) would obtain dispersal habitat characteristics in approximately eleven years (4 years slower than in the action alternative). Long term effects within the next 40-50 years would be that the stands would start to differentiate and show an increase in the levels of snags, down wood and understory development. The quality of dispersal (i.e. foraging and roosting) habitat would increase in quality to varying degrees, but the stands would likely never achieve suitable (i.e. nesting) spotted owl habitat due to the current management direction in the area.

Alternatives B (Proposed Action), C and D

North Willamette Late-Successional Reserve Areas and Critical Habitat Units:
The proposed action will not occur within a Late-Successional Reserve (LSR) or Critical Habitat Unit (CHU). Units 1, 2 and 6 do have boundaries that are shared with an LSR. The entire sale occurs within the Matrix and Riparian Reserve Land Allocations of the Northwest Forest Plan.

Effects to Dispersal Habitat on a Local and Watershed Scale

The proposed action will have an effect on dispersal-only habitat. Ten of the proposed units (406 acres) within the South Fork Environmental Assessment are considered dispersal-only habitat. The remaining three of the harvest units (91 acres) are considered non-habitat for the spotted owl. Dispersal habitat described below is a combination of NRF and dispersal-only habitat (i.e. All NRF habitat meets the requirements of dispersal habitat).

The South Fork Thinning Project occurs within the South Fork Clackamas, Clear Creek, and Mollala Watersheds. The spotted owl analysis area that was used is 20,041 acres in size and comprises all of South Fork Clackamas Watershed and small portions of Clear Creek and Mollala Watersheds. Land ownership within the analysis area is comprised of mainly Forest Service lands with small portions of Bureau of Land Management and other ownerships. Dispersal habitat (11/40 rule - average 11 inch DBH with an average canopy cover of 40%) comprises approximately 62% (12,425 acres) of the area. The proposed action will degrade (reduce in quality) approximately 3.3% (406 acres) of the currently available dispersal habitat from the analysis area.

A recent study by Meiman et al (2004) reports changes in spotted owl use following a commercial thinning in stands near core areas in Clatsop State Forest. Although sample sizes were not large, proportional use of the thinned area was significantly less during and post-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 short term adverse impacts.

Since current spotted owl surveys have not been completed for the area, it must be assumed that all suitable habitat has the potential to contain spotted owl activity centers. Since there is no adequate suitable habitat adjacent to the proposed thinning stands that are currently providing dispersal habitat, there is no potential for adverse impacts to a spotted owl activity center.

Although the dispersal habitat characteristics of units 4-13 will be reduced in quality, they will still function as dispersal habitat for the owl. No loss of dispersal habitat will occur. It is estimated that these units would again provide the same quality of habitat in approximately nine years after harvest. Units 1, 2 and 3 are currently providing no habitat for the spotted owl and will benefit the most from this proposed treatment by hastening their attainment as dispersal habitat. It is estimated that these units currently providing capable habitat would become dispersal habitat in about seven years (e.g. Four years quicker than if no timber management occurred in the units). All of the units would provide for better quality dispersal habitat within approximately 15-20 years after harvest than if they had never been harvested (i.e. no action alternative). Current management direction shows that harvest operations could occur again in the units within 20-30 years, thus preventing any attainment of suitable spotted owl habitat characteristics.

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

The United States Fish and Wildlife Service issued an opinion on the effects of the South Fork Timber Sale as well as many other projects within the document titled "Biological Opinion and Letter of Concurrence for Effects to Bald Eagles, Northern Spotted Owls and Northern Spotted Owl Critical Habitat from the U.S. Department of the Interior; Bureau of Land Management, Eugene District and Salem District, the U.S. Department of Agriculture; Mt. Hood National Forest and Willamette National Forest and the Columbia River Gorge National Scenic Area Calender Years 2005-2006 Habitat Modification Activities within the Willamette Province (USDI 2005)" The conclusion they reached is the following: "After reviewing the current status of the spotted owl and bald eagle, including critical habitat, the environmental baseline for both species, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the FY 2005-2006 Habitat Modification Projects in the Willamette Province are not likely to jeopardize the continued existence of the bald eagle or spotted owl and is not likely to destroy or adversely modify designated critical habitat for the spotted owl" (USDI 2005). The Service's rationale for these conclusions can be found within the Biological Opinion noted above.

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

The Record of Decision (ROD) for Amendments to Forest Service and Bureau of Land Management Project Documents within the Range of the Northern Spotted Owl 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 1994). The South Fork Environmental Assessment meets all the Standards and Guidelines set forth within this decision document.

It was stated on page 31 of this document that implementation of the Record of Decision would "adequately provide for the continued viability of the northern spotted owl on Federal Lands as required by NFMA and would provide federal lands contribution to recovery of the northern spotted owl under ESA."

A report was published by Sustainable Ecosystems Institute of Portland Oregon (September 2004). The report is titled "Scientific evaluation of the status of the Northern Spotted Owl."(S P Courtney, J A Blakesley, R E Bigley, M L Cody, J P Dumbacher, R C Fleischer, AB Franklin, J F Franklin, R J Gutiérrez, J M Marzluff, L Sztukowski). The Programmatic Biological Opinion applicable to this project addressed the items brought up by this report.

The report is a review and synthesis of information on the status of the Northern Spotted Owl. The report was prepared to aid the United States 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, and focused on identifying the best available science, and the most appropriate interpretations of that science. The focus is on 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 et al.

The following excerpt is from the executive summary of the SEI report. The italicized portion below each paragraph gives project specific information on that topic.

> Central to understanding the status of the subspecies is an evaluation of its taxonomic status. The panel is unanimous in finding that the Northern Spotted Owl is a distinct subspecies, well differentiated from other subspecies of Spotted Owls. *This information was considered and incorporated when developing the assessment of effects for the South Fork project.*
>
> The panel did not identify any genetic issues that were currently significant threats to Northern Spotted Owls, with the possible exception that the small Canadian population may be at such low levels that inbreeding, hybridization, and other effects could occur. *This information was considered and incorporated when developing the assessment of effects for the South Fork project. The South Fork project would not affect Canadian owls.*
>
> The use of habitat and of prey varies through the range of the subspecies. These two factors interact with each other and also with other factors such as weather, harvest history, habitat heterogeneity etc, to affect local habitat associations. While the general conclusion still holds that Northern Spotted Owls typically need some late-successional habitat, other habitat components are also important (at least in some parts of the range). *This information was considered and incorporated when developing the assessment of effects for the South Fork project.*
>
> The available data on habitat distribution and trends are somewhat limited. Development of new habitat is predicted under some models. However our ability to evaluate habitat trends is hampered by the lack of an adequate baseline. Given these caveats, the best available data suggest that timber harvest has decreased greatly since the time of listing, and that a major cause of habitat loss on federal lands is fire. In the future, Sudden Oak Death may become a threat to habitat in parts of the subspecies' range. *This information was considered and incorporated when developing the assessment of effects for the South Fork project. There have been no large fires in the South Fork area in recent years. Sudden Oak Death has not been found in the South Fork area.*
>
> Barred Owls are an invasive species, that may have competitive effects on Northern Spotted Owls (as was recognized at the time of listing). Opinion on the panel was divided on the effects of Barred Owls. While all panelists thought this was a major threat, some panelists felt that the scientific case for the effects of Barred Owls remained inconclusive; other panelists were more certain on this issue. *This information was considered and incorporated when developing the assessment of effects for the South Fork project. Barred owls are discussed within the cumulative effects section below.* .
>
> The demography of the Northern Spotted Owl has been recently summarized in a meta-analysis (Anthony et al 2004), which is the most appropriate source for information on trends. Although the overall population, and some individual populations show signs of decline, we cannot determine whether these rates are lower than predicted under the Northwest Forest Plan (since there is no baseline prediction under that plan). However the decline of all four Washington state study populations was not predicted, and may indicate that conditions in that state are less suitable for Northern Spotted Owls. Several reasons for this pattern are plausible (including harvest history, Barred Owls, weather).

The South Fork project area was not part of the demographic studies summarized by Anthony et al. (2004). Of the 14 study areas, one is nearby. The nearest is the H.J. Andrews study area. The estimated spotted owl population on the H.J. Andrews study area is 70-80% of the 1987 initial population size. The data from the report suggested that populations over all of the 14 study areas were declining about 4% per year during the study. It also was suggested that owl populations on federal lands had better demographic rates than elsewhere and that populations were doing poorest in Washington. This information was considered and incorporated when developing the assessment of effects for the South Fork project.

There is currently little information on predation on Spotted Owls, and no empirical support for the hypothesis, advanced at the time of listing, that fragmentation of forest after harvest increases predation risk. *This information was considered and incorporated when developing the assessment of effects for the South Fork project.*

West Nile Virus is a potential threat, but of uncertain magnitude and effect. *This information was considered and incorporated when developing the assessment of effects for the South Fork project. West Nile Virus has not been identified in the South Fork project area.*

In general, conservation strategies for the Northern Spotted Owl are based on sound scientific principles and findings, which have not substantially altered since the time of listing (1990), the Final Draft Recovery Plan (1992) and adoption of the Northwest Forest Plan (1994). Nevertheless we identify several aspects of conservation and forest management that may increase both short and medium term risks to the species. These are typically due to failures of implementation.

A full evaluation of the uncertainties of the data, the conclusions that can be drawn from them, and of the perceived threats to the subspecies, are shown in the summary of individual panelist responses to a questionnaire.

Major threats to Northern Spotted Owls at this time include: the effects of past and current harvest; loss of habitat to fire; Barred Owls. Other threats are also present. Of threats identified at the time of listing, only one (predation linked to fragmentation) does not now appear well supported.

D. ANALYSIS OF CUMULATIVE EFFECTS

The spotted owl analysis area appears to have adequate dispersal habitat for spotted owls. Dispersal habitat is potentially limited in adjacent areas outside the Forest in the Clear Creek and Molalla River Watersheds due to their land base being predominantly in private ownership. In this 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. A foreseeable future action that is likely to occur within this spotted owl analysis area is the BLM Hillock Timber Sale which proposed to degrade approximately 500 acres of dispersal-only habitat. Considering the Hillock Timber Sale's effects to spotted owls, the cumulative effects on dispersal habitat from the South Fork Project would still be minor, mainly because overall only a small percentage of dispersal habitat would be affected and it is not likely the limiting factor for owls in the analysis area. There would be no cumulative effects on suitable owl habitat because this project does not impact this habitat type.

The barred owl has been expanding into northern spotted owl territory from northeastern Canada since about 1900, moving into Washington, Oregon and Northern California and in some cases has been displacing spotted owls. Barred owls are known to be present on the Forest. Barred owls may be expanding their range because of changes to forest structure from logging, wildfire or climate change.

E. CONFLICT DETERMINATION (all alternatives):

All action alternatives for the South Fork Commercial Thinning Project will have a **"May Affect, and is Not Likely to Adversely Affect,"** call on the spotted owl and its habitat.

F. COMMUNICATION WITH U.S. FISH AND WILDLIFE SERVICE:

The northern spotted owl is listed as threatened throughout its range under the endangered species act (55 CFR 26114) on June 22, 1990. Any action that would result in a beneficial effect or could result in an adverse impact to the spotted owl would result in a may effect determination and would require consultation with the U.S. Fish and Wildlife Service.

Consultation with the U.S. Fish and Wildlife Service was initiated on the "South Fork Timber Sale" in August of 2004 through the document titled "The Programmatic Biological Assessment for Projects with the Potential to Modify the Habitats of Northern Spotted Owls and/or Bald Eagles or Modify Critical Habitats of the Northern Spotted Owl - Willamette Province FY 2005-2006." The Fish and Wildlife Service issued the Biological Opinion in March 2005. More information on the Biological Opinion is found about under the Effects to spotted owl on a province scale.

Northern Bald Eagle

(*Haliaeetus leucocephalus* – threatened)

A. HABITAT

The bald eagle is a permanent resident in Oregon. Their nests are usually located in multi-storied stands with old-growth components, and are near water bodies that support an adequate food supply. Nests, which usually consist of a bulky platform of sticks, are usually located in the super-canopy of trees, or even on a cliff. Nest sites are usually within ¼ mile of water in the Cascades.

Adequate forage sources are possibly the most critical component of bald eagle breeding and wintering habitat. Fish, waterfowl, rabbits, and various types of carrion comprise the most common food sources for eagles in the Pacific Recovery Plan area. Wintering bald eagles perch on a variety of substrates, proximity to a food source being the most important factor influencing perch selection. Eagles tend to use the highest perch sites available that provides a good view of the surrounding area. Communal roosts are invariably near a rich food source and in forest stands that are multi-storied and have at least a remnant old growth component.

B. FIELD REVIEW

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

Habitat available within the project area

No. Although Bald Eagles are commonly seen along the South Fork of the Clackamas River late summer through early fall, this river and other parts of the watershed do not appear to contain adequate foraging habitat for the species (USDA 1997). Prey availability appears also to be the limiting factor for bald eagles within the Clear Creek Watershed. According to the Hillock Environmental Assessment (USDI 2005), bald eagles have never been observed in the Hillock Area. The Molalla River Watershed Analysis (USDI 1999) states that bald eagles are suspected as rare migrants in the watershed and have been observed in the lower portions of the watershed. There are no known nest sites within the watershed (USDI 1999).

No further analysis needed due to lack of habitat.

Larch Mountain Salamander

(*Plethodon larseli* – Sensitive**)**

A. HABITAT

Habitat is mainly restricted to the talus slopes of the Columbia River Gorge, although the species is now known to occur at several locations in the Cascade Mountains of Washington. This salamander can be found near the surface under rocks during wet weather, but it retreats to considerable depths in the talus during cold and dry weather. Individuals can occur far from streams and seepages and seem to be less common in perpetually wet talus than in talus that varies from wet to dry with seasonal rainfall.

B. FIELD REVIEW

Habitat available within the project area
No. The South Fork Thin occurs just south of the identified Larch Mountain salamander distribution range as defined in the Northwest Forest Plan. Although 70 acres of rock/talus exists within the South Fork Clackamas River Drainage, it is not located in the steep, wooded areas preferred by the Larch Mountain Salamander (USDA 1997). The Clear Creek Watershed Analysis states that habitat may be available for the Larch Mountain Salamander, but all known occurrences are limited in areas in close proximity to the Columbia River Gorge (USDA 1995). In addition, all of the proposed timber sale units do not occur within or directly adjacent to any talus slopes.

No further analysis needed due to lack of habitat

Oregon Slender Salamander
(*Batrachoseps wright* - Sensitive)

A. HABITAT

The only amphibian endemic to Oregon, this species is found predominantly on the west slope of the Cascade Range from the Columbia River south to southern Lane County. Sites have been found in Lane, Linn, Clackamas, and Multnomah counties as well as a few sites on the eastern slopes of the Cascades in Hood River and Wasco counties. Sites are generally scarce, occurring in scattered and often widely separated colonies, but sometimes locally common. It is known to occur at only a few dozen localities.

The Oregon Slender salamander is found in moist woods consisting of Douglas fir, maple, hemlock, and red cedar. It is most common in mature Douglas-fir forests and appears to be dependent on mature and old growth stands. Individuals are found under rocks, wood, or bark and wood chips at the base of stumps as well as under the bark and moss of logs. They are also found in rotting logs, in holes and crevices in the ground, and in termite burrows. Nests that have been located were found under bark and in rotten logs.

B. FIELD REVIEW

The species has been documented in the Clear Creek Watershed, but have not been found in previously harvested areas regardless of the availability of significant quantities of down logs (USDA 1995). All the proposed harvest units occur within managed plantations, the oldest being 54 years. There are few, if any, remnant structures left over from the previous stand.

Habitat available within the project area
None. All of the proposed units do not have the habitat components necessary for occupation by the species.

Cope's Giant Salamander (*Dicamptodon copei* - Sensitive) & Oregon Spotted Frog (*Rana pretiosa* – Sensitive)

A. HABITAT

Cope's Giant Salamander: Cope's Giant salamander prefers streams and seepages in moist coniferous forests. They limit their occurrence to waters with temperatures in the 8 to 14 degrees Celsius range. They will also inhabit cold clear mountain lakes and ponds. They occur in suitable areas from sea level up to 1,350 meters elevation. The Cope's salamander breed and rear its young within the cracks and crevices of the rocky substrates within the stream course. They sometimes leave streams on wet rainy nights but remain on wet rocks and vegetation near the stream. This salamander is most frequently found on pieces of wood in streams, under logs, bark, rocks or other objects near streams.

Oregon Spotted Frog: The range of this species is from Northern British Columbia and coastal southern Alaska south to the Rocky Mountains of Idaho, Montana, and Utah. Populations are also present in both the interior and coastal mountains of the Pacific Northwest.

The Oregon Spotted Frog is a highly aquatic species that is rarely found far from permanent water. This species frequents waters and associated vegetated shorelines of ponds, springs, marshes, and slow-flowing streams and appears to prefer waters with a bottom layer of dead and decaying vegetation. They are found in aquatic sites in a variety of vegetation types, from grasslands to forests. Individuals may disperse into adjacent non-aquatic areas during wet weather.

The Oregon Spotted frog and Cope's giant salamander has the potential to be negatively affected by increased sedimentation resulting from timber sale activities adjacent to or intersecting streams and water sources. Sediment deposition within the substrate could impair preferred habitat characteristics. Also, sedimentation of streams can lead to asphyxiation of embryos and larvae as well as a degradation of overwintering habitat that may result in local extinctions.

B. FIELD REVIEW

Cope's Giant Salamander: This species' range is predominantly west of the Cascade Range. Potential habitat for this species does exist within the Clackamas River Ranger District. There have been documented sightings of the species within the South Fork Clackamas River Watershed (USDA1997). A portion of the planning area appears to have all the habitat characteristics necessary for species' occupancy.

The Cope's Giant Salamander is difficult to identify and can be easily confused with the Pacific Giant Salamander (Dicamptadon tenebrosus). There have been numerous sightings reported from streams on the Clackamas River Ranger District, many of which have not been positively confirmed.

Oregon Spotted Frog: This species is highly aquatic and needs a permanent water source to survive. Potential habitat for this species does exist within the Clackamas River Ranger District. A portion of the planning area appears to have all the habitat characteristics necessary for species' occupancy.

Habitat available within the project area
Yes. Six of the units (2, 6, boundary of 10 and 11, 12 & 13) within the South Fork Commercial Thinning Project include perennial streams that have potential habitat for the Cope's Giant Salamander and Oregon Spotted Frog.

C. ANALYSIS OF DIRECT/INDIRECT EFFECTS

Alternative A (No Action)

No effects to the Cope's Giant salamander or Oregon Spotted frog would occur with implementation of this alternative. The streams and wet areas within the stands would continue to provide potential habitat for the species for possibly far into the future.

Alternative B (Proposed Action) and D

Effects to Habitat and Individuals
There are several perennial streams occurring within six of the South Fork units. These 74 acres of riparian reserves will have active management occurring within them except for the no-cut buffers described below. A minimum of a 50-foot no-harvest buffer will be established along the active channel of all perennial streams. Larger buffer widths may be needed on a site-specific basis to prevent any increase in sediment delivery rates or a decrease in stream shading. Smaller buffer widths would be allowed if it is determined on a site specific basis that there would be no increase in sediment delivery rates or decrease in stream shading.

These buffers described above would be in place during the length of the timber sale and post-sale activities, including road construction. It is likely that the potential habitat for the Cope's Giant Salamander and Oregon Spotted frog would be present within these buffers. These no-cut areas should prevent any un-intentional extirpation or injuring of individuals that may be present near the water sources during on-the-ground activities.

The potential for increased sedimentation to these water sources would be minimized because the vegetative buffer created by the no-harvest buffers should act as an effective barrier to any sediment being transported by surface erosion or runoff. In addition, these no-harvest buffers would allow soil infiltration between the areas of activity and any water source. Even if some movement occurred, the vegetated buffer strips along the water source would act as an effective barrier. Although there is the potential that small micro-climate changes would occur with implementation of this project, the change is not predicted to be substantial enough to affect habitation of the areas by Cope's Giant salamander and Oregon Spotted frog.

Alternative C

The effects are the same as alternative B. Measures are being taken within alternative B to minimize any detrimental effects from the re-opening of old, overgrown roads and thinning in riparian reserves. These same measures are also being taken with the 2,300 feet of new temporary road construction that will occur with this alternative. Consequently, this alternative that includes new temporary road building would have no additional detrimental effects.

D. CUMULATIVE EFFECTS

None since no effects are predicted to occur with the action alternatives action.

E. CONFLICT DETERMINATION

The action alternatives of the South Fork Thin will have a **"No Impact"** on the Cope's Giant salamander and Oregon Spotted frog or their habitat.

Cascade Torrent Salamander

(*Rhyacotriton cascadae* – Sensitive)

A. HABITAT

The range of this species is from the coastal mountains on the Olympic Peninsula in Washington south to Mendocino County, California. It also has a known population in the Cascade Mountains of southern Washington and northern Oregon, with a local disjunct population in the southern Oregon Cascades.

The torrent salamander is most abundant in rocks bathed in a constant flow of cold water, but also occurs in cool rocky streams, lakes, and seeps. Individuals from this species require microclimatic and microhabitat conditions generally found only in older forests.

The diet of this salamander consists of aquatic and semi-aquatic invertebrates, including amphipods, springtails, fly larvae, worms, snails, and spiders. They search for prey under rocks and other objects in streams. Adults occasionally are found under surface objects a few meters from water after heavy rains, but they are the most aquatic of our metamorphosed salamanders and should be expected only in saturated stream-side talus and in streams. Experiments have shown that this species are among the most sensitive of all terrestrial northwestern salamanders to loss of body water and will die quickly in a desiccating environment.

B. FIELD REVIEW

The Cascade Torrent Salamander is suspected to occur within the vicinity of the proposed project (USDI 2004). There have been documented sightings of this species within the South Fork Clackamas River Watershed (USDA 1997). Potential habitat also exists for this species within Molalla River and Clear Creek watersheds.

Habitat available within the project area

No. All the proposed harvest units consist of young, managed second-growth stands, the oldest being approximately 50 years. None of these units have the habitat components necessary for occupancy by the Cascade Torrent Salamander.

No further analysis needed due to lack of habitat.

Gray Flycatcher
(Empidonax wrightii – Sensitive)

A. HABITAT

The Gray Flycatcher is a bird of the arid interior West. It prefers relatively treeless areas with tall sagebrush, bitterbrush, or mountain mahogany communities. It will also occupy these communities within open forests of ponderosa or lodgepole pine. It also lives in juniper woodland with a sagebrush understory.

B. FIELD REVIEW

Habitat available within the project area
None. There is no habitat for this species on the Clackamas River Ranger District

No further analysis needed due to lack of habitat.

American Peregrine Falcon
(Falco peregrinus anatum – Sensitive)

A. HABITAT

The most critical habitat components for Peregrine Falcons are suitable nest sites, usually cliffs, and overlooking fairly open areas with an ample food supply. They nest along seacoasts, near marshes, and even in cities, but are not well suited to life in interior forests. They usually nest or roost near a marsh, lake, or coast where water birds are plentiful.

B. FIELD REVIEW

This species is not known to be residing within the South Fork Clackamas River watershed (USDA 1997). Because of the proximity of an active peregrine falcon eyrie, the species could be occasionally observed in the watershed.

Habitat available within the project area
No, there are no cliffs that have the potential to be occupied by peregrine falcons in the vicinity of the proposed project area. The nearest active eyrie is over 3 miles away within the Lower Clackamas Watershed. All harvest units fall outside of the Peregrine Falcon Protection Zone set aside for this eyrie.

No further analysis needed due to lack of habitat.

Northern Painted Turtle (*Chrysemys picta* -Sensitive), Western Pond Turtle (*Clemmys marmorata marmorata*- Sensitive), Horned Grebe (*Podiceps auritus* – Sensitive), & Bufflehead *(Bucephala albeola* – Sensitive)

A. HABITAT

Painted Turtle: An aquatic turtle that frequents ponds, marshes, small lakes, ditches and streams where the water is quiet or sluggish and the bottom is sandy or muddy, and there is considerable vegetation. Mudbanks, logs, partially submerged branches and rocks are preferred for sunning.

Western Pond Turtle: The western pond turtle inhabits ponds, marshes, and the slow-moving portions of creeks and rivers that have rocky or muddy bottoms. Partially submerged logs, vegetation mats, mudbanks, rocks and tree branches provide areas for sunning. Western pond turtles have been found to occur from sea level up to around 2000 feet. During the winter months these turtles usually hibernate in bottom mud.

Horned Grebe: The Horned Grebe breeds throughout most of Alaska and Canada and, locally, just south of the Canadian border. It also breeds in northern Eurasia. Its habitat consists of areas with much open water surrounded with emergent vegetation.

Bufflehead: The Bufflehead is a northern species that breeds from Alaska across Canada, and south to Oregon, northern California, and Wisconsin. This species nests near mountain lakes surrounded by open woodlands containing snags. In many areas, the preferred nest trees are aspen, but it will also nest in ponderosa pine or Douglas-fir.

B. FIELD REVIEW

Habitat available within the project area

Painted turtle and Western Pond turtle: No. All of the units are situated within dense forested environments. Although many of the units contain riparian areas, they do not consist of relatively large open sites for sunning and abundant riparian and aquatic vegetation that is usually associated with the habitat for the species. There are no known sightings of these species on the Clackamas River Ranger District. The Region 6 Regional Forester's Sensitive Species list only has them as suspected to occur on the Mt. Hood National Forest.

Horned Grebe and Bufflehead: No. There are no lakes or ponds within the project area of the required size to provide habitat for these species.

No further analysis needed due to lack of habitat.

Harlequin Duck
(Histrionicus histrionicus – Sensitive)

A. HABITAT

Harlequin Duck: This species occurs from Iceland and Greenland west to eastern Canada. It is absent from the central part of North America, and the "western" population ranges from eastern Siberia east through Alaska and south to the Sierra Nevada of California and the mountains of southwestern Colorado. In the Northwestern United States, the Harlequin duck breeds along relatively low-gradient, slower-flowing reaches of mountain streams in forested areas.

B. FIELD REVIEW

This species is highly aquatic and needs a permanent water source to survive. Potential habitat for this species does exist within the Clackamas River drainage and within some of the potential harvest units. Harlequin ducks are occasionally sighted within Clackamas River Ranger District.

Habitat available within the project area
No. Although several of the units contain perennial streams (i.e. Clear Creek adjacent to unit 13, un-named tributary to Clear Creek adjacent to units 12 and 13, tributary to Memaloose creek within unit 2, and the upper headwaters of Oscar Creek adjacent to unit 6), none of them include any potential habitat for the harlequin duck. The streams are all too fast flowing and steep in these areas to provide habitat for the species.

No further analysis needed due to lack of habitat.

Wolverine
(*Gulo lyscus* – Sensitive)

A. HABITAT

Populations in the Cascade Mountains are small and scattered. Wolverines are usually found in high temperate coniferous forests, from mid-elevation (around 4000 feet) to moderately high elevation (above timberline), depending on the season. Common tree species are subalpine fir and lodgepole pine. They prefer to feed along rivers and streams and in wet meadows. The den is usually in a rock crevice, cave, or beneath a talus slope. Territories may encompass 10 to 80 square miles. Wolverines are believed to prefer areas of minimal people presence and high levels of solitude and seclusion. They are usually associated with wilderness, chiefly because they are so vulnerable to the activities of humans.

B. FIELD REVIEW

Habitat available within the project area:
No. Elevation within the project area ranges from approximately 2000 to 3800 feet in elevation. All of the proposed harvest units occur below 4000 feet in elevation and all of them are located within areas that lack solitude and seclusion qualities due to the open road densities, management activities, and recreational opportunities in the area. It is unlikely that a wolverine would be present in the project area.

Recent field surveys have not been accomplished. The last time broad based surveys were conducted on the Forest was during the winter of 1993-1994 and 1994-1995. There were no sightings of wolverine or sign of their presence.

No further analysis needed due to lack of habitat

Baird's Shrew
(Sorex bairdii permiliensis – Sensitive)

A. HABITAT

This species is endemic to Oregon. Its range is from northwestern Oregon from the Pacific coast east to the Cascades, and from the Columbia River south to Benton and Lane Counties.

Little published information exists that assigns with certainty habitat characteristics to the Baird's Shrew. In 1986 two specimens were collected in an open Douglas-fir forested area with numerous rotting logs in Polk County. The habitat of the Baird's shrew can be described as moist coniferous forests with a shrubby understory. Individuals of the species tend to forage near logs and rocks.

B. FIELD REVIEW

Habitat available within the project area
No. All the proposed harvest units consist of young, managed second-growth stands, the oldest being approximately 50 years. None of these units have the habitat components necessary for occupancy by the Baird's shrew.

No further analysis needed due to lack of habitat

Pacific Fringe-tailed Bat
(Myotis thysanodes vespertinus – Sensitive)

A. HABITAT
Little to nothing is known about this subspecies of the Fringed Myotis (Myotis thysanodes). There appears to be only one source of information for the Pacific Fringe-tailed bat. The distribution of this species is in California, Oregon, and Washington. No habitat data could be found on the Pacific Fringe-tailed bat so habitat information and the following analysis are based on what is known for the Fringed Myotis.

Although the Fringed Myotis is found in a wide variety of habitats throughout its range, it seems to prefer forested or riparian areas. Most Oregon records are west of the Cascade Mountains. Its nursery colonies and roost sites are established in caves, mines, and buildings. The species is thought to forage by picking up food items from shrubs or the ground. It consumes beetles, moths, harvestmen, crickets, craneflies, and spiders.

B. PRE-FIELD REVIEW

Habitat available within the project area
Yes. No breeding or roosting sites are available within the project area. There is the potential for the project area to contain foraging habitat, although foraging usually occurs near the species' breeding and roosting sites. Species would only occur in area during dispersal or possibly foraging.

C. ANALYSIS OF DIRECT/ INDIRECT EFFECTS & CUMULATIVE EFFECTS
No effects in any alternative due to lack of nesting or roosting habitat. In the event that individuals were dispersing or foraging through the area, they would likely be able to quickly disperse from the area during project implementation. Foraging habitat is not limiting and if individuals happened to be displaced, they could easily find other areas to forage within nearby. In addition, it is likely that the thinned units would still provide foraging habitat after project implementation.

D. CONFLICT DETERMINATION
The action alternatives of the South Fork Thin will have a "**No Impact**" to the Pacific Fringe-tailed bat or its habitat.

Puget Oregonian
(Cryptomastix devia - Sensitive)

A. HABITAT
The Puget Oregonian may be found in mature and old growth forest habitat, typically on or under hardwood logs and leaf litter. These snails are also found on or in the litter under sword ferns growing under hardwood trees and shrubs, especially big leaf maples.

B. PRE-FIELD REVIEW

Habitat available within the project area
No. None of the units have sufficient habitat components to provide habitat for the species.

No further analysis needed due to lack of habitat

Columbia Oregonian

(Cryptomastix hendersoni - Sensitive)

A. HABITAT

In the Western Cascades, this species can be found in mature forested habitats outside of riparian areas. Individuals have been found in damp situations under relatively closed canopies in mature western hemlock forests that include some Douglas-fir, cedar, vine maple, and alder.

B. PRE-FIELD REVIEW

Habitat available within the project area

No. None of the units have sufficient habitat components to provide habitat for the species.

No further analysis needed due to lack of habitat

Evening Fieldslug

(Deroceras hesperium - Sensitive)

A. HABITAT

This species has been reported to be associated with wet meadows in forested environments in a variety of low vegetation, litter and debris; rocks may also be used. Little is known about this species or its habitat. It is possible that individuals may be confined to moist surface vegetation and cover objects within 30 meters (98 feet) of perennial wetlands, springs, seeps and riparian areas.

B. PRE-FIELD REVIEW

Habitat available within the project area

Yes. Harvest will occur within 98 feet of the perennial streams, springs and seeps located within the harvest units. The units that contain some type of a perennial water source are 2, 6, 8, 10, 11, 12 and 13. Most of these riparian sites associated with these water sources have abundant moist surface vegetation.

C. ANALYSIS OF DIRECT/INDIRECT EFFECTS

Alternative A (No Action)

No effects to the Evening Fieldslug would occur with implementation of this alternative. The perennial streams and other riparian areas within the stands would continue to provide potential habitat for the species for possibly far into the future.

Alternative B (Proposed Action) and D

Effects to Habitat and Individuals

There are several perennial streams and other riparian sites occurring within South Fork units mentioned above. These areas consist of approximately 76 acres of riparian reserves within the project area that will have active management occurring within them except for the no-cut buffers described as follows. A minimum of a 50-foot no-harvest buffer will be established along the active channel of all perennial streams. Larger buffer widths may be needed on a site-specific basis to prevent any increase in sediment delivery rates or a decrease in stream shading. Smaller buffer widths would be allowed if it is determined on a site specific basis that there would be no increase in sediment delivery rates or decrease in stream shading. Smaller no-cut buffers would likely be applied to intermittent streams and smaller riparian sites such as seeps and springs.

These buffers described above would be in place during the length of the timber sale and post-sale activities, including road construction. However, it is possible that if this species were present within one of the harvest units, they could be found outside of the no-cut buffers and potentially be negatively affected by timber harvest activities. There could be un-intentional extirpation or injuring of individuals that may be present near the water sources during on-the-ground operations.

Because little is known about the species, it is unknown on what effect the change in stand structure (removal of trees and opening of the canopy) would have on individuals from the population. There is the potential that this change in stand structure and resultant micro-climate change would negatively affect individuals from the species by making the unit uninhabitable to the species.

Alternative C

Approximately 2,300 feet of temporary new road construction would occur with this alternative. However, since the construction of these roads will not occur within 100 feet of any potential habitat for the Evening Fieldslug, there will be no additional effects to this species.

D. CUMULATIVE EFFECTS

Little timber management currently occurs within 50 feet of riparian sites. Although the Evening Fieldslug can be found up to 98 feet from riparian areas, individuals are more likely to be found closer to standing water. A foreseeable future action that is likely to occur within the general area is the BLM Hillock Timber Sale which proposed to harvest 50 acres within riparian reserves. Considering the Hillock Timber Sale's effects to riparian habitat, the cumulative effects on Evening Fieldslug from the South Fork Project would still be minor, mainly because overall only a very small portion of potential habitat for the species would be impacted.

E. CONFLICT DETERMINATION

The action alternatives of the South Fork Commercial Thinning Project will have a **"May Impact Individuals, but not Likely to Cause a Trend to Federal Listing or Loss of Viability to the Species"** on the Evening Fieldslug or it's habitat.

Dalles Sideband

(Monadenia fidelis ochromphalus - Sensitive)

A. HABITAT

The Dalles Sideband has been located in steep situations on both sides of the Columbia Gorge near and below where springs are located and in upland locations where moisture conditions allow. This species is usually found associated with basalt talus, within 200 m. of streams, seeps or springs, in steppe or dry forest plant communities. It may be found among rocks, shrubs, or other vegetation and under down wood.

B. PRE-FIELD REVIEW

Habitat available within the project area

No. No none locations of this species have been found or are suspected to occur on the Clackamas River Ranger District. It's habitat in the surrounding area is expected to occur within the Columbia Gorge National Scenic Area as well as Hood River and Barlow Ranger Districts.

No further analysis needed due to lack of habitat.

Crater Lake Tightcoil

(Pristiloma arcticum crateris - Sensitive)

A. HABITAT

This species is found in perennially wet situations in mature conifer forests, among rushes, mosses and other surface vegetation or under rocks and woody debris within 10 m. of open water in wetlands, springs, seeps and riparian areas, generally in areas which remain under snow for long periods in the winter. It is found within moderate to high elevations (2000 to 7000 feet).

B. PRE-FIELD REVIEW

Habitat available within the project area
None. Although the project area occurs within the lower end of the elevational band known for the species, this area does not remain under snow for long periods in the winter. It is unlikely the species would be found in the area.

No further analysis needed due to lack of habitat

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South Fork Thinning Project
Fisheries Biological Evaluation

Clackamas River Ranger District
Mt. Hood National Forest
Fifth Field Watersheds: Middle Clackamas River, Lower Clackamas River, and Milk Creek

Date:10/08/05

Table 1. List of Proposed, Endangered, Threatened, or Sensitive (PETS) Fish and Aquatic Mollusk Species found on the Mt. Hood National Forest and addressed under this Biological Evaluation:

Endangered Species Act Listing by ESU	Date of Listing	Suitable Habitat Present	Species Present	Effects of Actions Alternatives			
Threatened				***A***	***B***	***C***	***D***
Lower Columbia River steelhead (*Oncorhynchus mykiss*)	3/98	No	No	NE	NE	NE	NE
Lower Columbia River chinook (*Oncorhynchus tshawytscha)*	3/99	No	No	NE	NE	NE	NE
Columbia River Bull Trout (*Salvelinus confluentus*)	6/98	No	No	NE	NE	NE	NE
Middle Columbia River steelhead (*Oncorhynchus mykiss*)	3/99	No	No	NE	NE	NE	NE
Upper Willamette River chinook (*Oncorhynchus tshawytscha)*	3/99	No	No	NE	NE	NE	NE
Upper Willamette River steelhead (*Oncorhynchus mykiss*)	3/98	No	No	NE	NE	NE	NE
Lower Columbia River coho *(Oncorhynchus kisutch)*	7/05	No	No	NE	NE	NE	NE
Regional Forester's Sensitive Species LIst							
Interior Redband Trout *(Oncorhynchus mykiss spp.)*	7/04	No	No	NI	NI	NI	NI
Columbia dusky snail *(Lyogyrus n. sp. 1)*	7/04	Yes	Unk	NI	NI	NI	NI

Abbreviations/ Acronyms:

NE	No Effect
NLAA	May Affect, Not Likely to Adversely Affect
LAA	May Afffect, Likely to Adversely Affect
Unk	Species presence unknown but suspected
NI	No Impact
MIIH	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

Written by: Robert Bergamini **Fisheries Biologist**

_____Date:_____

Reviewed by: Tom Horning **Fisheries Biologist**

_____Date:_____

INTRODUCTION

Forest management activities that may alter the aquatic habitat or affect individuals or populations of PETS (Proposed, Endangered, Threatened, and Sensitive) fish and aquatic species require a Biological Evaluation to be completed (FSM 267l.44 and FSM 2670.32) as part of the National Environmental Policy Act process to determine their potential effects on sensitive, threatened or endangered species. The Biological Evaluation process (FSM 2672.43) is intended to conduct and document activities necessary to ensure proposed management actions will not likely jeopardize the continued existence or cause adverse modification of habitat for:

A. Species listed or proposed to be listed as endangered (E) or threatened (T) by the USDI-Fish and Wildlife Service or National Marine Fisheries Service (NOAA Fisheries).

B. Species listed as sensitive (S) by USDA-Forest Service Region 6.

This Biological Evaluation (BE) addresses a proposal to thin and commercially harvest wood fiber in young plantations on approximately 497 acres within the Middle Clackamas River, Lower Clackamas River, and Milk Creek fifth-field watersheds within the Mount Hood National Forest. The objective of this action is to hasten tree growth to achieve a mature forest that is structurally diverse and to accelerate future large woody debris recruitment potential and snag habitat production.

This Biological Evaluation addresses all alternatives presented in the South Fork Thinning Environmental Assessment (EA).

PROJECT LOCATION

The South Fork Thinning project area is located within the Middle Clackamas, Lower Clackamas, and Milk Creek fifth-field watersheds. The legal description of the project area is Township 5 South, Range 4 East, Sections 11, 15, 23, and Township 5 South, Range 5 East, Sections 8, 10, 15, 17, and 18, of the Willamette Meridian, Clackamas County, Oregon.

The proposed treatment area is located within five subwatersheds of the Clackamas River and one subwatershed of Milk Creek, which is a tributary to the Molalla River. The total area of the six subwatersheds is 26,810 acres and includes: Memaloose Creek, Lower South Fork of the Clackamas, Upper South Fork of the Clackamas, Upper Clear Creek, Little Clear Creek, and Canyon Creek.

The South Fork of the Clackamas River and Upper Clear Creek watersheds are non-Key Watersheds under the Northwest Forest Plan. The South Fork and Clear Creek watersheds support populations of spring and fall chinook salmon, winter steelhead, and coho salmon over four miles downstream of the proposed project areas. The Canyon Creek subwatershed supports populations of winter steelhead and coho salmon. All of these watersheds also support populations of resident cutthroat and rainbow trout.

South Fork of the Clackamas River
The South Fork of the Clackamas River watershed is located in western Oregon on the west slope of the Cascade Range in Clackamas County. The South Fork watershed is a non-Key watershed under the Northwest Forest Plan. There is a mix of ownership in the watershed with the majority of the land (79%) administered by the Mt. Hood National Forest. The Bureau of Land Management (BLM) also administers approximately 18% of the watershed and 3% of the watershed is in private ownership.

The South Fork Clackamas River watershed is approximately 17,648 acres in size and is one of the smallest watersheds of the Clackamas River drainage. The watershed is oriented north to south and is comprised of two major drainages, The South Fork of the Clackamas River and Memaloose Creek. Memaloose Creek is a 4th order tributary that enters the South Fork at River Mile (RM) 0.6. The South Fork of the Clackamas River enters the mainstem Clackamas at RM 34.8.

Fish species present in the South Fork watershed consist of late and early run coho salmon, winter steelhead, spring chinook, resident rainbow and cutthroat trout, brook trout, large-scale sucker, sculpin, whitefish, longnose dace, and pacific lamprey. A 70-foot falls at RM 0.4 is a migration barrier to anadromous fish. The anadromous portion of South Fork is all on Forest Service administered land. Native populations of cutthroat and rainbow trout occupy both the South Fork and Memaloose Creeks as well as major tributaries such as the East Fork of the South Fork, Oscar Creek, Elbow Creek and Cultus Creek. Brook trout, which have been stocked in lakes such as Memaloose Lake, have proliferated throughout the drainage and may be a competitive concern for resident trout.

The South Fork watershed consists of 0.4 miles of anadromous streams, 24 miles of resident fish bearing streams and 69 miles of non-fish bearing streams. The anadromous portion of the South Fork Clackamas has been considered a crucial spawning area to late run coho because of its location as a low elevation tributary. Watershed Analysis was completed on South Fork in 1997 (USDA 1997).

Upper Clear Creek
The Upper Clear Creek watershed is located within the Lower Clackamas River 5th field watershed. Clear Creek originates in the Western Cascade at an altitude of 4,219 feet atop Goat Mountain and extends northwest to State Highway 211 south of the town of Estacada, Oregon in Clackamas County. The watershed encompasses approximately 18,208 acres in five sub-basins. The five sub-basins are: Upper Clear Creek, Middle Clear Creek, Little Clear Creek, Little Cedar Creek, and Hillockburn. Upper Clear watershed is a non-Key watershed under the Northwest Forest Plan.

Land ownership within the Upper Clear Creek watershed is grouped into three types: 1) Federally managed forests (4292 acres), 2) industrial forests (12042 acres), and 3) non-industrial landowners – primarily farms, small woodlots and home sites (1874 acres). The Forest Service portion of the Federal land totals approximately 2,000 acres. Watershed Analysis was completed on Upper Clear Creek in 1995 (USDA 1995).

The Upper Clear Creek watershed contains 29.1 miles of fish bearing streams, including 4.0 miles of streams that support anadromous fish. Resident cutthroat trout are present through out the watershed. The anadromous fish that utilize the watershed include winter steelhead, coho salmon, fall chinook, cutthroat trout, and pacific lamprey. Barrier falls located at the confluence of Clear Creek and North Fork Clear Creek, about one mile upstream of the mouth of Little Clear Creek, is the upstream limit of anadromous species. Little Clear Creek is the downstream boundary of the Upper Clear Creek watershed.

PROJECT/ACTION AREA

For purposes of this BE, the Project Area has been defined as the upper headwater areas of the South Fork of the Clackamas River, Upper Clear Creek, and Milk Creek, watersheds. The subwatershed associated with these fifth-field watersheds are: Memaloose Creek, Lower South Fork of the Clackamas, Upper South Fork of the Clackamas, Upper Clear Creek, Little Clear Creek, and Canyon Creek. The project action area will extend downstream for a distance of approximately 2.0 river miles in all of these streams. Downstream of this point it is believed any potential indirect effects to PETS species from implementing this project would be not measurable and insignificant.

Memaloose Creek subwatershed is approximately 7311 acres in size. Memaloose Creek is a 3rd order stream approximately 8.3 miles in length. It is the largest creek within this subwatershed. Memaloose Creek flows into South Fork Clackamas River approximately 0.4 miles above the confluence of the Clackamas River. Memaloose Creek flows from an elevation 4120 feet at the headwaters to 760 feet at the mouth. Average stream gradient for the entire length of the stream is approximately 7.7%. A 70-foot falls at RM 0.4 on the South Fork Clackamas River is a migration barrier for ESA listed species. No ESA listed fish species occur within the Memaloose subwatershed. Resident populations of cutthroat and rainbow trout occur throughout the watershed. Brook trout have also been introduced into the watershed through stocking that has taken place in Memaloose and Williams Lakes.

There are 5 proposed thinning units (#'s 1,2,3,4, and 5) and one partial unit (#7) totaling approximately182 acres within the Memaloose subwatershed. A total of 3.8 acres are located within a Riparian Reserve. The nearest occurrence of PETS fish species to these units is 4.2 miles downstream.

Lower South Fork Clackamas River subwatershed is comprised of the South Fork of the Clackamas River and all of its tributary streams from RM 0.0 to RM 4.0. The Lower South Fork subwatershed is approximately 3608 acres in size. A falls at RM 0.4 is a migration barrier for ESA listed species. Above this barrier resident rainbow and cutthroat trout occur throughout the watershed. Stream gradient from RM 0 to RM 4.0 averages 5% and increases to 12% from RM 4.0 to RM 9.0. The entire riparian area along the mainstem South Fork in the subwatershed lies within a Late Successional Reserve and is virtually undisturbed. These Riparian Reserves consist of late-seral stands of Douglas fir, western hemlock and western red cedar. Recruitment potential for LWD is excellent.

Proposed thinning units within the Lower South Fork lie within the Oscar Creek drainage. Oscar Creek is a 2nd order stream approximately 2.1 miles in length. It flows into the South Fork Clackamas River at approximately RM 3.0. Oscar Creek flows from an elevation of 3600 feet at the headwaters to 1600 feet at the mouth. Average gradient for the entire stream is 18%. Cutthroat trout occur within the first 0.5 miles of Oscar Creek h

There is one proposed thinning unit (#6) and one partial unit (#7) totaling approximately 85 acres within the Lower South Fork Clackamas River subwatershed. A total of 2.2 acres are located within a Riparian Reserve. The nearest occurrence of PETS fish species to these units is 4.4 miles.

Upper South Fork Clackamas River subwatershed begins at RM 4.0 of the South Fork Clackamas River and continues to the headwaters at RM 9.0. The subwatershed is 4,397 acres in size and consists of first and second order tributaries that enter the South Fork Clackamas River. Resident cutthroat and rainbow trout are present to approximately RM 8.5. A falls at RM 0.4 of the South Fork is a migration barrier for anadromous fish thus there are no ESA listed fish species that occur within the Upper South Fork subwatershed. Windthrow frequently occurs in the fall and winter within this subwatershed. Wind patterns, timber harvest and road building activities have resulted in windthrow along streams within Riparian Reserves. Consequently many perennial and intermittent streams lack necessary stream shading and LWD recruitment potential.

There is one proposed thinning unit (#8) totaling 48 acres within the Upper South Fork Clackamas River subwatershed. Approximately 2.3 acres are located within Riparian Reserves. The nearest occurrence of PETS fish species to this unit is over 6.2 miles.

Upper Clear Creek subwatershed encompasses approximately 18,208 acres**.** Clear Creek is a 5th order stream that flows through this subwatershed. Clear Creek flows between two subwatersheds, Middle Clear Creek and Upper Clear Creek. The first 4 miles of Clear Creek within the Middle Clear Creek subwatershed has anadromous fish (steelhead and coho salmon) up to the barrier falls at the confluence of Clear Creek and North Fork Clear Creek. Above these falls on Clear Creek (Upper Clear Creek subwatershed) are resident cutthroat trout.

Little Clear Creek is a major tributary to Clear Creek. Little Clear enters the mainstem Clear Creek at approximately RM 24. Anadromous fish species are not believed to utilize Little Clear Creek although no barriers have been identified. Resident cutthroat trout do occur within Little Clear Creek. A small portion of one proposed unit (#9) approximately 2.4 acres is located within the upper headwater region of Little Clear Creek. The unit is outside of riparian reserves and approximately one mile above the fish any bearing stream.

Five proposed thinning units thinning units (#11,12,13, and portions of unit #9, and 10) are located within the Upper Clear Creek subwatershed. A total of approximately 167 acres are proposed for thinning. A total of 65.8 acres are within the Riparian Reserves. The nearest occurrence of PETS fish species to any of these units is over 5 miles.

Canyon Creek subwatershed is approximately 3,288 acres and contains approximately 7.5 miles of fish bearing streams including 3.5 miles of stream that supports anadromous fish species. The anadromous species that utilize the watershed include winter steelhead and coho salmon. Resident cutthroat trout occur throughout the fish bearing section of Canyon Creek. Portions of two units (#9 and 10) totaling approximately 25 acres are located within the upland headwater region of the Canyon Creek subwatershed. These units are located outside of any riparian reserve and over four miles away from any occurrence of PETS fish species.

ACTIVITIES COMMON TO ALL ALTERNATIVES

The South Fork Thinning Project proposes to thin approximately 497 acres (423 acres of matrix land and 74 acres of the dry upland portion of riparian reserves). The stands are plantations ranging in age from 36 to 54 years. The average tree height ranges from 60 feet to 90 feet with dbh averaging between 10 and 15 inches. The timber to be harvested is primarily Douglas fir and western hemlock, as well as a small amount of western red cedar. The current stocking levels range from 190 trees per acre to 361 trees per acre. The management strategy is for a one-time entry into the Riparian Reserves. The objective of this action is to hasten tree growth to achieve a mature forest that is structurally diverse and to accelerate future large woody debris recruitment potential and snag habitat production.

The proposed action will thin from below harvesting the smaller trees. The largest and most dominant trees will be retained. Trees will be thinned using variable spacing (approximately 40% to 65% canopy closure). Post-harvest stand density of approximately 80 trees per acre is prescribed within the Riparian Reserves. Post-harvest stand densities within Matrix lands will range from 120 to 140 trees per acre.

Existing system roads, closed temporary roads from previous entries, and new temporary roads will provide access to the project area. Maintenance to the existing system roads prior to hauling will include spot patching, sealing, brushing, and ditch cleanout where needed. Ditch cleanout would be the removal of any material that may have slid into the ditch line that could impede the drainage capability. Existing ditch line vegetation would be maintained whenever possible to reduce the risk of erosion. Re-opening old temporary roads will consist of removing any gates or berms blocking vehicle access, brushing overgrown areas, blading, and spot rocking where needed. Road construction will be restricted to the dry season between June 1 and October 31 unless unusually dry conditions permit activities outside this window.

The new temporary roads will be of native surface and located along ridge tops, outside of any Riparian Reserve. No temporary road will cross any stream channel. Following harvest activities this road and newly constructed landings will be ripped and seeded.

Commercial thinning will be accomplished utilizing a combination of mechanical harvester, forwarders, tractor, skyline, and helicopter logging systems. The seasonal operation for ground-based equipment will be between May 31 and November 1. All ground based tractor operations will take place on slopes averaging less than 30% to

avoid the risk of damage to soil and water resources. Mechanical harvesters will be permitted on slopes up to 40% and will be operating within the stream influence zone (one site potential tree height ~ 180 ft.). Harvesters operating within the Riparian Reserves and Matrix Land will be required to work on a layer of residual slash placed in the harvester path prior to advancing the equipment. Harvester travel routes will be limited to one pass over a path whenever possible.

On areas where tractors will be used, skid trails will be located outside of riparian reserves and trees would be directionally felled away from the stream influence zone and winched. All skyline yarding will be one end or full suspension if needed, such as when yarding over a stream channel or seep.

Existing skid trails from prior entry in the project area will be used where possible. Following harvest activities, ground based skid roads will be seeded and mulched to reduce surface erosion. Water bars and/or cross ditches will be installed where needed to disperse water and control surface run-off.

No-harvest buffers (a minimum of 50 ft.) will be established along the active channel of all perennial streams. Larger buffer widths may be needed on a site-specific basis to prevent any increase in sediment delivery rates or a decrease in stream shading. No harvesting equipment will be allowed to operate within this area. Buffer width design will 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 will include any buffer of hardwood vegetation occurring along the stream bank. No-cut buffers will generally be at the top of slope breaks on steeper ground and would circumvent all wet areas to achieve aquatic conservation strategy objectives and maintain canopy cover along riparian areas. Falling trees for skyline corridors would be avoided, but where necessary the material would be left as woody debris.

For the next 50 ft. adjacent to the no-harvest buffers along perennial streams, only low impact harvesting equipment such as, but not limited to, mechanical harvesters or skyline systems (suspension yarding), 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 no-harvest buffer to minimize the disturbance to the forest floor.

No-harvest buffers (a minimum of 30 ft.) will be established along the channels of all intermittent streams. Smaller buffer widths would be allowed if it is determined on a site specific basis that there would be no increase in sediment delivery rates or a decrease in stream shading which would alter stream temperatures. Buffer width design will take into account the same parameters as perennial channels. No cut areas along seeps, springs, and wet areas would extend to the outer limits of riparian vegetation and would include the first row of coniferous trees.

Additionally, the project proposes to aerial fertilize approximately 178 acres of second growth plantations in matrix land. Fertilization is proposed in units 1, 3, 4, 5 and 7. Fertilizer application would be 200 pounds of nitrogen per acre. Fertilization of the

commercially thinned stands would hasten the recovery of forest canopy to meet matrix land timber objectives. Fertilization will not occur within Riparian Reserves. This will minimize the risk of fertilizer contaminating any water supply. Aerial application of urea fertilizer has the potential to enter the aquatic environment and may result in increased nitrogen levels in streams. Mitigation measures have been designed to minimize the risk of fertilizer entering streams. Application does not take place within riparian reserves, thus avoiding potential contamination of streams and areas of surface water for protection of fish and other aquatic organisms. Drift is avoided by limiting aerial application to days with little or no wind. Based on past District monitoring of forest fertilization activities, the only chance for approaching or possibly exceeding standards and thresholds would be in the case of an accidental spill. If this were to happen, the District spill containment plan would be implemented immediately with proper state and federal agencies notified.

DESCRIPTION OF ALTERNATIVES

Alternative A - No Action

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

Alternative B

Alternative B would thin plantations by using the same logging method used for the original harvest. Old roads, landings and skid trails would generally be reused.

Alt. B

Unit	Acres	GB	S	H	Reuse Old Temp Roads (ft)	New Temp Roads (ft)
1	25	25				
2	50	11	39			
3	16	16				
4	13	13				
5	12	12				
6	28	8	20			
7	112	99	13			
8	48	9	39			
9	25	25			800	
10	25	25			600	
11	105	40	65		600	
12	25		25			
13	13		13			
Total	**497**	**283**	**214**		**2000**	

Alternative C

Alternative C would be similar to B in units where there are few resource concerns. In other units a new logging method and road system would be proposed in order to

alleviate impacts resulting from using the original logging systems. Since future thinning or other forest management is likely to occur in plantations, the new logging method and/or road system would be designed and located to serve long-term management and transportation needs. Units with changed logging systems or roads are highlighted.

Alt. C

Unit	Acres	GB	S	H	Reuse Old Temp Roads (ft)	New Temp Roads (ft)
1	25	25				
2	50	11	39			
3	16	16				
4	13	13				
5	12	12				
6	28	8	20			
7	112	99	13			
8	48	9	39			
9	25		25			500
10	25	25			600	
11	105		98	7	600	
12	25		25			
13	13		13			2300
	497	**218**	**272**	**7**	**1200**	**2800**

Alternative D

Alternative D would be similar to C except it would eliminate new road construction. In units affected by the deletion of road construction with this alternative, the units would be logged using helicopter or other logging systems. Units with changed logging systems or roads are highlighted.

Unit	Acres	GB	S	H	Reuse Old Temp Roads (ft)	New Temp Roads (ft)
1	25	25				
2	50	11	39			
3	16	16				
4	13	13				
5	12	12				
6	28	8	20			
7	112	99	13			
8	48	9	39			
9	25	17		8	800	
10	25	25			600	
11	105	0	98	7	600	
12	25		25			
13	13			13		
	497	**235**	**234**	**28**	**2000**	

COMPARISON OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

The potential effects to water quality and fisheries for Alternative C and D would be less than that of Alternative B. These alternatives do not include any new temporary road construction; therefore there would be no risk of erosion or sediment entering streams due to the construction of temporary roads. There would be slightly less risk of erosion from harvest operations under alternatives C and D since helicopter logging would be used instead of ground based or skyline yarding systems on parts of some units. Because of less ground disturbance, the chance of sediment reaching the stream channel is even less likely than Alternative B. On units where temporary access roads would not be built, longer skidding distances may be used. This would result in many passes of equipment over a mainline skid trail, which when completed would have a very similar effect to that of a temporary road.

INTERRELATED OR INTERDEPENDENT ACTIONS

Secondary impacts include interrelated projects that have no independent utility apart from the proposed action, and interdependent projects that are a part of a larger action and depend on the larger action for justification.

There are no interrelated or interdependent actions for the proposed action.

PRESENCE OF PETS FISH AND AQUATIC SPECIES WITHIN OR DOWNSTREAM OF THE ACTION AREA

Columbia River Bull Trout *(Salvelinus confluentus)* - (Threatened) Bull trout were once prolific in the Clackamas River system. At present, they are believed to be extinct. Adult bull trout that occurred in the Clackamas River exhibited a fluvial life history character, maintaining residence in the main river and larger tributaries. It is quite likely that adult bull trout in the Clackamas River migrated to the Willamette and Columbia Rivers prior to construction of River Mill Dam. Adult bull trout would reside in the mainstem and larger tributaries until their spawning period during mid-August through September, at which time they would migrate upstream to smaller tributaries to spawn.

U.S. Forest Service fisheries biologists conduct fisheries sampling on an annual basis on many streams throughout the Clackamas River watershed upstream of North Fork Reservoir. To date, these sampling efforts have never yielded capture of bull trout. After several years of intensive sampling, U.S. Forest Service fisheries biologists believe that bull trout in the Clackamas River are considered to be "functionally extinct."

Lower Columbia River Steelhead (*Oncorhynchus mykiss*) - (Threatened) Adult steelhead migrate into the waters of the Clackamas River drainage above North Fork Dam primarily during April through June with peak migration occurring in May. Spawning occurs during the months of April through June in the Upper Clackamas River and during the months of March through June in the Oak Grove Fork. Steelhead use the majority of the mainstem Clackamas and major tributaries such as the South Fork of the Clackamas River, Fish Creek, Roaring River, Oak Grove Fork, Collawash River, and the

Hot Springs Fork of the Collawash as spawning and rearing habitat. Winter steelhead fry emerge between late June and late July and rear in freshwater habitat for one to three years. Smolt emigration takes place March through June during spring freshets.

LCR steelhead do not occur in any of the streams that flow within proposed units of the South Fork Project. The nearest occurrence of LCR steelhead is over 4 miles downstream.

Upper Willamette River Steelhead (*Oncorhynchus mykiss*) - (Threatened) Upper Willamette River steelhead occur in the Willamette River and its tributaries upstream from Willamette Falls. Adults migrate into the Upper Molalla drainage during late January through the end of April. Spawning occurs from February through May in tributary streams such as Milk Creek, lower Canyon Creek, the North Fork Molalla River, Table Rock Fork Molalla River and the mainstem Molalla River. Smolt emigration takes place March through July.

UWR steelhead do not occur in any of the streams that flow within proposed units of the South Fork Project. The nearest occurrence of UWR steelhead is over 4 miles downstream of the project area within Canyon Creek.

Upper Willamette River Spring Chinook (*Oncorhynchus tshawytscha*) - (Threatened) Upper Willamette River spring chinook salmon occur in the Clackamas River. The ESU consists of both naturally spawning and hatchery produced fish. These spring chinook enter the Clackamas basin from April through August and spawn from September through early October with peak spawning occurring the 3rd week in September. These fish primarily spawn and rear in the mainstem Clackamas River and larger tributaries.

Adults in the lower Clackamas drainage spawn in lower Clear Creek, Deep Creek, and Eagle Creek, below River Mill Dam and between River Mill and Faraday diversion dams. Spawning in the upper Clackamas drainage has been observed in the mainstem Clackamas from the head of North Fork Reservoir upstream to Big Bottom, the Collawash River, Hot Springs Fork of the Collawash River, lower Fish Creek, Roaring River, and the first 0.4-mile of the South Fork Clackamas River.

Upper Willamette River chinook do not occur within any of the streams that flow within the South Fork units. The nearest occurrence of UWR chinook to any proposed unit within the Clackamas River, South Fork Clackamas, or Clear Creek watershed is over 4.0 miles.

Lower Columbia River Fall Chinook (*Oncorhynchus tshawytscha*) (Threatened) The fall chinook within the Clackamas Subbasin are thought to originate from "tule" stock which was first released into the subbasin in 1952 and continued until 1981. Since 1981 no fall chinook have been released into the Clackamas River. However some adult fall chinook released as juveniles above Willamette Falls may have strayed into the Clackamas River.

Historically fall chinook spawned in the mainstem Clackamas River above the present site of the North Fork Dam before its construction. Currently the "tule" stock of fall chinook spawn in the mainstem Clackamas River below River Mill Dam and in the lower reaches of Clear Creek. Fall Chinook spawn late August through September. These fish primarily spawn and rear in the mainstem Clackamas River and larger tributaries and are not found above River Mill Dam. The nearest occurrence of LCR chinook to the project area is within lower Clear Creek over 15 miles downstream.

Lower Columbia River Coho Salmon (*Oncorhynchus kisutch*) (Threatened)
The Clackamas River contains the last important run of wild late-run winter coho in the Columbia Basin. Coho salmon occupy the Clackamas River and the lower reaches of streams in the Upper Clackamas watershed including the lower two miles of the Oak Grove Fork. Adult late-run winter coho enter the Clackamas River from November through February. Spawning occurs mid-January to the end of April with the peak in mid-February. Peak smolt migration takes place in April and May.

Coho salmon occur in the mainstem Clackamas River and in the lower reaches of the South Fork of the Clackamas River and Clear Creek. The anadromous portion of the South Fork Clackamas has been considered a crucial spawning area to late run coho because of its location as a low elevation tributary. The nearest occurrence of LCR coho salmon to the South Fork Project area is over four miles downstream of any proposed thinning unit.

Columbia Dusky Snail
(*Lyogyrus n. sp. 1*)
C3 species *Survey and Manage* (ROD)

This species of aquatic mollusks has a very sporadic distribution in the central and eastern Columbia Gorge, WA and OR. Known sites on the Mt. Hood National Forest occur in Clackamas, Multnomah, and Hood River counties. Lyogyrus species have been identified in both the Clackamas and Sandy River watersheds. Potential habitat for the Columbia Dusky Snail occurs in the Action Area.

EFFECTS DETERMINATION

The effects determination of the South Fork Thinning Project will be based on project elements of the action alternatives that could have potential direct or indirect impacts on PETS fish and aquatic species or their habitats. These project elements include:

- Timber harvest
- Road construction
- Yarding
- Log haul
- Road decommissioning (obliteration)
- Fertilization

The analysis of effects focused on relevant habitat indicators that potentially could be affected by these project elements. The relevant habitat indicators include:

- Peak/Base Flow
- Temperature
- Sediment
- Chemical Contaminants/Nutrients

Direct Effects

Potential direct effects associated with project elements of the South Fork Thinning Project are: increased levels of fine sediment in local streams generated during road building, road obliteration, logging, and hauling. An increase in stream temperature caused by loss of streamside vegetative cover by thinning within Riparian Reserves, an increase in peak flows caused by removal of vegetative cover, and chemical contamination caused by fertilizer entering a stream channel.

To determine potential direct effects to PETS species, each of the relevant habitat indicators was evaluated by proximity to the action area, probability that an effect would occur, and magnitude of the action, if needed.

Flow

Any potential increase in flow in the Project Area is not expected to be measurable at the downstream end of the Action Area due to the distance and relatively low probability of any potential flow increase. Current conditions in the project area indicate a low risk for peak flow enhancement. Since the proposed action will maintain all treated stands at no less than 40% crown closure, this proposal results in no additional risk. There would be no increase in the drainage network due to roads as a result of the project since road segments proposed for construction have no hydrologic connection.

Temperature

The no-cut buffers along perennial and intermittent streams would insure that the majority of shade producing vegetation would remain. Since the streams within the project area are relatively small (3-10 ft. width), the no-cut buffers would provide adequate canopy cover to maintain existing shade components thus, maintaining stream temperatures. Intermittent streams within the project area only carry water during wet times of the year (winter and spring) when temperatures are cooler, and 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. All of the existing shade components will be maintained. There is a very low probability that implementation of the project will increase solar radiation. No measurable change in stream temperatures is expected as the result of implementing this project. Current stream temperatures in all streams within and downstream of the project area are expected to be maintained.

Sediment

Ground disturbing activities associated with temporary road building within the South Fork Project Area have been designed to minimize the risk of erosion and the potential for sediment to be transported to streams. Road construction would be restricted to the dry season between June 1 and October 31. This restriction would reduce the risk of any surface erosion due to ground disturbance. The proposed temporary roads are located on dry ground, would not cross any stream channels, and would have no hydrologic link to any water source. These roads would be constructed on relatively flat terrain along ridgetops, which would avoid an increase in the drainage network. Because of the distance of the proposed 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 temporary roads would be obliterated and revegetated directly following completion of harvest operations to help reduce compaction and increase infiltration rates. Impact to water quality or fisheries resources caused by sedimentation due to road construction or road obliteration, if any, would be short-term and undetectable at a watershed scale.

Thinning within riparian reserves is a ground disturbing activity that has the potential to cause a temporary reduction in water quality by allowing sediment to enter the stream channel from surface erosion or run-off. No-cut buffers, a minimum of 50 ft. wide, along perennial streams and a minimum buffer width of 30 ft. along intermittent channels, have been established for the South Fork Project. Buffer width design would take into account the stream influence zone, steepness of slope, size and location of trees, orientation of the site to the sun (aspect), slope stability, and stream bank stability. No-cut areas would include any buffer of hardwood vegetation occurring along the stream bank. No-cut buffers would generally be at the top of slope breaks on steeper ground and would circumvent all wet areas to maintain canopy cover along riparian areas. 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. These buffer widths would allow soil infiltration between the unit and any water source. The use of skyline or helicopter yarding systems on steeper ground within riparian reserves will minimize ground disturbance. Seasonal restrictions on ground-based operations would further reduce the risk of soil disturbance and run-off. Even if some soil movement occurred, the vegetated buffer strips along every perennial or intermittent channel would act as an effective barrier. The probability that measurable amounts of fine sediment would enter any stream within the project area as a direct result of logging activity is low.

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. The potential for sediment input into streams along the haul routes will be minimized by permitting haul only when conditions would prevent sediment delivery to streams. Any sediment that would enter a stream during haul activities would be at crossings along aggregate surfaced roads. The majority of these crossings are at small streams that would not be flowing, or would have very little flow, during the normal season of operation (June 1 to October 31). Any sediment that leaves the road surface

due to run-off is expected to disperse over land or be stored within these small channels. It is very unlikely that any measurable amount of sediment produced during log haul would be transported to stream channels where fish species occur. There are no listed fish species that occur immediately downstream of any aggregate surfaced stream crossing along the haul route. If any sediment did enter stream courses from hauling activities, it would be in very small amounts and for a short-term duration. No adverse effect to fish or their habitat would occur from hauling logs.

Chemical Contaminants

Aerial application of urea fertilizer has the potential to enter the aquatic environment by direct application, drift, overland flow and subsurface drainage, which may result in increased nitrogen levels in streams. Small amounts of fertilizer in streams would likely have little affect on fish and may encourage increased productivity of algae and periphyton. Direct application poses the greatest risk to water quality and the aquatic environment, but can be prevented by adequate buffer strips around streams and wet areas. Design criteria have been incorporated to minimize the risk of fertilizer entering streams. No fertilizer would be applied within Riparian Reserves or wet areas. Buffers where no fertilizer would be applied would be two-site potential tree heights along fish bearing streams and one-site potential tree height along other streams and wet areas. These buffer widths would prevent the introduction of fertilizer into streams by direct application, overland flow and subsurface drainage. Drift would be avoided by limiting aerial application to days with little or no wind. Application of fertilizer would not take place under adverse weather conditions such as: when wind speeds are in excess of 10 miles per hour, dense fog, snow, or heavy rain. Fertilization would only occur when soil conditions are moist and approximately 0.5 inch or less of rainfall is forecast within 4 days following application. Application of fertilizer would not be made on more than one inch of snow or during heavy rainfall where there would be a chance of overland flow of fertilizer in solution. Adherence to these design criteria would insure that very little, if any fertilizer would enter any stream course. The probability that fertilization outside of Riparian Reserves would have adverse effects to fish species or water quality is low.

Indirect Effects

Potential indirect effects may include increased amounts of fine sediment downstream in rivers or at the intake of municipal water providers, due to erosion from harvest units and roads. The use of project design criteria and adherence to General Best Management Practices (BMP's) will allow for very little, if any, erosion or sediment transport into any stream course, substantially reducing the impacts of soil disturbance and run-off on water quality downstream of the project area. The probability of any indirect effects impacting PETS species or habitat downstream of the project area is low.

Cumulative Effects

Cumulative effects associated with the South Fork Thinning Project would focus around changes in the timing and/or magnitude of flow events resulting from past, present and future forest conditions. Past disturbances within the South Fork, Upper Clear Creek, and Canyon Creek subwatersheds include timber harvest and road-building activities along with recreational use such as off-road vehicle usage. The harvest levels in recent years

has been well below the level projected by the Northwest Forest Plan due to appeals, litigation and areas established for survey and manage species.

Analysis on past thinning projects has shown that there are little if any measurable impacts to hydrologic function at the subwatershed scale. Cumulatively, watershed conditions in the short-term may be slightly decreased by harvest activities, but would be improved in the long-term by improving the number, type and health of the trees and stands over the long-term. Implementation of the South Fork Thinning Project would maintain all riparian conditions at the 5th and 6th field watershed scales.

ESA Cumulative Effects

ESA cumulative effects are those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation [50 CFR section 402.02]. The project area is located completely within federal lands. There are no non-federal projects that are known occurring or are being planned in the Action Area at this time.

CONCLUSION

The implementation of the South Fork Thinning Project warrants a **"No Effect" (NE)** determination for Lower Columbia River steelhead, Lower Columbia River chinook, Upper Willamette River chinook, Upper Willamette River steelhead, Columbia River bull trout, and Lower Columbia River coho salmon and their designated or proposed critical habitat. A **"No Impact" (NI)** determination is warranted for Interior Redband trout and the Columbian Dusky Snail. These effects determinations are appropriate for all of the action alternatives because of the proximity of the proposed project area to ESA species or suitable habitat, the relatively minor magnitude of effects in the Project Area, and of the low potential for impacts generated at the project area to be transported to downstream reaches where these species are known or suspected to occur. There is a low probability of any direct of indirect effects to any listed or proposed fish or aquatic species or their habitat within or outside of the designated action area. This effects determination is based on the following reasons:

- The proximity of the harvest units to habitat where PETS species occur. The nearest occurrence of PETS fish species to the project area is over four miles.

- Project design features such as no-cut buffers along streams and seasonal restrictions for ground-based operations.

- The use of cable yarding and/or helicopters on steeper ground, within Riparian Reserves.

- Potential sediment delivery to streams during log transport will be minimized by restricting log haul to times when road related run-off is not present.

- Construction of new temporary roads will be on relatively flat ground or along ridge tops with no hydrological link to any water source.

The use of project design criteria and adherence to General Best Management Practices (BMP's) will allow for very little, if any, erosion or sediment transport into the stream course, substantially reducing the impacts of soil disturbance and run-off on water quality.

DETERMINATION OF EFFECTS – CRITICAL HABITAT

Critical habitat for twelve Evolutionary Significant Units (ESUs) of West Coast salmon and steelhead listed under the Endangered Species Act of 1973 (ESA) was designated on September 2. 2005. The ESUs that have designated critical habitat occurring within the watersheds associated with the South Fork Thinning Project include: UWR Chinook, UWR steelhead, LCR Chinook and LCR steelhead. 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.

There is no critical habitat that occurs within the South Fork Project area. Designated critical habitat occurs downstream of the project area in the mainstem Clackamas River (UWR Chinook, LCR Chinook, and LCR steelhead), South Fork Clackamas River ((UWR Chinook and LCR steelhead), Lower Clear Creek (UWR Chinook, LCR Chinook, and LCR steelhead), Milk Creek (UWR Chinook and UWR steelhead), and Canyon Creek (UWR steelhead). Because the distance of the project area to any designated critical habitat is over three miles the effects determination for the South Fork Thinning Project on Designated Critical Habitat is "No Effect" (NE) for all of the project alternatives.

DETERMINATION OF EFFECTS – ESSENTIAL FISH HABITAT

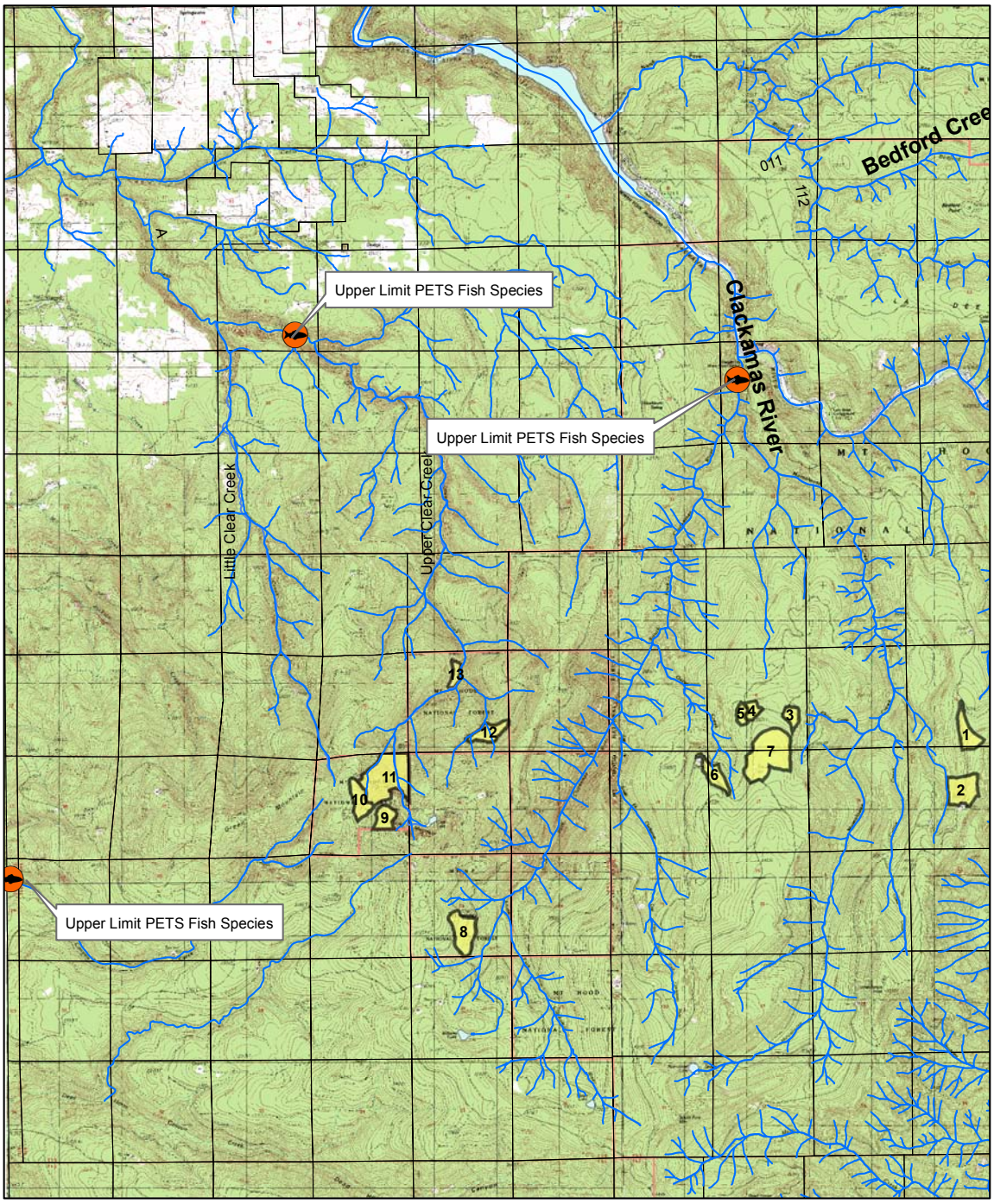
Essential Fish Habitat (EFH) established under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) includes those waters and substrate necessary to ensure the production needed to support a long-term sustainable fishery (i.e., properly functioning habitat conditions necessary for the long-term 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 Clackamas River, South Fork Clackamas River, and Clear Creek for rearing and spawning habitat. The proposed project is located approximately four miles above any habitat that could be utilized by chinook or coho. Implementation of the project covered in this BE will have **No Effect**

on essential fish habitat for chinook or coho salmon. The proposed project will not have any effect on water or substrate essential to the life history of coho, chinook, or chum salmon that occur within any basin on the Mt. Hood National Forest.

This activity will not jeopardize the existence of any of the species of concern or adversely modify critical habitat and will not adversely affect Essential Fish Habitat as designated under the 1996 Amendment to the Magnuson-Stevens Act.

Based on the **No Effect** determination of this project proposal, consultation with USFW and NOAA Fisheries is not required.

South Fork Thinning Project
PETS Fish Distribution



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BIOLOGICAL EVALUATION FOR
Proposed, Endangered, Threatened, and Sensitive Plants, Lichens, Bryophytes and Fungi

South Fork Commercial Thinning Project

Clackamas River Ranger District
Mt. Hood National Forest

INTRODUCTION

This report evaluates the potential effects of the proposed action on Proposed, Endangered, Threatened, and Sensitive (PETS) plant species in accordance with The National Environmental Policy Act (42 USC 4321 et seq.) the federal Endangered Species Act (16 USC 1531 et seq.), and the National Forest Management Act (16 USC 1604 et seq.). To comply with the above, the Forest Service has set forth guidance in FSM 2670 that is designed to ensure Forest Service actions (1) do not contribute to the loss of viability of any native or desired non-native species or cause a trend toward federal listing for any species, (2) comply with the requirements of the Endangered Species Act; and (3) provide a process and standard which ensures that PETS species receive full consideration in the decision making process.

To achieve these objectives, all Forest Service projects, programs and activities are reviewed for possible effects on PETS species and the findings documented in the Decision Notice (FSM 2672.4). On the Mt. Hood National Forest there are no federally listed (proposed, endangered, threatened) plant species known to occur, however one federally threatened species (*Howellia aquatilis*) is suspected.

The Region 6 Regional Forester's Sensitive Species List (April, 2004) was used to determine species of vascular plants, fungi, bryophytes and lichens that are documented from or suspected to occur on the Mt. Hood National Forest.

PROJECT LOCATION & DESCRIPTION

The project consists of 13 units located on the Clackamas River Ranger District of the Mt. Hood National Forest.

Proposed Action

The action proposed by the Forest Service to meet the purpose and need is to thin and harvest wood fiber from approximately 423 acres of matrix land and approximately 74 acres of the dry upland portion of riparian reserves. Since each stand is different, a silvicultural prescription would be developed to refine the number and types of trees to be retained. Variable density thinning prescriptions would be designed to enhance diversity. Thinning would generally remove the smaller trees, leaving approximately 80 to 140 variably spaced trees per acre (variations are described below); the average cut tree size would be approximately 10 to 15 inches in diameter. Design criteria describe the retention of snags and other wildlife trees as

well as down logs. Design criteria also describe that skidding equipment will be restricted to designated skid trails but other equipment, such as harvesters, will operate within the units on beds of slash.

Riparian – On areas proposed for riparian reserve thinning, the prescripton would be adjusted to create a wider spacing of leave trees. The intention is to enhance riparian reserves by accelerating the development of mature and late-successional stand conditions. Wider spacing would also mean that one thinning entry would create the desired conditions (compared to the matrix thinning spacing where multiple thinning entries would likely occur). Riparian thinning would generally remove the smaller trees, leaving approximately 80 of the largest trees per acre, variably spaced throughout the reserve. For this project, riparian reserve widths are 180 feet for non-fish-bearing streams and 360 feet for fish-bearing streams. Design Criteria #5 discusses no-harvest buffers of approximately 30 to 50 feet along streams. There are some small seeps and wet areas that are too small to show on the maps below. These areas would be excluded from harvest.

Fertilization – The proposed action is to aerially apply 200 pounds of nitrogen per acre to approximately 178 acres of second-growth conifer plantations within the matrix. (This is a connected action because it would occur in thinned plantations to supplement nutrient availability. Fertilization is not made necessary by thinning; it is a supplemental treatment to enhance growth. Fertilization is contingent upon funding availability. If funding is not immediately available, the thinning of plantations without fertilization is a viable option.) Fertilization would not occur in riparian reserves or seeps and wet areas.

Roads – For Alternative C, new temporary roads (approximately 2800 feet) would be constructed to access the landings. These roads would be obliterated and revegetated after completion of the project. Some existing overgrown roads need to be reopened to access landings for some units. Upon project completion, the roads that were opened would be closed.

Unit	Acres	Fertilization ac.
1	25	25
2	50	
3	16	16
4	13	13
5	12	12
6	28	
7	112	112
8	48	
9	25	
10	25	
11	105	
12	25	
13	13	
	497	

METHODOLOGY

Pre-Field Analysis: Prior to any site visits, the following pertinent information was reviewed: Aerial photography, Regional Forester's list of PETS species (revised April, 2004), Mt. Hood PETS plant database, and the Interagency Species Management System (ISMS) with information on the project area. No PETS species are known to occur within or adjacent to the proposed project area. Based on habitat and range information, (herbarium records, technical manuals, plant atlases, etc.), PETS species that are known or suspected to occur on the Mt. Hood National Forest and have potential habitat within the proposed project area are shown in Table 1.

TABLE 1. PETS Species Known Or Suspected Within The Vicinity Of The Proposed Project Area

Species	Common Name	General Habitat	Survey Period	Potential Habitat?
Vascular Plants				
Agoseris elata	tall agoseris	Moist-dry meadow	June-Aug	No
Arabis sparsiflora var. *atrorubens*	sicklepod rockcress	Dry meadow, shrub-steppe	May-Aug	No
Aster gormanii	Gorman's aster	Dry cliffs, talus, rock slopes above 3500'	June-Sept	Yes
Astragalus tyghensis	Tygh Valley milkvetch	Shrub-steppe grassland	May-Aug	No
Botrychium lanceolatum	lance-leaved grape fern	Sub-alpine meadow, glacial till	July-Sept	No
Botrychium minganense	Mingan moonwort	Forested wetlands	June-Sept	Yes
Botrychium montanum	mountain grape-fern	Forested wetlands	June-Sept	Yes
Botrychium pinnatum	pinnate grape fern	Forested wetlands	June-Sept	Yes
Calamagrostis breweri	Brewer's reedgrass	Sub-alpine, moist – dry meadows	June- Sept	No
Carex livida	pale sedge	Wet-dry meadow, fen	June-Sept	No
Castilleja thompsonii	Thompson's paintbrush	Rock outcrops east of the Cascade Crest	July-Aug	No
Cimicifuga elata	tall bugbane	Mesic mixed hardwood/ conifer forest	June-Sept	Yes
Coptis trifolia	3-leaflet goldthread	Edge of forested fens	June-July	No
Corydalis aquae-gelidae	cold water corydalis	Forested seeps and streams	June-Sept	Yes
Diphasiastrum complanatum	ground cedar	Open conifer forest	Apr-Nov	No
Erigeron howellii	Howell's daisey	Moist-dry cliffs, talus, rocky slopes	June-Sept	No
Fritillaria camschatcensis	Indian rice	Moist-dry meadow	June-Aug	No
Howellia aquatilis var howellia	howellia	Low elevation lakes and ponds	June- Sept	No

Species	Common Name	General Habitat	Survey Period	Potential Habitat?
Lewisia columbiana var. columbiana	Columbia lewisia	Dry cliffs, talus, rocky slopes	June-Sept	No
Lycopodiella inundata	bog club-moss	Wet meadows and bogs	July-Sept	No
Montia howellii	Howell's montia	Moist-dry open lowland forest	April-July	Yes
Ophioglossum pusillum	*adder's tongue*	Wet-moist meadow	June-Sept	Yes
Phlox hendersonii	Henderson's phlox	Sub-alpine, dry, rocky, scree	July-Sept	No
Potentilla villosa	villous cinquefoil	Sub-alpine, dry, rocky, scree	July-Sept	No
Ranunculus reconditus	*obscure buttercup*	Shrub-steppe grasslands	April-June	No
Romanzoffia thompsonii	mistmaiden	Vernally wet cliffs	April-June	No
Scheuchzeria palustris var.americana	scheuchzeria	Wet meadow, bog, fen	June-Sept	No
Sisyrinchium sarmentosum	Pale blue-eyed grass	Moist-dry meadow	June-Aug	Yes
Suksdorfia violacea	Violet suksdorfia	Moist cliffs, talus, rocky slopes	May-July	No
\Taushia stricklandii	Strickland's taushia	Moist-dry meadow	June-Sept	No
Wolffia borealis	Dotted water-meal	Pond, lake, gently flowing water	May-Sept	No
Wolffia columbiana	water-meal	Pond, lake, gently flowing water	May-Sept	No
Bryophytes				
Rhizomnium nudum	moss	Moist mineral soil in forest, 3000 – 5000 ft.	June - Oct	Yes
Schistostega pennata	green goblin moss	Moist mineral soil on rootwads	June- Oct	Yes
Scouleria marginata	moss	Rock and boulders in streams	May - Nov	No
Tetraphis geniculata	bent-awn moss	Large down wood in old growth forest	May- Oct	Yes
Lichens				
Chaenotheca subroscida	pin lichen	Boles of live trees and snags in moist forest	May-Nov	Yes
Dermatocarpon luridum	Brook lichen	Rock submerged in streams	May-Nov	No
Hypogymnia duplicata	Ticker-Tape lichen	Conifer boles where > 90" inches of precipitation	May - Oct	Yes
Leptogium burnetiae var. hirsutum	Jellyskin lichen	Bark of deciduous trees, down rotted logs and moss on rock	May-Nov	Yes
Leptogium cyanescens	Blue jellyskin lichen	Moss and bark of deciduous trees	May-Nov	Yes
Lobaria linita	Cabbage lungwort	Lower bole of conifers /often mossy boulders	May-Nov	Yes
Nephroma occultum	Cryptic kidney lichen	Tree boles and branches in older forest habitat	May-Nov	No

Species	Common Name	General Habitat	Survey Period	Potential Habitat?
Pannaria rubiginosa	Brown-eyed shingle lichen	conifer/deciduous tree bark in moist forest habitat	May-Nov	Yes
Peltigera neckeri	Black saddle lichen	Many substrates in moist forest	May-Nov	Yes
Peltigera pacifica	Fringed pelt lichen	On moss in moist forest habitats	May-Nov	Yes
Pilophorus nigricaulis	Matchstick lichen	Rock on cool, north-facing slopes	May-Nov	No
Pseudocyphellaria rainierensis	specklebelly	boles of hardwoods and conifers in older forests..	May-Nov	No
Ramalina pollinaria	Chalky ramalina	Bark in moist, low-elevation habitats	May-Nov	Yes
Tholurna dissimilis	Urn lichen	Branches of krummolz at moderate to high elev.	Jun-Oct	No
Usnea longissima	Methuselah's beard lichen	Branches of conifers and hardwoods in moist forest	Apr-Nov	Yes
Fungi				
Bridgeoporus nobilissimus	noble polypore	Large true fir snags	May-Nov	Yes
Cordyceps capitata	earthtongue	Parasitic on truffles (*Elaphomyces* spp.)	Sept-Oct	Yes
Cortinarius barlowensis	mushroom	Montane coniferous forest to 4000 ft.	Sept-Nov	Yes
Cudonia monticola	earthtongue	Spruce needles and coniferous debris	Aug-Nov	No
Gomphus kauffmanii	mushroom	Terrestrial in deep humus under pine and true fir	Sep-Nov	Yes
Gyromitra californica	mushroom	On/adjacent to-rotted confer stumps/ logs	June	Yes
Leucogaster citrinus	truffle	With the roots of conifers to 6600 feet	Aug-Nov	Yes
Mycena monticola	mushroom	Terrestrial in conifer forest above 3300 feet	Aug-Nov	Yes
Otidea smithii	cup fungi	Under cottonwood, D.-fir and w. hemlock	Aug-Dec	Yes
Phaeocollybia attenuata	mushroom	Terrestrial in conifer forest	Oct-Nov	Yes
Phaeocollybia californica	mushroom	With silver fir, Doug.-fir and w. hemlock	May, Oct-Nov	Yes
Phaeocollybia olivacea	mushroom	Terrestrial in low-elevation conifer forest	Oct-Nov	Yes
Phaeocollybia oregonensis	mushroom	Terrestrial with Doug fir, silver fir, w. hemlock	Oct-Nov	Yes
Phaeocollybia piceae	mushroom	Terrestrial with true & Doug.-fir /w. hemlock	Oct-Nov	Yes
Phaeocollybia pseudofestiva	mushroom	under mixed conifers and hardwoods	Oct-Dec	Yes

Species	Common Name	General Habitat	Survey Period	Potential Habitat?
Phaeocollybia scatesiae	mushroom	With true fir and *Vaccinium* spp.	May, Oct-Nov	Yes
Ramaria amaloidea	Coral mushroom	Terrestrial with true & Doug fir, w. hemlock	Sept-Oct	Yes
Ramaria gelatiniaurantia	Coral mushroom	Terrestrial with true & Doug fir, w. hemlock	Oct	Yes
Sowerbyella rhenana	Cup fungi	Moist, undisturbed, older conifer forests	Oct-Dec	No

Field Surveys: Field surveys were conducted within the project area between June 9 and September 14, 2004. With the exception of *Bridgeoporus nobilissimus*, surveys are not considered practical to detect the presence of PETS fungi species identified as having habitat within the proposed project area (FEIS 2004). It is assumed that these species are present in the project area where there is suitable habitat. Although there was an incidental find of one Sensitive Fungi within the project area, the surveys were not designed to survey for Sensitive fungi. Surveys to detect all other PETS species identified as having habitat in the project area are considered practical.

FINDINGS

Table 2.

Unit No.	Location	Habitat
3	Roads 45-220 & 45-63	Elevation is between 3000-3300'. Dominant trees are 30-50 year old silver fir, noble fir, western hemlock, western red cedar, Douglas fir with some red alder and bitter cherry. Poorly developed understory except on edges.
4 & 5	45-240 & 45-220	Elevation is between 3200-3400'. Dominant trees are 30-50 year old silver fir, noble fir, western hemlock, western red cedar, Douglas fir with some red alder and bitter cherry. Poorly developed understory except on edges and in disturbed openings.
6	45, 45-190	Elevation is between 32000-3500'. Lower portion dominated by western hemlock and Douglas fir aged 30-40 years and upper had pockets of silver and noble firs 50-70 years old, with western red cedar in wet areas. Wet areas and stream within central part of unit, east of the 4500 and south of the 190 spur, denoted by pink/black dot flagging.
7	Roads 45, 45-220 and 45-230	Elevation is between 3400-3600'. Old gravel storage area within unit is north of junction of 45-220 & 45-230 is weedy. Stream crosses 45-220 on the southern end of unit and there's a vernally wet meadow just off road 45 on the south end of unit that may be east of unit boundary. Much diversity present in the wet meadow, including Columbia brome (grass), native blue wild-rye (grass), carex species, willows, iris, lillies, and weeds too, with many large stumps. Obvious deer presence in meadow. Dominant trees are 30-50 year old silver fir, noble fir, western hemlock, western red cedar, and Douglas fir. Poorly developed understory due to

		dense stands, except on edges and in wet areas.
8	Roads. 45, 4510, 4510-021	Elevation is between 3200-3700'. Dominant trees are silver fir & western hemlock with some noble fir; some forest openings with rhododendron and vine maple; west of rd 4510 are some streams and wetlands and braided seeps; some wetlands contain skunk cabbage and salmonberry and other diverse species.
13	Road 4510-130	Elevation is between 2100-2400'. Western hemlock and Douglas fir trees dominate with western red cedar and red alder present along streams and in wet areas. The dominant understory shrub is salal. Clear Creek borders the east and south sides of the unit and there's a tributary to Clear Creek on the southwest side of the unit, near the bottom. The streamside vegetation is more lush and diverse and includes deer fern, skunk cabbage, and salmonberry.
11	Road 4510-160	Dominant trees include western hemlock, silver fir, and western red cedar and are up to 16" DBH. The area is largely dry and has few herbs and shrubs with some rhododendron presence. There's a small stream in the western part of the unit, observable from the 160 spur
10	4510-150	This unit is largely silver fir and noble fir with some western hemlock, western red cedar, Douglas fir, rhododendron and dwarf Oregon grape. Unit has some stumps over 3' diameter.
9	4510-161	This unit is near the top of Goat Mountain and is dominated by silver fir with some noble fir. Some high meadow & rocky openings near the top of the unit.
12	4510-150	Stand is dominated by western hemlock and Douglas fir, but there are some silver fir and noble fir also. This unit is bordered on the west side by a stream. Close to the western boundary, there's another fork that joins the stream, going through the unit's SW corner. Another stream flows southward through approximately the center of the unit. Near the east end of the unit there's a culvert with wet areas below, within the unit. The wet areas are evidenced by skunk cabbage, red alder, devil's club and mitrewort. The unit is quite wet and it's likely that water can be found wherever you observe the red alder.
1	Road 45	Dominant trees are western hemlock, silver fir, and Douglas fir and tend to be 50-70' tall and 8-12" DBH. There are some Pacific yew; the few understory herbs are spotty; common shrubs are rhododendron and vine maple
2	Road 45	Dominant trees are western hemlock, silver fir and Douglas fir and tend to be 50-70' tall and 8-12" DBH, some Pacific yew; the few understory herbs are spotty; common shrubs are rhododendron and vine maple. Memaloose Creek forms the western unit boundary.

PETS species detected by surveys:

Only one Sensitive Botanical species was found in the project area, *Gomphus kaufmannii*. One fruiting specimen for this fungal species was found between unit #13 and Clear Creek, within the 50' perennial stream buffer where no thinning is proposed. Although the identification of

this species has not yet been confirmed by experts, it will be assumed the preliminary identification is accurate.

Species Assumed Present due to presence of habitat:

Cordyceps capitata
Cortinarius barlowensis
Gomphus kaufmannii
Gyromitra californica
Leucogaster citrinus
Mycena monticola
Otidea smithii
Phaeocollybia attenuata
Phaeocollybia californica
Phaeocollybia olivacea
Phaeocollybia oregonensis
Phaeocollybia piceae
Phaeocollybia pseudofestiva
Phaeocollybia scatesiae
Ramaria amaloidea
Ramaria gelatiniaurantia

DETERMINATION OF EFFECT

Proposed, Threatened and Endangered Species

Howellia aquatilis is generally confined to palustrine wetlands. No habitat of this type exists within the project area, thus the proposed action will have **NO EFFECT** on this threatened species.

Sensitive Species

Table 3 displays the impact of the proposed action on species that were targeted by the field survey. Only one PETS species, Gomphus kaufmannii, was detected by the surveys, however, for the following fungi species, presence is assumed, because surveys are not practical and habitat is present.

Cordyceps capitata is a widespread but locally rare species documented from 38 sites in the western Cascade and Coast Ranges in Washington, Oregon and northern California. Two sites are known from Mt. Hood NF on Zigzag District. The species is parasitic on the fruiting body of *Elaphomyces* spp., a genus of underground-fruiting fungi in the truffle group. *Elaphomyces* are associated with the roots of conifers. Removal of some host trees, soil compaction, and nitrogen fertilization could have a localized negative impact on individuals. The proposed action will not remove all the host trees for *Elaphomyces,* and it is assumed that *C. capitata* will be able to persist. The proposed action May Impact Individuals but is not likely to lead to a trend toward federal listing for this species.

Cortinarius barlowensis is widely distributed, known from 16 sites in the western Cascades, Coast Range and Olympic Mountains of Washington and Oregon. There are three known sites from the Mt. Hood NF on the Zigzag District. Habitat is soil under conifers. Removal of some host trees, soil compaction, and nitrogen fertilization could have a localized negative impact on individuals. The proposed action will not remove all the host trees and it is assumed that *C. barlowensis* will be able to persist. The proposed action May Impact Individuals but is not likely to lead to a trend toward federal listing.

Gomphus kaufmannii is endemic to western North America and is found in California, Oregon, and Washington states. It is located either along the Pacific coast or in the Cascade-Sierran Range. Prior to locating the new site in this project area there were 5 known sites for this mushroom on the Mt. Hood National Forest, one of which is also on the Clackamas River Ranger District. The new site adjacent to unit 13 will not be impacted by project activities in the area where the above-ground fruiting body was collected. However, the below ground mycelium could extend into the unit where commercial thinning activities may compact the soil. Host trees for this species include a true firs and pines. Removal of some host trees, soil compaction, and nitrogen fertilization could have a localized negative impact on individuals. Although some host trees will be removed in the thinning units potentially impacting individuals, others will remain, continuing to provide the host trees for this species. The proposed action May Impact Individuals but is not likely to lead to a trend toward federal listing.

Gyromitra californica is distributed from British Columbia to northern California and east to Colorado, Montana and Nevada. It is known in Washington, Oregon and northern California from 35 sites, one of which is on the Mt. Hood NF, Hood River District. This species is found on well-rotted stumps and logs of conifers or in soil with rotted wood. Removal of some trees, soil compaction, and nitrogen fertilization could have a localized negative impact on individuals. The proposed action will not remove all the host trees and it is assumed that this species will be able to persist. The proposed action May Impact Individuals but is not likely to lead to a trend toward federal listing.

Leucogaster citrinus is endemic to the Pacific Northwest, known from western Washington, western Oregon and northern California and known from 45 sites. There are four sites from the Mt. Hood NF, Zigzag District. This truffle species is associated with the roots of conifers. Removal of some host trees, soil compaction, and nitrogen fertilization could have a localized negative impact on individuals. The proposed action will not remove all the host trees and it is assumed that this species will be able to persist. The proposed action May Impact Individuals but is not likely to lead to a trend toward federal listing for this species.

Mycena monticola is endemic to the Pacific Northwest where it is known from 153 sites, one of which is on the Mt. Hood National Forest. It is restricted to forests above 3000' in elevation, particularly those with Pinus spp. Mycena monticola is a saprophytic mushroom, living on the dead and decaying organic matter associated with coniferous forests. Commercially thinning units with this species may temporarily reduce the amount of suitable substrate for this species, potentially impacting some individuals. Removal of some trees, soil compaction, and nitrogen fertilization could have a localized negative impact on individuals. The proposed action will not remove all the trees and it is assumed that this species will be able to persist. The proposed action May Impact Individuals but is not likely to lead to a trend toward federal listing for this species.

Otidea smithii is known from 10 scattered sites in the western Washington, Western Oregon and northern California. On the Mt. Hood NF, there is one known location on Clackamas River District. This is found on soil under Douglas-fir, western hemlock and cottonwood. Removal of some host trees, soil compaction, and nitrogen fertilization could have a localized negative impact on individuals. The proposed action will not remove all the host trees and it is assumed that this species will be able to persist. The proposed action May Impact Individuals but is not likely to lead to a trend toward federal listing.

Phaeocollybia attenuata is endemic to the Pacific Northwest from western Washington and western Oregon to northern California where it is known from 131 sites. One site is known from the Mt. Hood NF on Zigzag Ranger District. This species is on soil under conifers. Removal of some host trees, soil compaction, and nitrogen fertilization could have a localized negative impact on individuals. The proposed action will not remove all the host trees and it is assumed that this species will be able to persist. The proposed action May Impact Individuals but is not likely to lead to a trend toward federal listing.

Phaeocollybia californica is endemic to the Pacific Northwest, known from 34 sites in western Washington, western Oregon, and northern California. No sites are known to occur on the Mt. Hood NF, however, there is a site on the adjacent Columbia River Gorge National Scenic Area. This species is terrestrial and associated with the roots of Douglas-fir, western hemlock and Pacific silver fir. Removal of some host trees, soil compaction, and nitrogen fertilization could have a localized negative impact on individuals. The proposed action will not remove all the host trees and it is assumed that this species will be able to persist. The proposed action May Impact Individuals but is not likely to lead to a trend toward federal listing for this species.

Phaeocollybia olivacea is endemic to the Pacific Northwest, known from 92 sites in western Washington, western Oregon and northern California. There is one known site on the Mt. Hood NF on Zigzag District. This species is terrestrial under conifers. Removal of some host trees, soil compaction, and nitrogen fertilization could have a localized negative impact on individuals. The proposed action will not remove all the host trees and it is assumed that this species will be able to persist. The proposed action May Impact Individuals but is not likely to lead to a trend toward federal listing.

Phaeocollybia oregonensis is endemic to Oregon where it is known from 11 sites, three of which are on the Mt. Hood National Forest, and one is known from the Clackamas River Ranger District. This species is terrestrial and associated with the roots of Douglas fir, western hemlock and Pacific silver fir. Removal of some host trees, soil compaction, and nitrogen fertilization could have a localized negative impact on individuals. The proposed action will not remove all the host trees and it is assumed that this species will be able to persist. The proposed action May Impact Individuals but is not likely to lead to a trend toward federal listing for this species.

Phaeocollybia piceae is endemic to the Pacific Northwest, known from 49 sites in western Washington, western Oregon and northern California. There is one known site on the Mt. Hood NF on Zigzag District. This species is terrestrial and associated with the roots of Douglas-fir, western hemlock and Pacific silver fir. Removal of some host trees, soil compaction, and nitrogen fertilization could have a localized negative impact on individuals. The proposed action will not remove all the host trees and it is assumed that this species will be able to persist. The

proposed action May Impact Individuals but is not likely to lead to a trend toward federal listing for this species.

Phaeocollybia pseudofestiva is endemic to the Pacific Northwest, known from British Columbia south through western Washington, western Oregon to California. There are 36 known sites in Washington, Oregon and California, four of which are on the Mt. Hood NF, Zigzag District. The species grows on soil under conifers. Removal of some host trees, soil compaction, and nitrogen fertilization could have a localized negative impact on individuals. The proposed action will not remove all the host trees and it is assumed that this species will be able to persist.. The proposed action May Impact Individuals but is not likely to lead to a trend toward federal listing.

Phaeocollybia scatesiae is endemic to western Oregon and northwestern California where it is currently known from 16 sites. Three of these sites are on the Zigzag Ranger District of the Mt. Hood National Forest. This species is associated with the roots of true firs, Sitka spruce, and huckleberry species, from sea level to 3750' elevation. Removal of some host trees, soil compaction, and nitrogen fertilization could have a localized negative impact on individuals. The proposed action will not remove all the host trees and it is assumed that this species will be able to persist. The proposed action May Impact Individuals but is not likely to lead to a trend toward federal listing for this species.

Ramaria amaloidea is endemic to the Pacific Northwest where one site has been documented on the Mt. Hood National Forest. This species is terrestrial and associated with the roots of Douglas fir, western hemlock, and true firs. Removal of some host trees, soil compaction, and nitrogen fertilization could have a localized negative impact on individuals. The proposed action will not remove all the host trees and it is assumed that this species will be able to persist. The proposed action May Impact Individuals but is not likely to lead to a trend toward federal listing for this species.

Ramaria gelatiniaurantia is another Pacific Northwest endemic species. It is currently known from a total of 24 sites, two of which are on the Mt. Hood National Forest. This species fruits in humus or soil and is associated with true firs, Douglas fir, and western hemlock. Removal of some host trees, soil compaction, and nitrogen fertilization could have a localized negative impact on individuals. The proposed action will not remove all the host trees and it is assumed that this species will be able to persist. The proposed action May Impact Individuals but is not likely to lead to a trend toward federal listing for this species.

Table 3.

Vascular Plants			
Species Name	**Common Name**	**Species Likely Present in Project Area?**	**Impact of Project**
Aster gormanii	Gorman's aster	No	No Impact
Botrychium minganense	mingan moonwort	No	No Impact
Botrichium montanum	Mountain grape-fern	No	No Impact
Botrychium pinnatum	pinnate moonwort	No	No Impact
Cimicifuga elata	tall bugbane	No	No Impact
Corydalis aquae-gelidae	cold water corydalis	No	No Impact
Montia howellii	Howell's montia	No	No Impact
Ophioglossum pusillum	Adder's tongue	No	No Impact
Sisyrinchium sarmentosum	Pale blue-eyed grass	No	No Impact
Bryophytes			
Rhizomnium nudum	Moss	No	No Impact
Schistostega pennata	Green goblin moss	No	No Impact
Tetraphis geniculata	Bent-awn moss	No	No Impact
Lichens			
Chaenotheca subroscida	pin lichen	No	No Impact
Hypogymnia duplicata	Ticker-tape lichen	No	No Impact
Leptogium burnetiae var. hirsutum	jellyskin lichen	No	No Impact
Leptogium cyanescens	blue jellyskin lichen	No	No Impact
Lobaria linita	lungwort	No	No Impact
Pannaria rubiginosa	brown-eyed shingle lichen	No	No Impact
Peltigera neckeri	black saddle lichen	No	No Impact
Peltigera pacifica	fringed pelt lichen	No	No Impact
Ramalina pollinaria	Chalky ramalina	No	No Impact
Usnea longissima	Methuselah's beard lichen	No	No Impact
Fungi			
Bridgeoporus nobilissimus	Noble polypore	No	No Impact
Cordyceps capitata	earthtongue	Yes	MIIH
Cortinarius barlowensis	mushroom	Yes	MIIH
Gomphus kaufmannii	Mushroom	Yes	MIIH
Gyromitra californica	mushroom	Yes	MIIH
Leucogaster citrinus	truffle	Yes	MIIH
Mycena monticola	Mushroom	Yes	MIIH
Otidea smithii	cup fungi	Yes	MIIH
Phaeocollybia attenuata	mushroom	Yes	MIIH
Phaeocollybia californica	mushroom	Yes	MIIH
Phaeocollybia olivacea	mushroom	Yes	MIIH
Phaeocollybia oregonensis	Mushroom	Yes	MIIH
Phaeocollybia piceae	mushroom	Yes	MIIH
Phaeocollybia pseudofestiva	mushroom	Yes	MIIH
Phaeocollybia scatesiae	Mushroom	Yes	MIIH
Ramaria amaloidea	Coral mushroom	Yes	MIIH
Ramaria gelatinaurantia	Coral mushroom	Yes	MIIH

Sowerbyella rhenana	Cup fungi	Yes	MIIH

MIIH = May Impact Individuals or Habitat but not likely to lead to a trend toward federal listing.
NI = A project or activity will have No environmental impacts on habitat, individuals, a population, or a species.

The Biological Evaluation is complete.

Recommended Design Criteria or Mitigation:
If an alternative is selected that has new road construction outside the existing proposed units, they will be surveyed by a trained Botanist and a supplemental BE will be prepared.

/s/ *Carol Horvath*

_____ November 20, 2004_____
Carol Horvath, Botanist Date

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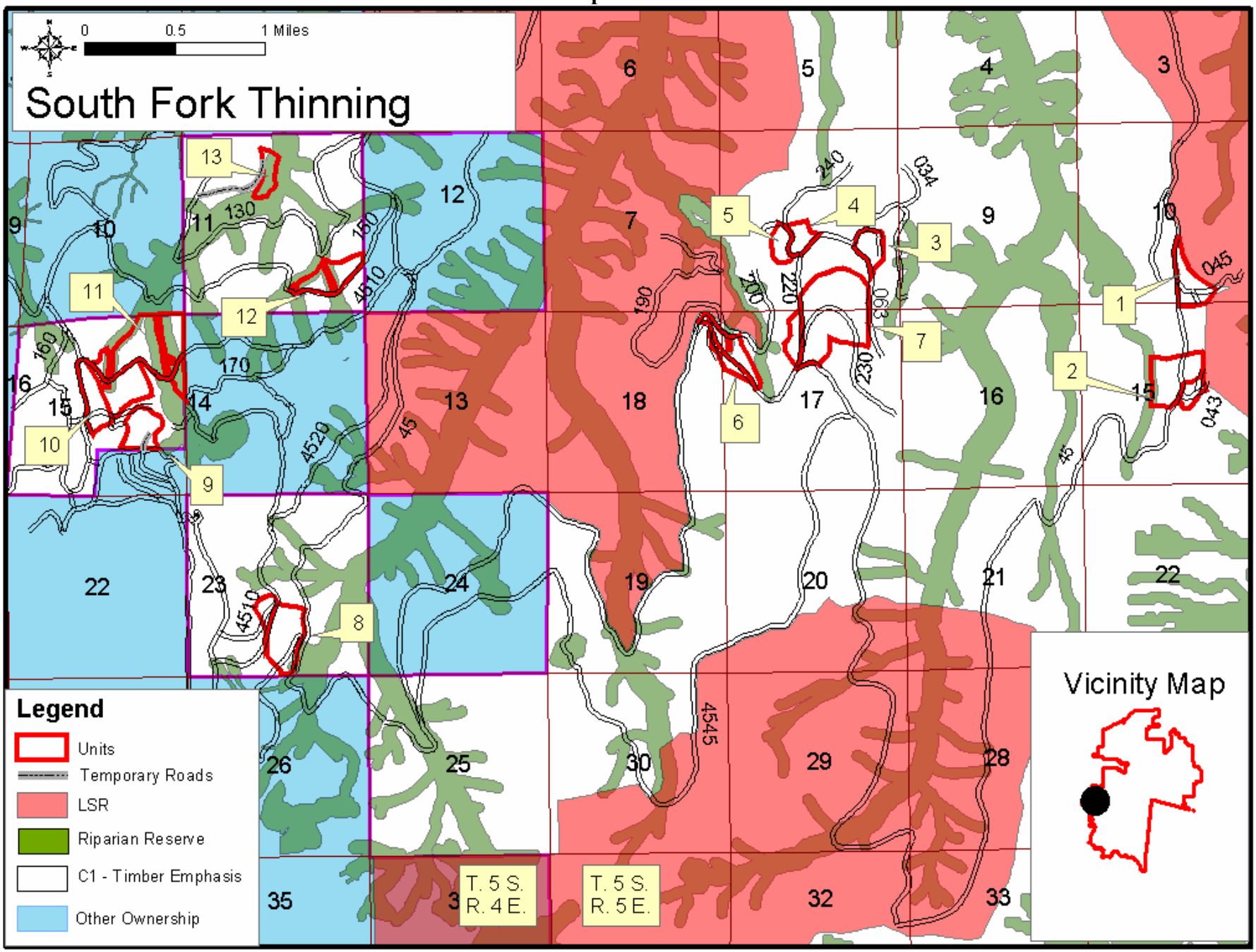
Tresder, Kathleen. A meta-analysis of mycorrhizal responses to nitrogen, phosphorus, and atmospheric CO2 in field studies by Kathleen K, Dept of Ecology and Evolutionary Biology and Dept. of Earth Systems Science, U of CA, Irvine, CA , New Phytologist (2004)

USDA Forest Service and USDI Bureau of Land Management. 2004. Record of Decision to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl. Portland, OR.

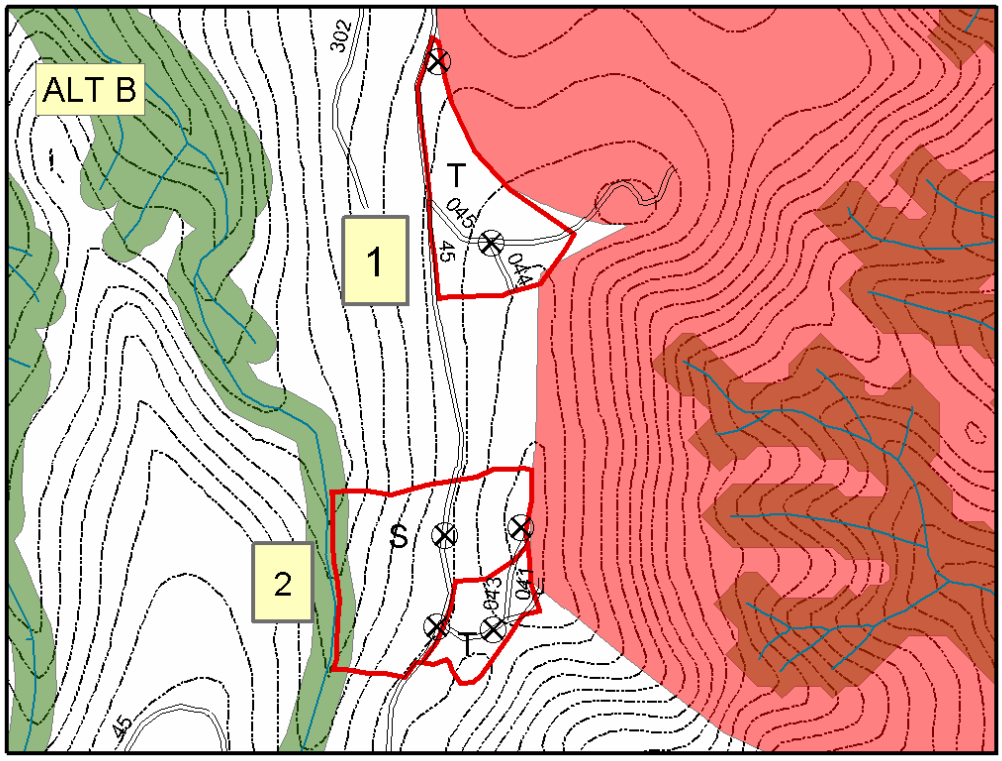
Table of Contents for Appendix E


0
0.5
1 Miles
South Fork Thinning
Legend
Units
Temporary Roads
LSR
Riparian Reserve
C1 - Timber Emphasis
Other Ownership
T. 5 S.
R. 4 E.
T. 5 S.
R. 5 E.
Vicinity Map

The following close-up maps are not to scale. All roads and landings shown are existing unless otherwise noted. To facilitate skyline logging with paralell settings, some additioanl skyline landings that use the road prism would also be used (these are not shown on maps). All non-paved roads used for log haul would receive routine pre-haul mainenance that includes brushing and blading. Some deep patch repairs (within the road prism) would be needed on road 45 to facilitate safe log haul. North is up on all maps. Countour interval is 80 feet.

Unit 1: Access is via road 45. Road 4500-045 is closed with a berm. It would be opened and closed again after use.

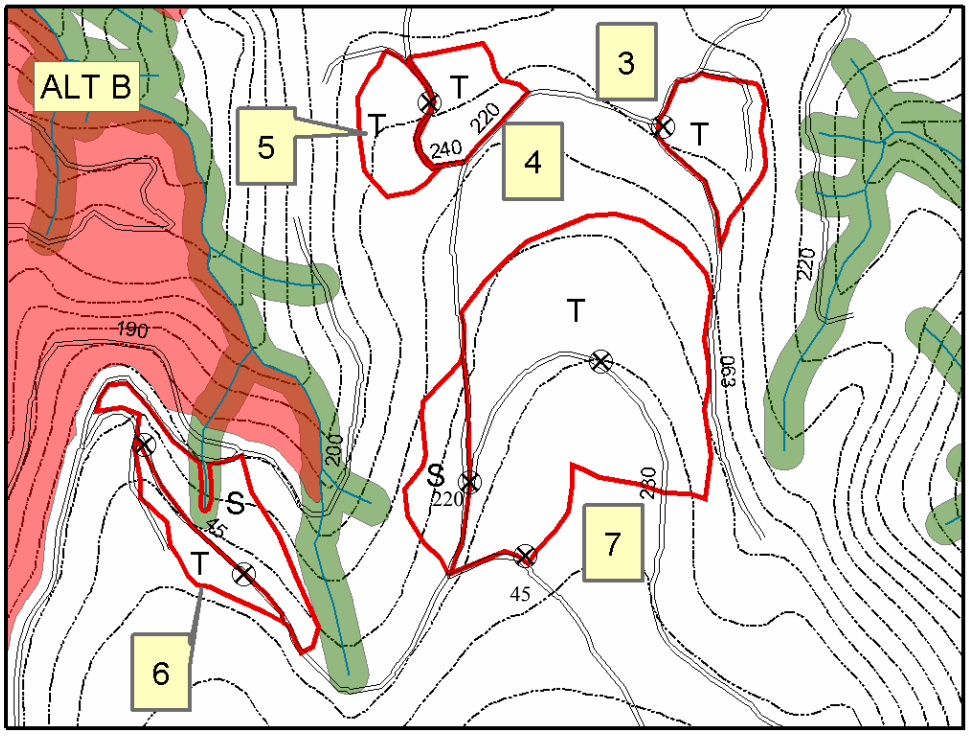
Unit 2: Access is via road 45. Roads 4500-041 and 4500-043 are closed with berms. They would be opened and closed again after use.



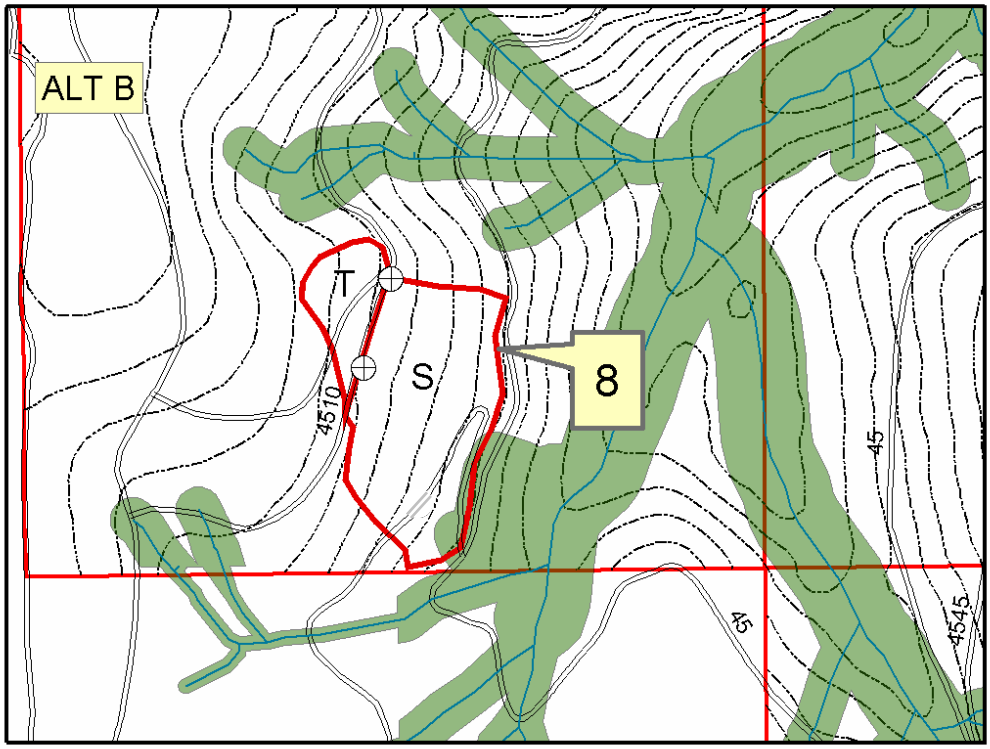
Legend for All Maps	
T	Ground Based or Tractor
S	Skyline
H	Helicopter
⊗	Landing
	Unit Boundary
■ ■ ■	Temporary Road
	Riparian Reserve
	Late-successional Reserve
	C1- Timber Emphasis
	Other Ownership

Units 3,4,5 and 7: Access is via road 45. Road 4500-220 has a gate at the road 45 junction that is closed year round. The gate protects a seed orchard administrative facility that is north of unit 4. Road 4500-230 is closed with a berm. It would be opened and closed again after use.

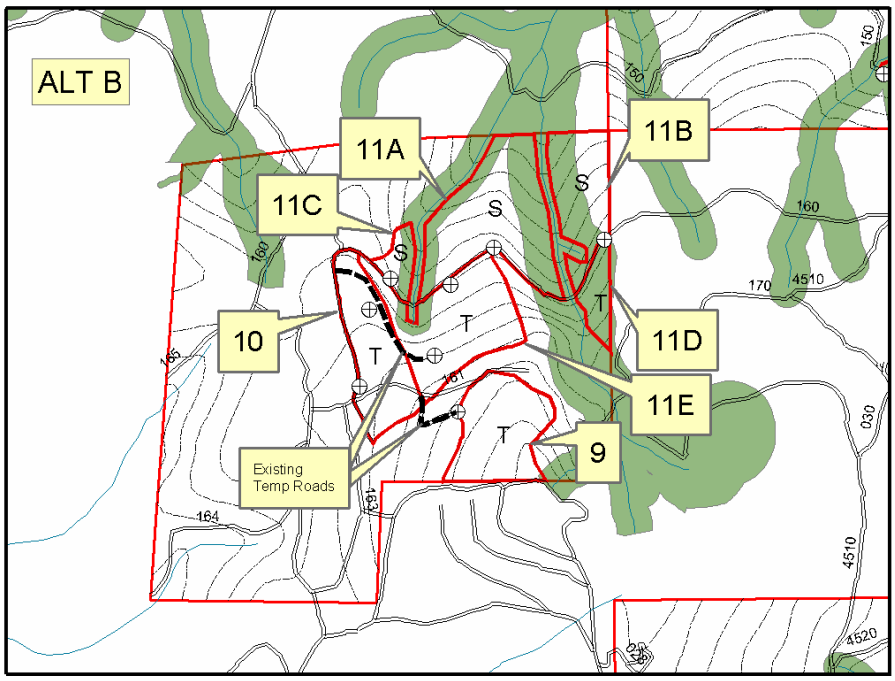
Unit 6: Access is via road 45.



Unit 8: Access is via road 4510. Other unnumbered roads are closed but would not be needed to harvest this unit.

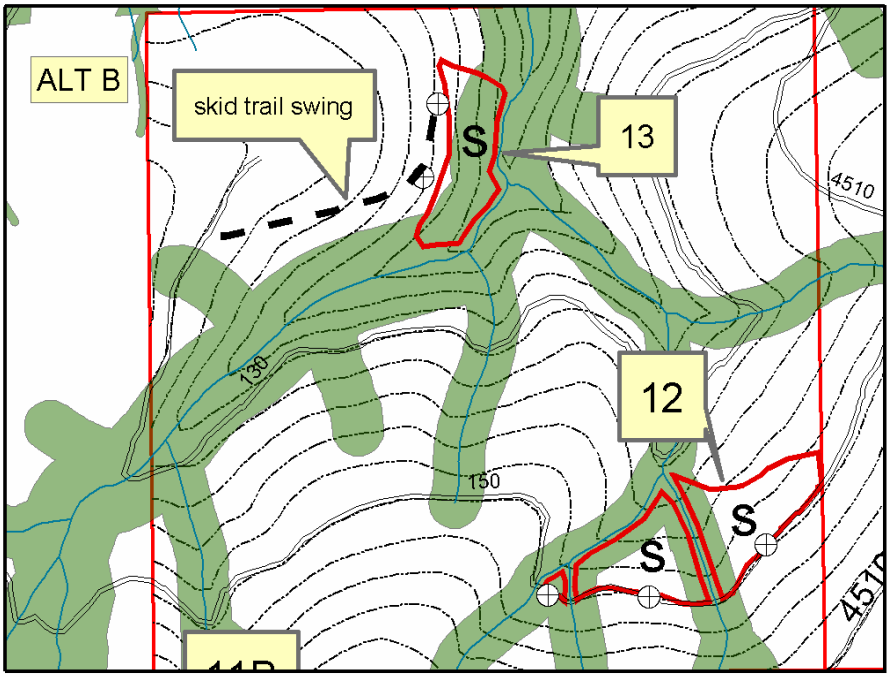


Units 9 through 11: Access is via road 4510-160. With Alternative B, existing old temporary roads (2000 ft.) would be reopened to access units 10, 11E, and 9. They would be obliterated after completion. Road 161 is closed with a berm and debris. It would be opened and closed again after use.



Unit 12: Access is via road 4510-150.

Unit 13: Access is via road 4510-130. A skid trail swing (2300 ft.) would be constructed to connect from road 130 to the landings. The swing trail is located on dry, stable, relatively gentle slopes. A transfer landing would be constructed at the junction of the swing trail and the 130 road to load log trucks.

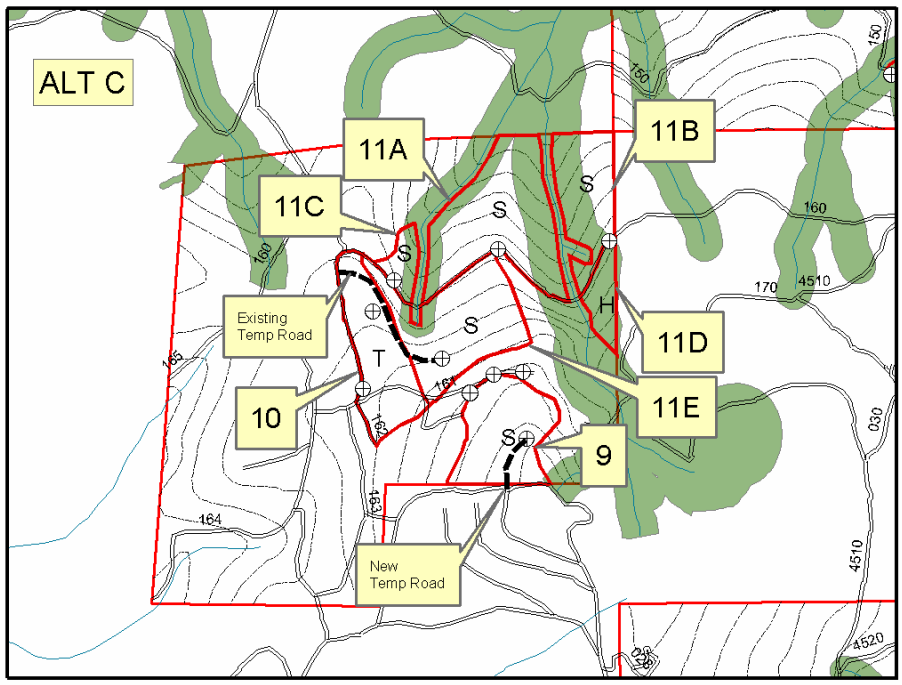


Alternative C – The following units would be the same as Alternative B: Units 1 through 8, 10, 11A, 11B, 11C and 12.

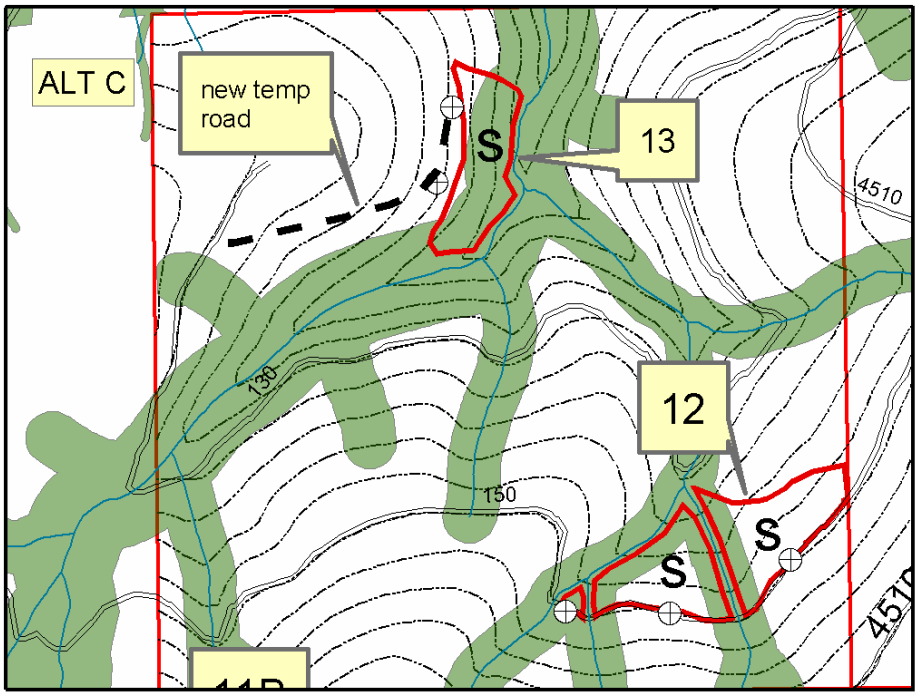
Unit 9: Change to skyline. To facilitate skyline logging a new temporary road (500 ft.) would be constructed connecting to an unnumbered road to the south.

Unit 11D: Change to helicopter. Use existing landings.

Unit 11E: Change to skyline. Landings would be constructed along the 161 road. Skyline corridors would cross out of the unit through a plantation to connect to the 161 road. An existing temporary road (1200 ft.) would also be reused to access units 11E and 10. It would be obliterated upon completion.



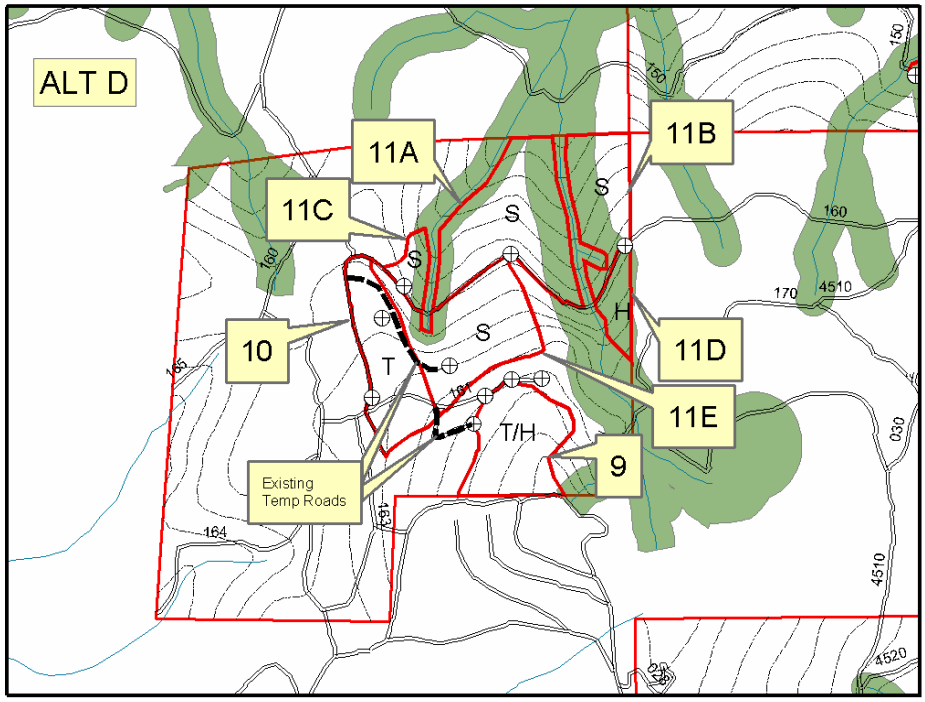
Unit 13: Access is via road 4510-130. A new temporary road (2300 ft.) would be constructed to connect from road 130 to the landings. The road is located on dry, stable, relatively gentle slopes.



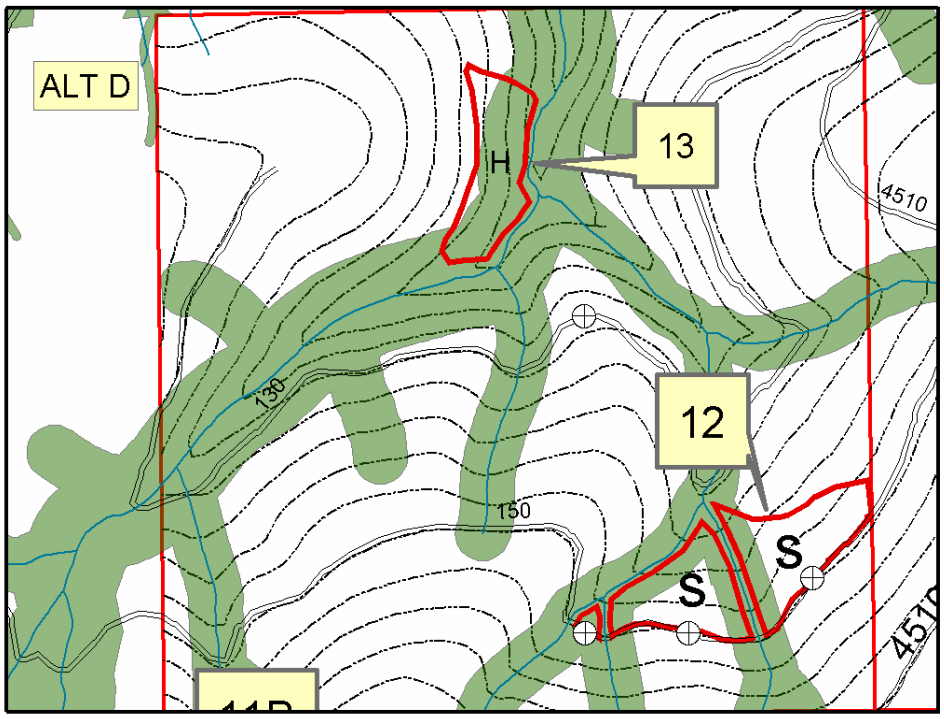
Alternative D – The following units would be the same as Alternative B: Units 1 through 8, 10, 11A, 11B, 11C and 12. Units 11D and 11E would be the same as Alternative C.

Unit 9: The gentler slopes would be changed back to Tractor similar to Alternative B. The steeper portions would be changed to helicopter. Existing landings would be used.

The existing temporary roads (2000 ft.) would be reused to access units 11E and 10. They would be obliterated upon completion.



Unit 13: Change to helicopter. Existing landing on road 4510-130 would be used.



SOUTH FORK THINNING
SILVICULTURAL DIAGNOSIS

Existing Condition

Stands proposed for commercial thinning harvest in the South Fork project area consist primarily of 40 to 55 year old overcrowded mid-seral plantations. Slopes range from nearly level to relatively steep (10 – 55%). Elevations range from approximately 2000 to 3800 feet with variable aspects. All vegetation in the proposed project area is within either the Western Hemlock Zone or the Pacific Silver Fir Zone, characterized by the following plant associations:

- TSHE//POMU/OXOR (*western hemlock/swordfern/Oregon oxalis*)
- TSHE/BENE-GASH (*western hemlock/dwarf Oregon grape-salal*)
- TSHE/RHMA-GASH (*western hemlock/Pacific rhododendron-salal*)
- TSHE/RHMA-BENE (*western hemlock/Pacific rhododendron/dwarf Oregon-grape*)
- TSHE/RHMA/XETE (*western hemlock/Pacific rhododendron/beargrass*)

The stands in the project area display an abundance of species diversity with common overstory and understory species consisting of Douglas-fir (*Pseudotsuga menziesii*), noble fir (*Abies procera*), Pacific silver fir (*Abies amabilis*), western hemlock (*Tsuga heterophylla*), western redcedar (*Thuja plicata*), and mountain hemlock (*Tsuga mertensiana*). Ground cover includes Pacific rhododendron (*Rhododendron macrophyllum*), beargrass (*Xerophyllum tenax*), dwarf Oregon grape *(Berberis nervosa*), vine maple (*Acer circinatum*), salal (*Gaultheria shallon*), and swordfern (*Polystichum munitum*).

The species mix is similar for each of the stands but most exhibit various concentrations and distributions. Douglas-fir, noble fir, and western hemlock generally dominate the overstory with minor to moderate amounts of both Pacific silver fir and western redcedar scattered throughout. Overstory diameters in plantations average approximately 7 to 24 and heights averaging approximately 100 feet.

There is a moderate amount of snags and downed wood in the proposed treatment stands, although much of it is small diameter wood. The stands average 3-4 snags/Ac and 3-4 downed logs/Ac (decay classes 1-5) however, the majority of the downed wood is not in desired decay classes 1, 2, or 3 and the distribution is scattered.

The soils in the project area present minimal limitations to timber harvest activities. All of the soil types within the proposed units are suitable for timber management in terms of soil productivity.

Disturbance Factors

Fire, wind, and harvest activity have been the major disturbance agents in the project area. Fire, historically, was the dominant landscape pattern-forming disturbance before timber harvest

activities began. This watershed is within the Pacific silver fir fire ecology group, which is a stand replacement fire type with a frequency of 50-300+ years.

Windthrow potential in the project area is categorized as moderate by the Soil Resource Inventory (SRI January, 1979) and primarily occurs in the stands that have experienced various stem and root diseases coupled with effects of the prevailing winds. Wind has not been a major factor in the plantations. However, tops have been broken out of intermediate size trees due to the high height-to-diameter ratio and crowding in the stands and some trees weakened by root disease have blown over.

Soil Mapping Unit	Windthrow Potential
315-317	moderate
320,321,322,324	moderate - high
325	moderate

Disturbance by insects and disease is closely associated with windthrow. Forest insects are present at endemic levels throughout the South Fork area. When abundant, favorable breeding habitat (weakened trees) becomes available, usually as windthrow, Douglas-fir bark beetle (*Dendroctonus pseudotsugae Hopkins*) populations can rise to epidemic levels creating mortality in live trees. There have been no known recent insect outbreaks in the project area.

Several forest diseases are present in the South Fork area. Small isolated pockets of laminated root rot (Phellinus weirii) are present throughout these stands with minor occurrences of western hemlock dwarf mistletoe (*Arceuthobium campylopodum tsugense*).

The Benefits of Thinning

The objective 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 (Smith, 1962). In general, thinning tends to improve the overall vigor, growth, health and architecture of trees. Thinning can directly maintain forest health by maintaining growth rates of stands.

With the variable density thinning method, residual trees are distributed throughout the stand in varying concentrations or densities. Minor species components and as well as trees with elements of wood decay that enhance biological diversity can be retained while meeting stand health and growth objectives.

Most of the South Fork plantations were precommercially thinned at approximately 15 to 20 years of age and are now between 40 and 50 years of age. In most units, another thinning in approximately 10 to 20 years would be desirable. Thinning would occur sooner in stands at closer spacing and later in stands thinned to a wider spacing.

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. The second response is the allocation of carbohydrate for diameter growth and finally the tree's

defense system (Oliver and Larsen, 1996). Thinning can improve the resistance of some trees to some pathogens by manipulating the structure and species composition of a young stand (Smith, 1962).

Thinning provides growing space, which gives the trees with the best competitive advantage the opportunity to take advantage of this growing space for the longest practical time, while fully utilizing the ability of the trees to expand their crowns into the growing room provided by the removal of neighboring trees (Oliver and Larsen, 1996). Failure to space trees early in their life can have consequences lasting the life of the timber stand (Smith, 1962).

Trees with larger crowns have greater stem taper, that is, the base of the tree is relatively large compared with trees that have small short crowns. Trees with more taper are less likely to suffer stem breakage. Large crowns are also more likely to recover from defoliation than a tree that has a short restricted crown.

If thinning is delayed, the crowns of prospective leave trees are shortened by the intense competition for light and growth is likely to slow down drastically if all trees compete strongly with one another (Smith and Reukema, 1986). These trees are usually slow to respond to the thinning and become susceptible to damaging agents during the time it takes their crowns to grow in to the additional space provided by the thinning.

Riparian Reserves

Riparian reserves would be thinned to a wider spacing than would be optimal for timber productivity. However, riparian objectives would be better served by a wider spacing where leave tree size would be maximized and the need for future or subsequent thinning entries would be avoided.

Windfirmness

Wind can damage trees by uprooting them, by causing them to snap off and by defoliation or severe injury to their crowns. Thinning increases a tree's resistance to the wind (windfirmness) and therefore, the physical stability of second-growth stands. Trees that have been exposed to winds when they are young and rapidly growing are less likely to suffer severe damage at a later age than those that have grown in tight stands initially. The natural structure of a tree that is exposed to the wind resists damage because trees adapt to the forces exerted upon them by the wind. The bending of the stem by wind causes growth due to stimulation of the cambial layer in both the stem and roots of the tree (Mergen, 1954).

This increased growth aids the tree in resisting the forces of the wind. Increased root growth, especially in the short stout horizontal roots on the leeward side of the tree, improves the anchoring in the soil. Increased stem growth at the base of the tree improves the shape and bending resistance of the stem (Smith, 1986).

Unmanaged forests often have high stand densities and tall trees that are shallowly rooted. In dense stands, individual trees depend on mutual support during a windstorm. When neighboring

trees are removed, in combination with certain terrain, soil, and exposure conditions, the potential for windthrow is increased.

Thinning at a young age helps trees maintain more crown. Trees with larger crowns have greater taper, that is, the base of the tree is relatively large compared with trees that have small short crowns (Smith, 1962). Large crowns also are more likely to recover from defoliation than a tree that has a short restricted crown. Trees with more taper are less likely to suffer stem breakage.

Thinning and Fertilization

Plantations in the matrix would be fertilized with nitrogen (N) to increase productivity or site quality following thinning activities. The objective of forest fertilization is to improve the nutrient status of soils by adding readily available sources of nutrients over the short or long-term (Daniel, Helms, and Baker, 1979).

Fertilization in combination with thinning provides an additive effect (Scanlin and Lowenstein, 1979) in terms of a greater and faster growth response from the stand. Stands experience an increase in crown densities, root systems, taper, overall vigor, and effective defense systems. This response allows desired objectives (forest health, larger diameters, timber production, increased site productivity) to be met sooner than if allowed to occur naturally.

For trees to respond well to nitrogen fertilization, they need to be able to build more crown (Mika, Moore, Brockley, and Powers, 1990). Younger stands or well-spaced stands respond favorably, at least until crown closure occurs. Trees grown in dense stands tend to have stems with little taper and short, live crowns. Fertilization alone typically results in little change in taper, that thinning increases taper and that the combination of fertilization and thinning will result in increased taper (Jozsa and Brix, 1989). Fertilization early in the rotation is important because the period before canopy closure is when greatest demands are made on the available nutrient capital of the site (Daniel, Helms, and Baker, 1979).

In general, response to fertilization is greatest when combined with thinning to -reduce competition for light, moisture, as well as the added nutrients (Walstad and Kuch, 1987). Generally, a response period of ten years or fewer can be expected after a single application of nitrogen fertilizer (Miller, R.E., J.R. Boyle, A.E. Harvey, T.A. Ballard, L.A. Palazzi, and R.F. Powers, 1990).

A typical result of fertilizer application, particularly on lower-quality sites, is increased mortality of trees in the lower crown classes because fertilization increases growth rates and competition causing a faster expression of dominance (Daniel, Helms, and Baker, 1979).

Stand selection for fertilization is based on both stand and site characteristics that indicate a probable increase in growth with the addition of nitrogen fertilizer. Past monitoring studies on the Clackamas River Ranger District have shown a 30% increase in basal area growth in un-thinned and fertilized stands compared to a 70% increase in basal area growth in thinned and fertilized stands on Ladee Flat.

Silvicultural Objectives

The primary silvicultural need and objectives for these stands is to:

- Provide forest products consistent with the Northwest Forest Plan goal of maintaining the stability of local and regional economies now and in the future
- Increase health and vigor and enhance growth that results in larger windfirm trees
- Enhance diversity by variable density thinning
- Enhance riparian reserves by accelerating the development of mature and late-successional stand conditions

RELATIVE DENSITY

Stand density expresses crowding of individual trees within stocked stands.
Stand density has been measured in many ways but not all measures are as useful in measurement because they do not relate to site occupancy. A good measure of stand density is quantitative and independent of management objectives.

Absolute methods of density control set a fixed standard on a measurable parameter such as stems per acre or basal area per acre. This standard is fixed and does not vary as the stand varies.

Relative density methods relate existing or planned density to some maximum biologically potential density, hence the term "relative". Relative density (RD) expresses stocking as a proportion of the maximum possible. For any given density, there is a maximum average tree size attainable. When reached, an increase in size occurs with a decrease in density.

Both tree and stand characteristics are closely related to relative density. Tree growth rates, crown structure and mortality, as well as understory development and natural regeneration are all closely related to RD. When relative density is held constant, residual basal area and spacing increase with an increase in average stand diameter.

The scale for relative density ranges from 0 – 100 and applies to stands of all sizes.

General Rules of Thumb (apply to many species)

- Mortality zone → >RD 55
- Optimum thinning for timber → RD 35 - 55
- Thin for diversity → RD 25 – 45
- Open for understory development → RD 20 – 30
- Near "full stocking"/understory progressively suppressed → RD 30 – 55

- Mortality of some trees must occur for larger growth → RD ~55 – 100

Stand densities in the South Fork Timber Sale area were analyzed using Curtis' Relative Density method. Determination of the thinning level for these stands was based on the need to meet resource management objectives. The table displays approximate relative densities for the no action alternative and densities post harvest in 20 years (matrix) as well as 40 years (riparian reserves) for the proposed timber sale. All stands will be treated using a variable density thinning where relative density should average ± 15% of the post RD at any given point in the stand.

Treatment Options

Proposed areas under consideration for treatment were field-reviewed by a certified silviculturist and specific silvicultural systems were selected based on site-specific analyses and management area goals and objectives. To meet the silvicultural objectives of these stands, several different treatments could be employed. All options must be considered and addressed.

Regeneration harvest was eliminated from consideration as the optional treatment because it would not meet the desired management goals for stands in the South Fork area and the trees in these stands have not yet reached culmination of mean annual increment. Treatment options considered in this analysis were: 1) no-treatment and 2) thinning.

The no-treatment option was not chosen because it would not move any of the stands closer to the desired future condition, nor would it address capturing growth potential and mortality in these stands. (Four-92, FW-382; Four-289; Four-292, C1-016).

The thinning option was chosen as the optimal treatment to achieve the desired management goals for stands 1 – 13 because they have not surpassed culmination of mean annual increment and are maintaining their growth capability at a slower rate due to overcrowding and the presence of disease. This treatment method is considered the optimum harvest method for these stands to meet forest health and site productivity objectives for C1 and Matrix lands (Four-86, FW-315; Four-88, FW-348; Four-92, FW-382). Thinning these stands would promote healthy vigorous stands to meet future management options and objectives.

Treatment Proposal

- Thin and harvest wood fiber in plantations from approximately 497 acres (423 acres of matrix land and 74 acres of the dry upland portion of riparian reserves) (EA s. 3.4). Variable density thinning will enhance diversity. Thinning will leave approximately 80 to 140 trees per acre.

- Variability – The proposal is to introduce diversity through variable spaced thinning (EA s. 3.2.1). Diversity and variability will be introduced in several ways: 1) Leave tree spacing will vary within units and between units, 2) Leave trees will include minor species and hardwoods, 3) Small gaps and skips would be created, 4) Leave trees will include some

trees with the elements of wood decay, 5) Leave trees will include some live trees where their crowns touch certain key snags, 6) Some snags and all existing large down logs will be retained, 7) Leave tree spacing will be wider in riparian reserves, and 8) No-harvest buffers will be included along streams.

- Riparian – Approximately 80 variably spaced trees per acre will be retained in riparian reserves to accelerate the development of mature and late-successional stand conditions. Riparian reserves would be thinned to a wider spacing than would be optimal for timber productivity. However, riparian objectives would be better served by a wider spacing where leave tree size would be maximized and the need for future or subsequent thinning entries would be avoided. Riparian reserve widths are 180 feet for non-fish-bearing streams and 360 feet for fish-bearing streams. There will be no-harvest buffers of approximately 30 to 50 feet wide on each side of streams.

- Fertilization - Approximately 178 acres of second-growth plantations within the matrix will be fertilized aerially with 200 pounds of nitrogen per acre. Fertilization is proposed in units 1, 3, 4, 5 and 7. Fertilization is contingent upon funding availability. If funding is not immediately available, the thinning of plantations will proceed. Fertilization would not occur in riparian reserves.

/S/ Glenda Goodwyne

Silviculturist

December 28, 2005
Date

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SILVICULTURAL CERTIFICATION FOR NFMA COMPLIANCE

SOUTH FORK COMMERCIAL THINNING

The proposed commercial thinning treatment of stands 1 – 13 have been field verified by a certified silviculturist.

Based on my analysis, stand diagnosis and design criteria for the commercial thinning treatment, I recommend the following findings of facts pursuant to NFMA be made in this project decision:

There is reasonable assurance that if prescriptions are implemented as I have prescribed:

Soil, slope or other watershed conditions will not be irreversibly damaged.

I further find that:

All lands within this project area that would be harvested are suitable for timber production.

Evenaged management is the optimal appropriate silvicultural system and commercial thinning is the optimum harvest method for those stands prescribed for treatment because it meets the objectives of the *NORTHWEST FOREST PLAN*, the *MT HOOD FOREST PLAN* and the recommendations of the *UPPER CLEAR AND SOUTHFORK WATERSHED ANALYSES*. These stands have not surpassed culmination of mean annual increment for fiber production.

All units or combination of adjacent units and immediately adjacent existing plantations less than an average of 4.5 feet in height do not create openings greater than 60 acres in size.

/S/ Glenda Goodwyne — April 13, 2005
Silviculturist — Date

DecAID Advisor

The following is a summary of snag data contained in the DecAID advisor for three different tolerance levels for both the Western Lowland Conifer Hardwood Forest Oregon Cascades and the Montane Mixed Conifer Forest. The data for each of these habitat types is given for three different structural conditions.

DecAID – Snag Density and Sizes for 3 Different Tolerance Levels

"Western Lowland Conifer Hardwood Forest Oregon Cascades" vegetative condition best fits with the Western Hemlock And Pacific Silver fir Plant Series

Vegetative Conditions Western Lowland Conifer Hardwood Forest Oregon Cascades	80% Tolerance Level for Snag Density and Diameter	50% Tolerance Level for Snag Density and Diameter	30% Tolerance Level for Snag Density and Diameter l
Larger (Late Seral)	36.4/acre > 10 in. with more than 14/acre > 20 in.	18.6/acre > 10 in. with more than 8.1/acre > 20 in.	5.3/acre > 10 in. with more than 4.8/acre > 20 in.
Small/Medium (Mid Seral)	36.4/acre > 10 in. with more than 15/acre > 20 in.	18.6/acre > 10 in. with more than 8.1/acre > 20 in.	5.3/acre > 10 in. with more than 4.8/acre > 20 in.
Open Canopy (Early Seral)	26/acre > 10 in. with more than 12.5/acre > 20 in.	9.4/acre > 10 in. with more than 4.2/acre > 20 in.	5/acre > 10 in. with more than 2.1/acre > 20 in.

"Montane Mixed Conifer Forest" vegetative condition best fits with the Mountain Hemlock Plant Series

Vegetative Conditions Montane Mixed Conifer Forest	80% Tolerance Level for Snag Density and Diameter	50% Tolerance Level for Snag Density and Diameter	30% Tolerance Level for Snag Density and Diameter l
Larger (Late Seral)	27/acre > 10 in. with more than 15/acre > 20 in.	15/acre > 10 in. with more than 9/acre > 20 in.	11/acre > 10 in. with more than 6.5/acre > 20 in.
Small/Medium (Mid Seral)	32/acre > 10 in. with more than 9.5/acre > 20 in.	16.6/acre > 10 in. with more than 4.2/acre > 20 in.	10/acre > 10 in. with more than 2.7/acre > 20 in.
Open Canopy (Early Seral)	23/acre > 10 in. with more than 5.3/acre > 20 in.	8.5/acre > 10 in. with more than 2.1/acre > 20 in.	4/acre > 10 in. with more than 1.1/acre > 20 in.

The following tables contain a summary of the snag data from Forest surveys. The data is summarized in a slightly different manner than the information in the DecAID advisor. The data separates snags into large (> 21 inches) and medium (15 to 21 inches). The DecAID advisor

generally uses large (>20 inches) and small (10 to 20 inches). In terms of comparison, the data under estimates the amount of snags.

The following analysis compares the snag data to the tolerance levels for the different wildlife habitat types and structural conditions identified in the DecAID advisory tool. It displays the percentage of the watershed in each structural condition and the tolerance level for snags. The percentages are based on all past, present and foreseeable future actions.

Average Snag Levels and Tolerance levels for Unmanaged and Managed Stands

Series and Seral Stage	Large Snags > 21 in.	Small Snags 15 to 21 in.	Current Tolerance Level at the Landscape Scale	Percent of analysis area
Western Hemlock Late Seral	6.2	1.7	> 30%	27.2
Western Hemlock Mid Seral	0.1	13.5	> 30% but lacks large snags	16.5
Pacific Silver Late Seral	7.8	4.8	Between 30% and 50%	15.5
Pacific Silver Mid Seral	1.9	3.2	Less than 30%	0.7
Mountain Hemlock Late Seral	3	0.1	Less than 30%	0
Mountain Hemlock Mid Seral	0.9	0.7	Less than 30%	0
All Series, Early Seral Plantations	1.5	0.5	Less than 30%	13.2
All Series, Mid Seral Plantations	0.1	0.1	Less than 30%	31.8

AQUATIC CONSERVATION STRATEGY

The Record of Decision to Clarify Provisions Relating to the Aquatic Conservation Strategy (USDA USDI, 2004a) contains new guidance on how to implement the Aquatic Conservation Strategy. Some highlights of the clarification include: (1) Project plans are not required to assess the contribution of a site-specific project to achieving Aquatic Conservation Strategy objectives. (2) The Aquatic Conservation Strategy objectives are not to be interpreted as standards and guidelines applicable to individual projects. (3) Project would be designed to contribute to maintaining or restoring the fifth-field watershed over the long term, even if short-term effects may be adverse.

1. **The existing condition, including the important physical and biological components of the fifth-field watersheds.** *The existing conditions for local resources can be found in the EA in the Water Quality and Fish section and in the Wildlife section. The existing conditions for fifth-field watersheds can be found below in this Appendix.*

2. **The effect of the project on the existing condition.** *The effects of the alternatives on resources can be found in the EA in the Water Quality and Fish section and in the Wildlife section.*

3. **Relevant information from applicable watershed analysis used in designing and assessing the project.**

Page references	Upper Clear Creek	South Fork Clackamas
Emphasis on thinning opportunities	78 to 80	4-9, 5-1, 5-4
Stream surveys	51 to 55	2-22,

4. **Consistency with Riparian Reserve standards and guidelines of the NFP on pages C-31 to C-38.** (Where standards and guidelines contain direction to "meet," "not adversely affect," "not retard or prevent attainment of" or otherwise "achieve ACS objectives," the Aquatic Conservation Strategy objectives apply only at fifth-field watershed and larger scales, are achieved only over a period of decades or longer, and do not provide additional direction constraining the short-term or long-term effects of individual projects."

Applicable riparian reserve standards and guidelines:

TM-1 c. Apply silvicultural practices for Riparian Reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain ACS objectives. *Refer to the purpose and need section. The objective of thinning in riparian reserves is to accelerate the development of mature and late-successional stand conditions. The design criteria and best management practices provide protection to riparian and aquatic resources.*

RF-2. For each existing or planned road, meet Aquatic Conservation Strategy objectives by:
a. minimizing road and landing locations in Riparian Reserves.
b. completing watershed analyses (including appropriate geotechnical analyses) prior to construction of new roads or landings in Riparian Reserves.
c. preparing road design criteria, elements, and standards that govern construction and reconstruction.
d. preparing operation and maintenance criteria that govern road operation, maintenance, and management.
e. minimizing disruption of natural hydrologic flow paths, including diversion of streamflow and interception of surface and subsurface flow.
f. restricting sidecasting as necessary to prevent the introduction of sediment to streams.
g. avoiding wetlands entirely when constructing new roads.
Any new temporary roads would not be located within riparian reserves and they would be built on gentle landforms and obliterated upon project completion. They would be consistent with this standard and guideline.

RF-3. Determine the influence of each road on the Aquatic Conservation Strategy objectives through watershed analysis. Meet Aquatic Conservation Strategy objectives by:

a. reconstructing roads and associated drainage features that pose a substantial risk.
b. prioritizing reconstruction based on current and potential impact to riparian resources and the ecological value of the riparian resources affected.
c. closing and stabilizing, or obliterating and stabilizing roads based on the ongoing and potential effects to Aquatic Conservation Strategy objectives and considering short-term and long-term transportation needs.
Road reconstruction needs have been identified along haul routes.

RF-5. Minimize sediment delivery to streams from roads. Outsloping of the roadway surface is preferred, except in cases where outsloping would increase sediment delivery to streams or where outsloping is unfeasible or unsafe. Route road drainage away from potentially unstable channels, fills, and hillslopes.
Any new temporary roads would not be located within riparian reserves and they would be built on gentle landforms and obliterated upon project completion. They would be consistent with this standard and guideline.

Fifth-field Watershed
Summary of Existing Condition

Middle Clackamas River

The Middle Clackamas Watershed includes the mainstem Clackamas River and watersheds that drain into the Clackamas from North Fork Reservoir to the confluence of the Collawash River. The watershed is 138,598 acres in size. The major subwatersheds that contribute to the Middle Clackamas fifth-field watershed includes: South Fork of the Clackamas River, North Fork Clackamas, Fish Creek, and Roaring River.

The Middle Clackamas River corridor, along with the Fish Creek and Roaring River drainages, are designated as Tier 1 key watersheds in the Record of Decision for the Northwest Forest Plan. Tier 1 watersheds have been identified as 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.

Management activities that have had an effect on aquatic resources within the Middle Clackamas River include timber harvest, road building, hatchery introductions, and hydroelectric development.

Using the "Matrix of Pathways and Indicators" (NOAA Fisheries, 1996), the condition of the existing environmental baseline with in the Middle Clackamas River watershed was assessed. Baseline habitat indicators that are described "at risk" in the Middle Clackamas watershed includes: temperature, physical barriers, large woody debris, off-channel habitat, refugia, floodplain connectivity, road density, and riparian reserves. Sediment/turbidity, chemical contaminants/nutrients, substrate, pool frequency/quality, streambank condition, and

peak/baseflows are described as “properly functioning”. Drainage network increase within the watershed is described as “not properly functioning”.

Lower Clackamas River

The Lower Clackamas Watershed includes the mainstem Clackamas River and all of the watersheds that drain into the Clackamas from its confluence with the Willamette River to North Fork Reservoir located upstream of Estacada Oregon. The watershed is 117,747 acres in size. The major subwatersheds that contribute to the Lower Clackamas fifth-field watershed includes: Clear Creek, Rock Creek, and Deep Creek.

The Lower Clackamas is the most highly developed area within the Clackamas basin. Land uses within the watershed include: agricultural, forestry, power generation, industrial, and rural residential.

Using the “Matrix of Pathways and Indicators” (NOAA Fisheries, 1996), the condition of the existing environmental baseline with in the Lower Clackamas River watershed was assessed. Baseline habitat indicators that are described “at risk” in the Lower Clackamas includes: temperature, chemical contaminants/nutrients, sediment/turbidity, physical barriers, large woody debris, pool quality, off-channel habitat, refugia, floodplain connectivity, road density, and riparian reserves. Drainage network increase within the watershed is described as “not properly functioning”.

Soil Report for Southfork Thinning EA

October 5, 2005

/S/ *Gwen Collier*

Resources Used to Make Interpretations

The soil interpretations and recommendations presented in this report were developed from field visits in 2004 and 2005, office interpretation of aerial photos with flights in 1946, 1958, 1959, 1961, 1972, 1995, and 2004, topographic maps, and the Soil Resource Inventory (SRI) for the Mt. Hood National Forest (Howes, 1979) containing a general map of the soils associated with landforms in the Southfork project area. Field verification reveals that the SRI soil mapping of this area is generally accurate.

Affected Environment

Physiographic Factors

The project is located within three fifth field watersheds; units 1 through 8 are located within the South Fork of the Clackamas River watershed, units 11 through 13 and the north portions of 9 and 10 are located within the Clear Creek watershed, and the southern portions of 9 and 10 are located within the Molalla River watershed. The maritime influenced climate of the area is typified by warm, but rarely hot, summers and cool winters. Persistent freezing temperatures and winter snowpack are common at higher elevations above 2,000 feet, but less so below. All the proposed units are located between 2,000 and 4,600 feet in elevation. Estimated average annual precipitation is 70 to 80 inches falling in the form of rain, snow, or rain-on-snow. Most of the precipitation falls during the fall and winter. Summer rainfall is light (Howes, 1979).

In general, landforms in the project area are typical of terrain shaped by alpine glaciers that occupied upper mountain slopes during the last ice age. The heavily forested topography is typified by moderately sloping upland hills and gently sloped upland ridges that pitch steeply down long slopes to deep, incised valley bottoms. Ridgelines and upper hill slopes are lightly dissected with generally rounded shapes. Valley side slopes are moderately dissected with steep first and second order incised tributary drainageways (MHNF, 1969).

Geology
The Southfork project area lies in the Western Cascade physiographic province. Large-scale geologic mapping by Hammond et. al. (1982) identified two geologic formations underlying Southfork timber sale units 1 through 7. The Rhododendron Formation consists chiefly of dark colored lava flows, light colored pyroclastic flows, and associated intrusions. These rocks dip slightly eastward, are often deeply weathered and form soils which may be rich in clay. The ridges and upper slopes are capped with the younger basalts and basaltic andesites of the High Cascades Group which generally consist of dark, unaltered basaltic and andesitic lava flows that tend to be less deeply weathered. The Soil Survey of Clackamas County Area, Oregon describe the soils of units 8 through 13 as being derived from andesite and basalt mixed with volcanic ash.

Soil Characteristics
Soil characteristics for soil mapping units within the proposed thinning units are listed in Table 1. Within any soil-mapping unit, there is a possibility of finding up to 25% inclusions of other associated soils and/or bedrock outcrops.

Table 1. Soil Mapping Unit Attributes

Soil Mapping Unit (thinning *unit #)*	Landform	Natural Soil Mantle Stability	Surface Erosion Potential	Compaction Hazard	Susceptibility to Soil Displacement	Windthrow Hazard
MU 4 *(6)*	**forested depressions with high water table**	**Stable**	**Very slight**	**High**	**Moderate**	**High**
MU 315 *(10)*	**Smooth to slightly undulating glacial slopes**	**Stable**	**Slight - Moderate**	**Moderate**	**Low - Moderate**	**Moderate**
MU 316 *(10, 11, 12)*	**Steep, smooth to slightly undulating glacial slopes – north and east aspects**	**Stable – Moderately Stable**	**Moderate**	**Moderate**	**Moderate - High**	**Moderate**
MU 317 *(8, 11, 13)*	**Steep, smooth to slightly undulating glacial slopes – south and west aspects**	**Moderatel y Stable**	**Moderate**	Moderate	**Moderate - High**	Moderate
MU 320 *(2, 3, 4, 5, 6, 7, 9, 11)*	**Nearly level to steep, smooth glacial slopes**	Very stable	slight	**Moderate**	**Low**	**Moderate -High**
MU 321 *(6)*	**steep north and east facing glacial slopes**	**stable**	**Moderate**	**Moderate**	**Moderate**	**Moderate -High**
MU 322 *(2, 8)*	**Steep south and west facing glacial slopes**	**stable**	**Moderate**	**Low-Moderate**	**Moderate**	**Moderate -High**
MU 323 *(1)*	**Nearly level to sloping, smooth glaciated uplands**	**Very stable**	**Slight**	**Moderate**	**Low**	**Moderate -High**

Soils within the proposed units have developed from colluvium weathered from glacial till that overlies fractured andesite. Both soil surface and subsurface horizons are primarily medium textured loams and silt loams. Rock content is usually high (>35% up to >60% by volume). Soil depths range from moderately deep to deep, with shallow inclusions on ridge top or upper side slope sites. Seasonal and year round high water tables and seeps are somewhat common in the area, generally surfacing at interbed contacts between contrasting geologic formations (Howes, 1979).

The soil resources in the project area support forested conifer stands primarily within the western hemlock and pacific silver fir zones. Inherent soil productivity as measured by Douglas-fir site class varies from class II to V, or high to low, with the majority of stands exhibiting moderate site classes of III and IV. The soils that have developed in the area have a good water holding capacity, but because they exhibit a frigid soil temperature regime, their nutrient cycling ability is relatively low to moderate, making them moderately productive.

On some sites in the project area, soil characteristics present several limitations to timber harvest activities. Surface

erosion potential of the majority of the acreage proposed for thinning is low to moderate, primarily because of the comparatively gentle relief and high relative infiltration rates of glacial till. Soil types that occur on slopes greater than 30% exhibit a higher surface erosion potential. Most of the soil types in the area are only moderately susceptible to detrimental compaction. The medium texture that dominates these soil types, along with the high rock content, makes them somewhat resilient to compaction; however, because of the rock content, they are difficult soil types to restore (Howes, 1979).

Although most of the project area is composed of soil types on stable slopes, indicators of an unstable slope condition were observed at one location. These unstable slope indicators are generally located where geologic contacts occur between resistant igneous formations of andesite and underlying formations or interbeds of pyroclastic formations. Steep slope breaks are typically the demarcation between the contacts that exhibit instability in the area. Generally, steep slopes in the area that pitch suddenly from the gently sloping uplands to steeper slopes below are characteristic of the pyroclastic/igneous contact.

Sensitive soil types within the project area generally occur as small (<10 acres) inclusions of either wetland type soils and riparian zones on gentle relief, or as cold, shallow, and fragmental soil types on ridge tops and upper side slopes. These soils are fragile and very susceptible to detrimental soil impacts.

Existing Soil Conditions

Detrimental Soil Condition.

Existing detrimental soil impacts resulting from historic logging operations and road construction are present in the stands proposed for thinning. The extent of detrimental soil condition was determined from field observations by the district soil scientist, interpretation of 1946, 1958, 1959, 1961, and 1967 aerial photographs, and calculations of disturbed ground from scanned aerial photographs using ERDAS Imagine software (Golden, Vanderzanden, 2004) in combination with ground observations.

Detrimental soil impacts, such as soil compaction, soil displacement and puddling, severe burning, accelerated erosion, excess removal of organic material, and aggravated mass wasting equate to an irretrievable loss of soil productivity (for definitions of listed impacts, see Forest Service Manual [FSM] 2521.1, Region 6 supplement 2500-96-2, effective 6/4/96). Standards and Guidelines in the MHNF Land and Resource Management Plan (LRMP) identify a threshold of acceptable detrimental soil disturbance in an activity area. Standard and Guidelines FW-022 and FW-023 state that the combined cumulative detrimental soil impact, occurring from both past and planned activities, should not exceed 15% of the soil resource within an activity area, such as a timber sale unit.

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. Units 1 through 7 were clear cut harvested from 1954 to 1963 and subsequently broadcast burned or machine piled. While in private ownership, Units 8 through 13 were clearcut harvested from 1945 to 1954 and broadcast burned or machine piled. Management practices at that time, both on private and Federal land, did not restrict machine movement within units, therefore existing detrimental impacts to soil are generally higher than that allowed under the current LRMP standards implemented in the early 1990's. Table 4, column 3 summarizes the estimated percent of area of each proposed unit that exhibits detrimental soil conditions. Of the 13 proposed units, four are estimated to exceed the 15% LRMP Standards and Guidelines threshold. The majority of readily observable ground disturbances in the field were heavily compacted old skid trails, landings, and non-system spur roads. Also observed were areas where displacement or excess removal of organic material had occurred from historic logging activity.

Organic Matter/Soil Fertility. Duff layers are relatively thin due to past clearcutting and fuel treatment practices, and range from ¼ to 1 ½ inches with an average of ½ inch. Generally there was a lack of notable quantities of course woody debris (CWD) on the forest floor in all units. It is inferred that this condition is well below historic ranges of CWD that naturally occurred in pre-settlement times in these types of plant communities. CWD plays an important role in nutrient cycling; therefore it is presumed that a general lack of it may have diminished inherent site productivity to some degree. The exact impact of this condition on soil nutrient capital and cycling is not explicitly known for the soil types in the project area.

Soil Erosion. In the Southfork sale area, surface soil erosion potential is severe for soils derived from weathered pyroclastics, and varies from slight to moderate for soils derived from glacial till. Existing surface erosion is mainly

confined to exposed soil on skidtrails, unpaved road surfaces, road cutbanks, and ditches. Heavy Off Highway Vehicle (OHV) use of skidtrails and temporary roads in the Goat Mountain area has created an ongoing erosion problem. Where subsurface water flow has been intercepted by skidtrails and roads, gullies have formed.

Unstable slope condition. Unit 6: Cracks in the ground were observed on the steep slope just below road 45, at the upper boundary of the wet area that spans the unit between road 45 and the lower road 45-190. This appears to be a contact between the andesite formation and the underlying pyroclastic formation.

Sensitive soil conditions. Unit 6: a perennially high water table surrounds the wet area / riparian area extending from road 45 to road 45-190. Scattered areas of devil's club were observed at various locations as far as 200 feet from the drainage area. Unit 7: a shallow soil phase on the gently sloping topography at the western edge of the unit. Area would be considered susceptible to detrimental soil impacts from ground-based logging systems.

Environmental Effects

Detrimental soil condition analysis: An estimate of detrimental soil condition resulting from proposed road and landing construction, reopening of decommissioned and closed roads, and felling and thinning activities was determined for each alternative (Table 4). Calculations include anticipated road rehabilitation projects listed below. It was assumed landings created during previous entries would be re-used, and where previous entries created higher percent detrimental conditions, a progressively greater number of existing skidtrails would be available to be re-used. See Table 2 for percent of additional impact anticipated with each logging method, based on current condition.

Table 2.

Current % Detrimental Soil Condition	Anticipated additional impact with:				
	Mechanical felling	Ground based harvest		Skyline harvest	
		skidtrails	landings	corridors	landings
0% (no previous entry)	0.5%	7%	1%	3.5%	0.5%
0% to < 5%	0.5%	7%	1%	2%	0%
5% to < 10%	0.5%	3%	0%	2%	0%
10% to < 15%	0.5%	2%	0%	2%	0%
15% to < 20%	0.5%	1%	0%	2%	0%
> = 20%	0.5%	0%	0%	2%	0%

Soil rehabilitation analysis: Units with greater than 15% of the activity area would be considered for rehabilitation, as directed in FW-028. All temporary roads constructed for this sale, and currently decommissioned roads reopened for this sale, would be obliterated and revegetated with native species. All landings and temporary roads used this entry would be subsoiled and revegetated with native species by the timber sale purchaser when detrimental soil conditions are greater than 15%. Existing temporary roads located within the thinning units but not used during the Southfork sale would remain in a compacted condition, unless funding became available for rehabilitation. Skidtrails, both used or unused this entry, would not be rehabilitated after thinning is completed, as deep soil tillage may cause adverse impacts to the root systems of established trees adjacent to the treated skidtrails. Rehabilitation of skidtrails would be considered in the future, following completion of the regeneration harvest entry.

Included in Alternatives B, C, D:
Landslides: Active landslide areas with slopes greater than 30 percent are to be excluded from the Southfork sale area. (FW-003, FW-004, FW-005) The Forest Geologist will identify and ribbon on the ground areas to be excluded from the thinning units.

Alternative A

There would be no impacts to soil resources at this time. Percent detrimental soil condition would remain unchanged. There would be no net change in short-term surface erosion rates. Soils would continue to develop through natural processes. The percent of existing detrimental soil condition would slowly decline as compacted areas move toward recovery due to physical and biological processes. Forest organic litter input, organic decomposition rates, duff layer development and soil fauna and microbe activity would remain at natural levels. Organic materials would be subject

to natural disturbances such as windthrow, fire, and natural climatic change. As unthinned stands age, trees will eventually fall over in a natural thinning process. Withholding natural disasters such as insect, disease, or fire devastation, these stands should eventually produce large trees which will be a source of future large decaying logs on the ground.

Alternative B

Thinning: Approximately 497 acres of plantations would be thinned using a similar logging method used for the original harvest. Old roads, landings and skid roads would generally be reused. Mechanical felling might occur in all or portions of units 1 through 11, where slopes are less than 40%. Use of existing skidtrails and landings would occur where appropriate.

Thinning in Riparian Reserves: Approximately 74 acres of Riparian Reserve area would be thinned.

Roads: Approximately 2,000 feet of old temporary roads would be reused. Approximately 2,300 feet of tractor swing skidtrail would be constructed to access the unit 13 landing. After logging is complete, where detrimental soil conditions are in excess of the Forest Plan standards, all re-opened roads and the constructed tractor swing skidroad will be obliterated and revegetated with native species.

Soils

Soils and long-term productivity are addressed by Forest Plan Standards and Guidelines for detrimental soil condition, and the retention of woody debris, ground cover, and live trees. The goal of these standards and guidelines is to protect soil structure and macropore space and soil organisms such as mycorrhizal fungi. Use of Best Management Practices and project design for harvest units and temporary road construction would result in meeting applicable standards for soil protection and long-term site productivity involving woody debris, ground cover, and live tree retention. The existing detrimental soil condition is greater than Forest Plan standards in four units.

Soil Detrimental Condition. Table 4 shows the estimated percent of each unit in a detrimental soil condition by alternative. Potential soil disturbances that have been considered are road and landing construction, reopening of closed roads, and felling and harvest operations. Calculations include obliteration of newly constructed temporary roads, obliteration of the reopened old temporary roads, and obliteration of temporary roads and landings used this entry on units where percent detrimental soil condition is greater than the Forest Plan standards.

A net increase in detrimental soil condition is predicted where more skidtrails, yarding corridors, landings and roads would be constructed than already exist. In units with greater than 15% detrimental conditions, restoration of temporary roads and landings by subsoiling and revegetation would initiate recovery of productivity, but is unlikely to return the soil to its original condition and productivity. Unit detrimental soil conditions would still remain above 15%.

Table 4. Existing and projected percent detrimental soil condition by unit and alternative.

Unit #	Logging system at previous entry	Existing Condition	Alt. A	Alt. B	Alt. C	Alt. D
1	T	12.5 %	12.5 %	15.0%	15.0 %	15.0 %
2	T, S	9.3 %	9.3 %	11.2 %	11.2 %	11.2 %
3	T	13.7 %	13.7 %	16.0 %	16.0 %	16.0 %
4	T	11.9 %	11.9 %	14.4 %	14.4 %	14.4 %
5	T, S	14.0 %	14.0 %	16.0 %	16.0 %	16.0 %
6	T, S	13.0 %	13.0 %	14.8 %	14.8 %	14.8 %
7	T, S	16.1 %	16.1 %	17.5 %	17.5 %	17.5 %
8	T, S	15.2 %	15.2 %	17.2 %	17.2 %	17.2 %
9	T	18.8 %	18.8 %	19.1 %	21.1 %	18.3 %
10	T	23 %	23 %	22.7 %	22.7 %	22.7 %
11	T, S	9.1 %	9.1 %	11.4 %	11.3 %	11.3 %
12	T, S	9 %	9 %	11.3 %	11.3 %	11.3 %
13	S	8 %	8 %	13.5 %	14.3 %	10.3 %

Soil Erosion.
Bare soil would be exposed as logs are dragged on and machines travel over the ground surface. Approximately 16 acres of roads, skidtrails and landings would be constructed or reconstructed. Approximately 5 acres of bare skyline yarding corridors would occur. A total of 21 acres would have potential increased erosion as a result of thinning activities. Disturbed areas, particularly where slopes are greater than 25%, would be potential chronic sources of sediment until they are revegetated successfully.

Erosion would not occur where duff and other effective ground cover is retained. Therefore, practices which limit the amount of soil exposure, or which re-establish ground cover after soil is exposed, will result in less erosion occurring. Of the proposed yarding systems, ground based systems result in a greater amount of ground exposure than skyline and helicopter systems. Units that are prescribed for ground based systems generally have flat to gentle terrain, so even if the potential for erosion may be high, eroding materials will not move far before redeposition occurs. If Best Management Practices are followed there is a low potential for sediment to be delivered to streams. Low slopes, use of designated skidtrails, and establishing effective ground cover by applying seed, fertilizer, and straw mulch on the disturbed soils (FW-025, FW-026) will aid in minimizing erosion.

The wider spacing planned for leave trees in the Riparian Reserves may increase windthrow occurrence in areas of high watertables (unit 6), therefore a tighter spacing in this area is needed. Soils exposed on the windthrow mounds could potentially become a source of sediment that could reach adjacent streams, especially where slopes are steep and ground cover has been disturbed by yarding equipment.

Organic Matter/Soil Fertility. Full suspension yarding would minimize duff disturbance in skyline operations. Designated skidtrails and the re-use of existing skidtrails in ground-based yarding operations would minimize duff layer disturbance by limiting tractors to skidtrails, and minimize the amount of area over which logs are dragged across the soil surface. Soil microbial populations will likely be reduced initially in areas of exposed soils until soil organic matter and litter layers build back up. Leaving slash and needles where trees are felled should help maintain carbon and nutrient levels. Leaving large woody debris would benefit soil fauna and microbes, and decomposer organisms. The mitigation measure for coarse woody debris and snags, and leaving 5 trees with wood decay per acre, will increase amounts of moderate-sized woody debris in the short term until larger diameter trees develop and return naturally or artificially onto the forest floor system.

Alternative C

Alternative C would be similar to B in units where there are few resource concerns. In other units, to reduce resource impacts, a new logging method and road system would be proposed (units 9, 11, 13).
Thinning: Approximately 497 acres of plantations would be thinned.
Thinning in riparian reserves: Approximately 74 acres of Riparian Reserve area would be thinned. Spacing of leave trees would be similar to Alternative B.
Roads: Approximately 1,200 feet of old temporary roads would be re-used (units 10, 11). Approximately 2,800 feet of new temporary road would be constructed to access landings (units 9, 13). After yarding is complete, the roads would be obliterated and revegetated with native species. Approximately 7 acres of helicopter yarding rather than skyline yarding would occur where road access would not be available (unit 11).

Soil Erosion and Organic Matter
The effects of this alternative within soil disturbance areas are expected to be similar to those of alternative B. Total acres of exposed soil are less than Alternative B. Approximately 11 acres of roads, skidtrails and landings would be constructed or reconstructed. Approximately 2 acres of bare skyline yarding corridors would occur. A total of 13 acres would have potential increased erosion as a result of thinning activities.

Alternative D

This alternative is similar to C but would eliminate new road construction. Those units where roads would not be constructed would be logged using helicopter or other logging systems. (units 9, 13). Unit 9: Eliminate 500 feet of new road by re-using 800 feet of old temporary road. Unit 13: eliminate of 2300 feet of new road by logging with helicopter.
Thinning acres in plantations and riparian areas are the same as Alternatives B and C.

Roads: Approximately 2,000 feet of old temporary roads would be re-used (units 9, 10, 11). As in Alternatives B and C, after yarding is complete, the roads would be obliterated and revegetated with native species.

Soil Erosion and Organic Matter

The effects of this alternative within soil disturbance areas are expected to be similar to those of alternative B. Total acres of exposed soil are less than both Alternatives B and C. Approximately 11 acres of roads, skidtrails and landings would be constructed or reconstructed. Less than 2 acres of bare skyline yarding corridors would occur. Less than 13 acres would have potential increased erosion as a result of thinning activities.

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Survey and Manage Report

Terrestrial Mollusks, Red Tree Voles, Salamanders and Great Gray Owls
South Fork Thinning

The Mt. Hood 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. Annual species reviews have been conducted since then to incorporate the new information gained from surveys and from other research. Changes to species lists were made that include moving species to different categories, changing their range or taking them off the list. The most recent annual species review was documented in a memo on December 19, 2003.

This report documents compliance with the 2001 Record of Decision for survey and manage standards and guidelines as amended or modified as of March 21, 2004.

Methodology of surveys

For some categories of species, site-specific pre-disturbance surveys are normally conducted prior to signing decision documents for habitat-disturbing activities. These are "clearance" surveys that focus on the project unit with the objective of reducing the inadvertent loss of undiscovered sites by searching specified potential habitats prior to making decisions about habitat-disturbing activities. The surveys are not designed to find all individuals. Sometimes surveys are conducted outside the actual project area if the project might affect adjacent habitat. Surveys are done according to the Survey Protocols that are designed by taxa experts. Survey protocols can be found at the following web site: http://www.or.blm.gov/surveyandmanage/sp.htm. Pre-disturbance surveys are normally conducted for species in Categories A and C where the species ranges overlap a project. Data is entered into the Interagency Species Management System (ISMS) database and the Geographic Biotic Observations Geodatabase (GeoBOB).

- Red tree vole surveys were completed in some of the units according to the survey protocol dated February 18, 2000 (Version 2.0). A line transect was used to achieve approximately 300 lineal feet per acre. Surveyors searched for nest sites along these transects. These surveys were conducted in August of 2002. However, the survey protocol for this species was updated in October of 2002 (Version 2.1) which more narrowly defined potential red tree vole habitat. Currently none of the units now contain potential red tree vole habitat and thus do not require pre-disturbance surveys.

- Terrestrial mollusk surveys have been completed to the draft survey protocol dated October 29, 1997 (Version 2.0). Surveys were conducted for a group of terrestrial mollusks with particular emphasis in searching for the species with home ranges overlapping the project area. All mollusk species encountered were identified. The surveys for terrestrial mollusks involved two visits to the project during the spring and fall when species were likely to be visible. Sample plots were intensively examined for 20 minutes and mollusks were identified and recorded on field forms. Surveys were conducted between October of 2000 and June of 2002.

The following is a summary of when the terrestrial mollusk surveys occurred for each unit. Survey forms completed for each unit and visit can be found at the Clackamas River Ranger District.

SOUTH FORK TERRESTRIAL MOLLUSK SURVEY RESULTS		
South Fork Unit #	**Visit #1 Completion Date**	**Visit #2 Completion Date**
1	4-09-01	5-27-02
2	10-29-01	6-28-02
3	10-26-00	6-11-01
4	10-25-00	5-16-01
5	10-25-00	5-16-01
6	10-31-00	5-16-01
7	10-26-00	5-17-01
8	10-30-00	5-18-01
9	10-25-01	5-31-02
10	10-30-01	5-31-02
11	11-1-01	6-27-02
12	11-08-01	5-27-02
13	5-26-02	6-28-02

- Surveys were not conducted for salamanders or great gray owls because habitat for these species is not affected by the project.

Results of surveys - Management of known sites

Some species require the management of known sites; those known before or discovered during surveys. Species in categories A, B and E require the management of all known sites and species in categories C and D require the management of high-priority sites. Data is entered into the Interagency Species Management System (ISMS) database and the Geographic Biotic Observations Geodatabase (GeoBOB).

Management Recommendations can be found at the following web site:
http://www.or.blm.gov/surveyandmanage/mr.htm

There are no known sites affecting the project. No changes are needed.

This project is consistent with the Survey and Manage standards and guidelines.

/S/ *Sharon Hernandez*		*1-26-06*
Sharon Hernandez		Date
Supervisory Wildlife Biologist		
Clackamas River Ranger District		

Survey and Manage Report

South Fork Thinning Project

Botanical Species

(Fungi, Bryophytes, Lichens, and Vascular Plants)

The Forest Plan for the Mt. Hood National Forest was amended by the 2001 Record of Decision (ROD) and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines. Annual species reviews have been conducted since then to incorporate new information about Survey and Manage species acquired from field surveys and scientific research. Changes to the Survey and Manage species list were made that included assignment of species to different management categories, changes in species ranges, or removal of species from the Survey and Manage list. The most recent Annual Species Review (ASR) was documented in a memo on December 19, 2003.

This report documents compliance with the 2001 Record of Decision for survey and manage standards and guidelines as amended or modified as of March 21, 2004.

Survey Methods

For some categories of species, site-specific pre-disturbance surveys are normally conducted prior to signing decision documents for habitat-disturbing activities. These are "clearance" surveys that focus on the project unit with the objective of reducing the inadvertent loss of undiscovered sites by searching specified potential habitats prior to making decisions about habitat-disturbing activities. The surveys are not designed to find all individuals. Sometimes surveys are conducted outside the actual project area if the project might affect adjacent habitat. Surveys are done according to the Survey Protocols that are designed by taxa experts. Survey protocols can be found at the following web site: http://www.or.blm.gov/surveyandmanage/sp.htm. Pre-disturbance surveys are normally conducted for species in Categories A and C where the species ranges overlap a project. Data is entered into the Interagency Species Management System (ISMS) database and the Geographic Biotic Observations Geodatabase (GeoBOB).

Field surveys for botanical species were completed at the same time as surveys for species on the R6 Regional Forester's Sensitive Species List. Surveys were conducted by botanists for several taxa groups including vascular plants, lichens, bryophytes and one fungus. The surveys for botanical species involved walking through likely habitat areas during the time of year suited for species identification. Generally, such field surveys are "intuitive-controlled" surveys and conducted by agency or contracted botanists. Intuitive-controlled surveys entail a complete examination of specific areas of the project after a walk through the project area and around the project perimeter or by walking more than once through the project area. The following Survey and Manage botanical species in management categories A and C, are thought to have ranges that overlap the project area: *Bridgeoporus nobilissimus* (fungus), *Schistostega pennata* (moss), *Tetraphis geniculata* (moss), *Bryoria pseudocapillaris* (lichen),

Dendriscocaulon intricatulum (lichen), *Hypogymnia duplicata* (lichen), *Leptogium cyanescens* (lichen), *Lobaria linita* (lichen), *Nephroma occultum* (lichen), *Pseudocyphellaria rainierensis* (lichen), *Botrychium minganense* (vascular plant), *Botrychium montanum* (vascular plant), *Coptis trifolia* (vascular plant), *Corydalis aquae-gelidae* (vascular plant), *Cyprepedium fasciculatum* (vascular plant), *Cypripedium montanum* (vascular plant), *Galium kamtschaticum* (vascular plant), and *Platanthera* (= *Habenaria*) *orbiculata* var. *orbiculata* (vascular plant). Field surveys were conducted in the project area from June 9 through September 14, 2004.

Survey Results - Management of Known Sites

Some species require the management of known sites (i.e., those known before or discovered during surveys).

Species in categories A, B, and E require the management of all known sites and species in categories C and D require the management of high-priority sites. Data is entered into the Interagency Species Management System (ISMS) database and the Geographic Biotic Observations Geodatabase (GeoBOB).

Management Recommendations can be found at the following web site:
http://www.or.blm.gov/surveyandmanage/mr.htm

One fungus, *Gomphus kauffmanii,* was found in the project area. *Gomphus kauffmanii* is a category E species that does not require pre-disturbance surveys but does require the management of known sites. The new site is adjacent to unit 13 and will not be impacted by project activities in the area where the aboveground fruiting body was collected. However, the belowground mycelium could extend into the unit where commercial thinning activities may compact the soil. The unit will be harvested using a helicopter logging system; therefore, compaction would be minimal. Host trees for this species include true firs and pines. Removal of some host trees and soil compaction could have a localized negative impact on undiscovered individuals or belowground mycelium. Although some host trees will be removed in the thinning unit, others will remain, continuing to provide hosts for this species. No changes to unit 13 are needed to provide for the persistence of the species at the site.

There are no other known sites affecting the project. No changes are needed.

This project is consistent with the Survey and Manage standards and guidelines.

/S/ *David Lebo*		Jan. 30. 2006
David Lebo		Date
Westside Zone Botanist		

Survey and Manage Report

South Fork Thinning
Aquatic Mollusks

The Mt. Hood 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. Annual species reviews have been conducted since then to incorporate the new information gained from surveys and from other research. Changes to species lists were made that include moving species to different categories, changing their range or taking them off the list. The most recent annual species review was documented in a memo on December 19, 2003.

This report documents compliance with the 2001 Record of Decision for survey and manage standards and guidelines as amended or modified as of March 21, 2004.

Method of surveys

For some categories of species, site-specific pre-disturbance surveys are normally required for certain habitat-disturbing activities. Sometimes surveys are conducted outside the actual project area if the project might affect adjacent habitat. Where needed, surveys are done according to the Survey Protocols that are designed by taxa experts. Survey protocols can be found at the following web site: http://www.or.blm.gov/surveyandmanage/sp.htm. Pre-disturbance surveys are normally conducted for species in Categories A and C where the species ranges overlap a project. Data is entered into the Interagency Species Management System (ISMS) database and the Geographic Biotic Observations Geodatabase (GeoBOB).

Surveys for aquatic mollusks would be conducted in suitable habitat, which includes cold, well-oxygenated springs, spring outflows and streams. A series of grids, ranging from a minimum of eight to as many as 16 would be surveyed to produce a total area sampled equal to about 0.5-1 square meter. Each grid would be a square of 25 centimeters on a side. Surveyors examine the bottom of the water body and collect specimens for identification.

Only one unnamed species has a range that overlaps this portion of the Mt. Hood National Forest: *Lyogyrus* n. sp. 1. This mollusk has been found in many areas across the Forest and is highly likely to be present in the streams near this project. For this reason, instead of conducting surveys in all adjacent streams, species presence is presumed.

Management of known sites

According to the latest Management Recommendations (Aquatic Mollusks v. 2.0) it is important to maintain cool, clean water that is well oxygenated and to maintain and/or restore native plant communities. It also indicates that in most cases, the riparian reserve standards and guidelines will be sufficient for management of this species.

The riparian reserve standards and guidelines and project design criteria are sufficient to provide for the habitat needs of this species. This project will have 50 foot no-cut buffers around perennial streams and other features that are considered habitat in the Management Recommendations. This will maintain the native plant communities and will result in sufficient shade to maintain cool water temperature. This buffer plus the other design criteria would minimize the risk of erosion and sedimentation.

In conclusion, because the habitat for this species is being protected, this project would not cause a significant negative effect on the species habitat or persistence of the species at the site.

Management Recommendations can be found at the following web site:
http://www.or.blm.gov/surveyandmanage/mr.htm

This project is consistent with the Survey and Manage standards and guidelines.

/S/ *Robert Bergamini* *01/27/06*

Robert Bergamini
Fisheries Biologist

Date