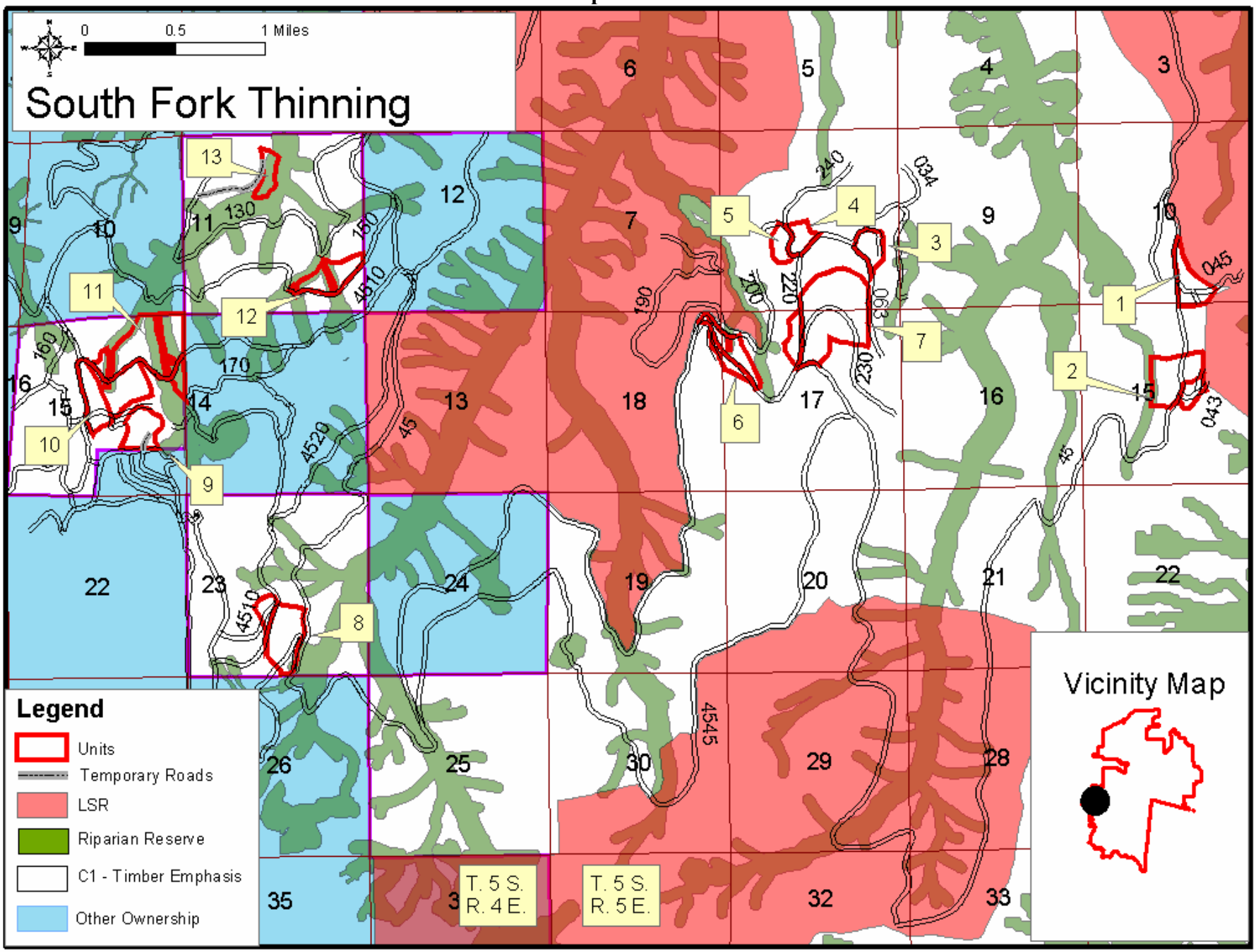
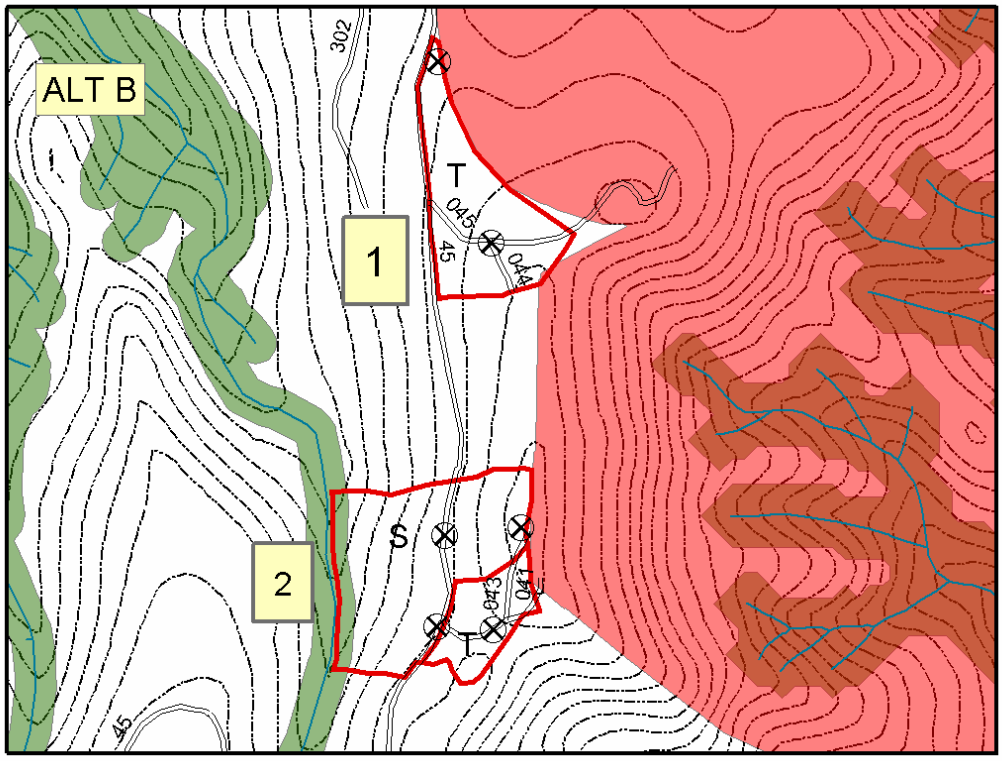
Table of Contents for Appendix E


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.

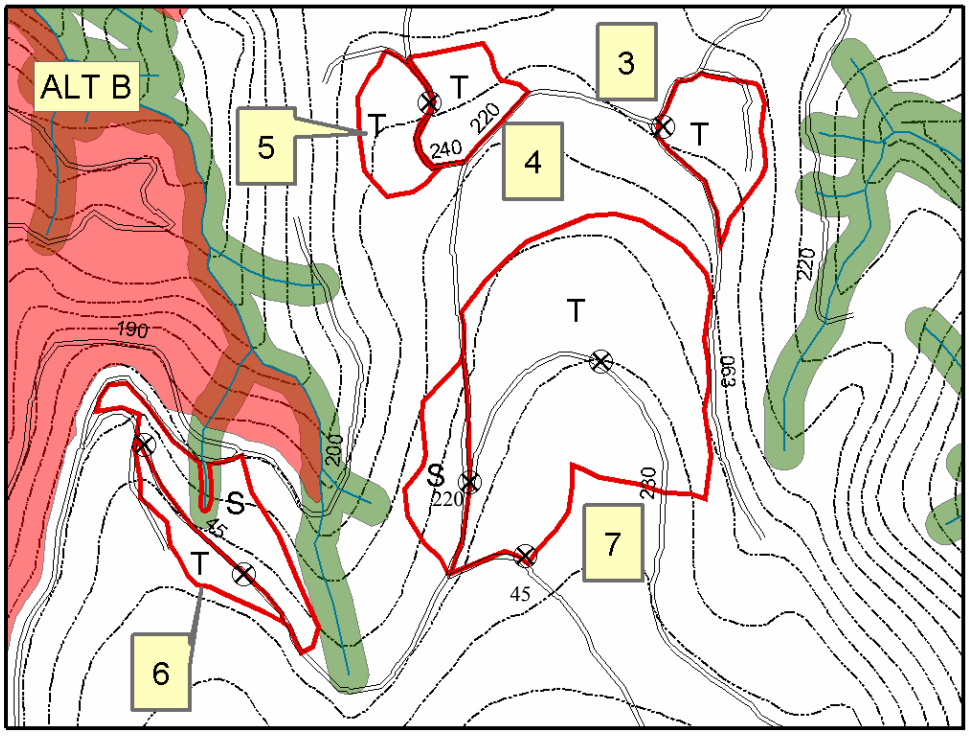
Unit 2: Access is via road 45. Roads 4500-041 and 4500-043 are closed with berms. They would be opened and closed again after use.



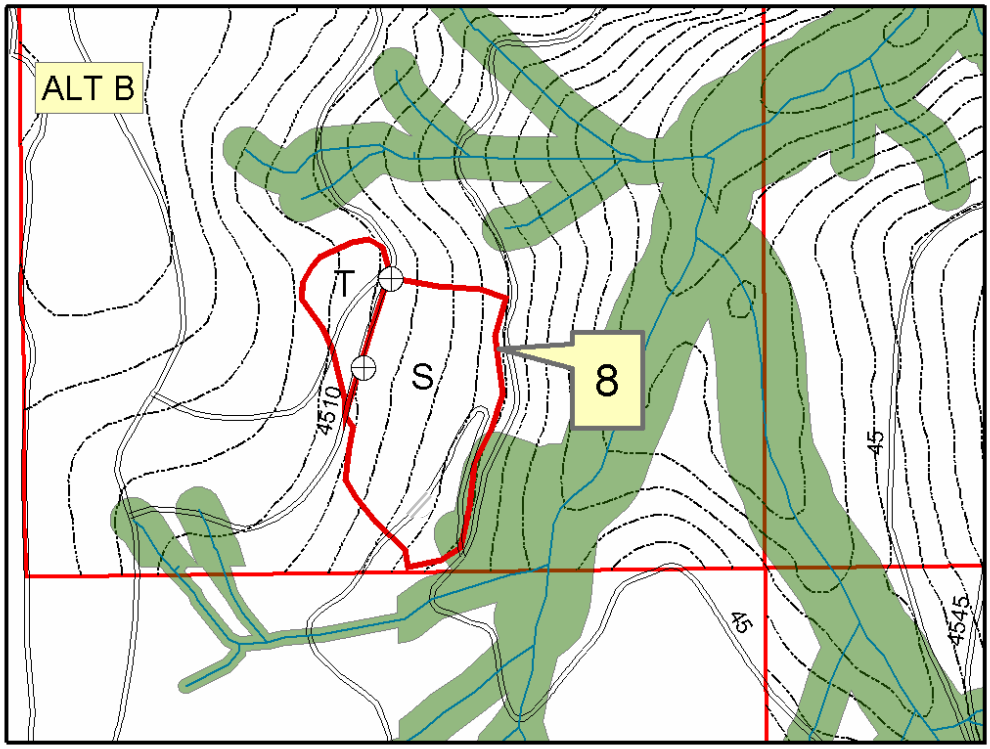
Legend for All Maps	
T	Ground Based or Tractor
S	Skyline
H	Helicopter
⊗	Landing
	Unit Boundary
■ ■ ■	Temporary Road
	Riparian Reserve
	Late-successional Reserve
	C1- Timber Emphasis
	Other Ownership

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.

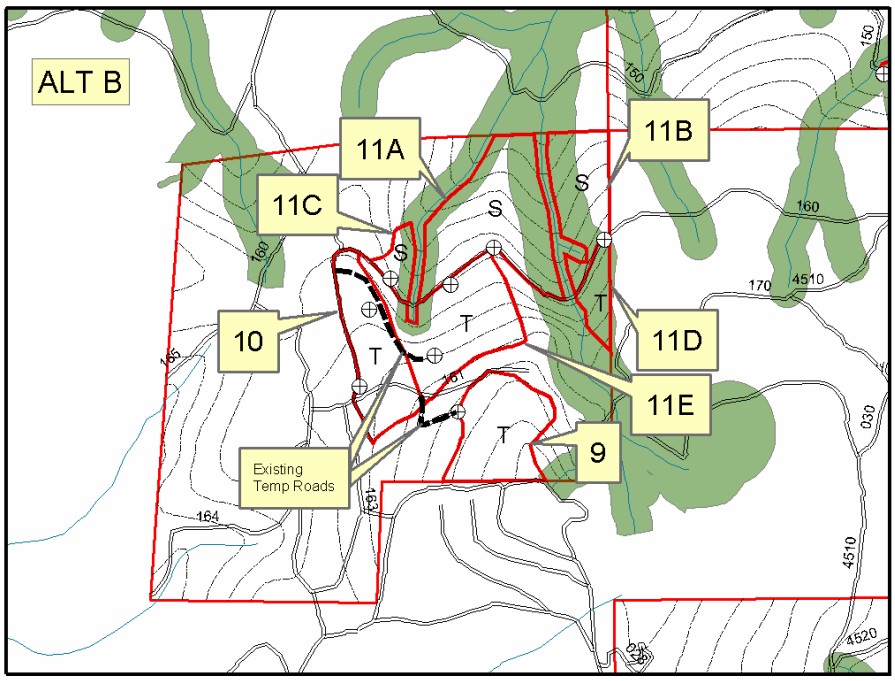
Unit 6: Access is via road 45.



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

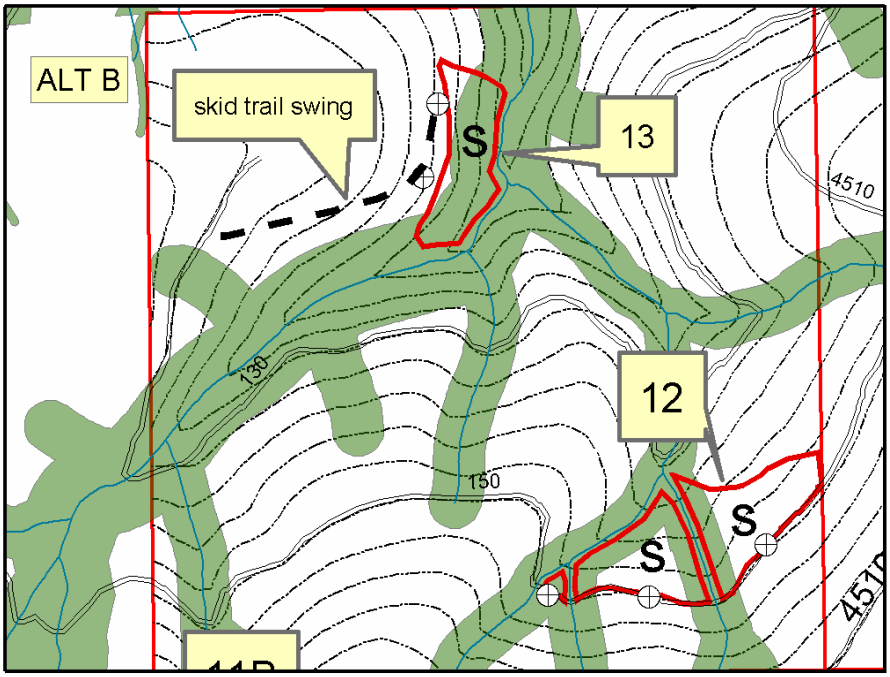


Units 9 through 11: Access is via road 4510-160. With Alternative B, existing old temporary roads (2000 ft.) would be reopened to access units 10, 11E, and 9. They would be obliterated after completion. Road 161 is closed with a berm and debris. It would be opened and closed again after use.



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.

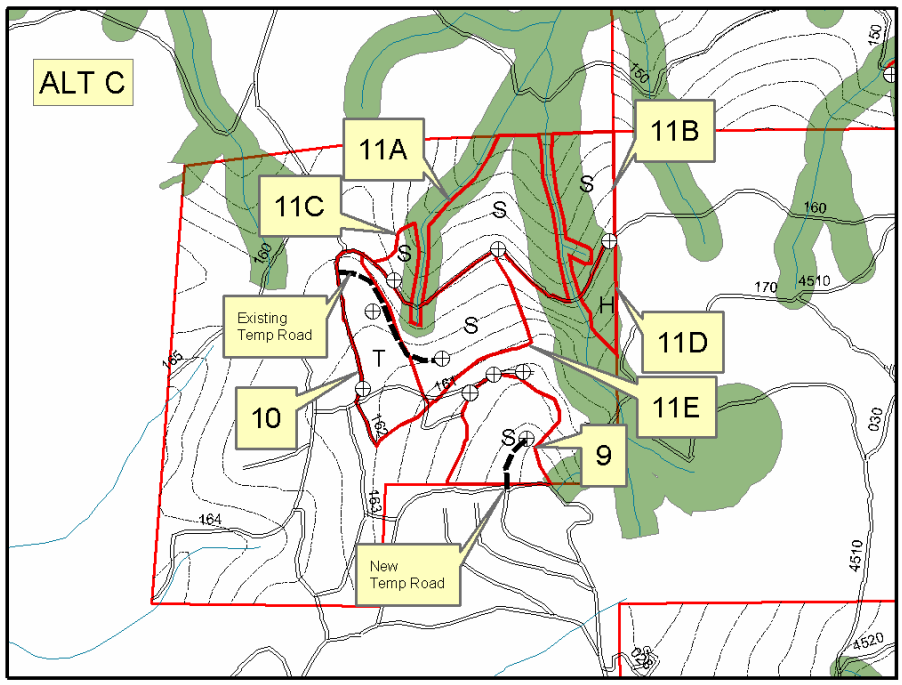


Alternative C – The following units would be the same as Alternative B: Units 1 through 8, 10, 11A, 11B, 11C and 12.

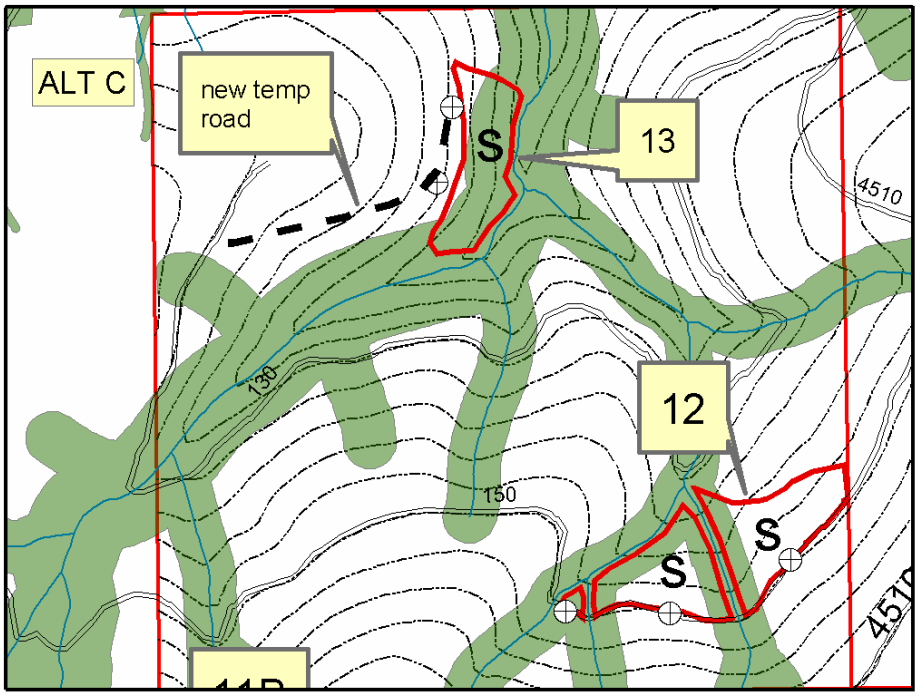
Unit 9: Change to skyline. To facilitate skyline logging a new temporary road (500 ft.) would be constructed connecting to an unnumbered road to the south.

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.



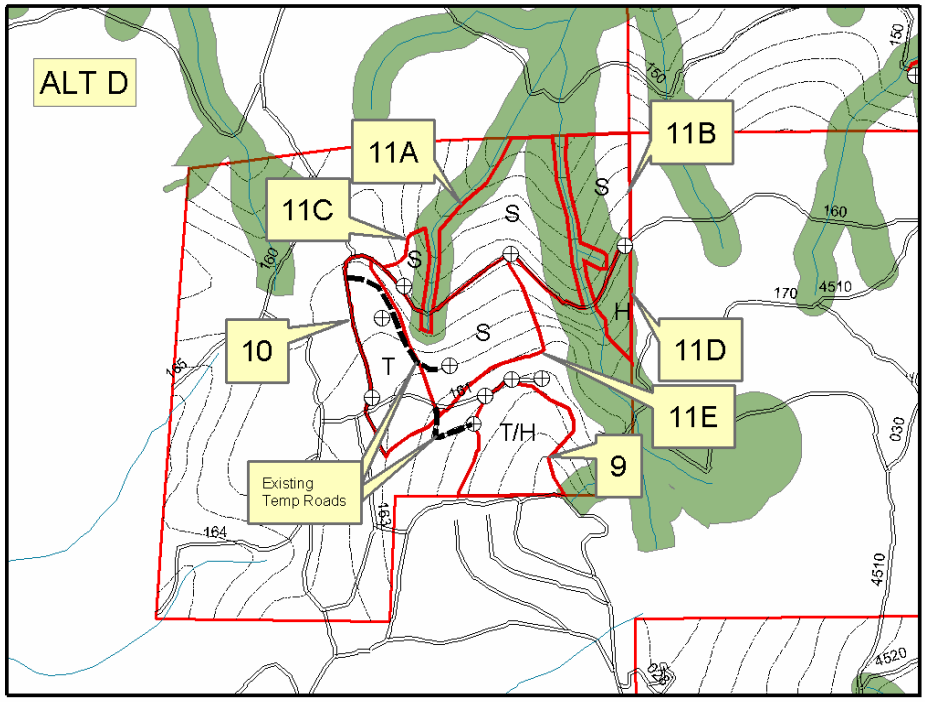
Unit 13: Access is via road 4510-130. A new temporary road (2300 ft.) would be constructed to connect from road 130 to the landings. The road is located on dry, stable, relatively gentle slopes.



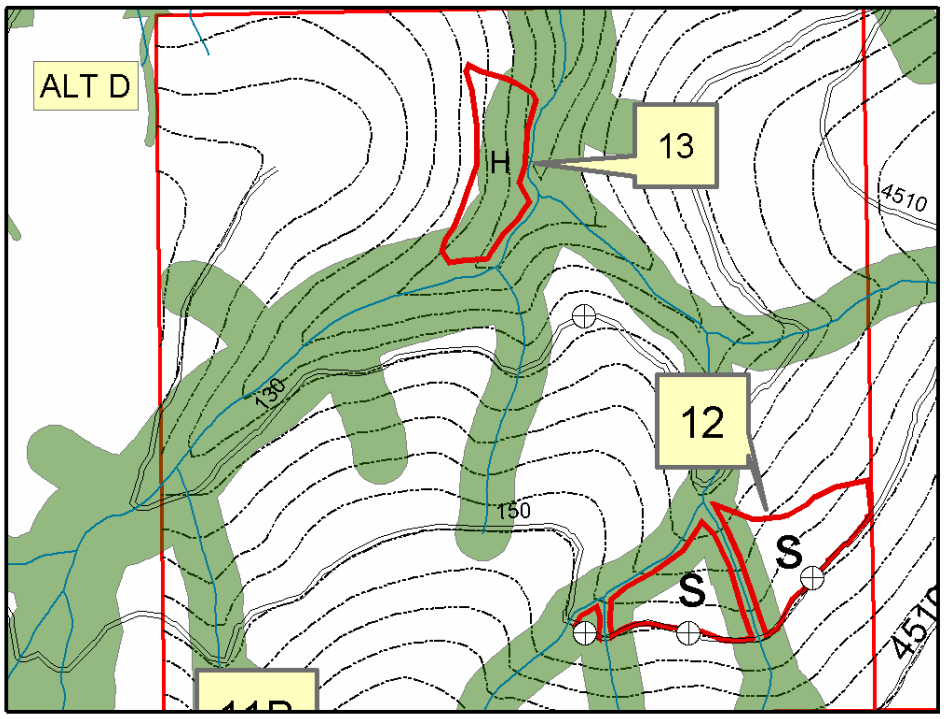
Alternative D – The following units would be the same as Alternative B: Units 1 through 8, 10, 11A, 11B, 11C and 12. Units 11D and 11E would be the same as Alternative C.

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