United States Department of Agriculture

Forest Service

2004

Environmental Assessment

Cloak Thinning

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

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

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SUMMARY

The Mt. Hood National Forest proposes a commercial thinning project. The project area is located in the Upper Clackamas and Oak Grove watersheds and is within the Clackamas River Ranger District, Mt. Hood National Forest, Oregon. Early scoping documents listed the Upper Clackamas Thinning and the Oak Grove Thinning but these have since been combined to form the Cloak Thinning.

The purpose of this initiative is to thin and fertilize young forest stands to achieve multiple objectives. The proposed action (Alternative B) is to thin and harvest wood fiber from approximately 1332 acres of matrix land and approximately 217 acres of riparian reserves. Approximately 1.8 miles of new temporary road would need to be constructed to access landings. Approximately 1049 acres would be fertilized.

In addition to the proposed action, the Forest Service also evaluated the following alternatives:

- Alternative A (No Action)
- Alternative C is similar to Alternative B except it would build no roads, would not thin riparian reserves and would not fertilize.
- Alternative D is similar to Alternative C except it would only thin in plantations.
- Alternative E is similar to Alternative B except it would have larger forage enhancement areas.

INTRODUCTION

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 four parts:

- *Introduction:* This section includes information on the history of the project proposal, 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.
- *Comparison of Alternatives, including the Proposed Action:* 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 summary table 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.

- *Agencies and Persons Consulted:* This section provides a list of preparers and agencies consulted during the development of the environmental assessment.
- *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.

Purpose and Need for Action

The purpose of this initiative is to thin young forest stands to achieve multiple objectives:

- Increase health and vigor and enhance growth that results in larger wind firm trees;
- Enhance and restore biological diversity;
- Enhance forage for deer and elk;
- Provide forest products consistent with the Northwest Forest Plan goal of maintaining the stability of local and regional economies now and in the future;
- Enhance riparian reserves by accelerating the development of mature and late-successional stand conditions.

This action is needed, because second-growth stands are experiencing a slowing of growth due to overcrowding. At the landscape level, young stands that once provided high quality forage are rapidly becoming crowded, contributing to a trend of declining forage for deer and elk.

If no action is taken, this overstocked condition would result in stands with reduced vigor, increased mortality, reduced diversity, and increased wind damage susceptibility. Forage would continue to decline across the landscape to the detriment of deer and elk. There is a need for forest stands that are healthy and vigorous with low levels of mortality and wind susceptibility. If no action were taken in 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.

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 2004 Record of Decision and Standards and Guidelines to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines. (USDA, USDI 2004b).

The Cloak Thinning project is located within the following Matrix land allocations: C1 Timber Emphasis, B2 Scenic Viewshed, B8 Earthflow and B11 Deer and Elk Summer Range and within Riparian Reserves. Refer to Land Allocation Map on page 11.

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. High quality forage is created through nutritional forage enhancement including fertilization. B2-023, B8-016 and B11-012.

Earthflow	Earthflows are hydrologically and physically balanced. Four-264. (Earthflows are naturally occurring geological features on gentle to moderate slopes where earth, and the trees growing there, move downhill very slowly.)
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 provide connectivity for species dispersal. 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.

Proposed Action

The proposed action is to thin and harvest wood fiber from approximately 1332 acres of matrix land and approximately 217 acres of the dry upland portion of riparian reserves. (See Alternative B for greater detail.) On areas proposed for thinning in the matrix, approximately 70 acres of forage enhancement areas would be included to increase forage for deer and elk. On areas proposed for thinning in the matrix, approximately 1049 acres would be fertilized. Thinning would be designed to enhance or restore biological diversity by applying variable density prescriptions.

New temporary roads (1.8 miles) are needed to access the landings. These roads would be obliterated and revegetated after completion of the project.

The proposed action would begin as soon as possible.

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 project first appeared in the Forest's winter 2002 issue of Sprouts, and in subsequent issues. Sprouts is a quarterly publication that is mailed to a wide audience. 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 and presentations made at meetings held by groups such as the Clackamas River Basin Council. On July 5, 2004 a proposed action that included preliminary analysis was made available for a 30-day public comment period. Several letters and e-

mails were received. This Environmental Assessment (EA) includes a response to the substantive comments (Appendix A).

Issues

The Forest Service received many comments during the scoping process. Using the comments received 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 natural second-growth stand management, forage, water quality and fish. Refer to the Response to Substantive Comments in Appendix A.

Issue #1: Water Quality and Fisheries - Roads
Based on the comments received, water quality and fish habitats are concerns for many people. Even though the proposed actions have been designed to meet current standards there is still a public concern about road construction and the effects to water quality.

Issue statement: The temporary road construction (approximately 1.8 miles) 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.

Issue #2: Water Quality and Fisheries - Riparian Reserve Management
The proposed action involves thinning in the dry upland portions of riparian reserves. There is a concern that this alteration of riparian reserves may cause erosion that may harm water quality and fish.

Issue statement: The thinning of 217 acres of riparian reserves may pose a risk to water quality and fish by contributing sediment to streams and increasing stream temperature. A qualitative assessment of sediment input and stream temperature would be used to describe impacts to water quality and fish.

Issue #3: 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.

Issue statement: The aerial fertilization of 1049 acres may pose a risk to water quality and fish by increasing the nitrogen levels in streams. A qualitative assessment would be used to describe impacts to water quality, fish and soil.

Issue #4: Natural Second-Growth Forest
The proposed action involves both the thinning of plantations and natural second-growth forests (areas of second growth that regenerated naturally after a forest fire, sometimes referred to as native forest). Comments were received expressing a concern over the thinning of natural second-growth stands. Commenters question the science behind the proposal to thin natural second-growth stands and feel that the stands should be left to

grow on their own.

Issue statement: The commercial thinning of 307 acres of natural second-growth forest should not occur. A qualitative assessment would be used to describe impacts to these stands.

Issue #5: Forage - Not Needed
The proposed action involves the creation of small forage enhancement areas in the thinned stands to enhance forage for deer and elk. Some comments were received expressing skepticism that the areas needed more forage.

Issue statement: The creation of forage enhancement areas is not needed. There is adequate forage for deer and elk. A quantitative assessment of forage available would be used to measure impacts to deer and elk.

Issue #6: Forage - Need More
The proposed action involves the creation of small forage enhancement areas in the thinned stands to enhance forage for deer and elk. Oregon Department of Fish and Wildlife has expressed that forage is needed but that forage enhancement areas should be larger to create higher quality forage.

Issue statement: The creation of forage enhancement areas would be too small to benefit deer and elk. Forage enhancement areas should be larger. A quantitative assessment of forage available would be used to measure impacts to deer and elk.

ALTERNATIVES

This chapter describes and compares the alternatives considered for the Cloak 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.

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 - The Proposed Action

The action proposed by the Forest Service to meet the purpose and need is to thin and harvest wood fiber from approximately 1332 acres of matrix land and approximately 217 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 or restore biological diversity. Thinning would generally remove the smaller trees, leaving approximately 80 to 140 variably spaced trees per acre (exceptions 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.

Forage - On areas proposed for matrix thinning in plantations, certain units were identified as needing increased forage for deer and elk. This would involve the inclusion of small forage enhancement areas of one to three acres in size (70 acres total) to get increased sunlight to the forest floor. These areas would be thinned to approximately 10-30 leave trees per acre: the lower range would be left in the smaller forage enhancement areas and the higher range would be left in larger forage enhancement areas. Shrub planting, grass seeding and nutritional supplementation may also occur in these areas if funding becomes available. These areas are not created openings but are areas where a wider thinning spacing is used to enhance diversity and to get sunlight to the forest floor. In time the forage value would be lost as trees grow and crowns close.

Riparian - On 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. 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 #9 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.

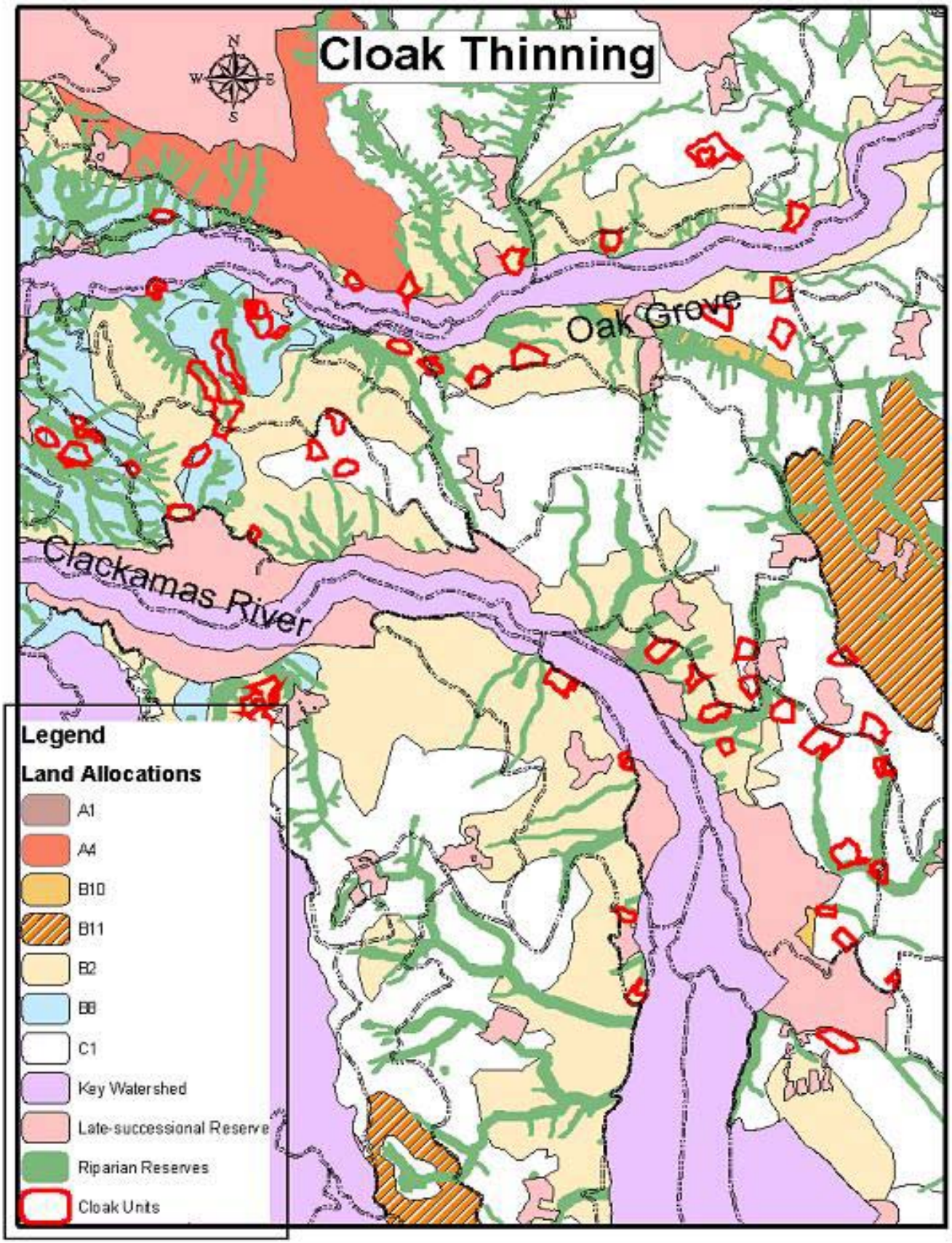
Connectivity – An interim connectivity network was recommended in the watershed analyses. Where natural second-growth stands occur in the connectivity network, the prescription would be adjusted to maintain a two-layer stand. The lower layer would consist of trees from the suppressed and intermediate crown classes and the upper layer would consist of the largest trees from the dominant and co-dominant crown classes. Together, these layers should retain a canopy cover of approximately 60%. This applies to approximately 144 acres in units 466, 475, 494, 495, 501 and 507.

Fertilization - The proposed action is to aerially apply 200 pounds of nitrogen per acre to approximately 1049 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.

Roads - New temporary roads (approximately 1.8 miles) are needed to access the landings. These roads would be obliterated and revegetated after completion of the project. Some existing decommissioned or overgrown roads need to be reopened (3.4 miles) to access landings for many units. Other roads have berms or drivable waterbars that would also be temporarily removed. Upon project completion, the roads that were opened would be closed. Approximately 1 mile of road reconstruction is included. This includes pavement grinding on road 58 and a small slump repair on road 4640 near unit 500.

Unit	Size (acres)	Notes	Unit	Size (acres)	Notes
426	15	S/FE/F	501	18	S
427	19	GB/FE/F	502	43	H/S/FE/F
428	12	GB/S/F	503	54	GB/S/H
437	12	GB/F	504	53	GB/S/H/FE/F
465	35	S/FE/F	505	25	GB/S/H/FE/F
466	18	S	506	27	GB/S/FE/F
467	32	S/FE/F	507	19	S
468	14	S	508	29	GB/S/F
469	39	S/H/FE/F	509	6	GB
470	30	GB/S/FE/F	510	10	S/FE/F
471	25	GB/S/FE/F	511	23	GB/S/FE/F
472	35	GB/FE/F	512	19	GB/FE/F
473	60	GB/FE/F	513	23	GB/FE/F
474	42	GB/FE/F	514	17	S/F
475	27	GB	515	30	GB/S/F
476	19	GB/FE/F	516	49	S/F
477	48	GB/F	517	42	GB/F
478	16	GB/F	518	33	GB/S/F
479	23	GB/F	519	36	GB/F
480	8	GB/F	520	20	GB/F
481	44	GB/F	566	17	GB
494	55	S/GB	567	15	S/F
495	7	S	568	22	S/F
496	24	S/F	571	34	GB/S/F
497	23	GB/FE/F	577	23	S/F
498	38	H/FE/F	578	60	GB/S
499	9	GB/FE/F	579	18	GB
500	24	H/S/FE/F	580	31	GB/S/F

GB = Ground Based Logging, S = Skyline Logging, H = Helicopter Logging, FE = Forage Enhancement, F = Fertilization


Cloak Thinning
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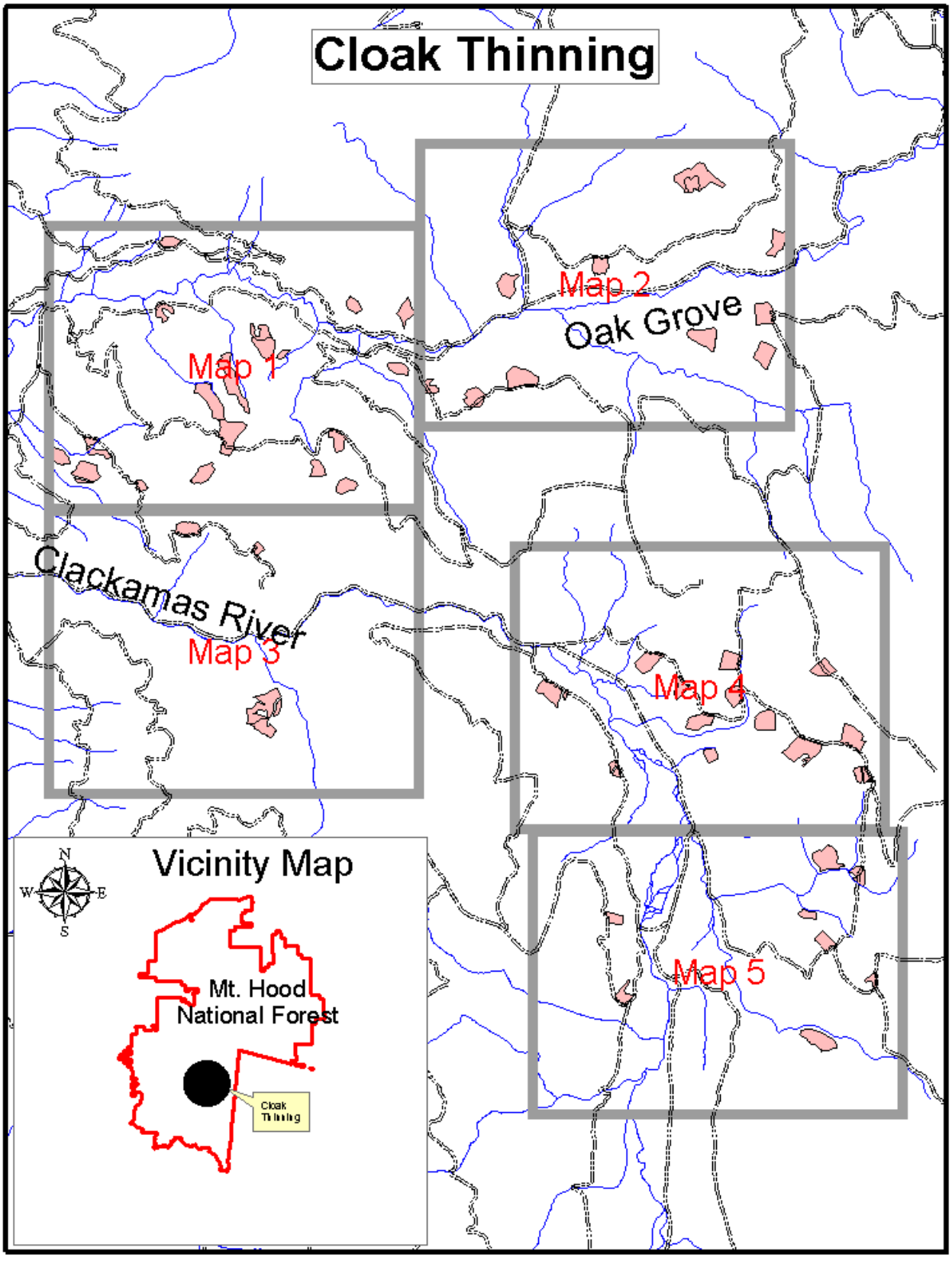
Oak Grove
Clackamas River
Legend
Land Allocations
A1
A4
B10
B11
B2
B8
C1
Key Watershed
Late-successional Reserve
Riparian Reserves
Cloak Units


Cloak Thinning
Map 1
Map 2
Oak Grove
Clackamas River
Map 3
Map 4
Map 5
Vicinity Map
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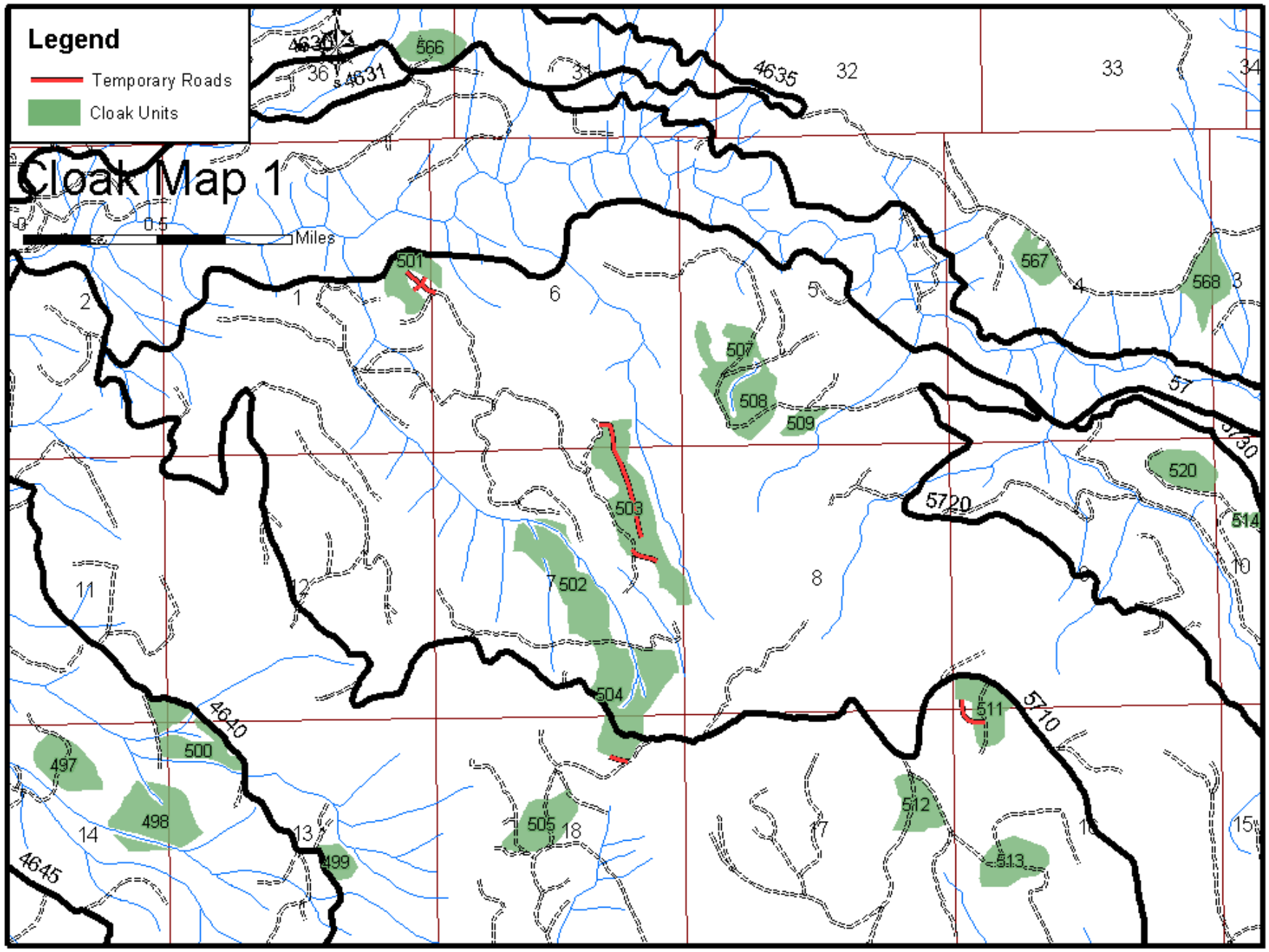
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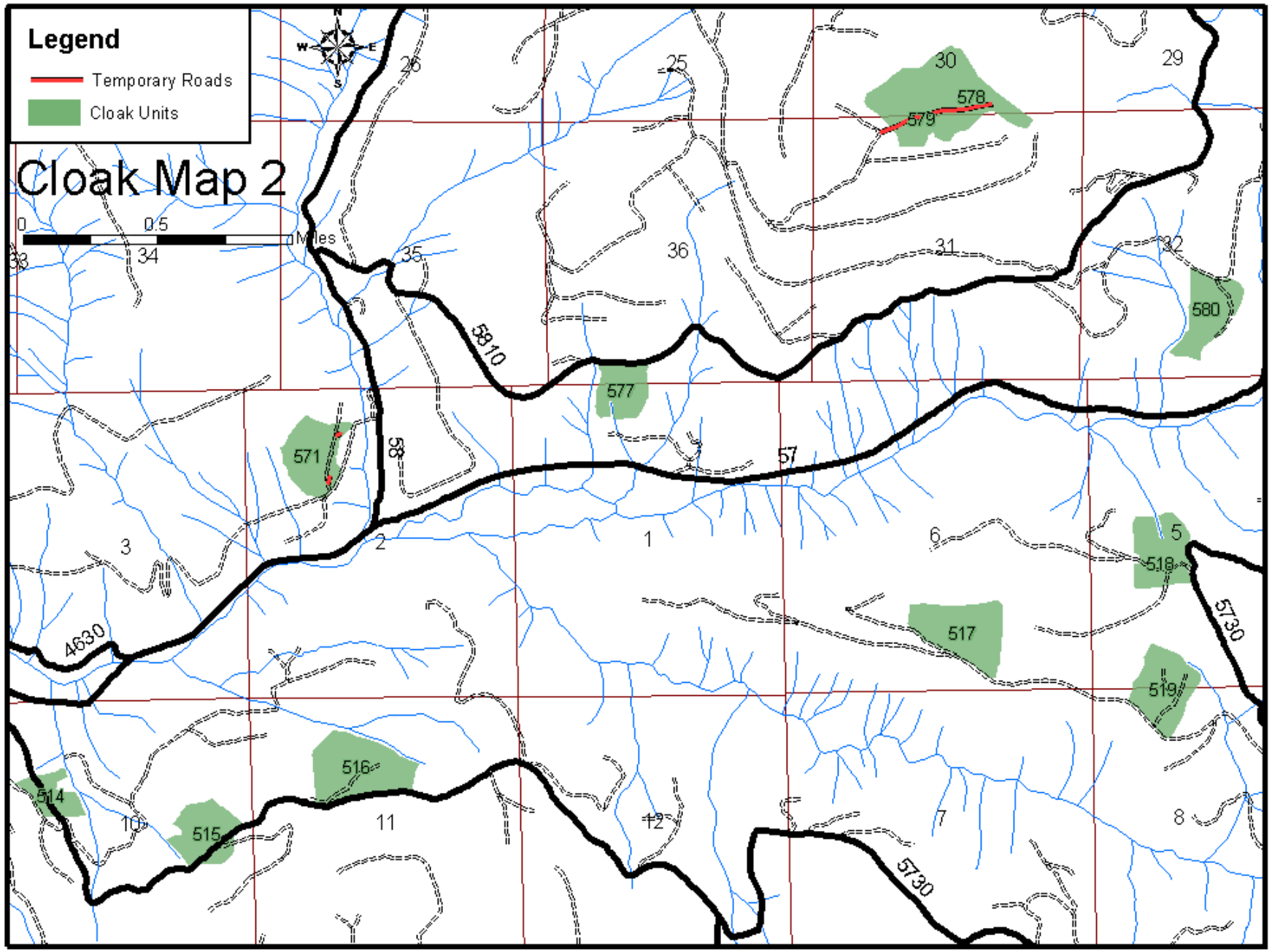
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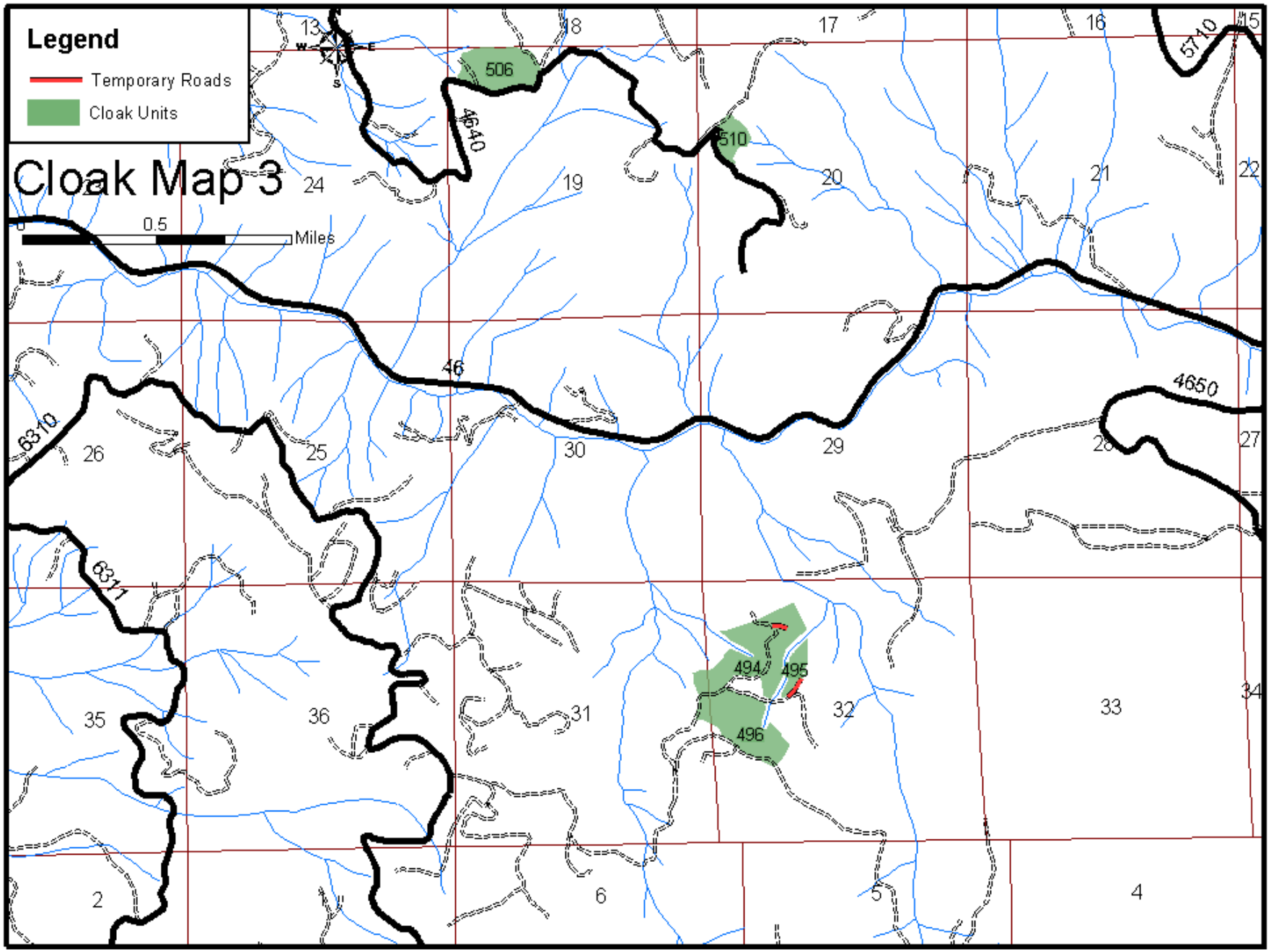
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Temporary Roads
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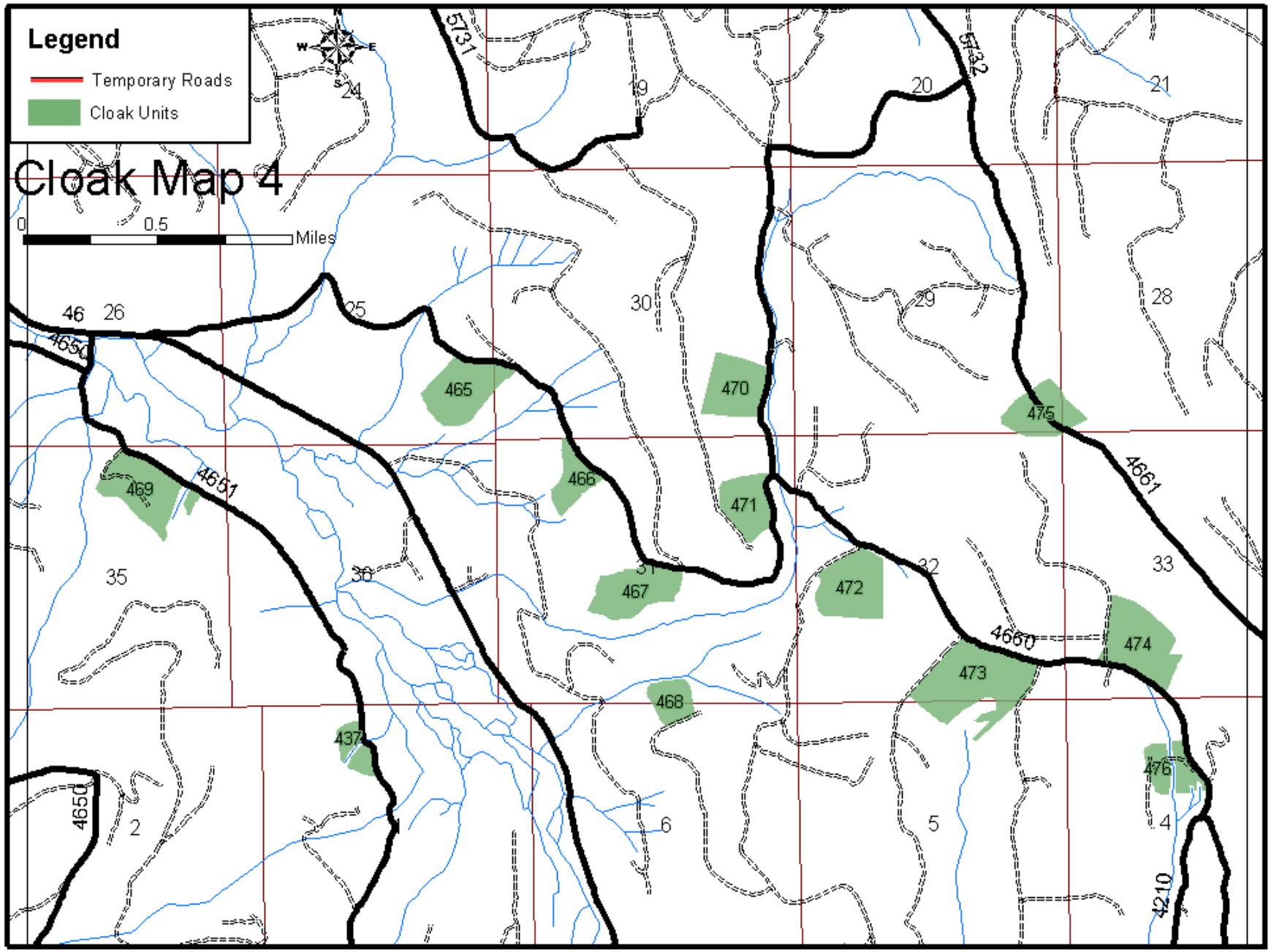
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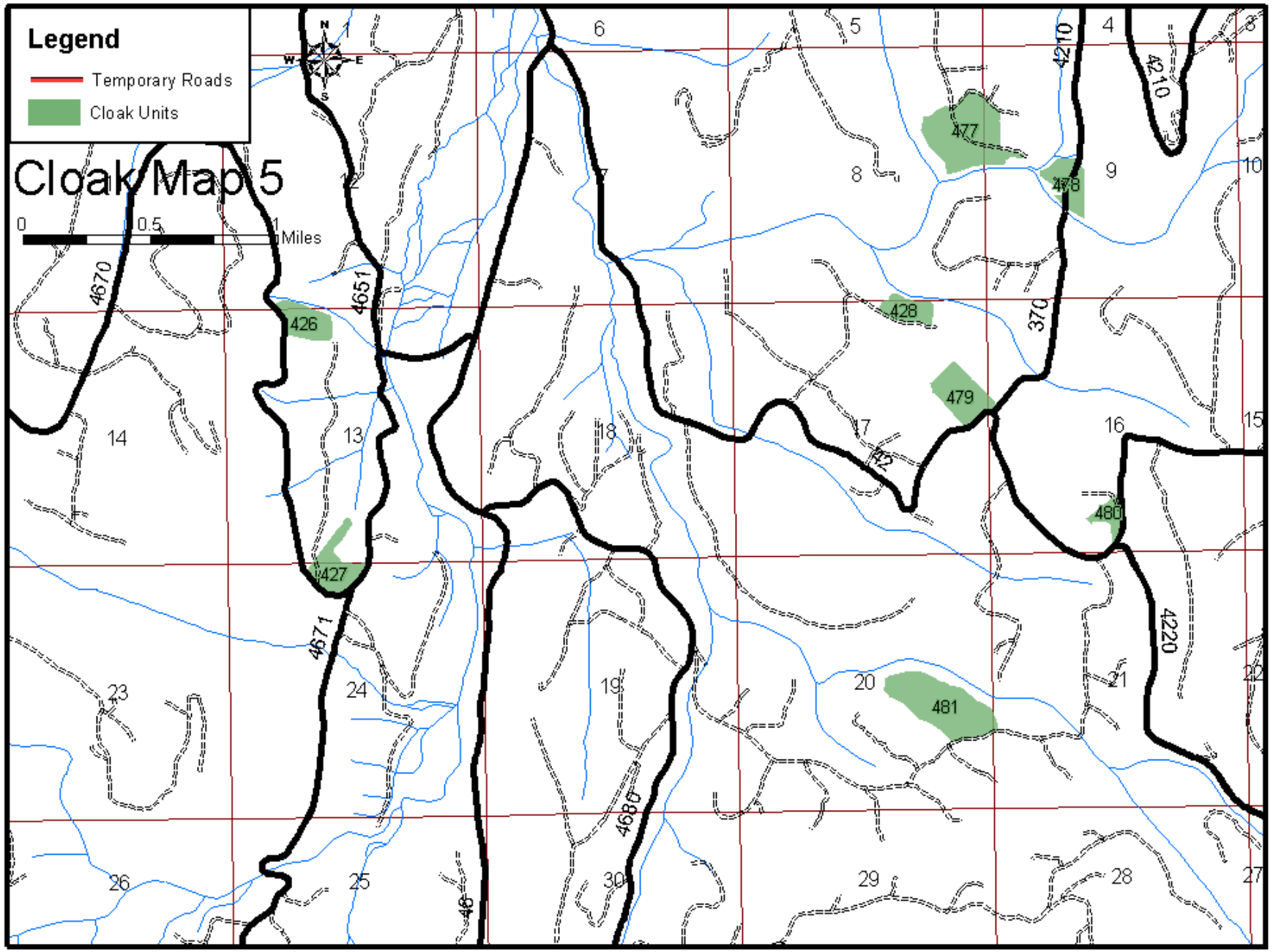
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Before – Cloak Unit 480

After – Jag Timber Sale

Alternative C

Alternative C is designed to respond to issues #1, 2, 3 and 5. It is similar to Alternative B except it would build no roads, would not thin riparian reserves and would not apply fertilizer. Units that are inaccessible from existing roads would be helicopter logged (240 acres). The creation of forage would not be an objective for this alternative. Gaps in the stands, if any, would be less than 0.1 acre in size. Alternative C would thin and harvest wood fiber from approximately 1332 acres of matrix land.

Some existing decommissioned or overgrown roads need to be reopened (3.2 miles) to access landings for many units. Other roads have berms or drivable waterbars that would also be temporarily removed. Upon project completion, the roads that were opened would be closed. Approximately 1 mile of road reconstruction is included. This includes pavement grinding on road 58 and a small slump repair on road 4640 near unit 500.

Alternative C

Unit	Size (acres)	Notes	Unit	Size (acres)	Notes
426	11	S	501	17	H
427	19	GB	502	22	H/S
428	9	GB/S	503	38	GB/H
437	8	GB	504	43	GB/S/H
465	34	S	505	25	GB/S
466	17	S	506	26	GB/S
467	31	S	507	16	S
468	9	S	508	25	GB/S
469	35	S/H	509	5	GB
470	23	GB/S	510	9	S

Unit	Size (acres)	Notes	Unit	Size (acres)	Notes
471	21	GB/S	511	23	GB/S/H
472	32	GB	512	19	GB
473	60	GB	513	23	GB
474	41	GB	514	10	S
475	27	GB	515	29	GB/S
476	8	GB	516	43	S
477	34	GB	517	42	GB
478	6	GB	518	30	GB/S
479	23	GB	519	34	GB
480	8	GB	520	20	GB
481	43	GB	566	14	GB
494	44	S/GB/H	567	13	S
495	3	H	568	18	S
496	21	S	571	33	GB/H
497	22	GB	577	19	S
498	24	H	578	60	GB/H
499	7	GB	579	18	H
500	10	S	580	29	GB/S

GB = Ground Based Logging, S = Skyline Logging, H = Helicopter Logging

Alternative D

This alternative is similar to C but would eliminate the thinning of natural second-growth stands. This alternative would respond to issue #4 as well as issues #1, 2, 3 and 5. Alternative D would thin and harvest wood fiber from approximately 1068 acres of matrix land and would reopen 3.1 miles of closed roads. Approximately 1 mile of road reconstruction is included. This includes pavement grinding on road 58 and a small slump repair on road 4640 near unit 500.

Alternative D

Unit	Size (acres)	Notes	Unit	Size (acres)	Notes
426	11	S	501	0	
427	19	GB	502	22	H/S
428	9	GB/S	503	0	
437	8	GB	504	43	GB/S/H
465	34	S	505	25	GB/S
466	0		506	26	GB/S
467	31	S	507	0	
468	0		508	25	GB/S
469	35	S/H	509	5	GB

Unit	Size (acres)	Notes	Unit	Size (acres)	Notes
470	23	GB/S	510	9	S
471	21	GB/S	511	23	GB/S/H
472	32	GB	512	19	GB
473	60	GB	513	23	GB
474	41	GB	514	10	S
475	0		515	29	GB/S
476	8	GB	516	43	S
477	34	GB	517	42	GB
478	6	GB	518	30	GB/S
479	23	GB	519	34	GB
480	8	GB	520	20	GB
481	43	GB	566	0	
494	0		567	13	S
495	0		568	18	S
496	21	S	571	33	GB/H
497	22	GB	577	19	S
498	24	H	578	0	
499	7	GB	579	0	
500	10	S	580	29	GB/S

GB = Ground Based Logging, S = Skyline Logging, H = Helicopter Logging

Alternative E

This alternative is similar to B but would have larger forage enhancement areas. This alternative would respond to issue #6. Alternative E would thin and harvest wood fiber from the same units described for Alternative B but would have forage enhancement areas of 3 to 5 acres in size. Leave trees would be retained at a rate of 20 to 40 trees per acre. The total quantity of forage enhancement areas would be the same as Alternative B (70 acres).

Alternatives Considered But Not Fully Developed

Alternatives were considered that would include restoration projects such as road closures and road decommissioning. Comments were received suggesting that we not mix restoration projects with timber harvest projects. These restorations are not connected actions and are not included in the range of alternatives for this analysis. These restoration projects have been assessed in a separate Forest-wide Restoration Environmental Assessment.

During the 30-day comment period, Oregon Natural Resources Council (ONRC) requested the consideration of an alternative that protects all snags. All of the action alternatives would save existing snags where safety permits but many snags would have to be felled. ONRC suggested an alternative that would save snags by avoiding all harvesting in the hazardous zone around the snags. Survey data shows that there are approximately 4-10 medium and large snags per acre within the natural second-growth stands and none in plantations. The hazardous zone around just one snag would be approximately one acre in size (assuming an average height of 120 feet). Trying to avoid the hazard zone around all snags would eliminate all of the natural second-growth harvest units. It would be very difficult to develop this alternative because snags are continually changing. In the 2 to 3 years between planning and logging, live trees may die and become hazardous snags. Snags that are a hazard today may fall by the time harvest occurs and no longer present a hazard. There is no way to predict today how many hazardous snags would have to be felled to prevent injuries to forest workers. It would be unfeasible to develop an alternative that would protect all snags within a timber sale that occurs over a 2 to 3 year period. ONRC's suggestion of an alternative that protects all existing snags is essentially the same as Alternative D.

During the 30-day comment period, BARK requested the consideration of an alternative for riparian reserves that would thin very small diameter trees by hand, with the cut trees left on the ground to add to the down woody debris layer. This alternative was considered however the stems that would be left on the ground would not be large enough to be consider coarse woody debris which refers to wood that is generally larger than 20 inches diameter. Thinning only the very small trees would not achieve the desired condition of releasing riparian trees. Since there is no source of funding for this type of operation it would be similar to Alternatives C and D that have no management in riparian reserves.

During the 30-day comment period, ONRC requested the consideration of an alternative that would eliminate the forage enhancement areas and instead would create much smaller gaps (0.25 –1 acre, preferably less than 0.5 acre). The gaps would have scattered trees in them and be surrounded by areas with moderate to high retention of trees (little or no thinning). This would be done in all stands except in riparian reserves. The purpose of the gaps would be to enhance diversity. This alternative was considered but not fully developed because it does not provide large enough areas to allow sufficient sunlight to the forest floor for forage species. Alternatives C and D eliminate forage enhancement areas.

Several letters suggested the consideration of an alternative that would eliminate all harvest units where the existing percentage of detrimental soil conditions exceeds Forest Plan standards. Although this alternative was not developed as a separate alternative it is within the range of alternatives being considered. The range of alternatives includes a no-action alternative that is applicable to any of the units considered in this proposal. The decision maker has the discretion to not go forward with any or all of the units being proposed

including those that currently exceed standards for soil conditions. Also, Forest Plan standard FW-28 indicates that rehabilitation to restore soil conditions is appropriate. If no action is taken in these units and natural recovery is allowed to proceed, it would take much longer for soils to recover compared to using equipment to decompact temporary roads, landings and certain skid trails.

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

1. **Northern Spotted Owl:** No activity that produces noise above the ambient noise level would take place within 0.25 mile of a known spotted owl nest site or activity center of any known pair, during the March 1 to July 15 critical nesting period. This includes noise-generating activities such as timber felling, logging and road construction, but does not include hauling. This restriction may be waived if the site or center is found to be unoccupied by a survey. This applies to units 426, 470, 475, 511 and 519. No blasting would occur in any units between March 1 and July 15. No helicopter use would occur between March 1 and July 15. *This is a standard requirement from the Biological Opinion.*

2. **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 427-465, 467, 469-494, 497-500, 502-506, 508-509, 511-513, 515, 517-566, 571, and 578-580. 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.*

3. **Deer and Elk Winter Range**: No harvest operations, road construction, use of motorized equipment or blasting would be permitted in key portions of deer and elk winter range areas between December 1 and March 31. This applies to units 427, 465, 466, 467, 468, 497, 498, 499, 500, 501, 503, 507, 508, 509 and 566. The restriction would be waived outside of the crucial zone if snow accumulation levels are less than 12 inches or if it is determined that the area is not being used by elk. Units 468, 501, 503, 507, 508 and 509 are outside the crucial zone. *This implements a memorandum of understanding with Oregon Department of Fish and Wildlife, and Forest Plan standards and guidelines B2-026 and B8-018.*

4. **Deer and Elk Winter Range Haul Routes:** No log haul or snow plowing would be permitted on the portions of roads 4200500, 4630, 4631, 4640, 4645, 4651, 4660, 4680 or 5710 in Crucial Winter Range between December 1 and March 31. Some units must use these haul routes, but for other units, alternate haul routes are available including roads 4200, 4600, 4670, 5700, 5720 and 5730 that have no

restriction. *This implements Forest Plan standard and guideline FW-211 and a memorandum of understanding with Oregon Department of Fish and Wildlife.*

5. **Deer and Elk Summer Range**: No timber felling, yarding or hauling, would be permitted in the B11 Summer Range land allocation during fawning, calving, and rearing season between April 1 and July 30. This applies to unit 475. *This implements Forest Plan standard and guideline B11-24.*

6. **Snags and wildlife trees:** 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.

   In **natural second-growth** stands, 18.6 live trees per acre greater than 10 inches diameter with "elements of wood decay" would be retained. Of these trees, 8 per acre should be greater than 20 inches diameter where available. Large mature trees that occur scattered in some of the natural second-growth stands would be retained, and where they contain the "elements of wood decay" they would be counted toward these totals. This applies to units 466, 468, 475, 494, 495, 501, 503, 507, 566, 578 and 579.

   In **younger second-growth** stands (plantations) in the matrix, 5 live trees per acre greater than 10 inches diameter with "elements of wood decay" would be retained. All 5 of these trees should be in the largest size class available. In younger second-growth stands (plantations) in riparian reserves, 18.6 trees per acre greater than 10 inches diameter with "elements of wood decay" would be retained. Of these trees, 8 per acre should be greater than 20 inches diameter where available. *This implements Forest Plan standards and guidelines as amended.*

7. **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.*

8. 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.*

9. **Thinning in Riparian Reserves –** *These are BMPs and implement NFP standards and guidelines, page C-30-32.*

   a. **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.

      For the next 50 ft. adjacent to the 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.

   b. **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.

c. 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.

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

A. 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.

B. 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.

C. 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.

D. 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.

E. On earthflows or where existing detrimental soil conditions exceed Forest Plan standards, existing temporary roads and landings that are reused, would be obliterated and revegetated.

11. **Roads –** *These are BMPs.*

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

b. Landings in riparian reserves 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.

c. Permanent road construction would be allowed if there would be no net increase in road density or drainage network, and no degradation of the baseline indicators. (No permanent road construction is proposed.)

d. 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.

e. 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.

f. Newly constructed roads would generally be located as far as possible from streams but no closer than at 150 feet from perennial streams and 100 feet from intermittent streams. A site-specific review would be required for all new roads located within a riparian reserve. The site-specific review would refine the road location and distance from the perennial stream needed to prevent sediment delivery to streams. (No road construction is proposed within riparian reserves.)

g. 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.

12. 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. **Invasive plants** are any plant species not native to a particular ecosystem that are likely to cause economic

or environmental harm, or harm to human health. These provisions contain specific requirements for the cleaning of off-road equipment. *This implements Executive Order 13112 dated February 3, 1999.*

Prior to the implementation of ground disturbing activities, a noxious weed survey of proposed landing sites, designated hauling routes, and rock/borrow pits needed for road work would be conducted to ensure that no new weed infestations exist at these locations. Manual control (handpulling and/or clipping) of any Oregon State "B" designated weeds would be conducted if the weeds occur in areas of high ground disturbance that may be utilized during the timber sale operations. Surveys have been conducted, but since weeds may spread quickly it is prudent to look again just prior to ground disturbing activities. *This implements Executive Order 13112 dated February 3, 1999.*

13. **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.

14. **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.*

15. **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.

Comparison of Alternatives

This section provides a summary of the effects of implementing each alternative. 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 Proposed Action**	**Alternative C**	**Alternative D**	**Alternative E**
Issue #1 Affect of Roads on Water Quality and Fish	No road construction. No impacts to water quality from road construction.	Construction of 1.8 miles 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.	No road construction. No impacts to water quality from road construction.	Construction of 1.8 miles 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.
Issue #2: Affect of Riparian Reserve Management on Water Quality and Fish	No change	217 acres riparian reserve thinned. 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 change	No change	217 acres riparian reserve thinned. 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.
Issue #3: Fertilization	No Effect, No improved tree growth.	Vegetative buffers would act as an effective barrier to fertilizer being transported into streams. Improved tree growth.	No Effect, No improved tree growth.	No Effect, No improved tree growth.	Vegetative buffers would act as an effective barrier to fertilizer being transported into streams. Improved tree growth.
Issue #4: Natural Second-Growth Forest	No natural second growth thinned	307 acres of natural second growth thinned	264 acres of natural second growth thinned	No natural second growth thinned	307 acres of natural second growth thinned
Issue #5: Forage - Not Needed	No Forage Created	70 acres of Forage Enhancement	No Forage Created	No Forage Created	70 acres of Forage Enhancement
Issue #6: Forage – Need More	No Forage Created	Forage Enhancement Areas 1-3 acres in size.	No Forage Created	No Forage Created	Forage Enhancement Areas 3-5 acres in size.
Approximate Timber Output (million board feet)	0	16 mmbf	11.9 mmbf	9.1 mmbf	16 mmbf
Acres of Timber Productivity Improved	0	1332	1332	1068	1332
Acres of Riparian Reserve Enhanced	0	217	0	0	217
Economic Viability Benefit/Cost ratio	0	2.6	2.59	2.52	2.6

ENVIRONMENTAL CONSEQUENCES

This section summarizes the physical, biological, social and economic environments of the affected project 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.

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. They include the actions of other agencies or individuals. The land area used for a cumulative effects analysis may vary depending on the resource. For this project, the various analyses include timber sales that have been recently planned but may not be completed yet. Included are the following timber sales that involve the regeneration harvest of mature timber (late-successional forest): Slinky, Imp, Borg, Bars, Barstool, Bazooka, Batwings, Solo, Bear, Cub, Jane and Tarzan. Included are the following timber sales that involve the thinning of young forest: Bonanza Thinning, Pardner Thinning, Bay Thinning, Peavine Thinning and Cowpoke Thinning. These sales are not just listed by name, but the actual acres of harvest are included in the analysis. For example, in the deer and elk analysis, the regeneration sales are subtracted from the available acres of optimal and thermal cover. Other past timber harvests are also included in the analysis through the use of a vegetation database in the Forest's Geographic Information System (GIS). For example the GIS layer titled "veg2004" contains polygons with data such as year-of-origin, seral stage, and wildlife habitat characteristics. Similarly, data for roads that were built in the past are contained in GIS layers that were used for cumulative effects analysis.

WATER QUALITY AND FISHERIES (Issues #1, 2 and 3)

This section addresses Issues #1, 2 and 3. This section also addresses effects from all components of the alternatives including logging and fuels treatments. It also includes an assessment of the Aquatic Conservation Strategy and a discussion of Best Management Practices. The Cloak Thinning Fisheries Biological Evaluation and Upper Clackamas and Oak Grove Thinning Fisheries Biological Assessments are incorporated by reference and summarized below.

Informal consultation with NOAA Fisheries concerning threatened or endangered **anadromous fish** and Essential Fish Habitat established under the Magnuson-Stevens Fishery Conservation and Management Act has been completed for this project. Letters of Concurrence from NOAA Fisheries dated December 19, 2002 and May 9, 2003 are in the analysis file.

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

Existing Situation

The following is a summary of information contained in the Fish Biological Evaluation in the Appendix.

The Cloak Thinning Project proposes to thin and commercially harvest wood fiber in young plantations and natural fire-created stands within the Clackamas River and the Oak Grove Fork watersheds. The river corridors of these watersheds are designated Tier I, Key Watersheds under the Northwest Forest Plan because they contain crucial refugia for at-risk fish species. These watersheds support populations of winter steelhead, coho salmon, chinook salmon, and resident cutthroat and rainbow trout.

The stands proposed for thinning are located within three 5th field watersheds tributary to the Clackamas River: Oak Grove Fork Clackamas, Upper Clackamas and Middle Clackamas. The 5th field watersheds are subdivided into subwatersheds. The project overlaps the following subwatershes: Lower Oak Grove Fork, Middle Oak Grove Fork, Lake Harriet, Peavine Creek, Shellrock Creek and Kink Creek in the Oak Grove Fork; Cabin Creek, Last Creek, Pinhead Creek, Dyke Creek, Big Bottom, Granite Creek, and the Austin Segment in the Upper Clackamas; and Tag Creek within the Middle Clackamas. There are no 303(d) listed water bodies in the project area.

The stands within the Cloak Project range in age from 35 to 95 years. The average tree height is 70 feet with an average diameter of between nine and 12 inches. The timber to be harvested is primarily Douglas-fir and western hemlock, and small amounts of other species. The current stocking levels range from 141 trees per acre to 360 trees per acre. Currently the stands identified for thinning are overcrowded, causing reduced growth and the potential for increased mortality. These even-aged stands have low levels of species and structural diversity.

There are no fish species listed under the Endangered Species Act (ESA) in the vicinity of thinning units. Resident cutthroat and rainbow 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 and Upper Willamette River (UWR) chinook salmon. Lower Columbia River coho salmon, a species proposed for listing, also occurs downstream of the project area. These species occur in the mainstem Clackamas River, Oak Grove Fork of the Clackamas River, and in the lower reaches of Tag, Pinhead, and Last Creek outside of the project area. The nearest occurrence of listed fish species to the project area is approximately 0.2 to 0.3 miles downstream of intermittent non-fish bearing tributaries that flow through proposed units within the Big Bottom and Lower Oak Grove Fork subwatersheds.

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 in this watershed would focus around changes in the timing and/or magnitude of flow events resulting from past, present and future forest conditions.

Cumulative effects associated with the Cloak Project center around changes in peak and base 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 (ARP analysis).

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 would 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 and E

Sediment

Ground disturbing activities associated with temporary road building within the Cloak Project Area have been designed to minimize the risk of erosion and the potential for sediment to be transported to streams. 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 flat terrain, 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. 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. 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, 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 Cloak 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. 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 chance that measurable amounts of fine sediment would enter any stream within the project area as a direct result of logging activity is negligible.

Log hauling would not measurably increase the amount of fine sediment in streams. The roads along the haul route are well-rocked or paved at all stream crossings, and road ditches have been maintained and are well vegetated. This would decrease the potential of any fine sediment entering stream channels during hauling activities. 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.

Erosion and the transport of material to streams is a natural process, however in these watersheds there are some human caused sources of sediment that add to the natural baseline level of sediment. Other timber sale projects use similar design criteria to minimize or eliminate the potential for erosion to occur in a way that transports soil to streams. Unsurfaced roads that cross streams or are on steep and unstable slopes are a primary source of human caused sediment in streams in these watersheds. Downstream monitoring in the Clackamas River (measured at the Carter Bridge water monitoring station) indicates that, "Overall, water quality is very good" (Mt. Hood 2002 Monitoring Report, page 62). Because of the precautions to minimize or eliminate sources of sediment described above for the Cloak project, and considering other potential sources of sediment, the Cloak project would not result in a significant cumulative effect.

Temperature

The no-cut buffers along perennial and intermittent streams would also 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. The 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 small probability of effects would decrease, as the canopy and ground cover are re-established to pre-harvest conditions.

Fertilization

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. 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 and would substantially negate any adverse effects to fish species or water quality.

Other projects also involve the use of fertilizer including restoration projects 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 Cloak fertilization project would not significantly add to the downstream nutrient levels.

Riparian Reserve Stand Structure

Alternatives B and E 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.

Alternatives C and D

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 road construction, therefore there would be no risk of erosion or sediment entering streams due to the construction of roads. Riparian Reserves would not be harvested under these alternatives. The probability of any sediment reaching a stream course or any decrease in stream shading would be less due to the greater distance a full Riparian Reserve buffer provides. There would be slightly less risk of erosion from harvest operations 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. Since there would be no application of fertilizer there would be no potential effects to water quality from fertilization. Under these alternatives there would be negative long-term effects in riparian reserves 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.

Fish Stocks of Concern

The effects of the implementation of the Cloak Thinning Project on fish stocks of concern would be based on local populations of resident cutthroat trout and populations of listed fish species within and downstream of the project area in the Oak Grove Fork and

Clackamas River. There are no threatened or candidate fish species that occur within any of the proposed units of the project area.

ESA listed species that occur within one mile downstream of the project area are Lower Columbia River steelhead and Upper Willamette River chinook salmon. The closest occurrence of these species to the project area is within the mainstem Clackamas River and Oak Grove Fork approximately 0.2 to 0.3 miles downstream of intermittent non-fish bearing tributaries that flow through proposed units. These tributaries are located within the Big Bottom and Lower Oak Grove Fork subwatersheds.

The no-action alternative would have ratings of "No Effect" for fish stocks of concern. The following effects determinations 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 Cloak 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 the lower 3.7 miles of the Oak Grove Fork 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 within the units of the Cloak Project. However, LCR steelhead do occur in the mainstem Oak Grove Fork and Upper Clackamas Rivers and near the mouths of some streams such as Cabin and Tag Creeks. The nearest LCR steelhead are approximately 0.2 to 0.6 mile downstream of tributaries that flow within or adjacent to proposed Cloak thinning units. Eight units are within this distance. All other Cloak units are located greater than one mile above any occurrence of LCR steelhead.

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 "May Affect, Not Likely To Adversely Affect" (NLAA).

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 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, South Fork Clackamas River and Roaring River.

Upper Willamette River chinook do not occur within the Cloak units. They occur in the mainstem Clackamas River, Oak Grove Fork of the Clackamas River, and Pinhead Creek. Spring chinook salmon have been documented in the lower reach of Pinhead Creek approximately 1.4 miles downstream from unit # 481. Spring chinook salmon also occur in the mainstem Clackamas River 0.2 to 0.6 miles downstream of proposed units along Tag Creek, Cabin Creek, and several intermittent, non-fish bearing tributaries within the Big Bottom subwatershed. The nearest occurrence of UWR chinook to any proposed unit within the Oak Grove Fork watershed is approximately 1.3 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 "May Affect, Not Likely to Adversely Affect" (NLAA).

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 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 on the Clackamas River Ranger District. Because of the distance of the occurrence of fall chinook from the project area (greater than 20 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*)
(Proposed for listing) 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 Oak Grove Fork and Upper Clackamas Rivers and near the mouths of some streams such as Cabin and Tag Creeks. The nearest Coho salmon are approximately 0.2 to 0.6 mile downstream of tributaries that flow within or adjacent to proposed Cloak thinning units. 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 "May Affect, Not Likely to Adversely Affect" (NLAA).

Southwestern Washington/Columbia River Cutthroat Trout (*Oncorhynchus clarki*) - (Sensitive). 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 upper Clackamas River and its tributaries including the Oak Grove Fork.

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."

Essential Fish Habitat

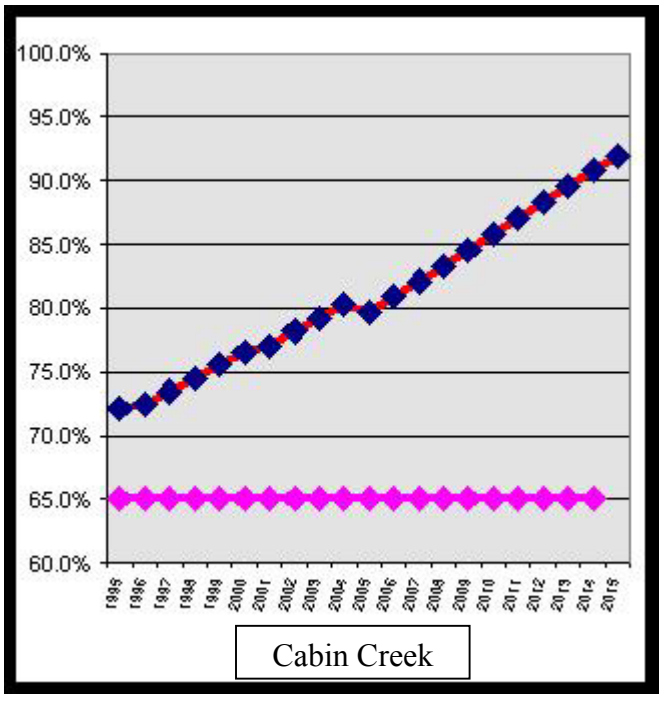
Essential Fish Habitat (EFH) established under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) includes those waters and substrate necessary to ensure the production needed to support a long-term sustainable fishery (i.e., properly functioning habitat conditions necessary for the long-term 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. Implementation of the Cloak Thinning Project **"May Not Adversely Affect"** EFH as designated under the 1996 Amendment to the MSA, or have any negative long-term effect 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.

Other Aquatic Species - The FSEIS to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines was issued in 2004. The Record of Decision moved many species from the requirements of the Survey and Manage Standards and Guidelines to sensitive species. However, it also indicated that projects still in the planning stage that had begun or completed surveys using the Survey and Manage Standards and Guidelines could proceed without conducting a new sensitive species analysis. The aquatic mollusk (*Lyogyrus* n. sp. 1) is known to occur in many streams on the district including some near Cloak units. Instead of conducting surveys in all adjacent streams, species presence was presumed. Riparian reserve standards and guidelines and project design criteria are sufficient to provide for the habitat needs of this species.

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 Cabin Creek. It is displayed here because it has the greatest change in ARP values as a result of the proposed action. The other subwatersheds are similar and they show that with all past, current and reasonably foreseeable future actions, that the subwatersheds are experiencing a period of steady hydrologic recovery. The minimum Forest Plan level for harvest dispersion in these watersheds is 65% (FW-62, page Four-53). This level 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, this watershed is more stable and is not affected by rain on snow events to the extent of some other watersheds within the Clackamas drainage that have thresholds as high as 82%.

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

ARP Value in 2005

Subwatershed	Alternative A	Alternative B&E
Tag	87.9	86.2
Kink	71.7	71.6
Shellrock	83.6	83.6
Peavine	77.8	77.7
Buck	87.8	87.7
Lower Oak	87.5	87.1
Lake Harriet	82.0	81.5
Middle Oak	80.3	80.1
Granite	93.7	93.6
Cabin	81.3	79.6
Pinhead	78.3	78.2
Last	73.6	73.4
Dyke	81.6	81.4
Austin	84.8	84.5
Big Bottom	84.7	84.3

Alternatives C and D would be similar but the ARP number would be slightly greater than Alternative B. 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 includes the effect of roads and permanent openings such as rock quarries. It also includes the impact of harvest and roads on other ownerships; in this area that would include the Austin Hot Springs property. The ARP analysis also includes other planned timber sales that overlap these subwatersheds including Slinky, Imp, Borg, Bars, Barstool, Bazooka, Batwings, Solo, Tarzan, Bonanza Thinning, Pardner Thinning, Bay Thinning, Peavine Thinning, Cowpoke Thinning.

The ARP analysis described above is analyzed at the subwatershed scale. However, the Forest Plan contains a standard that indicates that major drainages should not be below 65% recovery (FW-63, page Four-53). An analysis of major drainages indicates that both the Oak Grove, Lower Clackamas and Upper Clackamas watersheds would be at approximately 80% recovered after all of the past, present and reasonably foreseeable projects are included. The analysis shows a trend of 1% hydrologic recovery each year due to the rapid growth of mid-seral plantations. If future harvest were to occur at the rate projected in the watershed analyses, the result in terms of ARP would be to reduce the 1% annual recovery by approximately 0.2%. In other words, even with future projected

harvest the ARP curve would show a steady 0.8% annual increase and a trend toward continual hydrologic recovery.

Other foreseeable projects include restoration actions. These projects do not change the ARP calculation because they do not affect tree canopies but they would have a beneficial effect to aquatic and riparian resources within the watersheds. Planned projects include: replacement of culverts to improve fish passage, rehabilitation of rock pits located within riparian areas and decommissioning roads. These projects may result in a short-term increase in sediment but would result in long-term benefits.

Currently the Mt. Hood National Forest is participating in a collaborative process with a local utility and other federal and state agencies to relicense the Oak Grove Fork Hydro Electric Project. Foreseeable beneficial effects to the Oak Grove Fork watershed as the result of this effort could include: an improved flow regime for listed and resident fish species downstream of Lake Harriet Dam, culvert improvements for fish passage, gravel augmentation below Lake Harriet Dam to improve spawning, and in stream habitat improvement projects.

For more information on cumulative effects on watershed and fisheries, refer to Chapter 5 of the Upper Clackamas Watershed Analysis, Chapters 6, 7 and 8 of the Oak Grove Watershed Analysis and Chapter 2 of the Lower Clackamas Watershed Analysis.

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. Appendix E contains documentation of consistency with Riparian Reserve standards and guidelines and summaries of existing conditions for the fifth-field watersheds.

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). The following is a summary of the items applicable to the Cloak project.

Project Specific BMPs for the action alternatives

- **Design Criteria –** Design criteria 2, 8, 9, 10, 11, 13 and 15 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 would be outside of riparian reserves.
  - Proposed temporary road construction 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. See Appendix E for an analysis of BMPs.

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

TIMBER PRODUCTIVITY

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

Alternatives B & E

Plantations

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. 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 or restoring biological diversity.

Thinning at an early age provides growing space, which gives the trees with the best competitive advantage and the opportunity to quickly take advantage of this growing space for the longest practical time, fully utilizing the ability of the trees to expand their crowns into the growing room provided by the removal of neighboring trees. Failure to space trees early in their life can have consequences lasting the life of the timber stand (Smith, 1986). Most of the Cloak plantations were precommercially thinned at approximately 15 to 20 years of age and are now between 35 and 50 years of age. In

most units, another thinning would be desirable in 10 to 20 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. 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. This is because the natural structure of a tree grown that is exposed to the wind resists damage and trees adapt to the forces exerted upon them by the wind. The bending of the stem by wind causes 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. 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. 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.

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.

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.

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 on 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.

Natural Second Growth

Units 466, 468, 475, 494, 501, 503, 507, 566, 578 and 579 are natural second growth stands. The stands originated after forest fires and the majority of the trees are 70 to 95 years old. At present, these stands are in an overstocked condition and are experiencing suppression mortality, making the stands more susceptible to damaging agents such as decay, insects and diseases. Early in their life, these stands have grown much slower due to delayed stand establishment, brush competition and/or overcrowding than a similar aged plantation. Dwarf mistletoe is present in the western hemlock trees in the project area causing reduced growth and wood quality, and increased mortality. The discussion above for plantations applies to natural second growth except that in some cases the stands have grown closely spaced for longer than desirable. In many stands, another thinning would be desirable in 10 to 20 years; it would be sooner in stands that had closer spacing in the first thinning and later in stands thinned to a wider spacing.

In several of these stands, the wind has broken out of some of the tops of intermediate size trees due to the high height-to-diameter ratio. It is expected that some additional wind damage could occur. Leave tree spacing would be closer in the stands where wind damage may occur so that in the long term, stands would remain fully stocked. About five years following thinning, it is expected that stability of the residual stands would increase as both their root systems and needle complement increase and diameter growth improves.

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 a future thinning entry would be avoided.

Forage Enhancement Areas

Forage enhancement areas would be thinned to a much wider spacing than would be optimal for timber productivity. The leave trees would respond to thinning as described above and may develop open grown characteristics. Eventually seedlings would become established and a multi-story stand would develop. In the long term, forage value would decrease as canopies close.

Connectivity Network

Natural second-growth stands in the interim connectivity network would be thinned to a closer leave tree spacing than would be optimal for timber productivity. Connectivity objectives would be better served by a closer spacing but to maintain health and growth, a subsequent thinning entry may be needed within 10 years.

Alternative C would have similar discussion to Alternatives B and E but except that riparian thinning, fertilization and forage enhancement would not be included. For the acres not thinned with this alternative, the discussion under Alternative A would apply.

Alternative D would have similar discussion to Alternatives C except that natural second-growth would not be included. For the acres not thinned with this alternative, the discussion under Alternative A would apply.

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 or until some disturbance or stand differentiation allows stand development to continue or reinitiate. 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 than stands intensively managed.

LANDSCAPE HEALTH (Issues #4, 5 and 6)

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

This section addresses Issues #4, 5 and 6 at a landscape scale and takes a look at long-term thinning opportunities. Stand growth and health in natural second-growth stands are discussed in the Timber Productivity section and forage is also discussed in the Wildlife section. The proposed action involves both the thinning of plantations and natural second-growth forests (areas of second growth that regenerated naturally after a forest fire) and the creation of forage enhancement areas. Since the watershed analyses were completed eight years ago, changes have occurred on the landscape. Some regeneration harvest has been planned and/or implemented and there has been considerable growth particularly in younger stands that have changed the forage situation.

Forage Availability –

Some animals including deer and elk require forage areas: relatively open areas where grasses, forbs and young shrubs are abundant and palatable. Forage is provided in meadows but it is also provided in early-seral forest stands after wildfire or regeneration timber harvest. The forage value in early-seral forest stands after wildfire or regeneration timber harvest gradually declines as conifers grow and shade increases. Since meadows and other natural forage producing areas are relatively rare in these watersheds, and since trees grow relatively rapidly in early-seral stands, animals rely on fires and timber harvest to provide a continuous supply of new forage. The Forest Plan indicates that forage should be created by regeneration harvest at the rate of 8-10% per decade for the Oak Grove and 9-11% for the Upper and Lower Clackamas (FW-196, page Four-71). Even though it has been 14 years since the Forest Plan, the expected quantity of early-seral forest created by regeneration harvest ranges from 10-40% of the desired level. Biologists are concerned that populations that rely on early-seral conditions would begin to decline.

Regeneration Harvest Creating Forage

	Lower Clackamas		Oak Grove		Upper Clack	
1990-2000	505 ac.		1954 ac.		3162 ac.	
Completed, Started or Foreseeable since 2000	0 ac.		516 ac. *		970 ac.^	
Amount of regeneration harvest since Forest Plan and percentage of watershed (1990).	505 ac.	1.2%	2470 ac.	2.8%	4132 ac.	4.1%
Desired level of forage to create from regeneration harvest per decade in Forest Plan. Percentage of each total watershed.		9-11%		8-10%		9-11%

* includes Bars, Barstool, Borg, Solo, Batwings and Slinky. ^ includes Bazooka, Bear, Cub, Tarzan, Jane, Imp and Slinky.

Analysis of Young Forest

Data source: Watershed Analysis and GIS data from Veg2004.shp	Lower Clackamas	Oak Grove	Upper Clack
Vegetated Acres in Watershed.	41,090	87,367	94,796
% of watershed in early seral at time of Watershed Analysis.	20%	28%	27%
% of watershed converted from early seral to mid seral by tree growth.	-5.3%	-4.6%	-9.5%
% of watershed converted to early seral by recent and planned regeneration sales.	0%	+0.7%	+1.1%
% of watershed in early seral now.	14.7%	24.1%	18.6%

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. A first commercial thinning for plantations is often considered desirable at age 40 to 50. For natural second-growth stands, commercial thinning may not be viable until age 70 or later (because of their slow start and overcrowding early in life). Refer to the Timber Productivity section for more detail on health and growth. 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)						Natural Second-Growth Stands in 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 and emphasis. Since that time approximately 1500 acres of plantations and 5800 acres of natural second-growth stands have been commercially thinned. Planned commercial thinning projects would add another 2400 acres of plantations and 2700 acres of natural second-growth thinning. The table above indicates that thinning opportunities will increase in the coming decades as plantations age.

Landscape Health –

One of the key landscape-level issues identified in the watershed analyses is the fragmentation of late-seral forested habitats. Given that some landscapes, including those found in the Cloak planning area, are highly fragmented, the watershed analyses recommended that stand manipulations should be prioritized in a manner that minimizes additional fragmentation of remaining late-seral interior patches. Plantation and natural second-growth commercial thinning were given the highest priority.

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 to varying degrees depending on acres managed and other factors.

WILDLIFE (Issues #5 and 6)

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

This section includes a discussion of issues #5 and 6 as well as many other wildlife analyses. The Cloak Biological Evaluation is located in the appendix and is incorporated by reference and summarized below. The Cloak project is covered by a Programmatic Biological Assessment (USDA 2002). At that time the Cloak project was two separate sales called Upper Clackamas and Oak Grove Timber Sales, (see Biological Assessment pages 77 and 78). 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 February 27, 2003 (USDI 2003). A follow up letter was received from the U.S. Fish & Wildlife Service with clarification about the Biological Opinion (USDI 2004). The Biological Assessment and Biological Opinion remain valid for decisions signed before December 31, 2004.

Northern Spotted Owl (Threatened)

Existing Situation – The landscape pattern of vegetation has been affected by historic and recent timber harvest activities and fire suppression, 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 increases, the amount of interior forest habitat decreases, impacting organisms that prefer large patches of interior habitat, such as the spotted owl. Mostly because of past management, Oak Grove, Upper and Lower Clackamas watersheds are very fragmented watersheds within a highly fragmented sub-basin (USDA 1996a & b, USDA 1995). 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 this watershed.

The proposed action would have an effect on dispersal and nesting/roosting/foraging (NRF) 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. All of the harvest units are dispersal habitat. Five of the harvest units (86 acres) contain the habitat

components that comprise NRF habitat for the spotted owl. These are natural second-growth stands that have some scattered large remnant trees (466, 468, 501, 507 and 566).

The Cloak terms and conditions from the Biological Opinion include a seasonal restriction for activities within a ¼-mile radius of any current or historic spotted owl activity center between March 1 and July 15th. There are five units (519, 511, 470, 475, and 426) that are within ¼ mile of a known spotted owl activity center.

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.

Effects – Including Direct, Indirect and Cumulative Effects

Alternative A - No short-term effects to the owl would be predicted with this alternative. The units would continue to function as spotted owl suitable or dispersal habitat for the short term. It is likely that the stands that are currently suitable NRF habitat would remain suitable habitat for a long time. Considering long-term effects, there is the potential that some of the natural second-growth stands that are currently dispersal habitat would obtain some late-seral characteristics and become suitable habitat for the spotted owl. However, plantations would take much longer to become suitable habitat, due to the density and composition of tree species. Recent studies have indicated that dense, closed-canopy second growth without legacy trees can not only be devoid of exploitable prey populations but also poorly suited for owl roosting, foraging or nesting. This 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).

Alternatives B and E

Effects to NRF and Dispersal Habitat on a Local and Watershed Scale

In the short term, thinning with or without forage enhancement areas, would degrade dispersal habitat. Although the dispersal habitat characteristics of the units would be reduced in quality, they would still function as dispersal habitat for the owl. No loss of dispersal habitat would occur. During consultation with the U.S. Fish and Wildlife Service, the Biological Assessment and the Biological Opinion anticipated that 264 acres of dispersal habitat would be removed by heavy thinning and 363 acres of NRF would be downgraded (USDA 2002, p. 77 & 78). After refinement of the proposed action and field verification, the current assessment of impact is zero acres of dispersal removed and only 86 acres of NRF downgraded. Because none of the large remnant trees in these 86 acres of NRF would be cut, the area would eventually become NRF habitat again (in approximately 15 years). In the long term, variable-density thinning in plantations could

result in acceleration of the development of spotted owl habitat and dense prey populations (Courtney 2004, appendix 5, p. 3-24).

	Current Dispersal Habitat	Dispersal Habitat Degraded	Current NRF Habitat	NRF Habitat Downgraded
Oak Grove	53% (42,452 ac.)	0.9% (690 ac.)	37% (29,853 ac.)	0.1% (54 ac.)
Upper Clackamas	48% (45,633 ac.)	0.7% (731 ac.)	43% (40,382 ac.)	<0.1% (32 ac.)
Lower Clackamas	60% (24,334 ac.)	0.3% (128 ac.)	46% (18,689 ac.)	0

Many of the harvest units occur within Critical Habitat Units OR-10 and OR-11. As described above, there would be short-term degradations of dispersal and NRF habitat.

Critical Habitat Unit (CHU)	Current Dispersal Habitat	Dispersal Habitat Degraded	Current NRF Habitat	NRF Habitat Downgraded
OR-10	63% (55,938 ac.)	(564 ac.)	44% (39,015 ac.)	(54 ac.)
OR-11	50% (25,045 ac.)	(541 ac.)	42% (21,180 ac.)	(32 ac.)

Although there are no known spotted owl nests within the Cloak units, five of the units are considered suitable NRF habitat. The downgrading of 86 acres of this habitat could cause detrimental effects to owls that may use the area and would alter habitat from a landscape that has the potential to be occupied by owls. Therefore, in the context of the local and watershed scale, these alternatives would adversely affect the spotted owl and its habitat.

Effects to spotted owl on a province scale (Willamette Province)
The US Fish and Wildlife Service (USFWS) issued a biological opinion (USDI, 2003). The conclusion reached after considering the cumulative effects of this and other projects is that 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.

Effects to spotted owl on the entire range of the species (Washington, Oregon, and California)
The Northwest Forest Plan established a system of land allocations and a rate of timber harvest (probable sale quantity) that is considered to be consistent with maintaining viability for the northern spotted owl across its range (USDA USDI 1994b). The Cloak project is not within late-successional reserves. The Cloak project would not significantly alter the landscape's capability to provide for the continued viability of the northern spotted owl on Federal Lands.

Cumulative Effects
The current condition figures above include planned and foreseeable timber sales that would remove or have removed suitable habitat from the area. These timber sales include the following: Bazooka, Bear, Cub, Tarzan, Jane, Slinky, Imp, Bars, Barstool, Borg, Solo and Batwings.

The Cloak commercial thinning project adds to the effects of the above by downgrading 86 acres of suitable habitat and turning them into dispersal habitat. However, these stands affected are still relatively young stands, the oldest stand age being 95 years. Although they have just begun to have the structural characteristics required for classification as suitable habitat, they are still considered mid-successional stands. The Cloak project would not further add to the fragmentation of late-successional stands.

Alternative C
The effects would be similar to Alternatives B and E except that it would only downgrade 73 acres of suitable habitat and degrade 1,257 acres of dispersal-only habitat due to reduced riparian reserve acres. Although the amount of suitable habitat downgraded is somewhat less in this alternative, it would still adversely affect the spotted owl and its habitat but it would not likely jeopardize the continued existence of the spotted owl and would not likely destroy or adversely modify designated critical habitat for the spotted owl.

Alternative D
This alternative would not harvest the natural second-growth stands that contain NRF habitat. A total of 1068 acres of dispersal-only habitat would be degraded but would still function as dispersal habitat. For this reason, in the context of the local and watershed scales, this alternative would not likely adversely affect the spotted owl or its habitat.

LSR Assessment:
The proposed action would not occur within an LSR. However, several of the units occur within the Roaring River/Upper Clackamas General Area of Concern that is noted within the North Willamette LSR Assessment (USDA 1998b). This Area of Concern was delineated because the LSR is very narrow in places and is bisected by a busy highway. The Roaring River/Upper Clackamas General Area of Concern is an important connectivity area between two LSRs, to provide some habitat redundancy, and to compensate for the road.

The Watershed Analyses recommended the retention of a connectivity network of mature forest dispersal habitat until plantations in the LSR and Riparian Reserves develop into late-seral habitat. The LSR Assessment determined that there is enough area within the interim connectivity design cells that connectivity objectives should be met within this General Area of Concern (USDA 1998b, p. 3-80).

Some of the thinning units occur within the General Area of Concern and overlap the connectivity design cells. However, all but one of these units are plantations that are currently not serving as mature forest connectivity habitat. Unit 466 is in the General Area of Concern and is a natural second-growth stand that would have a special prescription to maintain connectivity. No degradation of the existing connectivity network within this General Area of Concern is expected to occur because canopy cover would be maintained at 60%.

During the 30-day comment period it was suggested that we explain the recent scientific documents about the northern spotted owl. 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 US 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 Forest examined these documents and evaluated new information and it's relevance to the Cloak project (Appendix E).

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

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. Marginal habitat is available within the project area and is likely used primarily for foraging and travel. One unit (501) has the potential to be utilized as nesting, roosting, or perching habitat for the bald eagle.

Effects
Alternative A - No effect to the bald eagle or its habitat would occur with implementation of this alternative. The one unit within this project area would continue to provide poor quality habitat for the species.

Alternatives B, C and E
Bald eagles usually nest within ¼ mile of a water body in the Cascades. There is one Cloak harvest unit with a multi-storied canopy and scattered large trees that is within 700 feet of the Oak Grove Fork of the Clackamas River. This stand could conceivably be used for nesting. However, the likelihood is low that this unit would be utilized as nesting/roosting/perching habitat because the area between the stand and the river is bisected by road 5700, a paved a well-used road. This adjacent section of the Oak Grove Fork presents obstacles to successful foraging by eagles due to topography and low flows. No eagles have been known to nest or roost along any portion of this river. The rest of the units within the Cloak Timber Sale are either beyond ¼ mile of a water body or do not have the structural characteristics to serve as potential nesting/roosting/perching habitat for the bald eagle.

The Cloak project would result in a degradation of 18 acres of poor quality potential bald eagle habitat. Although degraded, the large trees would be retained and this habitat

would remain as poor quality bald eagle habitat after project implementation. The effects determination in the biological opinion is that the project may affect, but is not likely to adversely affect the bald eagle.

Alternative D – There would be no effect to bald eagles because unit 501 would not be harvested with this alternative.

Canada Lynx (Threatened)

In a letter dated December 3 of 2003, the Mt. Hood National Forest made a determination, based on the best available scientific and commercial data, that the Canada lynx and its habitat are currently not present on the Forest. This letter follows the Canada lynx conservation agreement and is consistent with the Lynx Conservation Assessment and Strategy (Ruediger et al. 2000).

Forest-wide winter tracking surveys have been conducted during the winters of 1994-1995, 1995-1996, 2000-2001, and 2001-2002. No lynx were detected during these surveys.

Sensitive Species

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

Species	Suitable Habitat Presence	Potential for Species Presence	Impact of Alternatives*				
			A	B	C	D	E
Oregon Slender Salamander	Yes	Low	NI	MII-NLFL	MII-NLFL	NI	MII-NLFL
Larch Mountain Salamander	No						
Cope's Giant Salamander	Yes	Low	NI	NI	NI	NI	NI
Cascade Torrent Salamander	Yes	Low	NI	NI	NI	NI	NI
Oregon Spotted Frog	Yes	Low	NI	NI	NI	NI	NI
Painted Turtle	No						
Northwestern Pond Turtle	No						
Horned Grebe	No						
Bufflehead	No						
Harlequin Duck	Yes	Low	NI	NI	NI	NI	NI
American Peregrine Falcon	No						
Gray Flycatcher	No						
Baird's Shrew	Yes	Low	NI	MII-NLFL	MII-NLFL	NI	MII-NLFL
Pacific Fringe-tailed Bat	Yes	Low	NI	NI	NI	NI	NI
California Wolverine	No						
Pacific Fisher	Yes	Low	NI	MII-NLFL	MII-NLFL	NI	MII-NLFL

* Impact abbreviations
"NI" = No Impact
"MII-NLFL" = May Impact Individuals but not likely to cause a trend to federal listing or loss of viability

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 and reconstruction and log haul.

The FSEIS to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines was issued in 2004. The Record of Decision moved many species from the requirements of the Survey and Manage Standards and Guidelines to sensitive species. However, it also indicated that projects still in the planning stage that had begun or completed surveys using the Survey and Manage Standards and Guidelines could proceed without conducting a new sensitive species analysis.

Surveys have been competed to the Survey and Manage protocol for terrestrial mollusks and red tree voles and no individuals were found. Surveys were not conducted for the Larch Mountain Salamander and great gray owl because habitat for these species is not present within the Cloak project area.

Snags and Down Wood

Existing Situation - In the Upper and Lower Clackamas and the Oak Grove Watershed Analyses snag and down woody debris density and condition were taken from Forest Inventory surveys were completed in 1986 and 1987 in late-seral and naturally regenerated mid-seral stands, as well as from 1992 Forest Inventory surveys in plantations.

The natural second-growth stands have between 2 and 13 medium snags per acre and between zero and 3 large snags per acre. The down woody debris density in natural second-growth stands was found to be between 4 and 8 hard down logs per acre and between 7 and 16 soft logs per acre.

The Cloak plantations have no medium or large snags. The down wood density was found to be about 2 hard and 3 to 4 soft logs per acre.

In addition, snag surveys were conducted during the 2002 field season in all of Cloak's natural second-growth stands. The average snag density was found to be 6.8 medium snags per acre and 2.9 large snags per acre in the Upper and Lower Clackamas and 3.1 medium snags per acre and 1.1 large snags per acre in the Oak Grove.

The primary and secondary cavity nesting species for the Pacific silver fir zone area are as follows: 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). Within the Western hemlock zone, the primary and secondary cavity nesting species are as follows: 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).

In the Cloak 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 and/or live wildlife trees per acre in the mid and late-seral stages for the units within the Pacific silver fir zone and 2.2 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 are as follows:

- Decayed wood elements consist of more than just snags and down wood, such 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 from the watershed analysis to the tolerance levels for the different wildlife habitat types and structural conditions identified in the DecAID advisory tool. All of the units within the Cloak project are located within the habitat type identified in DecAid as the Westside Lowland Conifer-Hardwood Forests of Western Oregon Cascades and vegetation condition of "small/medium trees."

For all three watersheds, all of the habitat types and structural conditions for plantations currently contain snag numbers that are much less than the 30% tolerance level for snag density and size based on inventory data. The natural second-growth stands located within the Upper and Lower Clackamas watersheds are less than the 30% tolerance level for snag density and size within the western hemlock zone and are between 30-50% tolerance level in the Pacific silver fir zone. The natural second-growth stands located within the Oak Grove watershed are less than 30% tolerance level in both the western hemlock and Pacific silver fir zones.

Within the habitat type and vegetation condition noted above, the DecAID advisor identifies the 30% tolerance level for 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.

DecAID advisor identifies the down wood 30% tolerance level for 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 mid-seral stands would be up to 10% cover of down wood with sizes of pieces averaging 8-12 inches in diameter.

Effects - Alternative A - The natural second-growth stands would continue to provide a source of high quality snag and down log habitat. The plantations would continue to be very deficient in snags and down wood. Based on snag surveys completed in each of the natural second-growth stands, it is presumed that there would continue to be on average approximately 2.9 large and 6.8 medium snags per acre for those units within the Upper Clackamas Watershed and 1.1 large and 3.2 medium snags per acre for those units within the Oak Grove Watershed. This is above the level of snags required for 100% 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 range from below 30% to between the 30% and 50% tolerance level. Levels would be higher if live trees with the elements of wood decay were included.

Based on Forest Inventory surveys the natural second-growth stands within the Upper Clackamas and Oak Grove watersheds would continue to provide approximately 4 hard and 16 soft down logs per acre in the western hemlock vegetation zone and 8 hard and 7 soft down logs per acre in the Pacific silver fir vegetation zone. The plantations within the Upper and Lower Clackamas watersheds for all plant series would continue to provide about 2 hard and above 3 soft logs per acre. The down wood density in the plantations of the Oak Grove Watershed for all plant series would continue to provide about 2 hard and almost 4 soft 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.

Alternatives B and E

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 tractor logging. Approximately 918 acres would be tractor, 541 acres for skyline and 90 acres with helicopter.

Snags that are left standing after the timber sale would be more prone to wind damage and snow breakage than they were before the stands were harvested. There would likely be some loss of the remaining snags within 10 years after the 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 #6). 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, especially 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 #6 are combined for the purpose of determining DecAID levels for the action alternatives. After project implementation, the snag and defective tree resource in the natural second-growth stands, including the riparian reserves associated with those units, would have snag and defective tree densities and size guidelines at the 50% tolerance level as determined in the DecAid advisor. Due to the lack of large diameter trees and snags in the plantations, most would have snag and defective tree densities and size guidelines below the 30% tolerance level. Leave trees damaged during the harvesting operation have the potential to become defective or decayed trees useful for wildlife species.

In the Cloak 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 per acre for those units occurring within the western hemlock zone. Past experience and monitoring indicate that there would likely be some snags remaining after harvest.

Design Criteria #6 would result in additional protection to snags. Forest Plan standard and guideline FW-215, would likely be met in the natural second-growth units.

There are few if any medium or large snags in plantations. 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 #6 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 within the 2003 Forest-wide Restoration EA that would create additional small snags in the plantations of the Cloak project, 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, plantations would have down wood at the 30% tolerance level (approximately 4.5% cover from all decay classes) and the natural second-growth stands would be at the 50% tolerance level after harvest (approximately 10% cover from all decay classes). The project would be consistent with Forest Plan standards for coarse woody debris because it would not remove any existing coarse woody debris; it 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 will eventually fall naturally to create coarse woody debris.

These predicted tolerance levels for both snags and down wood are 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 helicopter logging would occur on 240 acres. Helicopter logging typically results in a loss of snags greater than in both tractor and skyline logging. Helicopter logging has less effect on the existing down wood. Riparian reserves would not be harvested in this alternative, resulting in 217 fewer acres being harvested. The snag and down woody debris impacts

would be similar to Alternative A for the riparian reserves.

Predicted tolerance levels for down wood cover and snags would be similar to Alternative B where harvest would occur and would be similar to Alternative A for the deleted portions.

Alternative D – The effects would be similar to Alternative B for plantations. In this alternative there would be no harvest of the natural second-growth stands. This would eliminate thinning from 307 acres that contain the highest snag and down woody debris densities in the project, the effects of this being similar to Alternative A. Of the action alternatives, D would have the least negative impact on the snag and down wood resource.

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 the table below were generated from field surveys. (Snags per acre data by stand type and plant association was summarized in the watershed analysis and was based on surveys completed by Forest inventory and ecology crews. Weighted averages include the entire land base including all forest types, private land inclusions as well as all non-forest areas within the analysis area. Large snags are $\geq$ 21 inches diameter and medium snags are between 15 and 21 inches. For cumulative effects, the standard for landscapes is 40% of biological potential, which equates to about 1.6 snags per acre in the Pacific silver fir and western hemlock zone. The 100% biological potential would be between 3.7 and 4 snags per acre.

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

There is potential for a foreseeable future action that involves snag and down woody creation in young plantations. An enhancement project was included in the 2003 Forest-wide Restoration EA to add snags and down wood to plantations some of which are included in the Cloak project. Funding for this work may come from Cloak timber sales or from other sources. If funding is available and if a post harvest review indicates that enhancement is still desired, snags and down woody debris would be created. This applies to units: 426, 427, 428, 437, 465, 467, 469, 470, 471, 472, 473, 474, 476, 477, 478, 479, 480, 481, 496, 497, 498, 499, 500, 502, 504, 505, 506, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 567, 568, 571, 577 and 580. Snags would be created by heart rot inoculation or by topping with explosives or chainsaws. Down woody debris would be created by girdling or felling. Approximately two structures per acre would be created. 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.

Snag Habitat (analysis areas that overlap Cloak units)

Snag Analysis Area	Total Acres	Total Large Snags (≥21")	Large Snags/Acres	Total Medium Snags (≥15")	Medium Snags/Acre	Total Snags/Acre
Tag Creek	4090	14112	3.5	4528	1.1	4.6
Kink Creek	4392	9867	2.2	6462	1.5	3.7
Cot Creek	4665	12458	2.7	9259	2.0	4.7
Lightning Creek	4447	12911	2.9	12537	2.8	5.7
Peavine Creek	7977	20696	2.6	18377	2.3	4.9
Anvil Creek	5123	18347	3.6	16378	3.2	6.8
Pint Creek	5146	13397	2.6	9322	1.8	4.4
Middle Oak Grove	5265	16998	3.2	13460	2.6	5.8
Granite Creek	4181	9535	2.3	15149	3.6	5.9
Pot Creek	5509	17616	3.2	9117	1.7	4.9
Cabin Creek	4117	16799	4.1	9706	2.4	6.4
Pinhead Creek	6279	15615	2.5	10770	1.7	4.2
Last Creek	6670	23007	3.4	10794	1.6	5.1
Dyke Creek	4982	19980	4.0	9582	1.9	5.9
Switch Creek	4834	16451	3.4	11345	2.3	5.8
Kansas Creek	5882	24305	4.1	12912	2.2	6.3

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 either greater or very close to the 100% biological potential level for all alternatives. The above figures have been reduced for foreseeable timber sales that overlap these snag analysis areas including Slinky, Imp, Borg, Bars, Barstool, Bazooka, Batwings, Solo, Tarzan, Bonanza Thinning, Pardner Thinning, Bay Thinning, Peavine Thinning, Cowpoke Thinning and Cloak Thinning. This exceeds the Forest Plan standard of 40% biological potential (FW-216). The biological evaluation contains a discussion of effects to sensitive, threatened or endangered species that utilize snags.

Deer and Elk Habitat (Management Indicator Species)

Existing Situation – The harvest units are located within both summer and winter range. 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 Cloak units) Forest Plan standards FW-203 & 205

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.)	Target Road Density (mi./sq. mi.)
KS 1	3368	26	20	68	30	15%	1.3	1.5
SR 4	5317	29	20	52	30	25%	1.8	2.5
SR 6	5768	35	20	54	30	31%	2.1	2.5
SR7	6976	26	20	38	30	32%	2.8	2.5
SR8	4707	33	20	45	30	32%	1.8	2.5
SR10	7186	46	20	53	30	30%	1.8	2.5
SR12	4147	36	20	43	30	29%	2.9	2.5
SR19	3656	27	20	63	30	14%	1.1	2.5
SR20	6571	32	20	55	30	19%	2.3	2.5
SR56	5028	41	20	49	30	32%	2.6	2.5
WR1	2505	45	20	57	40	6%	3.7	2.0
WR5	4197	58	20	66	40	10%	1.9	2.0
WR7	2635	80	20	84	40	4%	1.9	2.0
KW2	5173	50	20	72	40	8%	1.7	1.5
KW3	3631	54	20	69	40	8%	1.6	1.5
KW6	4519	65	20	73	40	8%	1.8	1.5

* 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 but is generally of low quality. The low quality of the forage, especially in winter range, and the lack of wetlands and permanent low-gradient streams within winter range on the District is considered the limiting factor for elk and possibly deer within the project area. See Landscape Health section. Populations of deer and elk are currently stable but there is a concern with a projected long-term trend of declining forage (USDA 2004b, p. 72).

Effects – Including Direct, Indirect and Cumulative Effects

Alternative A - The 86 acres of stands (501, 507, 566, 466, and 468) with late-seral characteristics and a multi-story would continue to function as optimal cover for deer and elk. An additional 1,463 acres of plantations and natural second-growth would continue to serve as thermal cover. No cover would be lost and no forage would be gained in this alternative. In the long term, deer and elk populations would steadily decline, as forage is lost.

Alternative B - Approximately 86 acres of optimal cover would be downgraded to thermal cover (54 acres in KW2 and 32 acres in KW6). Both analysis areas would still remain well above minimum cover requirements for optimal cover. This downgrading to

thermal cover would be relatively short-term in nature. As trees grow and the canopy closes, these 86 acres would return to optimal cover.

Approximately 1,463 acres of thermal cover would also be temporarily downgraded. This would result in a thermal cover decrease of no more than 5% for any of the analysis areas. All analysis areas would still remain above minimum cover requirements. These changes to the thermal cover characteristics would be short-term in nature. The 1,463 acres would return to thermal cover as trees grow.

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

On the areas proposed for matrix thinning, approximately 70 acres of scattered forage enhancement areas would increase forage for deer and elk. Some forage would be created in other thinning units on landings and skid trails. However, this increase in forage due to the commercial thinning is predicted to be low to moderate quality and would be short-term in nature. The forage created in the forage enhancement areas is predicted to last much longer. These actions would benefit deer and elk since forage is considered one of the limiting factors for deer and elk herds.

Road Density - Approximately 1.8 miles new temporary roads would be constructed and 3.4 miles of decommissioned or overgrown roads would be reopened to access several of the units. In addition, several miles of bermed roads would be opened. These roads would not be open to the public and use by loggers would occur when the disturbance and noise of logging equipment is already present. There would not be any additional disturbance from using the roads over the level of disturbance caused by the logging. After logging, the roads that were opened would be closed and open road density would be back to the current level. New temporary roads would not contribute to the long-term harassment of deer and elk. There would be no increase in permanent "system" roads open to the public and therefore no increase in open road density with any alternative.

The closure of currently open system roads is not part of the Cloak proposed action. A future Forest-wide restoration EA may address road closures.

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 but is restricted on other roads (Design Criteria #4). This results in predictable areas where animals can rely on solitude during critical winter months.

Disturbance - The logging and road-building activities could potentially disturb animals that happened to be in the area at the time of implementation. Disturbance that occurs during the spring/summer/fall would probably only displace animals and would not likely affect their health. The design criteria that limit the season of logging would protect animals from disturbance during the most critical times of the year. Disturbance is predicted to be small in scale and temporary in nature.

Alternative C – Effects would be similar to Alternative B except that no roads would be built, eliminating some of the temporary increases in disturbance that are discussed in Alternative B. However, because no roads would be constructed, helicopter logging would occur in some of the units. 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.

There would be fewer acres managed with this alternative. The 217 acres in riparian reserves would not be managed and would retain their cover characteristics. There would be no forage enhancement areas and no increase of high quality forage.

Alternative D - Cumulative effects would be similar to Alternative C. Compared to Alternative C, Alternative D would have 264 fewer acres managed in natural second growth and these acres would retain their cover characteristics. There would be no increase of high quality forage.

Alternative E – The effects would be similar to Alternative B except forage enhancement areas would be larger in size and have higher quality forage that would last longer than the smaller size areas in Alternative B. The total quantity of forage enhancement areas would be the same as in Alternative B (70 acres). The increase in size would allow more sunlight to reach the forest floor and would provide a greater concentration of high quality forage in the proposed units.

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. Some of the natural second-growth stands contain habitat for the pine marten and pileated woodpecker while the plantations do not. These animals rely on older forest structure and pileated woodpeckers also rely on snags and live trees with the elements of wood decay.

Most of the management areas for pine marten and pileated woodpeckers in Mt. Hood Forest Plan (B5 land allocation) were removed because other land allocations would meet the habitat needs for these species. The nearest remaining B5 land allocation is 2.5 miles from Cloak and would not be affected. Trends are stable for pine marten and pileated woodpecker. The FEMAT report showed pileated woodpecker to be well distributed on 100% of its range and pine marten to be well distributed on 67% of its range and locally restricted on 27% of its range (USDA et al. 1993, p. IV-166). It also found martens to be relatively abundant in the Cascades of Washington and Oregon (USDA et al. 1993, Appendix J2 p. J2-471). Recent monitoring has shown stable populations of both species on the Forest (USDA 2004b, p. 73).

Effects – Including Direct, Indirect and Cumulative Effects

Alternative A
There would be no short-term effects to the pine marten or pileated woodpecker with this alternative. The natural second-growth stands would continue to function as potential habitat. In time, the young plantations would eventually grow into a mature structural stage and become potential habitat for these species but it would take much longer than with the action alternatives.

Action Alternatives
Approximately 307 acres of natural second-growth stands that provide habitat for pine marten and pileated woodpeckers are proposed for commercial thinning. The microclimate would likely change within the harvest units as a result of the timber harvest, but probably not to the degree that would make the units unsuitable for the two species. As noted within the snag and down wood section and snag design criteria, all non-hazardous snags would be left as well as approximately 18.6 trees per acre that are defective or contain elements of wood decay. Adequate levels of snags and defective trees would be maintained across the landscape to provide habitat for the pileated woodpecker. Alternatives B, C and E would degrade but not remove the potential pileated woodpecker and pine marten habitat while Alternative D would not alter this habitat.

Cumulative Effects
The Analysis of Older Forest from page 32 of the Slinky EA (included in Appendix E) shows the condition of habitat for pine marten and pileated woodpeckers and other species that use older forest for habitat. The analysis shows that older forest comprises 42% of the Oak Grove and 37% of the Upper Clackamas watersheds. Alternatives B, C and E would add to the effects by temporarily degrading an additional 307 acres of suitable habitat. (None of the natural second-growth thinning units are in the Lower Clackamas Watershed.)

Migratory Birds

Existing Situation – Close to 30 species of migratory birds occur within the Oak Grove, Upper and Lower Clackamas Watersheds, some of which are likely present within the Cloak 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 small openings.

Alternative B and E – 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 1242 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 and are very common on 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 on the Clackamas River Ranger District. For species that prefer un-thinned second-growth stands there is abundant habitat in wilderness areas, riparian reserves and late-successional reserves.

The thinning of 307 acres of habitat with late-seral characteristics would reduce the quality of this habitat for some migratory bird species using the area, particularly those that require mature habitats and snags. Some migratory species that could be negatively affected are: Vaux's swift, brown creeper, red crossbill, pileated woodpecker, varied thrush, hermit warbler, Hammond's flycatcher, Wilson's warbler, and winter wren.

Cumulative effects for migratory birds that rely on late-successional habitats would be similar to the discussion for northern spotted owl nesting/roosting/foraging habitat. Although there would be a loss of quality habitat for these species, there is abundant habitat in wilderness areas, riparian reserves and late-successional reserves.

There are also some species of migratory birds that could benefit from the proposed forage enhancement areas. These are the species that prefer early-seral habitats with certain habitat attributes such as snags, residual canopy trees, and a deciduous shrub layer. A few of these species that are potentially present within the watershed and could benefit from these forage areas are the olive-sided flycatcher, western bluebird, and orange-crowned warbler. Historically these habitats were created from fire events that would create early-seral habitat with abundant snags and down wood. Since fires have been suppressed, this habitat component has been on the decline. There has been abundant regeneration harvest during the past 50 years, but until recently most left little or no legacy structures such as snags and down wood logs, often a necessary habitat component for migratory birds preferring early-seral habitats.

Alternative C – The effects would be similar to Alternative B except that it would only reduce the quality of 264 acres of habitat with late-seral characteristics and thin 1,068 acres of young plantations. None of the riparian reserves would be thinned which would have both positive and negative effects depending on the species of migratory bird. There would also be no forage enhancement areas.

Alternative D –The effects would be similar to Alternatives C except that there would no harvest of any of the natural second-growth stands and there would be no reduction in the quality of habitat with late-seral characteristics.

SOILS

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

Existing Situation

Updated mapping has occurred in some areas of the Cloak project based on field verification and other field reconnaissance work. Within any soil-mapping unit, there is a possibility of finding up to 25% inclusions of other associated soils and/or bedrock outcrops.

Suitability - The Cloak planning area includes areas that are considered unsuitable for timber management as defined by the Forest Plan. Areas unsuitable for timber management would include wet areas and soils that are excessively rocky. There are some small seeps, wet areas and rock outcrops that are too small to show on the maps on pages 11-17. These unsuitable areas would be excluded from harvest.

Detrimental Conditions - Appendix E contains a description of the analysis methodology and tables that show soils conditions. All of the natural second-growth stands have soils with little or no detrimental impact.

Some Cloak units are plantations that were logged approximately 50 years ago. 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. Due to past management practices that included tractor logging, landing construction, site preparation and fuels treatment, several of the Cloak units exceed the Forest Plan standard and guideline FW-022. Approximately 14% of the acreage proposed for thinning in the Cloak project has detrimental soil conditions that are above 15%.

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 scarify deeply into 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 these units due to past logging practices.

Soil Erosion - In the Cloak project area, surface soil erosion potential varies from slight to moderate for soils derived from glacial till and andesites and moderately severe to severe for soils derived from pyroclastics. Existing surface erosion is mainly confined to the unpaved road surfaces, road cutbanks and ditches and on unvegetated skidroads.

Effects

Analysis Methodology

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.

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.

Long-Term and Cumulative Effects

Soils would continue to develop and recover from detrimental conditions caused by past harvesting through natural processes. The percent of existing detrimental soil condition would slowly decline as compacted areas recover due to physical and biological processes. Forest organic litter input, duff layer development and soil fauna and microbe activity would also gradually recover. As unthinned stands age, trees would eventually fall over in a natural thinning process. In the absence of natural 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.

Alternatives B & E

Approximately 1242 acres of plantations and 307 acres of natural stands would be thinned. A combination of tractor, loader, skyline and helicopter yarding would occur. Ground based systems have the greater potential to impact soils. Existing roads, skid trails and landings would be reused where appropriate to minimize additional compaction.

Mechanical felling equipment may be used in many units, depending on slope. Mechanical decompaction would occur in some areas to restore soils.

Short-term Effects

Bare soil would be exposed where machines travel over the ground surface and where logs are dragged. Approximately 33 acres of roads, skid trails, skyline corridors and landings would be used. These areas would have potential increased erosion. Disturbed areas, particularly where slopes are greater than 25%, could be potential sources of erosion until they are successfully revegetated.

Full suspension yarding would minimize duff disturbance in skyline operations. Designated skid trails in ground-based yarding operations would minimize duff layer disturbance by limiting tractors to skid trails, and minimize the amount of area over which logs are dragged across the soil surface. 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.

Some soils have severe erosion potential. Erosion would not occur where duff and other effective ground cover is retained. Therefore, practices which limit the amount of soil exposure, or which re-establish ground cover after soil is exposed, would result in less erosion occurring. Of the proposed yarding systems, ground based systems result in a greater amount of ground exposure than skyline and helicopter systems. Units that are prescribed for ground based systems generally have flat to gentle terrain, so even if the potential for erosion may be high, eroding materials would not move far before redeposition occurs. With Best Management Practices there is a low potential for sediment to be delivered to streams. Units 497, 499, 504, and 508 are ground based harvest units located on severely erosive soil, but the low slopes, use of designated skidtrails, and establishing effective ground cover by applying seed, fertilizer, and straw mulch on the disturbed soils would aid in minimizing erosion. All other units on severely erosive soils would be logged by skyline or helicopter, resulting in only minor amounts of erosion with Best Management Practices. Ground based logging on those areas of the earthflows that are high in rock, such as pressure ridges, have low erosion potentials and would result in a minimal increase in soil erosion (units 503, 509 and 566).

Fertilizer application may affect soil organisms but would not cause adverse effects to soil physical, chemical or biological functions.

Long-Term and Cumulative Effects

A net increase in detrimental soil condition is predicted where more skid trails, yarding corridors, landings and roads would be constructed than already exist. The level of detrimental soil condition would remain below 15% in all natural second-growth stands,

regardless of logging system, and in all skyline units that were previously skyline logged.

Design criteria #10 indicates how existing temporary roads, landings and skid trails would be reused and restored.

Skid trails in older 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.

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.

In many units, ground based yarding would occur on areas where there is existing soil disturbance. Nine units would be above 15% detrimental soil condition. An exception to Forest Plan standard FW-22 is proposed because examination of the sites has found that certain soils have high rock content where compaction risk is not great, or that the use of existing roads, skid trails and landings with restoration, would result in less impact than would be caused by using skyline logging systems with new skyline corridors and in some cases new roads, and new landings.

The objective of maintaining long-term site productivity would still be met. Surface erosion and runoff from old skid trails is not occurring. Even though there was no standard for long-term soil productivity when the original clearcuts were logged, the stands continue to grow well and are projected to continue to grow well after the proposed thinning. Stand exams show that plantations that have detrimental soils above 15% have similar growth rates compared to nearby similar plantations that are below 15%. Mean annual increment is a measure of growth taken from stand exam data.

Unit #	Existing Soil Disturbance	Mean Annual Increment (cubic feet per acre per year)
499	28%	207
498	10%	166
509	17%	179
508	9%	156

Alternative C
Approximately 1068 acres of plantations and 264 acres of natural stands would be thinned. Thinning in riparian reserves would not occur. New roads would not be constructed. Helicopter yarding rather than skyline yarding would occur where road access is not available (approximately 106 acres). Approximately 27.5 acres of roads, skid trails, skyline corridors and landings would be used. A total of 27.5 acres would have potential

increased erosion as a result of thinning activities. These areas would have potential increased erosion.

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 because no new temporary roads would be constructed. No detrimental soil effects would occur within riparian reserves adjacent to harvest units. Application of fertilizer would not occur, therefore changes in soil organisms such as mycorrhizae due to fertilizer application would not occur.

Long-Term and Cumulative Effects
Cumulative effects would be similar to Alternative B except that only eight units would be above 15% detrimental soil condition.

Alternative D
This alternative is similar to C but would eliminate the thinning of natural second-growth stands.

Short-Term Effects
Within plantations, the effects of this alternative would be similar to those of Alternative C. No change in soil condition would occur within the unthinned natural second-growth stands.

Long-Term and Cumulative Effects
For plantations, cumulative effects would be similar to Alternative C.

Earthflows
Earthflows are very large naturally-occurring geological features on gentle to moderate slopes where earth, and the trees growing there, move downhill very slowly. Three earthflows occur within the Cloak project area. Some areas are exhibiting localized movement such as active slumping, large cracks in the ground, and dips in road surfaces.

Earthflow information and percent recovery by alternative (2005 baseline).

Earthflow	*Risk Category*	*Goal**	*Alt. A*	*Alt. B*	*Alt. C*	*Alt. D*	*Alt. E*	*Cloak units*
Tag/Mag	Moderate	>=75%	95.8 %	94 ac. 95.5%	63 ac. 95.6%	63 ac. 95.6%	94 ac. 95.5%	Units 497, 498, 499, 500
Butte	High	>=90%	96.3 %	153 ac. 95.4%	112 ac. 95.7%	41 ac. 96.1%	153 ac. 95.4%	Units 501-504, 507-509
Pint	High	>=90%	91.9 %	17 ac. 91.8%	14.2 ac. 91.8%	0 ac. 91.9%	17 ac. 91.8%	Unit 566

* Goal figures are from Forest Plan standards and guidelines B8-31 and B8-32.

All alternatives are above the minimum for recovery.

To provide for earthflow stability, the Forest Plan has a standard of 8% detrimental soil impacts. Most plantations in the earthflow exceed this level. For all action alternatives, ground based yarding would be used on earthflows where soil disturbance would be 8% or less or in plantations where ground based systems were used in the original logging. Exceptions to Forest Plan standards B8-36 and B8-40 are proposed because examination of the sites has found that the use of existing roads, skid trails and landings with restoration, would result in less impact than would be caused by using skyline logging systems with new skyline corridors and in some cases new roads, and new landings. The objective of earthflow stability would still be met by thinning to create healthy, productive stands. The no-action alternative would result in stagnated slow-growing stands. With Alternative E, the larger forage enhancement areas would allow for greater snow accumulation and thus quicker and greater hydrologic response from rain on snow events.

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 would consider 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 Imp viewer positions. The current or future projects that may be seen from the Cloak viewer positions would include Slinky, Imp and Solo.

Existing Situation

This analysis is in two parts. The first task is to look at primary viewer positions such as heavily traveled highways, rivers or campgrounds to evaluate whether people can see the project and if the project meets Visual Quality Objectives (VQO) assigned to these important viewer positions. The second part involves the evaluation of the project close up, as seen from less traveled backcountry roads.

The primary viewer positions are from the Clackamas River and Road 46, which parallel each other closely and from the Oak Grove Fork of the Clackamas River and Road 57, which parallel each other closely. There are no views into the timber sale area from the rivers due to topography and vegetative screening.

Areas within approximately ½ mile of roads 46 and 57 have a Visual Quality Objective (VQO) of retention. The VQO of retention means that activities would not be evident to the casual forest visitor. This would include portions of units 465, 501, 507, 514, 567, 568, 571 and 577. All other areas that are with the viewshed would have a VQO of partial retention. The VQO of partial retention means that activities may be evident but subordinate to the characteristic landscape. This would include all or portions of units 426, 427, 437, 465, 466, 467, 468, 469, 494, 495, 497, 499, 501, 502, 504, 506, 510, 514,

515, 516, 518, 520, 566, 567, 568, 571, 577, and 580. The current condition of the landscape as seen from roads 46 and 57, meets the cumulative VQO of middle-ground partial retention and foreground retention.

There is also a VQO of modification for other landscapes. Under the modification VQO, human activity may dominate the characteristic landscape but would utilize natural 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. Prior to arriving at the viewer positions near the Cloak units, a visitor would have driven through several miles of landscape dominated by a checkerboard pattern of forest plantations at many different ages and heights. The current condition of landscape, including power line towers, rectangular patterns, straight lines, and high vertical contrast between plantations and taller stands are elements that prevent the area from meeting the VQO of modification.

Effects

Alternative A:
In the absence of the Cloak thinning, changes in scenery would be expected to come slowly from forest growth. Gradually, over approximately 50 years, the existing checkerboard pattern seen from some local forest roads would become less evident as early and mid-seral trees adjacent to late-seral forest stands grow tall enough to cover the trunks and soften straight lines.

Effects to scenery as seen from roads 46 and 57 for Alternatives B and E:
Alternatives B and E would have similar effects to scenery. Units would meet the VQOs of retention and partial retention because of vegetative screening, the number of green trees retained, the distance and the viewer angle. No log landings would occur on, and no forage enhancement areas would be visible from roads 46 or 57. These factors combined would result in no noticeable change to the casual observer; the viewer would not notice any dramatic changes in forest structure or see bare ground or slash. Several units have been thinned in this area in the recent past with no noticeable impairment of visual quality. Other current or planned timber sales including Slinky, Imp and Solo would also not be evident to the casual observers on roads 46 and 57.

Effects to scenery as seen from local roads for Alternatives B and E: Alternatives B and E would result in some minor changes to foreground views from local open roads. 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. Forage enhancement areas would generally not be located where they would be visible from an open road. From other more distant viewer positions, the thinning with forage enhancement areas would not be evident to the casual observer.

Alternatives B and E would meet the VQO of modification. The current condition of the landscape as a whole would gradually improve.

Effects to scenery for Alternatives C and D: Alternatives C and D would be similar to Alternative B except they would have slightly less visual impact due to fewer acres harvested and utilizing helicopters in some areas instead of building temporary roads. These alternatives would also meet visual quality objectives.

BOTANY

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

Proposed, Threatened, Endangered, and Sensitive Plant Species & Habitat:

Existing Situation - No listed threatened, endangered or proposed botanical species are known to occur on the Mt. Hood National Forest. The Imp Botany Biological Evaluation is in the appendix and is incorporated by reference and summarized below. There is potential habitat for several sensitive species including *Botrychium lanceolatum, Botrychium minganense, Carex livida, Cimicifuga elata, Corydalis aquae-gelidae* and *Coptis trifolia.*

Effects – Including Direct, Indirect and Cumulative Effects
Surveys were conducted for Sensitive plant species, in the proposed units and in similar and connected habitats (e.g. streams) if immediately adjacent to the proposed units. No Sensitive plant species were documented in the project area.

None of the alternatives would have any adverse effects on Proposed, Threatened, Endangered or Sensitive botanical species.

The FSEIS to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines was issued in 2004. The Record of Decision, which became effective on April 21, 2004, moved many species from the requirements of the Survey and Manage Standards and Guidelines to sensitive species. However, it also indicated that projects still in the planning stage that had begun or completed surveys using the Survey and Manage Standards and Guidelines could proceed without conducting a new sensitive species analysis.

For this project, surveys were completed in 2002 and 2003.

The following is a list of botanical species that may have habitat in the project area, that were surveyed using the Survey and Manage survey protocol.

Species	Group
Schistostega pennata	Bryophyte
Tetraphis geniculata	Bryophyte
Bridgeoporus nobilissimus	Fungi
Bryoria pseudocapillaris	Lichen
Dendrisocaulon intricatulum	Lichen
Hypogymnia duplicata	Lichen
Leptogium cyanescens	Lichen
Lobaria linita	Lichen
Nephroma occultum	Lichen
Pseudocyphellaria rainierensis	Lichen
Ramalina thrausta	Lichen
Botrychium minganense	Vascular plant
Botrychium montanum	Vascular plant
Coptis trifolia	Vascular plant
Corydalis aquae-gelidae	Vascular plant
Cypripedium montanum	Vascular plant

Field surveys were conducted for the species listed above, in and adjacent to the proposed harvest units and none were found.

MANAGEMENT OF COMPETING AND UNWANTED VEGETATION

The Record of Decision and Mediated Agreement (MA) for the "Managing Competing and Unwanted Vegetation" Final Environmental Impact Statement (FEIS) apply to road and landing slash and invasive plants and noxious weeds. The use of herbicides is not being proposed for any of the activities associated with the Cloak EA.

Invasive plants are species not native to a particular ecosystem that are likely to cause environmental harm, or harm to human health. They include, but are not limited to, the Oregon Department of Agriculture (ODA 2003) 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 areas. They are Cytisus scoparius (Scot’s broom), Cirsium arvense (Canada thistle), and Hypericum perforatum (St. Johnswort). These weeds are well distributed on the Clackamas River Ranger District.

The action alternatives with Design Criteria 8 and 12 would have a risk ranking of moderate.

The projects would be surveyed in the same year and season as the project implementation for any existing weed spread from sites along roads leading into the projects or new weed species establishment in the areas.

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. A more complete discussion of the effects on these resources can be found elsewhere in this EA.

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.

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**.** The primary haul routes are paved except for local roads near harvest units. 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 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 area. The project area 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 Cloak or any other timber sale on 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.

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

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 sales are prepared and auctioned to bidders. For sales to sell they must have products that prospective purchasers are interested in and they must have log values greater than the cost of harvesting. This is a concern for 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 generated from the Cloak project 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 societies 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 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 large timber sale. The selected alternative would most likely be divided into 5 to 7 separate timber sales based on haul

routes, location or 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	Alternatives B&E	Alternative C	Alternative D
Present Value - Benefits	0	$9,467,085	$7,050,213	$5,390,142
Present Value - Cost	0	-$3,647,124	-$2,719,625	-$2,142,904
Present Net Value	0	$5,819,961	$4,330,586	$3,247,238
Benefit/Cost Ratio	NA	2.60	2.59	2.52

Present Value - Benefits: This is the present day value based on delivered log prices.

Present Value - Cost: This is the present day value of the cost associated with harvesting.

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 current value of logs delivered to the mill is relatively high at slightly greater than an average of $300/ccf. In the future, if the value of delivered logs dropped by more than $140/ccf, the cost of logging with a helicopter would result in a negative PNV. Delivered log prices would have to drop by more than $185/ccf for skyline harvesting and more than $210/ccf for ground based harvesting to result in a negative PNV. Helicopter logging is the most expensive logging system and is fuel intensive.

The bidding results of the timber sales sold since September of 2001 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 prepared from the Cloak Thinning EA 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.

One or more of the timber sales from the Cloak project may be considered for inclusion in a Stewardship Contract where the value of the timber is used to pay for restoration work. The removal of timber would be combined into a contract that also includes the implementation of restoration projects such as correcting fish passage problems elsewhere in Clackamas County. These other restoration projects would be covered by their own EAs where necessary. The value of the timber described above would remain the same but there would be no receipts to the treasury; instead the value of the timber

would be used to achieve needed restoration projects. Where stewardship contracting is used there would be additional benefits to local and regional economies from increased jobs.

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 on the Forest. The Forest-wide Roads Analysis identified, for approximately half of the current road system, the need to change maintenance levels to lower standards, to store roads in a maintenance level one category or decommission.

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 Cloak project are #2 and 7.

Existing Situation

There are no inventoried roadless areas in the Cloak Thinning project. A roadless area is near units 567 and 568 but is on the other side of road 4635120. The Cloak project area can be accessed from several directions but roads 46 and 57 are the primary haul routes.

Some road repairs along haul routes would be completed by other projects. Road 57 at Sam Creek was washed out by the failure of a beaver dam. This affects the haul for 15 units and repair may take a year or more to complete. There are other potential haul routes for these units that could be used. Roads 5730 and 5720 have some planned reconstruction that would be completed by other projects. The timing of completion of repairs would affect the timing of auction of timber sales or would affect the haul routes available.

There are road repairs that would be accomplished by the Cloak project. One is a slump on road 4640 at milepost 1.7. This affects four units that would normally haul down the

4640 past this point. It is assumed that the timber sale would generate enough revenue to repair the road (approximately $200,000) to safely allow log truck traffic. However, if market conditions at the time of appraisal are insufficient to cover the cost of road repair, there are other longer haul routes available for these units.

Another repair is the grinding of approximately 1 mile of pavement on road 58 at a cost of approximately $12,000. Pavement grinding would return the section of road to an aggregate surface, with reduced long-term maintenance costs.

The roads to be used for Cloak would also be used by other timber sales including Imp, Slinky, Solo, Borg, Batwings, Tarzan, Bear and Cub Timber Sales.

There are many closed roads in the Cloak project area. However, on some roads the closure devices are damaged by vandalism.

Alternative A

No roads would be built or repaired.

Alternatives B and E

New temporary roads would be constructed (1.8 miles) to access landings. Some existing roads have been obliterated, decommissioned or overgrown and would be need to be reopened prior to use (3.4 miles). All lengths are approximate. The new temporary roads are located on gentle landforms near ridge tops, and they avoid streams and wet areas.

Alternative C and D

No new temporary roads would be constructed and harvest units would be logged with helicopter. Some existing roads have been obliterated, decommissioned or overgrown and would be need to be reopened prior to use (3.2 miles for Alt. C and 3.1 miles for Alt. D).

Public Comment

Public involvement efforts for this project resulted in comments that relate to roads. Some said there should be no road construction. Alternatives C and D have been specifically developed to address these concerns.

Some said that the roads shouldn't be called 'temporary' because their effect would last a long time. "Temporary" means temporary use. With Alternatives B and E, temporary roads would be obliterated by the purchaser upon completion of operations. While the roadway may be visible for a long time, obliteration and revegetation would help reduce compaction and increase infiltration rates. The roads would not be returned to pre-disturbance conditions. The roads constructed for this project have been designed and located to serve the long-term transportation needs for access with skyline and ground

based systems. These roads would likely be needed again in the future for timber management.

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 2002-06-06-03-0004 and 2003-06-06-03-0001. There would be no anticipated effects on heritage resources. Project design criteria have been incorporated to protect 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.

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.

The Cloak project is in the middle of a large contiguous block of the Mt. Hood National Forest with no nearby private or other ownership. For the purpose of this analysis, the term "Cloak area" is used to include the timber sale units and approximately 40 square miles of adjacent National Forest. (Data source – U. S. Census Bureau)

Potentially Affected Communities

There are communities with minorities and low-income populations that may be affected by the Cloak Project. The town of Estacada (the nearest community) is approximately 20 miles away. Other more distant communities that may have an interest in the Cloak area would include the Detroit and Mill City area, the Molalla area, the Woodburn area, and the Portland metropolitan area. Individuals from these communities may work, recreate or have other interests in the Cloak area. There are no known special places for minority or low-income communities in the Cloak area.

Census data confirm that all of these communities contain minority and low-income populations. Poverty status ranges from 4 to 10 percent and minority populations range from 9 to 21 percent. In the rural communities and small towns, income is lower than the state and national averages and unemployment is higher than state and national averages. In recent decades, rural areas have experienced an influx of high-income families that have moved to the country and commute to work in the Portland metropolitan area. However there is still a small town and rural population that relies more on earning their

living or supplementing their income on the Forest. Some of these rural communities have experienced downturns in their economies due to reductions in timber harvest and closure of sawmills and other associated facilities.

Even farther away, but potentially affected are the American Indian communities of Warm Springs and Grande Ronde. Tribal groups have been contacted about the proposed action and did not express any interest. There are no known areas of religious significance in the Cloak area.

Potentially Affected Workers

Many people work in the Mt. Hood National Forest. In the Cloak area, employment opportunities include logging and other work associated with timber sales such as truck drivers and Forest Service inspectors. Post sale employment includes contractors and Forest Service employees that pile and burn slash and plant trees. In recent years, the percentage of Hispanics working on the Forest has increased. Alternatives B and E would provide employment to woods workers on the Forest as well as mill workers in adjacent communities. Alternatives C and D provide less timber volume and would provide less employment. The no-action alternative would not provide this employment. There are hazards and risks associated with working in the woods with heavy equipment, chainsaws, falling trees, burning and driving narrow roads. These risks do not fall disproportionately on minorities or low-income workers and there are safety practices in place to provide appropriate levels of protection.

A report titled, Employment Transitions in Oregon's Wood Products Sector During the 1990's (Helvoigt, 2003) documents statistics for displaced wood products workers. It indicates that only 51 percent of workers displaced from the wood products sector during the 1990's remained employed in Oregon by 1998. Of these, 45% found employment in the service and wholesale-retail trade sectors. The median wage of separated workers in 1998 was below their wage when employed in the wood products sector and below the median wage of all Oregon workers. The report expressed a concern that many of those who remained in rural areas are chronically underemployed.

Some minorities and low-income people work in the forest gathering products. In the Cloak area, the primary products would include boughs, firewood and beargrass. Other products that are harvested at much lower levels, with few if any harvested in the Cloak units, may include mushrooms, salal, huckleberries, Christmas trees and landscaping plants. Some of this gathering is for resale to generate income and some is for personal use or subsistence use. Permits are issued for most gathering but some minor uses occur without need for a permit. A large percentage of commercial forest product gathering is by minority and low-income individuals to supplement their income or as a primary job (Richards 2003). Asian Americans and Hispanics are frequent product gatherers. In recent years, the Cloak Timber Sale units have not specifically been requested for gathering permits. The Cloak action alternatives may result in a short-term increase in firewood opportunities and a short-term decrease in other products. However, forest product availability on a landscape level would not be negatively affected. Many

thousands of acres are available for special forest product gathering and the Cloak Timber Sale units do not represent a special or unique source of products that are not available elsewhere. The no-action alternative would not provide any firewood.

Potential Affect to Recreation

Minorities and low-income people recreate on the Mt. Hood National Forest. In the Cloak area there are no campgrounds, trails or other destination recreation features. The Cloak area is used for dispersed camping as well as hunting. There is no indication that recreators including minorities or low-income people focus on the Cloak area to recreate more than any other similarly remote portion of the Forest. With the action alternatives, there may be short-term movement of dispersed campers or hunters during project implementation. The no-action alternative would not have this effect. See recreation section.

Potential Affect to Health

The Cloak project would not be a significant source of pollution. Refer to the water and air quality discussions. An example of indirect effects may include increased amounts of fine sediment downstream at the intake of municipal water providers, due to erosion from harvest and road construction. Because of the distance of the proposed temporary roads and harvest units to streams, vegetative buffers would act as an effective barrier to any sediment being transported into stream channels by surface erosion or runoff. Any impact to water quality caused by sedimentation would be short-term and undetectable at a watershed scale. The proposed action does not involve the use of herbicides or pesticides.

An example of effects to air quality may include smoke caused by slash burning. Burning has the potential to degrade air quality for short periods of time affecting primarily visibility for recreation users. Usual wind direction during burning would carry smoke away from nearby communities and there would be little if any health effect. Health risks for employees or contractors conducting the burning would be greater than for the general public. Risks are minimized by training and using job hazard analyses.

Potential Affect to Historical or Cultural Sites

Surveys have been conducted and the project would not affect any sites that are historically or culturally significant to minority or low-income communities.

Potential Affect to Environment

Many resources were evaluated to determine the extent of environmental benefit or impact that may affect minority or low-income communities. The following resources may be of particular value to these communities: Rare plants and animals, fish, water quality, wildlife, old growth, soils, scenery, air quality and heritage resources.

No adverse impacts were identified that would have a disproportionate affect on minority or low-income communities. No adverse civil rights impacts were identified.

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 Cloak units there are no campgrounds, trails or other destination recreation features. The Cloak area is used for dispersed camping as well as hunting. Fire rings are present at old landings and road junctions. Based on inspection of fire rings and other recreation indicators, the Cloak 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 dispersed campers or hunters during project implementation. Even with this temporary displacement, dispersed camping availability on a landscape level would not be negatively affected. Many thousands of acres are available for camping and other forms of recreation and the Cloak Timber Sale units do not represent a special or unique recreational opportunity that is not available elsewhere. The no-action alternative would not have this effect.

With Alternatives B and E, hunting opportunities may increase over the next 10 to 15 years, as more early-seral vegetation would be available to provide forage for deer or elk. The other alternatives would not have this effect.

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 area are not used by fishers to access fish bearing streams. Access to streams for angling is not altered by any of the action alternatives.

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.

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 project first appeared in the Forest's fall 2001 issue of Sprouts, and in subsequent issues. Sprouts is a quarterly publication that is mailed to a wide audience. Comments have been received periodically since then. A 30-day comment period ended on August 4th 2004. 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 and presentations made at meetings held by groups such as the Clackamas River Basin Council. One or more of the timber sales from the Cloak project may be considered for inclusion in a Stewardship Contract where the value of the timber is used to pay for restoration work. The removal of timber would be combined into a contract that also includes the implementation of restoration projects such as correcting fish passage problems elsewhere in Clackamas County. Where stewardship contracting is used, there would be additional benefits to local and regional economies from increased jobs. The Clackamas County Economic Development Commission has expressed the desire to use stewardship contracts to combine harvest from this EA with restoration projects. The Clackamas River Basin Council is a collaborative group that is assisting with the prioritization of potential restoration projects to combine with Cloak harvest units.

List of Preparers

Glenda Goodwyne, - Forester, Certified Silviculturist. Glenda has a 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 24 years in Oregon, Washington, and California.

Craig Edberg - Silviculturist. Craig has a B.S. in Natural Resources Management from California Polytechnic University in San Luis Obispo in addition to graduate work in silviculture at Humboldt State University. He has worked as a forester for the Forest Service for 35 years in California and Oregon. He was first certified as a silviculturist in 1982 and most recently recertified in 2003 and specializes in vegetation management.

Gale Masters - Botanist. Gale has a B.S. in Forest Botany from S.U.N.Y. Environmental Science & Forestry and post baccalaureate coursework from University of Washington. She has worked for the Forest Service for 19 years in Oregon, Colorado, and Washington. She has also worked for the National Park Service in Washington, the former Crown Zellerbach Genetics Research in Oregon, University of Washington Arboretum, SUNY ES&F greenhouses, and commercial plant nurseries in Washington.

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.

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 15 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 11 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 25 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 26 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 26 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 27 years. He is a specialist in the preparation of environmental documents under the National Environmental Policy Act.

Ivars Steinblums - Forest Hydrologist. Ivars has a B.S. in Forestry from Humboldt State University (1973), and a M.S. in Forest Engineering (Watershed Management) from Oregon State University (1977). He has worked 2 years as a timber appraiser for county government in Northern California, and 27 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 24 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 25 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 14 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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USDI Fish and Wildlife Service. 2004. Letter clarifying Biological Opinion For The Willamette Province Fiscal Year 2003-2004 Habitat Modification Projects, October 18, 2004.

Other References

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

GIS shape files:	Snagx2004.shp	(snag data)
	Veg2004.shp	(timber type and age data, elk habitat data, owl habitat data)
	Roads.shp	(road data)
Spreadsheets:	arp.xls	(Aggregate Recover Percentage model)
	cover.xls	(Deer and elk optimal and thermal cover calculations)
	snagxacres.xls	(snag analysis)
	Open road density.xls	(Deer and elk open road density calculations)

Text Documents: Fish Biological Assessments - fish BA Oak Grove Thin.doc
fish BA Upper Clack Thin.doc
fish Cloak Amendment to BA.doc

wildlife03_04_BA.doc - Wildlife Biological Assessment - 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 2003-2004. November 2002.

Preliminary Assessment.doc

Lynx Effects Determination memo December 3 of 2003.doc

The following documents (paper format) were referenced where appropriate and are in the project analysis file:

Text Documents: Biological Opinion, Letter from U. S. Fish and Wildlife Service, February 27, 2003.

Letter from U.S. Fish and Wildlife Service clarifying Biological Opinion, October 18, 2004.

Letter of Concurrence, Letter from NOAA Fisheries, for the Clackamas portion of the Cloak project, December 19, 2002.

Letter of Concurrence, Letter from NOAA Fisheries, for the Oak Grove portion of the Cloak project, May 9, 2003.

Public Involvement: Letters and e-mail documents from commenters.
Letters to interested persons requesting comments.
Mailing list, Commenter list