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Environmental Assessment

Slinky (2003)

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

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

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SUMMARY

The Mt. Hood National Forest proposes a timber management project. The project area is located in the Oak Grove Fork watershed and the Upper Clackamas watershed and is within the Clackamas River Ranger District, Mt. Hood National Forest, Oregon.

The purpose of this initiative is to regenerate older forest stands that are fragmented and growing slowly, to create young productive forest stands, and to provide forest products consistent with the Northwest Forest Plan goal of maintaining the stability of local and regional economies now and in the future. This action is needed, because the project area contains fragmented stands of older forest that are growing slowly due to the effects of diseases, insects and mortality. If no action were taken these stands would continue to grow slowly and would not contribute to a sustainable supply of forest products.

The proposed action (Alternative B) is to harvest trees from approximately 184 acres using the reserve shelterwood regeneration method and to construct approximately 0.4 mile of temporary roads.

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 not construct any new temporary roads.
- Alternative D is similar to Alternative C but would leave more trees.

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 possible mitigation measures. 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.

Background

The proposed action involves the harvest of timber from mature forest stands. This EA replaces an earlier version that was prepared in 1999 but was delayed by court cases that have since been resolved.

Summary of Changes

- To gain greater focus to the analysis, the proposed action includes only the regeneration harvest units.
- Alternatives have been adjusted and new ones added.
- The associated projects that had been part of the proposed action have been separated from this EA and are not connected actions. Public comments suggested that timber projects not be mixed with restoration projects.

Purpose and Need for Action

The purpose of this initiative is to regenerate older forest stands that are fragmented and growing slowly, to create young productive forest stands, and to provide forest products consistent with the Northwest Forest Plan goal of maintaining the stability of local and regional economies now and in the future.

This action is needed, because the project area contains fragmented stands of older forest that are growing slowly due to the effects of diseases, insects and mortality. If no action were taken these stands would continue to grow slowly and would not contribute to a sustainable supply of forest products.

This assessment is tiered to the Mt. Hood National Forest Land and Resource Management Plan Final Environmental Impact Statement (USDA 1990a) and the Northwest Forest Plan Final Supplemental Environmental Impact Statement (USDA, USDI 1994a). The Mt. Hood National Forest Land and Resource Management Plan as amended (USDA 1990b) (referred to as the Forest Plan) is incorporated by reference. This action responds to the goals and objectives outlined in the Forest Plan, and helps move the project area towards desired conditions described in that plan. The Forest Plan was amended by the Record of Decision and Standards and Guidelines for the Final Supplemental Environmental Impact Statement on 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). That document was amended by the 2001 Record of Decision and Standards and Guidelines for the Final Supplemental Environmental Impact Statement for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (USDA, USDI 2001) (hereafter referred to as the Survey and Manage Plan). The results of the 2001 Survey and Manage Annual Species Review are incorporated by reference. Refer to pages 18-19 of the Survey and Manage Plan Standards and Guidelines.

The Slinky project is located within the following land allocations in the Matrix: C1 Timber Emphasis (Units 5, 8, 9, 21, 151, the southern 1/3 of unit 2 and all of the temporary road construction) and B2 Scenic Viewshed (Units 1, 15, 17 and the northern 2/3 of unit 2). Refer to Land Allocation Map on page 11.

During the 30-day public comment period there appeared to be some confusion on the relationship between the land allocations in the Mt. Hood Forest Plan and the Northwest Forest Plan. The NFP page C-39 states, "Most timber harvest and other silvicultural activities would be conducted in that portion of the matrix with suitable forest lands, according to standards and guidelines." The Matrix section of the NFP amended the Mt. Hood Forest Plan by adding certain standards and guidelines to the Forest Plan land allocations that occur within this area. These include survey and manage, green tree retention, and coarse woody debris. Timber Emphasis allocations in the matrix were not extinguished; the NFP did not eliminate the management goals for allocations that make up the matrix. The matrix is the primary area where commodity production is expected, but not all matrix lands are timber emphasis. The matrix also contains land allocations for recreation, big game, scenic areas and other multiple uses. However, most matrix lands in this project are C-1 Timber Emphasis. Timber harvest is being proposed to achieve Forest Plan goals.

The NFP on page B6 states, "Stands in the matrix can be managed for timber and other commodity production, and to perform an important role in maintaining biodiversity. Silvicultural treatment of forest stands in the matrix can provide for retention of old-growth ecosystem components such as large green trees, snags and down logs, and depending on site and forest type, can provide for a diversity of species. Retention of green trees following timber harvest in the matrix provides a legacy that bridges past and future forests."

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	Forests 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.
Scenery	The forest is visually appealing with a wide variety of natural appearing landscape features. Forest stands and openings are blended with natural landforms and existing vegetation, and have natural shapes, edges, patterns, and sizes. This applies throughout the landscape with increased emphasis for areas seen from sensitive viewing positions. Four-218, goal; Four-113, FW-558; and Four-108.
Deer & Elk	The forest provides high quality summer rearing habitat for deer and elk. The forest contains a mix of habitats including forage, thermal cover and optimal cover. Four-72, FW-202 to 207.
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. Early-seral stands are diverse and contain patches of green trees and snags as well as dispersed green trees and coarse woody debris. NFP pages C-40-41.
C1 Timber Emphasis	The forest consists of stands with an even distribution of age classes, up to approximately 120 years, ranging from seedlings to mature timber. Four-290.
Timber Harvest Levels	One goal is to provide a sustainable level of timber products to stabilize local economies and provide jobs. 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 outside the Matrix 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 pages 2 & 3.

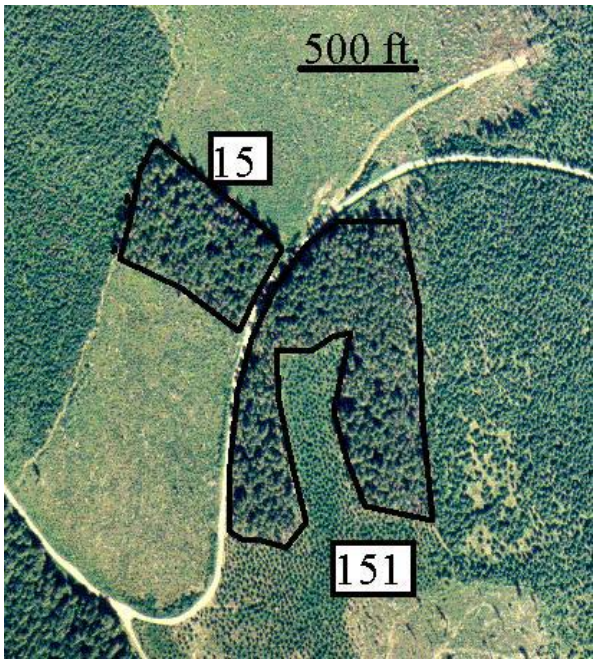
The following statements describe desired future conditions from the **Upper Clackamas Watershed Analysis and the Oak Grove Fork Watershed Analysis**. Only the conditions relevant to this proposal are summarized.

- Forests contain a mix of habitats including early, middle and late-seral stands dispersed across the landscape.

- Matrix lands provide the majority of the landscape's early-seral habitats with a variety of sizes and shapes.

One of the key landscape level issues identified in these Watershed Analyses is the fragmentation of late-seral forested habitats. Some of the landscape contains interior patches of late-seral forest. Interior habitat occurs in stands that are at least 500 feet from any openings. Other parts of the landscape however, are fragmented; where late-seral stands are surrounded by openings. The Watershed Analyses recommended that:

- Stand manipulations should be prioritized in a way that minimizes additional fragmentation of remaining late-seral interior patches, while focusing on isolated patches that have little or no interior habitat. This strategy accomplishes two things; it avoids the interior patches that are most valuable to species dependent on late-seral habitats, and it increases the average patch size. (Oak Grove Watershed Analysis page 54 and Upper Clackamas Watershed Analysis page 61.) The Proposed Action follows that recommendation and only harvests in patches that contain little or no interior habitat. An example of an isolated patch can be seen in this aerial photograph of proposed units 15 and 151.



During the 30-day comment period there appeared to be some confusion that logging to reduce fragmentation was one of the major justifications for this project. For the Slinky project the condition of the landscape and the health of stands is not a justification for harvest but is one means to prioritize where to propose harvest treatments within a watershed. The Clackamas River Ranger District prioritizes harvest treatment areas to meet the timber production as well as the other management goals of the NFP and the Forest Plan. Proposed harvest areas are based on the following and supported in the various watershed analyses. These are listed on a priority basis:

1. Thinning of plantations that are economically feasible
2. Thinning of natural second-growth stands that are economically feasible
3. Salvage of dead or downed trees
4. Regeneration harvest of mid or late-seral stands that have little or no interior habitat and are growing slowly due to the effects of diseases, insects and mortality

5. Regeneration harvest of mid or late-seral stands which do not directly affect important stands with interior habitat

Following these priorities, the Clackamas River Ranger District has planned and implemented many projects in which plantations and natural second-growth stands were thinned. In 1996 a large salvage effort of trees killed by the Douglas-fir bark beetle was also planned and implemented. The District is also currently planning four other projects that would thin plantations and natural second-growth stands. Some plantations are not ready for thinning because the trees are not yet large enough to create an economically viable timber sale. The Slinky project, and others like it, are planned to provide forest products for local and regional economies to meet timber production goals. The Northwest Forest Plan anticipated that some older forest stands would need to be harvested to meet the Probable Sale Quantity (PSQ). Other thinning projects would be proposed in the future as plantations grow. To gain greater focus on issues relevant to each harvest type, the District has chosen to analyze commercial thinning proposals separate from regeneration harvest proposals. However in cumulative effects analysis, all past, present and foreseeable projects are evaluated.

Proposed Action

The action proposed by the Forest Service to meet the purpose and need is to harvest trees from approximately 184 acres using the reserve shelterwood regeneration method. Approximately 10% of the harvest area would be retained in patches and scattered large trees would be retained at the rate of 10 to 12 per acre. The scattered leave trees would primarily be selected from the largest component of trees present in the unit except where smaller trees are retained for spacing and species diversity. The scattered leave trees would include some decaying, hollow or dead topped trees where present. Snags and large logs would also be retained. The harvesting operation would generally remove most of the smaller trees as well as some of the larger trees; the average cut tree size would be less than approximately 20 inches diameter. Visual Quality Objectives would be met.

This photo is an example of what the regeneration harvest units would look like after project completion (Gum Timber Sale).

Several temporary roads would be constructed to access landings, (approximately 0.4 mile total, of this distance 650 feet would be new construction and 1400 feet would be built on existing skidtrails).

These temporary roads would be obliterated and revegetated after completion of the project. Several miles of road reconstruction along haul roads would also occur.

Logging methods used would include ground-based tractor and loader skidding and skyline yarding. Fuels reduction and site preparation would be accomplished through manual and machine piling and burning of logging slash prior to planting. A mix of conifer species that are adapted to the site conditions would be planted. 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 September 1998. The project first appeared in the Forest's spring 1998 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. On June 30, 2003 a proposed action that included preliminary analysis was made available for the 30-day public comment period. Numerous letters, e-mails and postcards were received. This Environmental Assessment (EA) includes a response to the substantive comments (Appendix A) and also includes some additional analysis and clarification.

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. All of the substantive comments are tied to the discussions of water quality, fish and harvesting old trees. 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. The nearest fish bearing streams are Kink Creek and Kelly Creek, which feed into the Oak Grove Fork of the Clackamas River.

Issue statement: The temporary road construction (approximately 0.4 mile) may pose a risk to water quality and fish by contributing sediment to streams. Qualitative measurements of sediment input would be used to describe impacts to water quality and fish.

Issue #2: Harvesting of Older Forest – Based on the comments received there is a concern that the proposed harvest may impact the habitat of plants and animals associated with older forest. Comments also state that the assertion that the stands are fragmented and have little or no interior habitat is flawed, (Desired Future Conditions – Purpose and section). They go on to state that the stands should be left intact as refugia for plants and animals to use until surrounding plantations mature.

Issue statement: The proposed action may reduce the habitat for animal and plant species within the project area by harvesting older forest stands. The effect on these species would be measured in terms of 1/ quantity of late-seral interior habitat remaining, 2/ effects to species that require late-seral interior habitat, and 3/ the number of older trees remaining on a per acre basis.

ALTERNATIVES

This chapter describes and compares the alternatives considered for the Slinky 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 harvest trees from approximately 184 acres using the reserve shelterwood regeneration method. Northwest Forest Plan standards for green tree retention and coarse woody debris in regeneration harvest would be applied. Approximately 10% of the harvest area would be retained in patches. Scattered trees would be retained to meet the green tree retention standard and to achieve silvicultural and wildlife objectives. The scattered leave trees would be retained at the rate of 10 to 12 per acre and would primarily be selected from the largest component of trees present in the unit except where smaller trees are retained for spacing and species diversity. The scattered leave trees would include some decaying, hollow or dead topped trees where present. Snags and large logs would also be retained. The harvesting operation would generally remove most of the small trees as well as some of the large trees.

Several temporary roads would be constructed to access landings, (approximately 0.4 mile total, of this distance 650 feet would be new construction and 1400 feet would be built on existing skidtrails). These temporary roads would be obliterated and revegetated by the timber sale purchaser after completion of the project. Several miles of road reconstruction along haul roads would also occur including spot rocking and brushing on 5710, addition of aggregate surfacing on 5720190, and deep patch repairs to 5720.

Logging methods used would include ground-based tractor and loader skidding and skyline yarding. Fuels reduction and site preparation would be accomplished through manual and machine piling and burning of logging slash prior to planting. A mix of conifer species that are adapted to the site conditions would be planted.

Alternative C

Alternative C is designed to respond to issue #1 (effect to water quality and fish due to road construction). Alternative C is similar to Alternative B except it would not construct any new temporary roads. Portions of proposed harvest units that are not accessed by existing roads would be harvested by helicopter or (on flatter ground) longer skidding distances would be used to transport logs from the harvest units to log landings on exiting roads. Unit 31 and part of unit 5 would be helicopter logged for a total of 40 acres. A portion of Unit 5 would be tractor logged but with long skidding distances.

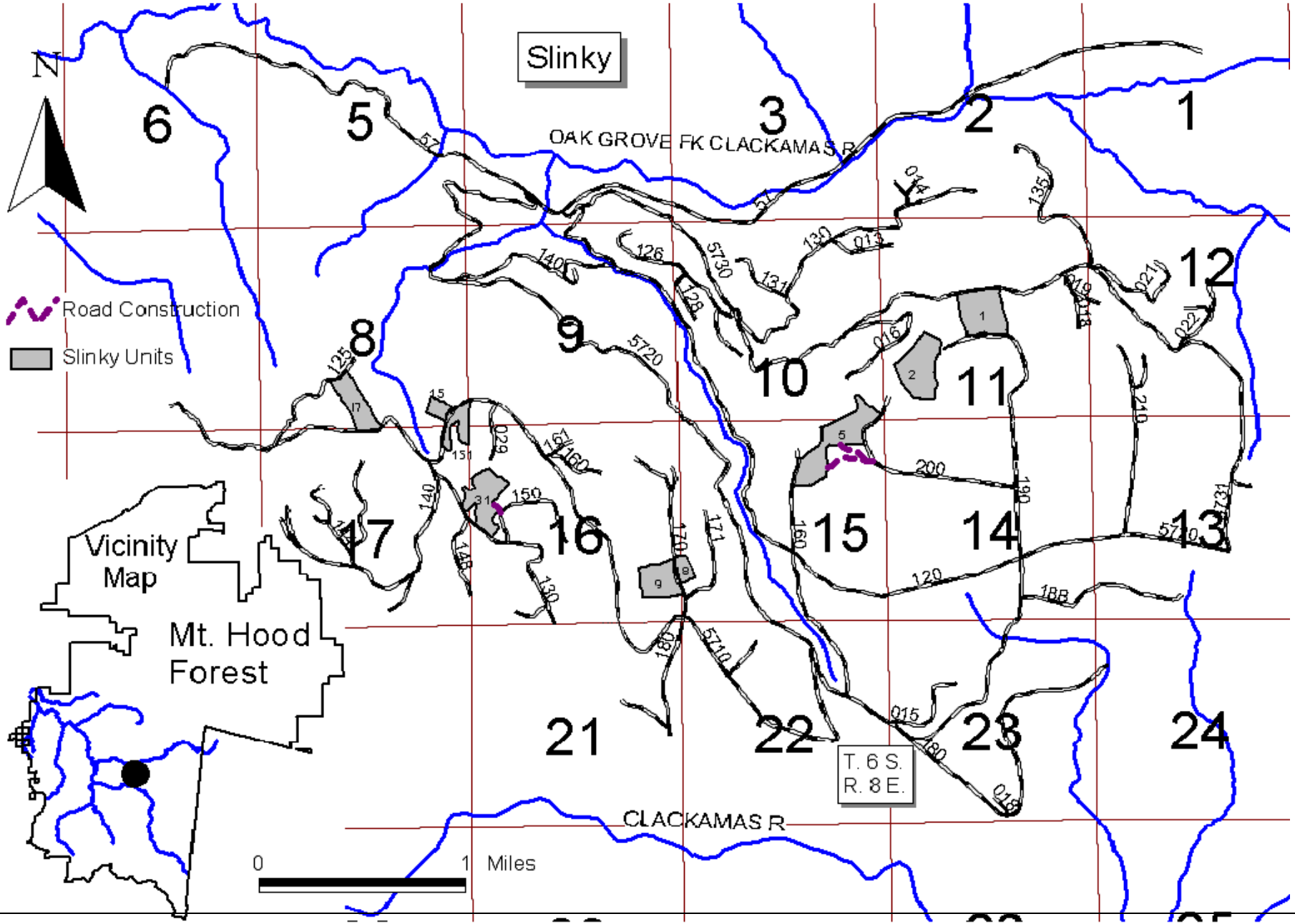
Alternative D

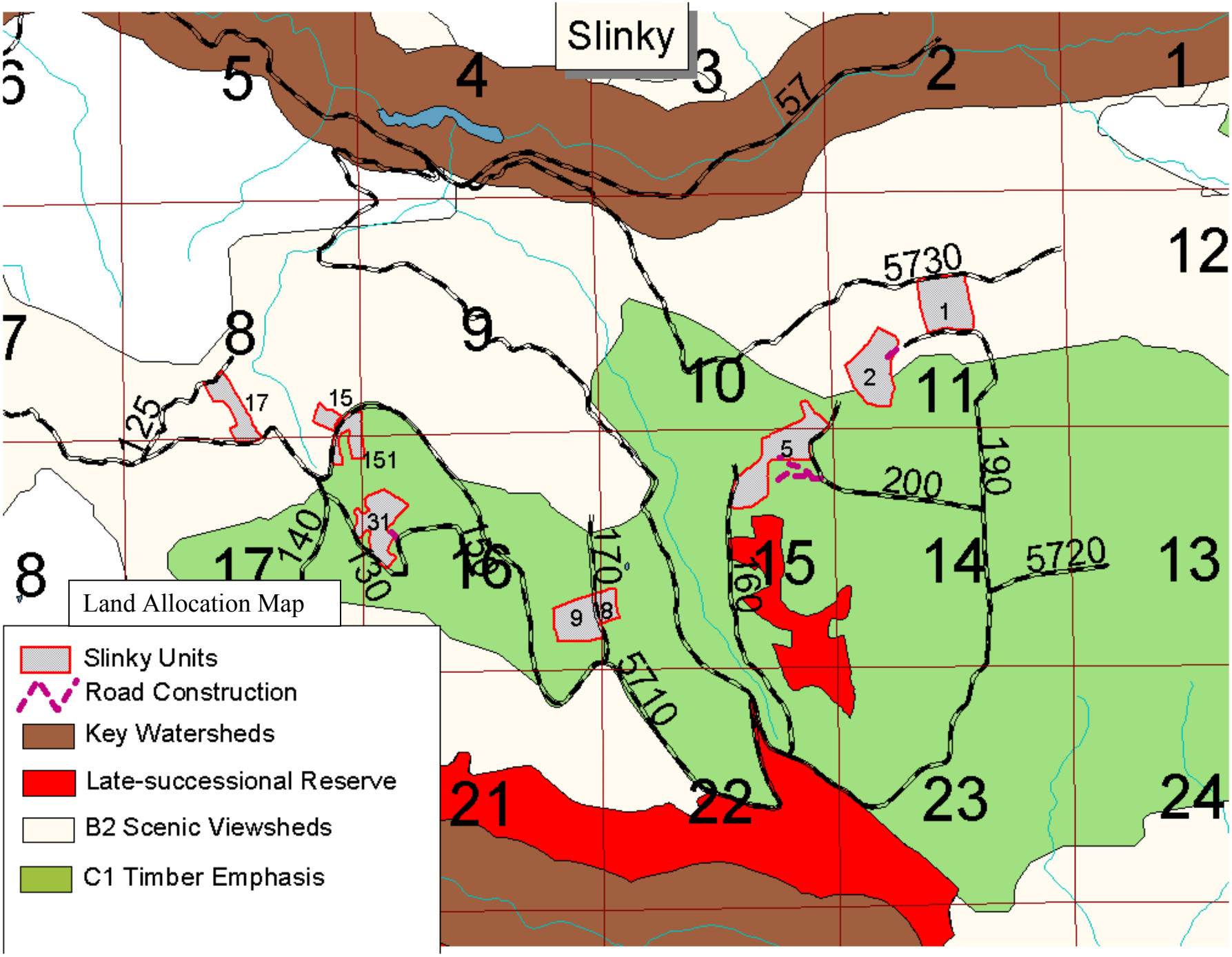
Alternative D is designed to respond to issue #1 (effect to water quality and fish due to road construction) and issue #2 (a concern about the effects to animal and plant species that are dependent on older forest stands). Alternative D has the same unit boundaries as Alternative B but instead of the 10 -12 leave trees per acre with Alternative B, it would leave approximately 30 of the largest and oldest trees per acre. Stands harvested using this alternative would retain more of the older forest stand components needed for certain animal and plant species. As in Alternative B, leave trees would primarily be selected from the largest component of trees present in the unit except where smaller trees are retained for spacing and species diversity.

The units would still be considered regeneration harvests and would include site preparation and planting. As with alternative C, portions of proposed harvest units that are not accessed by existing roads would be harvested by helicopter or (on flatter ground) longer skidding distances would be used to transport logs from the harvest units to log landings on exiting roads.

Photo showing what 30 trees per acre would look like after harvest.

This map shows the project locations for all action alternatives.




Slinky
Land Allocation Map
Slinky Units
Road Construction
Key Watersheds
Late-successional Reserve
B2 Scenic Viewsheds
C1 Timber Emphasis
5730
5720
5710
57
125
140
130
170
190
200
151
1
2
5
9
8
15
17
31

Alternatives Considered But Not Fully Developed

An alternative was considered that would build the temporary roads as described in Alternative B but would retain 30 trees per acre as described in Alternative D. This alternative was not developed separately because it is within the current range of alternatives. In other words, the decision maker could select Alternative B but elect to leave 30 trees per acre.

Alternatives were considered that would include restoration projects such as road closures, road decommissioning and quarry restoration. 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 are being assessed in a separate Forest-wide Restoration Environmental Assessment.

During the 30-day comment period, Oregon Natural Resources Council (ONRC) requested that an alternative that protects all snags be considered. All of the action alternatives would save existing snags where safety permits. 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 13 snags per acre within the proposed harvest units. 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 13 snags would eliminate all of the 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 the no-action alternative.

Best Management Practices and Design Criteria Common to All Alternatives

1. **Soils:** No operation of off-road ground-based equipment would be permitted between November 1 and May 31. This restriction applies to harvest units 2, 8, 151 and ground based portions of units 5, 17, and 31 as well as the ground-based equipment on connected projects and road construction, reconstruction, and 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.

2. **Big Game Winter Range:** No log haul or snow plowing would be permitted in Crucial Winter Range areas between December 1 through March 31. The "backbone" roads that are exempt from this restriction would include road 57 and Highway 224. This restriction applies to the west end of road 5710. Since the east end of 5710

connects to 5720, which has no restriction, an alternate haul route may be approved for hauling and plowing within the time listed above.

3. Where safety permits all existing **snags** would be retained in all units. If a post harvest review of snags indicates that units do not meet the minimum level of 2.4 hard snags per acre, snag creation would be scheduled by the 4th year after harvest.

4. In regeneration units leave 240 linear feet of **coarse woody debris** per acre greater than or equal to 20 inches diameter. Logs less than 20 feet in length cannot be credited toward this total.

5. 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.

   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.

   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.

   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.

6. 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, pursuant to Executive Order 13112 dated February 3, 1999. **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 related to road construction and reconstruction, road maintenance, and harvest operations.

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.

7. Avoid the use of ground-based yarding operations (tractors, skidders, etc.) on slopes greater than 20%, because of the risk of damage to soil and water resources. Skid trails for ground-based equipment would be designated to meet Mt. Hood Forest Plan standards for soils. Existing skid trails would be used where possible. Restrict ground-disturbing activities to non-saturated soil areas.

8. When slash is piled in harvest units, one pile per acre would be retained unburned for use by wildlife.

9. Firewood would be made available to the public at landings where feasible.

10. Riparian Reserves: All of the harvest units have been designed to avoid riparian reserves therefore; no special riparian design criteria are required.

11. Monitoring: Prior to advertisement of a timber sale, a cross walk 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, site preparation, tree planting, snag creation and firewood removal. Based on these reviews, post harvest activities would be adjusted where needed to achieve project and resource objectives.

    Reforestation monitoring would be conducted and if insufficient survival rates are encountered, replanting would be scheduled. Monitoring of noxious weeds and invasive plants would be conducted where appropriate to track changes in populations over time and corrective action would be prescribed where needed.

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

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**
Issue #1 Affect of Roads on Water Quality and Fish	No road construction. No impacts to water quality from road construction.	0.4 mile of temporary road construction. 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 and consistency with ACS.	No road construction. No impacts to water quality from road construction.	No road construction. No impacts to water quality from road construction.
Issue #2 Changes to late-seral interior habitat	No change	Removes 3 acres of interior habitat out of 21,574 in the watersheds.	Same as B	Same as B
Issue #2 Effects on Northern Spotted Owl	No Effect	Will not likely jeopardize the continued existence of the spotted owl or result in the destruction or adverse modification of spotted owl critical habitat.	Same as B	Same as B
Issue #2 Number of older trees remaining per acre	80 to 100	10-12	10-12	30
Approximate Timber Output	0	12,500 CCF or 6,500 MMBF	12,500 CCF or 6,500 MMBF	6,225 CCF or 3,250 MMBF
Acres of Timber Productivity Improved	0	184	184	184
Economic Viability Benefit/Cost ratio	0	1.53	1.19	0.38

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.

WATER QUALITY AND FISHERIES (Issue #1)

This section addresses Issue #1: Temporary road construction may pose a risk to water quality and fish by contributing sediment to streams. This section also addresses effects from all other 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 Slinky Fisheries Biological Evaluation and Biological Assessment are incorporated by reference and summarized below.

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 References

Riparian Reserves - page A-5
Aquatic Conservation Strategy - pages B-9 to B-34
Riparian Reserves Standards and Guidelines - pages C-30 to C-38
Watershed Analysis - pages E-4, E-20 to E-21

Existing Situation

The following is a summary of information contained in the Fish Biological Evaluation in the Appendix. The Slinky Project area is located within the Oak Grove Fork and the Upper Clackamas River watersheds. The river corridors along portions of both of these watersheds are designated Tier I watersheds under the Northwest Forest Plan because they contain crucial refugia for at-risk fish species. The Slinky Project is located outside of these Tier I corridors. The majority of the project, approximately 156 acres, is located within the Harriet Lake and Kink Creek subwatersheds of the Oak Grove Fork. Approximately 28 acres lie within the Austin subwatershed of the Upper Clackamas River. Preliminary Riparian Reserve mapping shown on corporate geographic information system (GIS) maps was found to be inaccurate in the Slinky area. Based on field inspections, the actual locations of streams were remapped and Riparian Reserve boundaries have been refined according to the recommendations in the Watershed Analyses. A new map of accurate streams and Riparian Reserve boundaries in the Slinky area is attached to the Biological Evaluation. None of the Slinky units are in Riparian Reserves.

The environmental baseline for temperature is properly functioning in Kink Creek, with a sampled range of 48 to 50 degrees Fahrenheit. The baseline for sediment is not properly functioning for Kink Creek due to erosion from a road and rock quarries in close proximity to the stream. The road (5730.120) and the quarries (Kink and K2) are scheduled for decommissioning and restoration as soon as funding can be acquired. The project is not near any Clean Water Act 303(d) listed water bodies.

Fish bearing streams associated with the Slinky project within the Oak Grove Fork watershed include Kink Creek, Kelly Creek, and several unnamed first and 2nd order tributaries to the Oak Grove Fork. These streams flow into the Oak Grove Fork at Lake Harriet approximately 0.4 miles upstream of the Lake Harriet Dam. All of the tributaries are intermittent in sections but do provide habitat for resident cutthroat trout. The streams associated with the Slinky project within the Austin subwatershed are all non-fish bearing, first and second order tributaries to the Upper Clackamas River. The adjacent Clackamas River is a State Scenic Waterway and a Recreational segment under the Wild and Scenic

Rivers Act. The nearest portion of the proposed action is 1.7 miles from the Clackamas River.

No Endangered Species Act (ESA) listed fish species occur in any of the streams within the project area. The migration of listed fish species in the Oak Grove Fork is blocked by Lake Harriet Dam located approximately two miles downstream from the closest proposed unit. The nearest proposed unit to listed fish species or habitat in the Upper Clackamas River is 1.7 miles. The presence of Lake Harriet dam will negate impacts from any sediment that may be produced by project implementation on listed fish species that occur below the project area in the Oak Grove Fork. At Harriet Dam, the entire flow of the river is diverted through a pipeline to the Oak Grove Powerhouse. The dam acts as a sediment barrier, to the lower Oak Grove Fork below the dam. All flow in the Oak Grove Fork below Harriet Dam is from accretion flow from springs and tributaries outside of the project area.

Municipal water providers supply high quality drinking water to their customers from the Clackamas River. Without high quality water at intakes, water treatment costs can become very expensive for water suppliers and ratepayers.

The 1996 amendments to the *Safe Drinking Water Act* (Section 1453) require States to develop and implement source water assessment (SWA) plans which will delineate the boundaries of the surface and groundwater source areas that supply drinking water to public systems. The SWA assessment plans for the various public water systems receiving water from the Forest are available on the Drinking Water page of the Oregon Department of Environmental Quality's website: www.deq.state.or.us/wq/dwp/SWACompleteSW.asp. SWA plans are available for the following public water systems on the Forest: Clackamas River Water, Lake Oswego, North Clackamas County Water Commission, Oregon City and the City of Estacada. Water intakes are more than 25 river miles away from the Slinky project area, and any particles in the water would have the opportunity to settle in three reservoirs.

Effects

Potential effects to listed, proposed, candidate, or sensitive fish species and their habitat from the proposed project could 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. 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. 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 Slinky 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.

Alternative A

In its current condition the project area would remain unchanged in regards to water quality and fisheries. There would be no effects to water quality or fisheries resources. The no-action alternative would have ratings of "No Effect" for fish stocks-of-concern.

Alternative B

Ground disturbing activities associated with road building have been designed to minimize the risk of erosion and the potential for sediment to be transported to streams. Because of the distance of the proposed temporary roads to any water source, 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 or fisheries resources caused by sedimentation due to road construction would be short-term and undetectable at a watershed scale. The following design criteria would minimize or prevent any negative impacts to water quality and aquatic resources:

- The proposed temporary roads would be constructed on gently sloping ground and would be out sloped, which would avoid an increase in the drainage network.
- All of the proposed temporary roads are over 200 feet from any intermittent or perennial stream. All roads are located on dry ground outside of any riparian area, would not cross any stream channel, and have no hydrologic link to any water source.
- The proposed temporary roads would be obliterated and revegetated directly following completion of harvest operations.
- A portion of the constructed roads would be on existing skid trails, which are already compacted thus reducing the amount of new ground disturbance.
- Road construction would occur during the dry season between June 1 and October 31.

Established Riparian Reserve widths of two site potential tree heights along fish bearing stream channels and one site potential tree height along other streams would reduce the risk of any sediment being transported to a stream channel. The Riparian Reserve widths would allow soil infiltration between the unit and any water source. Even if some soil movement occurred, the vegetated buffer strips along every stream would act as an effective barrier. The Riparian Reserve widths would also maintain stream shading so there would be no increase in stream temperatures caused by harvest. Seasonal restrictions on ground-based operations would further reduce the risk of soil disturbance and run-off. 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. There would be no effect to municipal water operations.

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. There are no perennial stream crossings that occur along the aggregate portion of the haul route. All perennial steam crossings occur along paved portions of the haul route. This would decrease the potential of any fine sediment entering stream channels during hauling activities. Any sediment entering stream

courses from hauling activities would be small and for a short-term duration. No adverse effect to listed fish or resident cutthroat trout habitat is expected from hauling logs along the specified route.

The potential for an increase in peakflows affecting any listed or resident fish species or their habitat as a result of this sale is negligible due to the rapid hydrologic recovery of the area, dispersion of the units across three subwatersheds, and the upland location and gentle terrain of the sale area. No harvest activities would take place in Riparian Reserves therefore, soil infiltration would occur between the units and live water tempering any increase in peak flows.

Adherence to project design criteria would maintain watershed conditions and would not retard or prevent the attainment of the Aquatic Conservation Strategy objectives. State Water Quality Standards, and the Clean Water Act, would be met for this alternative as designed and through adherence to Best Management Practices.

Fish Stocks-of-Concern

Columbia River Bull Trout *(Salvelinus confluentus)* - (Threatened) Bull trout were once prolific in the Clackamas River system. 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” for this 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 thru June in the Upper Clackamas River and during the months of March thru June in the Oak Grove Fork. Steelhead occur more than two miles downstream from any proposed unit within the Oak Grove Fork watershed and approximately 1.7 miles downstream from any unit within the Upper Clackamas River. 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 for the Slinky Project is "No Effect."

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. Spring chinook occur in the lower Oak Grove Fork more than two miles downstream from any proposed unit and approximately 1.7 miles downstream from any unit within the Upper Clackamas River. 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 for the Slinky Project is "No Effect."

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. 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.”

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.”

Lower Columbia River/Southwest Washington Coho Salmon (*Oncorhynchus kisutch*) (Candidate 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 occur more than two miles downstream from any proposed unit within the Oak Grove Fork watershed and approximately 1.7 miles downstream from any unit within the Upper Clackamas River. Because of the distance of the project area to any presence of Lower Columbia River/Southwest Washington coho salmon or its habitat, the effects determination for this species for the Slinky Project is "No Effect."

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 cutthroat 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 but is not likely to

cause a trend to federal listing or loss of viability." The likelihood of impacting individuals is low because ground-disturbing activities associated with road building and logging have been designed to minimize the risk of erosion and the potential for sediment to be transported to streams. Vegetative buffers would act as an effective barrier to any sediment being transported into stream channels by surface erosion or runoff.

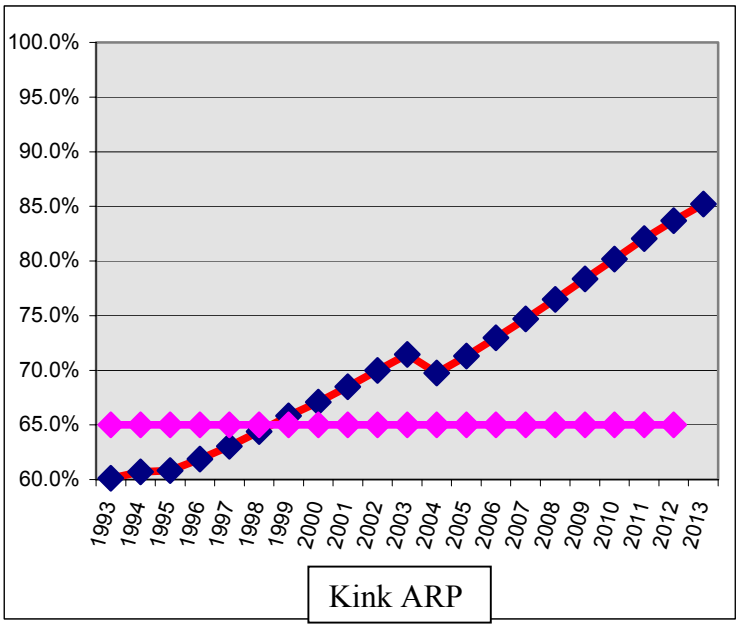
Essential Fish Habitat

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 this alternative would not adversely affect essential fish habitat. It would not have any negative long-term effect on water or substrate essential to the life history of coho, chinook, or chum salmon.

Alternative C and D

The direct and indirect effects for Alternative C and D would be similar to Alternative B except they do not include any road construction therefore there would be no risk of erosion due to the construction of roads. There would be less risk of erosion from harvest operations since helicopter logging would be used instead of skyline yarding in some areas. Because of less ground disturbance, chances of sediment reaching the stream channel is even less likely then Alternative B. On unit 5, 350 feet of road would not be built but longer skidding distances would 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.

Cumulative Effects - Hydrology



The Aggregate Recovery Percentage (ARP) index is often used to calculate cumulative effects of past and future harvest activities on hydrology. 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. Three subwatersheds are affected: Kink, Harriet and Austin. The Kink graph shows the 20-year trend for ARP values. The others 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% (Forest Plan, Four-53). This level was established based on the sensitivity of landforms in the watersheds to potential cumulative watershed effects such as changes in peak flows caused by harvest activities. In relative terms, these watersheds are more stable and are not affected by rain on snow events to the extent of some other watersheds within the Clackamas drainage that have thresholds as high as 82%.

ARP Value in 2004

Subwatershed	Alternative A	Action Alternatives
Kink	73	70
Harriet	84	81
Austin	84	84

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 Veg2000.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 Batwings, Bonanza Thinning, Pardner Thinning, Upper Clackamas Thinning and Oak Grove Thinning.

The examination of potential thinning opportunities is ongoing. While the actual acres and the timing are somewhat speculative at this point, the ARP analysis includes our best

estimate of these acres. Approximately 770 acres of thinning are being examined at this time for possible thinning in the Upper Clackamas. Approximately 730 acres of thinning are being examined at this time for possible thinning in the Oak Grove. This potential thinning is included in the ARP analysis.

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 (Four-53). An analysis of major drainages indicates that both the Oak Grove and the 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 (refer to discussion on EA page 25) the resultant affect in ARP figures 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 Oak Grove Fork and Upper Clackamas River watersheds. Planned projects in the Oak Grove Fork watershed include: replacement of five culverts to improve fish passage, rehabilitation of three rock pits located within riparian areas, decommissioning of 19 miles of roads, skid trail subsoiling and waterbarring, and repairing vehicle caused damage at eight dispersed camp sites within the riparian area of the Oak Grove Fork. Planned restoration projects within the Upper Clackamas River watershed include: replacing five culverts to improve fish passage, road repair along 24 miles of road to reduce erosion problems, repairing vehicle caused damage at 11 dispersed campsites within the riparian area of the Upper Clackamas River, and skid trail/temporary road subsoiling and waterbarring.

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 and chapters 6, 7, and 8 of the Oak Grove Watershed Analysis.

During the 30-day comment period on the proposed action there appeared to be some confusion relating to the interpretation of information on peak flow analysis contained in a report titled “Cumulative Effects of Forest Practices in Oregon” (Beschta 1995) which was prepared for the Oregon Department of Forestry. The report is relevant to Oregon State

forest practices rules, while this project was prepared with the more restrictive standards and guidelines of the Northwest Forest Plan.

The report identifies that the general topic of peak flows has received considerable attention by the public and research communities since peak flows are associated with downstream flooding and are assumed to be a major factor affecting catastrophic changes in channel morphology. It also states that increases in peak flows following timber harvesting or other forest practices at the subwatershed level are likely to be unobservable farther downstream in context of the larger watershed (p. 113). For similar reasons, the peak flow analysis for this project uses the subwatershed level as the appropriate scale for cumulative effects analysis.

The report discusses nine different peak flow models intended to represent alternative approaches to cumulative hydrologic effects assessments. The report admits that the discussion was not meant to be an exhaustive presentation of all available models. The ARP model used in the Slinky analysis was not included in this report.

The report concludes that the scientific results indicate that forest practices have been found to alter hydrologic systems in some instances, while having no effect in others. Part of the variability in response can be attributed to the wide range of practices associated with roading, harvesting, site preparation practices and riparian management practices. Furthermore, the report states, the magnitude of hydrologic response, or lack thereof, is contingent on a wide array of watershed variables including geology, climate, topography, landforms, stream density, vegetative pattern, silvicultural practices, and natural disturbance regimes (p. 160).

The Forest Plan (p. Four-53,54&55) identified 15 major watershed impact areas and set thresholds of concern for each of these based on geology, climate, topography, stream density, vegetative pattern, planned silvicultural practices and the natural disturbance regimes. It also determined that the watershed impact areas should typically be 3000 to 6000 acres in size. The watershed specialists on the Forest determined that the ARP model was the most appropriate model to use in this area and thresholds have been set to match the Forest Plan standards and guides. The thresholds selected reflect the site-specific information known about these subwatersheds.

A concern has been raised that the watershed analyses are outdated because harvesting has occurred or been planned since then. The table below shows that harvest levels are below the levels projected in the watershed analyses. The watershed analyses projected future regeneration harvest levels based on the Proposed Sale Quantity from the Northwest Forest Plan and found that those levels were both sustainable and within standards for cumulative effects analysis. Refer to Upper Clackamas Watershed Analysis page 52 and Oak Grove Watershed Analysis page 131. Future harvest, if any, would be at or below the projected PSQ level. The figures below are the regeneration harvests that have been planned between 1995 and 2003. The actual time frame for completing these sales would likely extend into the next 2 or 3 years. Contract termination dates for the sales currently under contract such as Solo, Borg, Batwings, Lemiti, Cub and Tarzan generally expire between 2004 and 2006.

Regeneration Harvest Acres Since the Northwest Forest Plan		
	Oak Grove	Upper Clackamas
Projected	210 acres per year.	200 acres per year.
Completed or Started	159 acres. Lightning Flats, Bars, Barstool and Borg.	548 acres. Gum, Bazooka and Lemiti.
Foreseeable Projects	418 acres. Solo, Batwings and Slinky.	539 acres. Bear, Cub, Tarzan, Jane, Imp and Slinky.
Actual 1995 to 2006	52 acres per year. (577 total acres in 11 years)	99 acres per year. (1087 total acres in 11 years)

The Aquatic Conservation Strategy

The Upper Clackamas Watershed Analysis and the Oak Grove Watershed Analysis evaluated the geomorphic and ecological processes operating in these watersheds. These analyses set the stage for planning projects that achieve the ACS objectives and made recommendations for future planning efforts so that proposals would not retard or prevent the attainment of the ACS objectives. The action alternatives are consistent with the recommendations made in the watershed analysis.

Riparian Reserve widths for all of the proposed timber harvest are consistent with the recommendations in the watershed analysis. By implementing these reserve widths the projects would be consistent with objectives #1, 2, 3, 4, 5, 8, and 9 of the ACS. Additionally the cumulative watershed effects analysis (ARP) shows that the projects are also consistent with ACS objectives #6 and #7 because the projects minimize the increases in peak stream flows. Projects were designed to maintain ARP values above the thresholds stated in the Mt. Hood Forest Plan.

The ACS was considered in developing site specific BMPs to limit effects of projects on water quality. These BMPs include practices such as seasonal restrictions on ground disturbing activities, no-cut buffers along streams, erosion control measures, and obliteration of temporary spur roads. Stream shade conditions would remain unchanged and no change in water temperature is expected. Design criteria have been developed to

minimize the risk of fertilizer entering streams during grass seeding operations. Direct application is avoided by using a "no application buffer" to avoid application near streams and areas of surface water for protection of fish and other aquatic organisms. Adherence to the BMPs would maintain water quality and the sediment regime, both being consistent with ACS objectives #4 and #5.

The action alternatives maintain, restore, and/or do not prevent the attainment of the ACS objectives at the watershed scale. They are consistent with the ACS strategy of the Northwest Forest Plan.

Best Management Practices and the Clean Water Act

Forest Management and associated road building in the steep rugged terrain of forested mountains have long been recognized as potential sources of nonpoint water quality pollution. Nonpoint pollution is not, by definition, controllable through conventional treatment plant means. Nonpoint pollution is controlled by containing the pollutant at its source, thereby precluding delivery to surface water.

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 defined as *"methods, measures or practices selected by an agency to meet its nonpoint source control needs. BMPs include, but are not limited to, structural and nonstructural controls, operations, and maintenance procedures. BMPs can be applied before, during, and after pollution producing activities to reduce or eliminate the introduction of pollutants into receiving waters"* (EPA Water Quality Standards Regulation, 40 CFR 130.2). BMPs are the primary mechanism to enable the achievement of water quality standards. BMPs are used to control or prevent nonpoint sources of pollution from resource management activities, and to ensure compliance with the Clean Water Act of 1972, as amended (1977 and 1987), the Oregon Administrative Rules (OAR 340-41-001-975, Department of Environmental Quality (DEQ); and the Memorandum of Understanding between the Oregon DEQ and the USDA, Forest Service.

The Clean Water Act provided the initial test of effectiveness of the Forest Service nonpoint pollution control measures where it required the evaluation of the practices by the regulatory agencies (State and EPA) and the certification and approval of the practices as the "BEST" measures for control. Another test of BMP effectiveness is the capability to custom fit them to a site-specific condition where nonpoint pollution potential exists. The Forest Service BMPs are flexible in that they are tailor made to account for diverse combinations of physical and biological environmental circumstances. A final test of the effectiveness of the Forest Service BMP is their demonstrated ability to protect the beneficial uses of the surface waters in the State. The BMPs incorporate 75 years of erosion control and watershed protection experience and are based on sound scientific principles. The land treatment measures incorporated into Forest Service BMPs evolved through research and development measures, and have been monitored and modified over

several decades with the expressed purpose of improving the measures and making them more effective.

BMPs are applied as a system of practices rather than a single practice. BMPs are basically a preventative rather then an enforcement system. BMPs are a whole management and planning system in relation to sound water quality goals, including both broad policy and site-specific prescriptions. BMPs are designed to accommodate site-specific conditions. They are tailor made to account for the complexity and physical and biological variability of the natural environment. General BMPs are described in the document General Best Management Practices, USDA Forest Service, Pacific Northwest Region (11/88). BMPs are primarily based on and include various requirements as Forest Service Manual direction, timber sale contract provisions, environmental documents, Mt. Hood Forest Plan Standards and Guidelines, and the Northwest Forest Plan Standard and Guidelines, which includes the Aquatic Conservation Strategy.

All of the action alternatives use design criteria and BMPs to meet the Clean Water Act's requirements for nonpoint source pollution control. The selection and design of the BMPs for these projects were based on site-specific conditions and the water quality standards of the waters potentially impacted. These projects followed all the appropriate standards and guidelines from both the Mt. Hood Forest Plan and the Northwest Forest Plan that are related to water quality protection. In addition, these projects do not retard or prevent the attainment of the Aquatic Conservation Strategy.

BMPs are incorporated into the design criteria. The list includes such measures as no landing construction within 125 feet of a stream, no ground-based harvest operations or road construction during the rainy season, erosion control measures, and the limiting of ground based equipment to slopes less then 20%. These are only examples of the many BMPs that are part of the design of the alternatives.

Monitoring implementation of project specific BMPs is ongoing during project layout and sale administration. Once the BMPs are implemented, further monitoring is done on a Forest-wide basis to determine the effectiveness of the BMPs. 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.

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

Existing Situation

This section addresses the effects to productivity in terms of timber and other wood products. The project area contains stands of trees that are growing slowly, are diseased and are greater than 200 years old. The larger trees in these stands are Douglas-fir and western hemlock averaging approximately 20 to 30 inches in diameter. There is also a component of medium to small size Pacific silver fir and western hemlock trees that average 10 to 15 inches in diameter. In terms of timber production, the following conditions are affecting wood fiber production to varying degrees in the proposed harvest units: Moderate to heavy infections of dwarf mistletoe can be found in various species of conifers. Some small pockets of phellinus root disease are present in the stands. These stands are showing a trend toward reduced vigor and increasing mortality. Most of the stands would continue to lose net growth due to mortality caused by insect and diseases and structural weakening. Due to the dense layer of brush that dominates the understory in most areas, young conifers are not becoming established in sufficient quantities to replace the overstory that is experiencing slow mortality. All of the stands considered for harvest are past culmination of mean annual increment, meaning that their growth has leveled off or begun to decline. In terms of timber productivity the stands are growing below their capability. A silvicultural diagnosis and certification can be found in Appendix E.

In some of the stands, the larger trees are gradually dying out leaving rhododendron brush and small diameter but old Pacific silver fir. This photo shows Unit 2. Most of the trees are western hemlock ranging from 12 to 24 inches diameter. There are areas where rhododendron brush is dense enough to preclude most conifer regeneration.

Effects of Alternatives

This section evaluates direct and indirect effects. Cumulative effects of harvesting older forest are addressed in the Fragmentation and Wind sections.

Alternative A

Without silvicultural treatments at this time, potential wood fiber productivity for this Matrix land would be foregone. If no action were taken these stands would continue to decline in terms of wood fiber productivity. Disturbances such as fire, wind, insects and

disease would effect future stand development. In the long term, the larger trees would gradually die out leaving rhododendron brush and small diameter but old Western hemlock and Pacific silver fir. Depending on the type and scale of future disturbances, rhododendron biomass could increase as conifers decline and this brush competition could prevent the seeding in of a sufficient quantity new conifer trees.

Alternatives B and C

This treatment could substantially reduce dwarf mistletoe in infected stands and also decrease the number of diseased trees. Replacing these stands with younger trees can help these areas achieve their productive growing potential. All of the harvest units are in the Matrix land allocation where timber productivity is a primary goal.

Site preparation and slash reduction by grapple piling would occur after harvest. By retaining 10-12 leave trees per acre following logging, there would be good frost and sun protection provided for the new crop of seedlings that would be planted. Little damage to leave trees is expected from site preparation and fuel reduction activities. The retention of 10-12 leave trees per acre would result in some reduction of long-term growth of the planted trees over what would be expected in direct sunlight but growth would be sufficient to contribute to healthy productive stands. In the long term, the stands would have young fast growing trees that could be managed to provide a future supply of wood products, with scattered large trees in the overstory.

Opening up the canopy in the Slinky units would release young trees in adjacent plantations from competition for sunlight, moisture and nutrients. This would slightly increase the amount of wood fiber production in the plantations. The removal or reduction of sources of pathogens from the Slinky units would benefit adjacent plantations because there would be less spread of disease from one stand to the other.

Alternative D

The retention of 30 leave trees per acre would effect the establishment and growth of seedlings planted. The overstory trees would create a canopy closure of approximately 34%. To retain 30 trees per acre, leave trees would have to be selected from trees with dwarf mistletoe, which would eventually be spread to understory trees. With closer leave tree spacing it would become difficult to avoid damaging them during site preparation. Overstory density is a determining factor in each understory tree's survival and height growth. Survival rates and growth rates for the shade intolerant species such as Douglas-fir would be lower than for other shade tolerant species (Oliver, 1996). All species slow in height growth as overstory shade increases. The whole new stand would grow at a rate that is considerably lower than its potential. In the long term, the more shade tolerant trees would be affected less and the stand may eventually convert to shade tolerant species such as Pacific silver fir.

The long-term production of wood fiber in Alternative D would be lower than with Alternative B or C.

HARVEST OF OLDER FOREST (Issue #2)

This section addresses Issue #2: The proposed action may reduce the habitat for animal and plant species within the project area by harvesting older forest stands. This analysis is organized into two parts: a landscape level look at **Fragmentation**, and the effects of **Wind**. Refer also to the sections on Wildlife and Botany for more discussion of the effects to specific species of animals or plants.

Mt. Hood Forest Plan References

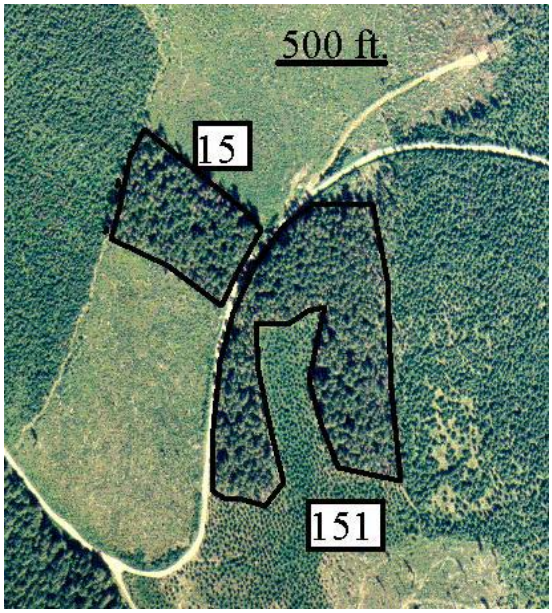
Forestwide Diversity Standards and Guidelines - FW-158 to FW-160, page Four-67
Forestwide Timber Management Standards and Guidelines - FW-306 to FW-385, page Four-86
Timber Emphasis Standards and Guidelines – C1-16 to C1-35-39, page Four-296
Mt. Hood FEIS pages IV-50 to IV-76

Northwest Forest Plan References

Matrix Standards - page C-44

Existing Situation - Fragmentation

This photo shows unit 15 on the left and unit 151 on the right. One of the key landscape level issues identified in the Upper Clackamas and Oak Grove Watershed Analyses is the fragmentation of late-seral forested habitats. Given that some landscapes, including those found in the Slinky planning area, are highly fragmented, the Watershed Analyses recommended that stand manipulations in the matrix should be prioritized in a way that minimizes additional fragmentation of remaining late-seral interior patches. Stand manipulations, such as regeneration harvest treatments, should focus on isolated late-seral patches that have little or no interior habitat (Upper Clackamas Watershed Analysis, p. 61, and Oak Grove Watershed Analysis p. 54).



Units 15 and 151 are entirely surrounded by relatively young plantations and the edge effect (sunlight and wind penetration into the stand) results in no interior habitat. In a stand with no interior habitat, certain plants and animals will still be found. But the primary species of concern are species that require large intact stands of mature habitat with substantial areas of interior habitat that are not influenced by edge effect. This aerial photograph also demonstrates the fragmented nature of units 15 and 151. These units combined are 17 acres. The plantations surrounding these units are taller than 4.5 feet in height and are no longer considered created openings for the purpose of opening size computation. None of the Slinky units create openings greater than 60 acres.

Effects of Alternatives-Fragmentation

Alternative A

The watershed analyses pointed out that the current landscapes have smaller patch sizes compared with historical fire regimes. This condition would continue. Small patches of older forest with no interior late-seral habitat would continue to occupy the site.

Alternatives B, C and D

The strategy of regenerating the smaller isolated stands avoids harvesting the larger and more contiguous stands of interior late-seral habitat. These larger and more contiguous stands are more valuable to species dependent on late-seral habitats. This strategy would also move the landscape toward increased average patch size. As these proposed plantations grow, they would blend in with adjacent existing plantations to form large contiguous patches that are closer to the patch size expected in unmanaged forests. Fifty years from now, the plantations would more resemble and function as one large stand.

The regeneration of fragmented stands would aid in meeting the desired future conditions for maintaining stand health and vigor and would capitalize on the productive capability of the site. These types of stands are highly productive and are capable of producing a sustainable supply of forest products.

Cumulative Effects

This aerial photo shows a wider landscape view of the area. It shows some large blocks of interior forest (not proposed for logging) that are intact and provide habitats for species dependent on interior habitats.

Cumulative effect for fragmentation would be similar for all action alternatives. The analysis considers the Oak Grove and Upper Clackamas watersheds.

Regeneration Harvest of Older Forest Since Watershed Analysis		
	Oak Grove	Upper Clackamas
Completed, Started or Foreseeable	421 acres. Lightning Flats, Bars, Barstool, Borg, Solo, Batwings	1059 acres. Gum, Bazooka, Bear, Cub, Tarzan, Jane, Imp
Slinky	156 acres.	28 acres.

Analysis of Older Forest

	Oak Grove		Upper Clack	
Data source: Watershed Analysis and GIS data from Veg2000.shp	Acres	% of Watershed	Acres	% of Watershed
Vegetated Acres in Watershed.	87,367		100,380	
Amount of older forest at time of Watershed Analysis.	37,568	43%	38,144	38%
Current level of older forest.	37,147	42.5%	37,085	36.9%
Level of older forest after Slinky.	**36,991**	**42.3%**	**37,057**	**36.9%**
Minimum level of older forest specified in the Northwest Forest Plan.		15%		15%
Amount of interior older forest at time of Watershed Analysis.	10,484	12%	11,124	11%
Current level of interior older forest.	10,455	12%	11,119	11%
Level of interior older forest after Slinky.	**10,452**	**12%**	**11,119**	**11%**

The Northwest Forest Plan recognized the importance of isolated remnant old-growth patches because they function as refugia for species with limited dispersal capabilities. These include fungi, lichens, bryophytes, arthropods, vascular plants, small mammals, amphibians and some bird species. This is the rationale for the green tree retention requirements and for the survey and manage program. There is also a standard (page C-44) that requires the retention of older forest in watersheds that contain 15 percent or less of older forest. The Oak Grove and Upper Clackamas watersheds contain more than twice that level indicating that the concern for refugia is less at the watershed scale. The Slinky action alternatives would reduce older forest by 0.2% in Oak Grove and less than 0.05% in the Upper Clackamas. Slinky would affect 3 acres of interior older forest habitat or a total of 0.003% change for the Oak Grove Watershed. There would be more than 74,000 acres of older forest remaining within the Oak Grove and Upper Clackamas watersheds after the harvesting is completed.

At the Forest scale, there is abundant habitat for species with limited dispersal capabilities. More than 80% of the 1 million acres on the Mt. Hood National Forest are in land

allocations other than matrix. The late-seral and old-growth forest in other allocations provide habitat for these species.

The no-action alternative would not change the conditions for species with limited dispersal capabilities. Surveys have been conducted where needed for threatened, endangered, sensitive, and "survey and manage" species. No species of concern were found within the harvest units.

The action alternatives would alter conditions for species that depend on older forests and have limited dispersal capabilities. Some individuals may survive within the harvest units in the green tree retention patches or on individual trees, but others would be eliminated from the harvest units. There is little concern for the persistence of common species because of the large amount of habitat available in late-successional reserves, riparian reserves and in other forested areas not scheduled for harvest. No rare or uncommon species were found in the harvest units.

Existing Situation – Wind

Wind is one of several factors that contribute to the falling of trees in the forest. Other factors include root rot and stem decay in live trees. Of course when trees die they eventually decay and fall. While trees naturally fall in forests for a variety of interrelated reasons, management actions can cause trees to fall at increased rates. This analysis will focus on factors that contribute to increased risk of wind damage from management activities. The term windthrow will be used here and it includes live trees blown down or where treetops are broken out by severe windstorms.

Many factors may contribute to windthrow: wind direction, topography, aspect, position on the slope, rooting depth, soil moisture, root rot and support from other trees, to name just a few. The support from other trees is the primary factor that humans have an effect on. The least predictable factor is the strength and duration of storms when they pass through an area.

All of the proposed units in Slinky are classified as "Moderate" hazard for windthrow in the Soil Resource Inventory (USDA Forest Service. 1979). The definition of Moderate is: "Factors indicate some susceptibility to windthrow but major problems are not likely. The effective rooting depth is generally between 18 and 36 inches." Site-specific observations from each of the units concur with this assessment.

When young trees grow up in a crowded condition they compete with each other to gain height at the expense of diameter and root strength. They rely on their neighbors holding each other up and the continuous canopy deflects wind. Most of the mature stands in the Slinky area grew up this way and still have some degree of reliance on their neighbors for support.

All of the units show evidence of frost cracks in western hemlock, noble fir and Pacific silver fir. These frost cracks can not only weaken the tree trunk structurally but may also

provide entry to disease organisms that weaken the individuals to a greater degree, making them more susceptible to wind damage. There are also pockets of root rot that weaken stability.

In recent decades, timber harvest has fragmented the landscape with clear cuts in a manner that often causes windthrow along the edge of non-harvested stands. All of the proposed units are adjacent to or surrounded by clearcut harvests of various ages. The abrupt changes in heights from the younger plantations to the fragmented older stands can cause turbulence in the wind flow. This turbulence can last for a considerable distance (one-quarter of a mile or more from the point of initiation), depending upon the wind speed and tree height differential. This can affect not only the taller stand, but also adjacent stands on the downwind side. Winds in the Slinky area usually come from the southwest. Some of the Slinky units have experienced some windthrow.

Effects of Alternatives-Wind

Alternative A

Past windstorms have tested the edges of the stands in the Slinky area. Some windthrow has occurred, but most of the trees that were weak and likely to blow down have already done so.

In the short term, wind may continue minor unraveling of some of the stand edges.

In the long term, other gradual changes would occur. Individual trees would become less vigorous over time and would blow down or fall from other causes, and since there are few if any young conifers present, the stand would become more open and the understory of rhododendron would become denser.

Alternative B and C

Wind may affect leave trees and Green Tree Retention patches (GTR) that are being retained with the action alternatives. If a unit has even a minor concern about windthrow, the GTR patches are placed where they are most likely to resist windthrow. In addition to these GTR patches, 10-12 leave trees per acre would be retained across the units. While there are at least 10-12 wind-firm trees per acre to select from, Northwest Forest Plan standards indicate that to the extent possible, we should consider leaving some decadent or leaning trees. Since these types of trees are most likely to fall down, it is clear that it was intended for some retention trees to become part of the large woody debris component on the forest floor. In the Slinky project, this desired, but unspecified level of leave trees falling down would likely come from wind damage. However, since the alternative is leaving approximately twice as many trees as required by Northwest Forest Plan standards, it is unlikely that levels of wind damage would reduce the stand below the minimal level. Leave trees that blow down would be left on the site and would function as large woody debris.

All of the proposed units in Slinky have soils with moderate hazard for windthrow where there is some susceptibility to windthrow but major problems are not likely. Across the landscape, there are many examples of previously harvested shelterwood units on similar soils that have stood the test of time and have not blown down.

Prior to the early 90's, windthrow was more common because timber harvest then focused on clear-cut patches that left walls of mature trees with poor windfirmness. The wind would drop down into the clear cut and cause windthrow on the down wind edges. In recent years, regeneration harvest has focused on isolated islands of mature timber surrounded by plantations. This is the case with Slinky where the harvest would not create new edges susceptible to windthrow. The downwind forests are young stands that are relatively windfirm.

In the long term, stands with greater windfirmness would develop. The units would be restocked with young conifers and as they grow and they would be thinned periodically to a spacing wide enough to keep them healthy and growing vigorously. Trees that are grown at wider spacing from early in life develop windfirmness. Wider spacing allows roots to spread more (Oliver & Larson, p105), and to develop stronger roots and stems. Wider spacing allows trees to sway in the wind developing strong reaction tissue in the trunk and they become more wind tolerant (Oliver & Larson, p 83 & 84). While mature leave trees would not change as quickly as young trees do in response to a thinning, the leave trees in Slinky units would eventually develop increased root and trunk strength.

Cumulative Effects

Since wind turbulence can have an effect for approximately ¼ mile, other current and foreseeable actions being considered for cumulative effects are Batwings and several units of the Oak Grove Thin.

The Batwings Timber Sale is located to the southeast of Slinky unit #1. Since the prevailing winds come from the southwest, unit #1 of Slinky is not likely to affect the Batwings area and Batwings is not likely to affect Slinky units.

There are several proposed commercial thinning units (Oak Grove Thin) near Slinky units.

Slinky Unit	Nearby Oak Grove Unit
1	516
151	511
31	512 & 513

Due to the location of these units in relation to each other, the prevailing wind direction and topography, the Slinky units are not likely to affect the commercial thinning units and the thinning units are not likely to affect Slinky.

Alternative D

This alternative would leave 30 trees per acre. With more trees per acre remaining, it is anticipated that many of the leave trees would have to be selected from trees with poor windfirmness characteristics. Some of these trees may fall. Since the alternative is leaving approximately five to six times as many trees as required by forest plan standards, it is unlikely that levels of wind damage would reduce the stand below the minimum level. Cumulative effects would be similar to the discussion for Alternatives B and C.

WILDLIFE

The Slinky Wildlife Biological Evaluation and Biological Assessment are located in the appendix and are incorporated by reference and summarized below.

Northern Spotted Owl (Threatened)

Existing Situation - The entire timber sale consists of late-seral stands and is considered nesting/roosting/foraging (NRF) habitat as well as dispersal habitat for the spotted owl. This area has high potential for species occurrence. (Data source for this analysis – GIS data from Veg2000.shp)

Effects – Including Direct, Indirect and Cumulative Effects

Alternative A - No short-term effects to the owl would be predicted with this alternative. Units would continue to function as spotted owl suitable nesting habitat well into the future. These stands are currently 200-300 years old and in the long term, they would likely start to become increasingly more susceptible to damaging agents. Future small-scale disturbances such as insects, disease, and wind would create gaps and openings, eventually changing the stand structure. This could create a more open structure than what is currently present. The stands could become increasingly more open in canopy closure to the point at which they may no longer be considered nesting/roosting/foraging habitat for spotted owls (i.e. a canopy closure less than 60% is considered too open to meet nesting requirements for spotted owls).

Alternatives B, C and D - There are no units or associated activities that are within ¼ mile of historic spotted owl activity centers: no seasonal restriction is required.

The alternatives would affect dispersal habitat as well as NRF habitat. The Slinky Timber Sale would occur in two watersheds, Oak Grove and Upper Clackamas, both of which contain dispersal habitat within approximately 70% of its area (11 inch diameter trees with an average canopy cover of 40%). Although, the proposed action would remove dispersal habitat for the northern spotted owl, the change would be minimal.

NRF habitat is considered to be the limiting factor for spotted owls. Approximately 38.4% (34,257 acres) and 40.1% (40,757 acres) of the Oak Grove and Upper Clackamas watersheds, respectively, contain NRF habitat. The action alternatives would remove 184 acres of spotted owl NRF habitat (156 acres in Oak Grove and 28 acres in Upper Clackamas). The timber sale would reduce the percentage of NRF habitat in the Oak Grove Watershed from 38.4% to 38.2%. Within the Upper Clackamas Watershed, the percentage of NRF habitat would be reduced by less than 0.1% - essentially no change at the watershed scale.

Harvest units 1, 2, 15, 17, 151 and a portion of 5 and 31 occur in Critical Habitat Unit (CHU) OR-10. The action alternatives would remove 108 acres of both dispersal and NRF habitat from this CHU. This would reduce the percentage of NRF habitat within the CHU from 44.2% (39,123 acres) to 44.0% (39,015 acres).

The loss of suitable habitat from both a watershed and CHU scale would be relatively minor, with approximately a 0.2% loss in both the Oak Grove watershed and CHU. In addition, these patches of NRF habitat are isolated late-seral patches surrounded almost entirely by relatively young plantations. The Slinky harvest units have little to no interior habitat and are mostly edge habitat. The spotted owl's preferred habitat occurs in mature/old-growth stands of a more unfragmented nature (large tracts of forest land with more interior habitat). However, it is not unknown for spotted owls to nest in fragmented pieces of suitable habitat. Especially considering the current condition of spotted owl habitat on a regional scale and the loss of habitat and increase in fragmentation that has occurred in its habitat within the last half century. This has resulted in the owl being found more often in fragmented habitat even though that is not considered its preferred habitat.

The current condition of the habitat for spotted owls within the two watersheds takes into consideration recently harvested or soon to be harvested timber sales that will remove or have removed suitable habitat from the area. These timber sales include the following: Batwings, Bars, Barstool, Borg, Imp, Lighting Flats, Solo, Bazooka, Bear, Cub, Jane, and Tarzan.

Risk Assessment - Risk to habitat would be high with the action alternatives and low for the no-action alternative. Risk to individuals would be high under all action alternatives and low for the no-action alternative. There would be no risk to the population with any of the alternatives.

All action alternatives are likely to adversely affect the spotted owl and its habitat. The U. S. Fish and Wildlife Service (USFWS) issued an opinion on the effects of the Slinky Timber Sale as well as many other projects within the document titled "Willamette Province Fiscal Year 1999 Habitat Modification Biological Opinion for Listed Species." The conclusion they reached is the following: "After reviewing the current status of the spotted owl, the environmental baseline for the action area, the effects of the proposed actions and the cumulative effects, it is the Service's biological opinion that the FY 1999 Habitat Modification Projects in the Willamette Province are **not likely to jeopardize the**

continued existence of the spotted owl or result in the destruction or adverse modification of spotted owl critical habitat (USDI, 1998). The Biological Opinion did not specify any additional terms and conditions that would apply to this project.

The viability of the northern spotted owl is provided by the system of reserves and other standards and guidelines established by the Northwest Forest Plan.

During the 30-day comment period on the proposed action there appeared to be some confusion concerning the Roaring River/Upper Clackamas General Area of Concern identified in the North Willamette Late Succession Reserve Assessment and the interim connectivity design cells in the Oak Grove Watershed Analysis.

The Oak Grove Watershed Analysis recommended the retention of a connectivity network of late-successional stands until plantations in the LSR and Riparian Reserves developed into dispersal habitat (USDA 1996, Table 10-1). These areas are called interim connectivity design cells are not within LSRs but are matrix lands. The LSR Assessment identified General Areas of Concern. The Roaring River/Upper Clackamas General Area of Concern was identified as an important connectivity area to provide some habitat redundancy between two LSRs. The LSR Assessment determined that there is enough area within the interim connectivity design cells that connectivity objectives between two LSRs should be met (USDA 1998, p. 3-80). Because none of the Slinky units are in the interim connectivity design cells, there would be no effect to connectivity objectives.

Northern Bald Eagle (Threatened)

Existing Situation - 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 planning area and is likely used only for very occasional foraging and travel habitat.

Effects
Alternative A - No effect to the bald eagle would occur with implementation of this alternative. The planning area would continue to provide poor quality habitat for the species.

Alternatives B, C and D - The Slinky timber sale units are comprised of trees that could conceivably serve as nesting trees for bald eagles, though the potential is quite low for two reasons: 1) Bald eagles usually nest within ¼ mile of a water body in the Cascades. The closest Slinky harvest unit to the Oak Grove Fork is just a little over ¾ mile. All other units are as least 1 mile from either the Oak Grove Fork or the Clackamas River. 2) The adjacent sections of the Oak Grove Fork and Clackamas River represent marginal nesting and foraging habitat at best. Limiting factors include the topography and physical features of the river (a narrow strip of open water and low flows) and represent significant obstacles to successful foraging by eagles. No eagles have been known to nest along these portions of the two rivers.

It is also conceivable but unlikely that the Slinky timber sale units would be used as a roosting site due to the lack of a nearby abundant food source. The Slinky timber sale would result in the loss of 184 acres of poor quality potential bald eagle habitat. In terms of cumulative effects, Batwings Timber Sale is the only other adjacent project that may affect potential nest trees. It has similar poor quality nest tree potential.

It is unlikely that bald eagles would be affected by the proposed action or by Batwings. In the rare instance that a bald eagle would be present in the stand during project implementation, they would have the ability to quickly move to adjacent acceptable habitat.

All action alternatives would have a determination of "**may affect, not likely to adversely affect**."

Canada Lynx (Threatened)

Existing Situation - In the Pacific Northwest, lynx are associated with high elevation, boreal forests that typify northern latitudes. They are found primarily above 1220m (4000 ft.) in Washington (WDW 1993). High quality lynx habitat is comprised of a mosaic of early-successional forests with high prey densities (especially snowshoe hare) for foraging and of late-successional forests with an accumulation of down logs used for denning, thermal and security cover. Intermediate successional stages are used mainly for travel and landscape connectivity but may also provide foraging opportunities.

The Forest lacks structural components essential for high snow shoe hare densities. Young trees do not have dense spreading low branches to provide cover for snow shoe hares. In addition the snow characteristics on the Forest do not provide the light fluffy snows for a long enough period of time to provide an ecological advantage for foraging lynx. Research has shown that when snow shoe hare densities are low that lynx will abandon the area or starve.

In a letter dated August 2 of 2001 (USDA 2001b), the Mt. Hood National Forest has 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 (USDA, USDI 2001, p. 35).

The elevation of the Slinky Project varies between 3000 and 4000 feet. 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.

Effects - No effects are expected from any of the alternatives due to lack of the species and its habitat on the Forest.

Sensitive Species

The following table summarizes effects from the Biological Evaluation, which is incorporated by reference. Alternative A would have No Impact for all species.

Species	Step #1 Pre-field	Step #2 Field Recon.	Step #3 Risk Assessment by Alternative				Impact for Action Alternatives
	Suitable Habitat Presence	Potential for Species Presence	A	B	C	D	
Oregon Slender Salamander	Yes	Mod-high	L	H	H	H	MII-NLFL
Larch Mountain Salamander	No	No	N	N	N	N	NI
Cope's Giant Salamander	Yes	Moderate	N	N	N	N	NI
Cascade Torrent Salamander	Yes	Low	N	N	N	N	NI
Oregon Spotted Frog	Yes	Low	N	N	N	N	NI
Painted Turtle	No	No	N	N	N	N	NI
Northwestern Pond Turtle	No	No	N	N	N	N	NI
Horned Grebe	No	No	N	N	N	N	NI
Bufflehead	No	No	N	N	N	N	NI
Harlequin Duck	No	No	N	N	N	N	NI
American Peregrine Falcon	No	Flyovers only	N	N	N	N	NI
Gray Flycatcher	No	No	N	N	N	N	NI
Baird's Shrew	Yes	Low-High	L	H	H	M	MII-NLFL
Pacific Fringe-tailed Bat	Yes	Dispersal Only	N	N	N	N	NI
California Wolverine	Yes	Low-Moderate	N	L	L	L	MII-NLFL
Pacific Fisher	Yes	Moderate	L	M	M	M	MII-NLFL

RISK ASSESSMENT:
"N" = No Risk to species or habitat
"L" = Low Risk to species or habitat
"M" = Moderate Risk to species or habitat
"H" = High Risk to species or habitat

EFFECTS / IMPACT CALL:
"NI" = No Impact
"MII-NLFL" = May Impact Individuals but not likely to cause a trend to federal listing or loss of viability

Survey and Manage Wildlife Species

The Northwest Forest Plan includes the requirement to conduct surveys and to manage known sites of certain species when there is a concern for the species persistence. In the Slinky area, this includes such species as the Oregon red tree vole, several terrestrial mollusks species. Required surveys have been competed to protocol.

One known site occurs in the vicinity of the Slinky units. The snail *Crypotomastix hendersoni* was found approximately 250 feet outside the western boundary of unit 2. A habitat area was created for management of this site all of which is outside of unit 2. None of the alternatives would affect this species.

Snags and Down Wood

Existing Situation - The harvest units are in the Pacific silver fir zone. Based on surveys completed by Forest inventory and ecology crews and summarized in the Oak Grove and Upper Clackamas Watershed Analyses, snag density for unmanaged large conifer stands averages approximately 7 large and 6 medium snags per acre. Down log density averages approximately 8 hard and 6 soft down logs per acre. Since the area is fragmented, younger plantations surround these units with much lower levels of snags and down wood. (Data source for this analysis – GIS data from Snag.shp)

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). In the Slinky planning area, the standard and guideline from the Forest Plan 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. Also for cumulative effects the standard for landscapes is 40% of biological potential which equates to 1.6 snags per acre (Forest Plan Four-74).

Comments received by ONRC during the public comment period suggested the Forest Service do site-specific surveys for snags and coarse woody debris, including an analysis of the number of snags protected versus felled for safety reasons. Snags are continually changing; In the 2 to 3 years between planning and logging, snags or live trees that were stable may become hazardous due to decay. Snags that are a hazard today may fall by the time harvest occurs. There is no way to predict today how many hazardous snags would have to be felled to prevent injuries to forest workers, but actual monitoring of similar past harvest units has shown that an average of approximately 2.5 snags per acre are present after harvest and fuels treatment activities.

Other comments stated that current management at both the plan and project level does not reflect new scientific information about the value of abundant snags and down wood. They also stated that there should be no reduction of existing or future large snags and logs until applicable management plans are rewritten to update the snag retention standards. They base this comment on information contained in the publication Dead and Dying Trees: Essential for Life in the Forest (Duncan 1999). In this document researchers identified additional categories important to wildlife: living trees containing decay, hollow trees and mistletoe-infected trees. This report only references research completed on east-side forests and did not consider the green tree retention and coarse woody debris standards in the NFP. The information contained in this report supports the higher level of green tree retention and coarse woody debris required in the NFP. The NFP requirement to retain 240 linear feet of coarse woody debris and 15% of the area in green trees that include the largest, oldest live trees, decadent or leaning, includes trees that fit into the categories described by these researchers. The NFP already included this information into its standards and guidelines for green tree retention. The Slinky action alternatives would leave more green trees than the minimum needed to meet the 15% green tree retention standard.

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 this web site 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:

- Important decayed wood elements consist of snags, down wood and live trees with dead tops or stem decay.
- Decayed wood provides habitat and resources for a wide array of organisms and their ecological functions.
- Wood decay is an ecological process important to many organisms.

The DecAID tool provides information on the array of key ecological functions and functional groups of wildlife that use snags and down wood, and can be used to describe the effect of changing snag and down wood levels on those functions and functional groups. 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.

Appendix B 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. For the Oak Grove and Upper Clackamas watersheds most of the habitat types and structural conditions for unmanaged stands currently contain snag numbers that average less than the 30% tolerance level for snag density and size based on inventory data. The late-seral stands in the Pacific silver fir zone (described as part of the Westside Lowland Conifer-Hardwood Forest Wildlife Habitat Type, Western Oregon Cascades) are currently between the 30% and 50% tolerance levels for snag density and size. Both the early and mid-seral managed stands are less than the 30% tolerance level for snag density and size. Within the Pacific silver fir zone the DecAID advisor identifies the 30% tolerance level for early-seral stands as 5 snags per acre greater than 10 inches with more than 2.1 of these snags per acre greater than 20 inches. For both mid and late-seral stands in this zone the DecAID advisor identifies the 30% tolerance level as 5.3 snags per acre greater than 10 inches with more than 4.8 of these snags per acre greater than 20 inches. All of the proposed harvest units are within late-seral stands in the Pacific silver fir zone.

For down woody debris within the Pacific silver fir zone the DecAID advisor identifies the 30% tolerance level for wood larger than four inches in diameter as: early-seral stands - 2.3% cover, mid-seral stands - 4.5% cover, late-seral stands - 6% cover.

Effects - Alternative A - The stands would continue to provide one of the few sources of high quality snag and down log habitat in the area immediately surrounding the units. 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 within the units. Stands would continue to average approximately 7 large and 6 medium snags per acre and approximately 8 hard and 6 soft down logs per acre. This is above the level of snags required for 100% biological potential. It is also between the 30% and 50% tolerance level for snags within the applicable habitat type and structural condition identified in the DecAID advisor. There would be no short-term change in the amount of cover in down wood greater than 4 inches in diameter.

Alternative B - Snags are difficult to retain during logging because of their inherent instability and danger. It is likely that some snags would need to be cut down during harvest operations due to safety considerations. Snags retained in the green tree retention patches would be more secure. The skyline units would likely require more snag removal than the areas logged with ground-based systems. Approximately 73 acres are proposed for tractor and 111 acres for skyline logging.

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. Snags and downed logs that might have formed in the future would be removed through the timber harvest.

If down woody debris is insufficient to meet standards and guidelines, logs from cut trees would be retained to make up the difference. Down logs would be retained at a rate of 240 lineal feet per acre, which equals approximately 12 logs per acre. Snags or green trees that fall down after the harvest operation would contribute to the down wood component of the future stand. Snags and green trees for snag creation would be retained at the level of 2.4 per acre. A post harvest review would be conducted and snag creation would occur if necessary to achieve this level. Newly created snags would not be fully functional immediately but would be used over time as decay occurs. This would meet the 60% biological potential level for snag dependent species.

Approximately 10% of the harvest area would be retained in unharvested patches and scattered large trees would be retained at the rate of 10 to 12 per acre. These retained unharvested patches and scattered individual trees would include some of the largest, oldest and most decadent live trees as required in the NWP. There is a high likelihood that some of these retained trees would be decayed or hollow, and some would have large broken branches or mistletoe brooms. These living trees would serve as wildlife habitat and most likely would stand longer than snags, providing habitat over a longer period of time.

The DecAID advisor identifies the 30% tolerance level for early-seral stands as 5 snags per acre greater than 10 inches with more than 2.1 of these snags per acre greater than 20

inches. For both mid and late-seral stands in this zone the DecAID advisor identifies the 30% tolerance level as 5.3 snags per acre greater than 10 inches with more than 4.8 of these snags per acre greater than 20 inches. The alternative would retain all non-hazardous snags, as well as 10 to 12 green trees per acre and the unharvested patches equal to 10% of the area to be harvested (these areas contain approximately 100 trees per acre). Due to this level of retention, Alternative B has the potential to maintain snag densities within harvest units above the 30% tolerance level as they progress over time through the early and mid-seral stages.

The harvesting operations would add large and small woody debris to the site. The site preparation and hazardous fuels treatments would remove some of the smaller material to create planting spots and reduce fire risk but would leave larger material. The DecAID advisor identifies the 30% tolerance level for down wood within early-seral stands as 2.3% cover greater than 4 inches in diameter. Following timber harvest and fuels treatment, there would be an increase in down wood over current levels due to the retention of 240 linear feet per acre of down wood greater than 20 inches plus the smaller existing down wood, the wood from tree tops and broken logs and wood from trees that may fall. These combine to create down wood at the 30% tolerance level as the stands progress over time through the early and mid-seral stages.

The effectiveness of artificially created snags is being examined. A long-term monitoring project was started in 1997 on the adjacent Willamette National Forest to determine wildlife use of artificially created snags. The report found that nearly half of the created snags had new foraging excavations by woodpeckers and other unidentified excavators, indicating that one or more species that occur in the elevation range of the study were using the snags for foraging (Boleyn 2002). The report also documents that the majority of the created snags monitored were recently killed (within the last 10 years) and had little decay. As the amount of decay increases and the snags become soft enough for cavity foraging excavation, it is expected that nesting and roosting activities would increase (Boleyn 2002).

Alternative C - Affects are similar to Alternative B except that helicopter logging would be required on unit 31 and part of unit 5, for a total of 40 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. Tolerance levels for down wood cover would be similar to Alternative B.

Alternative D - Affects are similar to Alternative B except it would leave approximately 30 trees per acre. This alternative would reserve more of the current snag levels within the units as well as maintain options for the future. By leaving these additional trees per acre, it would decrease the percentage of snags that would need to be cut down due to safety considerations. However, since the helicopter logging is still a part of this alternative, it is likely there would be a loss of snags within unit 31 and part of unit 5. There would also be less of a chance for snag loss to occur through wind and snow breakage, or at least there would be more snags left in the unit so such occurrences would not have as much of an effect on the resource.

A long-term benefit of leaving these additional large-diameter trees is that there would be more large snags and downed logs available during the early and mid-seral stages. There would also be more decayed and hollow living trees, as well as mistletoe infected trees. Due to the higher level of retention, this alternative has the potential to maintain snag densities above the 50% tolerance level as the stands progress over time through the early and mid-seral stages. Since fewer trees are harvested, there would be less material left in the form of down wood cover.

Cumulative Effects – Down log affects are very localized and generally do not extend outside a unit boundary. Some snag dependent bird species are known to forage on down logs but affects to these species are measured by changes to snag habitats. Snags however are utilized by species that have wider home ranges so a larger analysis area is used to calculate cumulative effects for snags. Planned regeneration timber sales in these areas include Slinky and portions of Batwings. The regeneration areas have approximately 13 snags per acre. For thinning timber sales, the plantations generally have no snags and the "natural" second growth has approximately 4 snags per acre. The planned thinning timber sales include portions of Oak Grove Thin.

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 Analyses and was based on surveys completed by Forest inventory and ecology crews. Weighted averages include private land inclusions as well as all non-forest areas within the analysis area. Large snags are > 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 1.6 snags per acre.)

Snag Analysis	
	Slinky Area
Acres	7293
Existing Total Snags (Large and Medium)	36,287
Existing weighted average snags per acre	5.0
Completed, Started or Foreseeable Thinning Sales	192 acres - Oak Grove
Completed, Started or Foreseeable Regeneration Sales	35 acres - Batwings
Slinky	184 acres
Total Planned Regeneration Sales	219 acres
Change in Snag Levels *	-3356
Remaining Snags	32,931
Weighted average snags per acre after implementation (4 snags per acre is 100% biological potential)	4.5
Minimum to meet 40% biological potential, snags per acre	1.6

*12.9 snags per acre before and 2.4 per acre after for regeneration sales; 7.9 per acre before and 2.4 per acre after for thinning sales.

The analysis shows that within the snag analysis area, the snag levels after the past, present and foreseeable future harvest activities occur would still be greater than the 100% biological potential level. The analysis may overestimate the loss of snags since it

assumes that all snags within the harvest units would need to be felled for safety purposes. The alternatives are designed to maintain all current snags unless it is determined to be a hazard at the time of the timber harvest. Many snags in the green tree retention patches would be retained since they would be far enough away from logging operations to not be a safety hazard. All of the action alternatives would provide enough snags to provide habitat for populations of cavity dependent species based on biological potential concept. The biological evaluation contains a discussion of effects to sensitive, threatened or endangered snag dependent species.

Appendix B of the EA contains an analysis of tolerance levels for the different wildlife habitat types and structural conditions identified in the DecAID advisory tool. It displays the percentage of the watershed in each structural condition and the tolerance level for snags. The percentages are based on all past, present and foreseeable future actions. Since the NFP was implemented, approximately 577 acres within the Oak Grove and 1087 acres within the Upper Clackamas watersheds have been or would be converted from late-seral snag habitat to early-seral snag habitat. The action alternatives would result in a change of 0.2% for Oak Grove and a negligible change for the Upper Clackamas. In the Oak Grove, the late-seral snag habitat would go from 29.1 to 28.9 percent while early-seral plantations would increase from 28 to 28.2 percent.

Deer and Elk Habitat (Management Indicator Species)

Existing Situation - The project area is located within summer range and encompassed by analysis areas Summer Range 6 (Kink) and 7 (Peavine). There are no known calving or rearing areas identified within the project area. Forest Plan Standards and Guidelines have minimum requirements for optimal cover and thermal cover habitat components but no level for forage. (Data source for this analysis – GIS data from Veg2000.shp and Roads.shp)

Existing Condition for the Kink and Peavine Deer and Elk Management Areas

Analysis Area	Acres	Current Optimal Cover	Minimum Level for Optimal Cover	Current Thermal Cover	Minimum Level for Thermal Cover	Current Forage
Kink (SR6)	5768	37%	20%	17%	10%	30%
Peavine (SR7)	6976	27%	20%	11%	10%	35%

Deer and elk are not known to be particularly abundant in this area. Forage is widely available within the analysis area but is generally of low quality. The low quality of the forage and the lack of wetlands and permanent low-gradient streams probably remain the limiting factor for elk and possibly deer within the area.

Summer Range 6 and 7 analysis areas currently have an open road density of approximately 2.1 and 2.8 miles per square mile, respectively. In summer range the Mt. Hood Forest Plan Standard and Guideline is 2.5 miles per square mile.

Effects – Including Direct, Indirect and Cumulative Effects
Alternative A - These 184 acres of late-successional stands would continue to function as optimal cover for deer and elk. No cover would be lost and no forage would be gained in this alternative.

Alternative B - To assess cumulative effects, other timber sales within the deer and elk analysis areas that have been planned but not yet implemented are considered. All of the Batwings Timber Sale and most of the Solo Timber Sale would occur within Summer Range 7 for a total of 336 acres. The effects of these sales have been factored into the existing condition figures for deer and elk cover and forage values displayed in the above table. There are no foreseeable regeneration harvest timber sales within Summer Range 6. The removal of an additional 184 acres with Slinky would cause a loss of approximately 2% of the existing optimal cover in each of the analysis areas and cause a gain of approximately 2% in forage. Optimal cover is not a limiting factor for deer and elk in this area. The loss of this cover could alter the distribution of deer and elk use of the area in the summertime but is not predicted to cause a measurable reduction in deer and elk numbers utilizing the area. In the analysis areas as a whole, the resulting percentages of optimal and thermal cover would remain within the Mt. Hood standards and guidelines for this area.

Road Density - A total of 0.4 mile of new temporary roads would be constructed near units 2, 5, and 31. Approximately 1000 feet (0.2 miles) would be built in the Kink Summer Range analysis area and 1000 feet (0.2 miles) would be built in the Peavine Summer Range area. These increases are slight and would temporarily cause an increase of 0.02 mile per square mile of road density in Kink and Peavine Summer Ranges. The roads would not be open to the public and road use would occur during logging when the disturbance and noise of logging equipment is already present. After logging, the roads would be closed and road density would be back to the current level. These 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 this project.

Haul Routes - There are potential haul routes that go through deer and elk winter range. Roads 5730 and 5720 go through winter range that is classified as having a moderate value (transitional range) and no seasonal restriction is required. If timber were hauled west on road 5710 it would go through crucial value winter range and a seasonal restriction would be required. No log haul or snowplowing would be permitted on this route from December 1st to March 31st.

Disturbance - The logging and road-building activities could potentially disturb animals that happened to be in the area at the time of implementation. However, deer and elk would likely not be in the area during the winter season, the period when they are most vulnerable to disturbance. Disturbance that occurs during the spring/summer/fall would probably only displace animals and would not likely affect their health.

Alternative C – Cumulative effects would similar to Alternative B except that no roads would be built eliminating the slight short-term increase in road density that is discussed in alternative B. However, because no roads would be constructed, helicopter logging would occur in units 31 and part of unit 5 for a total of 40 acres. 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 logging.

Alternative D - Cumulative effects would be similar to Alternative C except that 30 trees per acre would be left. It would still remove the optimal cover currently being provided in the stands but due to the increased canopy closure, less forage would be created.

Management Indicator Species

Existing Situation - Indicator species for this area include deer and elk, pine martin and pileated woodpecker. Management indicator species are key species that have been identified in the Forest Plan. The status and condition of these 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. Deer and elk have already been discussed above. All of the proposed harvest units contain habitat for the pine marten and pileated woodpecker. These animals rely on older forest structure and pileated woodpeckers also rely on snags.

Effects – Including Direct, Indirect and Cumulative Effects - Alternative B, C, and D would remove habitat for pine marten and pileated woodpecker and alternative A would retain it. The NFP removed land allocations for pine marten and pileated woodpecker in Mt. Hood Forest Plan (B5 land allocation) because other land allocations such as late-successional reserves and riparian reserves would meet the habitat needs for these species. The Oak Grove Watershed Analysis recommended the retention of two B5 habitat management areas but neither of them are near any of the Slinky units. In terms of cumulative effects, pine marten and pileated woodpecker habitat have already been evaluated in the Older Forest analysis in the Fragmentation section and pileated woodpecker, a snag dependent species, has already been addressed in the Snag section above.

Migratory Birds

Existing Situation - Over 27 species of migratory birds occur within Oak Grove and Upper Clackamas Watersheds, some of which are likely present within the Slinky Timber Sale during the breeding season. Some species favor late-successional habitat and others favor early-successional habitat with large trees.

Effects – Including Direct, Indirect and Cumulative Effects
Alternative A - There would be no alterations of habitat for migratory birds.

Alternative B and C - The harvesting of 184 acres of late-successional habitat would reduce the amount of habitat for some migratory bird species using the area; particularly those that require mature habitats and snags, and those that do not require interior habitat. 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 habitat for these species as well as others, there is considered to be abundant potential habitat for these migratory species in protected lands on the Forest including wilderness areas, riparian reserves and late-successional reserves.

There are also some species of migratory birds that could benefit from the proposed regeneration harvest with reserve trees. 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 watersheds and could benefit from the proposed action 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.

In conclusion, the Slinky Timber Sale would have a combination of positive and negative impacts on migratory bird species, depending on the habitat preference of the species.

Alternative D

Affects would be similar to Alternatives B and C except that 30 trees per acre would be left in the units and more legacy structures would remain after treatment. These stands would still be considered early-seral habitat but there would be much less deciduous understory development, which is an important habitat component for some migratory birds.

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 References

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

For soil resources, cumulative effects are analyzed for each harvest unit. The percentage of the unit that has been detrimentally impacted by past practices and the expected additional impact from the current proposal such as road building, logging, site preparation and fuels treatments.

Existing Situation

Large-scale geologic mapping by Hammond et. al. (1982) indicate the Slinky project area is underlain by Quarternary basalts, basaltic andesites and glacial deposits. Soils in the project area have been derived from glacial till deposits and are mapped as 304, 307, 316, 323, 324, and 325 (USDA 1979). Within any soil-mapping unit, there is a possibility of finding up to 25% inclusions of other associated soils and/or bedrock outcrops.

The percentage of area in a detrimental soil condition varies from stand to stand, due to the occurrence, manner and extent of past timber salvage harvesting. Field surveys were conducted to determine the current level of detrimental soils. All of the proposed units meet the Mt. Hood Forest Plan Standard and Guideline (FW-022) with detrimental soil conditions less than 15% of the activity area.

Soil Mapping Unit Attributes

Mapping Unit and Project Unit#	Landform	Surface Erosion Potential	Compaction Hazard	Susceptibility to Soil Displacement	Sediment -ation Yield Potential	Potential for Regeneration
(304) #2, #5-all but SW corner	Nearly level to undulating sideslopes	Slight	Low-Moderate	Low	Low	Moderate
(307) #1	Steep north and east slopes	Moderate	Moderate	Low-Moderate	Moderate	High
(316) #15 #17	Steep, smooth to slightly undulating slopes	Moderate	Moderate	Moderate-High	Moderate	Moderate
(323) #8, #151, #31, #9-east 1/4	Nearly level to sloping, smooth glaciated uplands	Slight	Moderate	Low	Low	High
(324) #5-SW corner	Sloping to steep, south and west facing, smooth glaciated uplands	Moderate	Moderate	Moderate	Low-Moderate	Moderate
(325) #9-west 3/4	Steep, north and east facing, smooth glaciated uplands	Moderate	Moderate	Moderate	Low-Moderate	Moderate

The area to the east of Unit 8 exhibits a very shallow depth to subsoil variation of MU 323, resulting in a reduced infiltration rate. This area is in a riparian reserve and a green tree retention patch. All of the harvest areas are suitable for timber management in terms of soil productivity.

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 has set the maximum for detrimental soils at 15% (FW-022). 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 direct or indirect effects to soil. Percent detrimental soil condition would remain unchanged. There would be no net change in short-term surface erosion rates.

Long-Term and Cumulative Effects

There would be no impacts to soil resources at this time. Soils would continue to develop through natural processes. The percent of existing detrimental soil condition would slowly decline as compacted areas recover due to physical and biological processes.

Alternative B

A combination of tractor, loader and cable yarding, and ground based site preparation would occur. Potential soil disturbances that have been considered are road and landing construction, harvest operations, site preparation and burning. Of the 0.4 mile of temporary road construction, most of the length follows existing skid trails that are already in a disturbed condition. Use of Best Management Practices and project design for harvest units and temporary road construction would result in meeting applicable standards for soil protection and long-term site productivity.

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

Alternative B: Percent detrimental soil condition by unit.

Unit #	Acres	Logging System	Site Prep	Existing	Yarding & landings	Roads	Site prep	Cumulative
1	30	S	GP	1 %	4 %		4 %	9 %
2	30	T	GP	0 %	8 %		1 %	9 %
5	23	L	GP	4 %	6 %	0.9 %	2 %	11.7 %
	15	S	GP	0 %	4 %	1.8 %	4 %	
8	8	S	SB	3 %	4 %		3 %	10 %
9	20	S	GP	1 %	5 %		4 %	10 %
15	5	S	GP	0 %	4 %		4 %	8 %
17	6	T	GP	3 %	7 %		1 %	9.1 %
	10	S	GP	0 %	4 %		4 %	
31	1.7	L	GP	1 %	6 %		2 %	10.3%
	23.3	S	GP	1 %	5 %	0.4 %	4 %	
151	12	T	GP	1 %	8 %		1 %	10 %

Logging system:	Site Prep:
T = tractor or rubber tired skidder	GP = grapple piling
L = Loader	SB = Slash buster
S = skyline	

Short-Term Effects

Soil damage within proposed units would increase from the current condition but should remain below 15 percent, providing for long-term site productivity. If implementation monitoring reveals damage in excess of 15 percent, compaction can be mitigated through subsoiling of skidtrails and landings. Restoration by subsoiling and revegetation would initiate recovery of productivity, but is unlikely to return the soil to its original condition and productivity. There may be a slight increase in surface erosion rates, however the duration and extent should be minimal, and no erosion is expected to impact riparian areas.

Long-Term and Cumulative Effects

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.

Alternative C & D

The effects of these alternatives are expected to be very similar to those of alternative B. The difference is that no roads would be built. Helicopter yarding would occur on 40 acres on unit 5 and 31 and increased skidding distances would occur on a portion of unit 5.

Alternatives C & D: Percent detrimental soil condition by unit.

Unit #	Acres	Logging System	Site Prep	Existing	Yarding & landings	Extra Skid Trails	Site prep	Cumulative
1	30	S	GP	1 %	4 %		4 %	9 %
2	30	T	GP	0 %	8 %		1 %	9 %
5	23	L	GP	4 %	6 %	.9 %	2 %	9.7 %
	15	H	GP	0 %	1 %		4 %	
8	8	S	SB	3 %	4 %		3 %	10 %
9	20	S	GP	1 %	5 %		4 %	10 %
15	5	S	GP	0 %	4 %		4 %	8 %
17	6	T	GP	3 %	7 %		1 %	9.1 %
	10	S	GP	0 %	4 %		4 %	
31	25	H	GP	1 %	1 %		4 %	6 %
151	12	T	GP	1 %	8 %		1 %	10 %

Logging system:	Site Prep:
T = tractor or rubber tired skidder	GP = grapple piling
L = Loader	SB = Slash buster
S = skyline	
H = Helicopter	

Short-Term Effects

These alternatives would reduce the amount of soil disturbed from harvesting activities and reduce the risk for erosion from construction and use of temporary roads and skid trails. Long skidding distances for unit 5 would eliminate the need for 350 feet of temporary road, but after many passes with equipment over mainline skidtrails the effect would be similar to that of a temporary road.

Long-Term and Cumulative Effects

Cumulative effects are expected to be the same as alternative B.

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 will 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 Slinky viewer positions described above. The other future projects that may be seen from the Slinky viewer positions would include Batwings and the Oak Grove Thinning.

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 back country roads.

The harvest units cannot be seen from the Clackamas River or Road 46. The primary viewer position is along Road 57 and the Oak Grove Fork Clackamas River. Currently, the project area is screened from sight by vegetation except for one minor view of a portion of unit 2 visible for approximately 200 feet along Road 57.

This photo shows this view with unit 2 highlighted approximately 1.5 miles away.

The Slinky project area is in the middle ground and the VQO is partial retention for the area seen from road 57. The VQO of partial retention means that activities may be evident but subordinate to the characteristic landscape. With minor exceptions, the current viewshed from road 57 meets the cumulative VQO of middle-ground partial retention.

There is also a VQO of modification for other landscapes. The viewer positions would be from open roads that are traveled by the recreating public. Some roads are not considered viewer positions for the purpose of this analysis and would include temporary roads, closed roads, and roads that are maintained for high clearance vehicles with drivable waterbars that are maintained primarily for timber harvest operations. The primary focus for this analysis would be the viewer positions from road 5710 (units 17, 15, and 151), and roads 5730 and 5720190 (units 1 and 2). Under the modification VQO, human activity may dominate the characteristic landscape but would utilize natural established form, line, color, and texture. The roads listed above 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 Slinky 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 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 Slinky timber harvest, changes in scenery would be expected to come slowly from forest growth. Gradually, over approximately 50 years, the existing checkerboard pattern in the vicinity of the Slinky units 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.

Alternatives B and C:

Effects to scenery as seen from road 57: Alternatives B and C would have similar effects to scenery. Four units (1,2,15,and 17) are in the B2 Scenic Viewshed land allocation. Only a portion of unit 2 can potentially be seen from Road 57. This unit would meet the VQO of partial retention because of the number of green trees retained, the distance and the viewer angle. These factors combined would result in no noticeable change to the casual observer; the viewer would not notice any dramatic changes in the skyline silhouette or see bare ground or slash. There are many examples of similar harvest prescriptions (e.g. Bazooka, Gum, Bars Timber Sales) that have been completed. These units when viewed from 1.5 miles are not readily noticeable to the casual observer.

Effects to scenery as seen from local roads: Design features for regeneration harvest units seen from roads 5710, 5730 and 5720190 (including green tree retention) would soften the straight lines and square corners of the existing checkerboard pattern. As with Alternative A, the action alternatives would gradually meet the VQO of modification over time as adjacent trees grow. From a landscape perspective, the action alternatives would result in a softening of visual contrast as young trees planted in the harvest units grow up and blend with the adjacent young trees. There are many examples of similar harvest prescriptions (e.g. Bazooka, Gum, Bars Timber Sales) that have been completed. These units when viewed from adjacent roads do not look like clearcuts because of the number of trees retained, but look more like open park like stands as in the photo below. Other current and future timber sales can also be seen from the Slinky viewer positions described above including Batwings and several potential future thinning units. These other timber sales would have a similar effect of softening visual contrast.

This photo is an example of what Slinky units would look like.

Several of the harvest units also have a screen of young trees along the road that would obscure the foreground view of stumps and logging debris. The photo below shows this vegetative roadside screen between road 5730 and unit 1 on the left.

Alternative D

Alternative D would have 30 leave trees per acre and would have less impact on scenery compared to alternatives B and C. The photo below shows an example of what 30 trees per acre would look like after harvest.

Effects to scenery as seen from road 57: Alternative D would be similar to alternatives B and C in terms of effects to scenery. Because of distance, the angle of view and the number of green trees retained there would be no noticeable change to the casual observer; the viewer would not notice any dramatic changes in the skyline silhouette or see bare ground or slash.

Effects to scenery as seen from local roads: In terms of short distance views from local roads, alternative D would have less visual impact compared to alternatives B and C. The greater number of leave trees would screen views of stumps and red slash. Landings and landing slash would still be visible.

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 References

Appendix J2
Survey and Manage Plan

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

Existing Situation - The original EA input was based on 1998 data. The current Threatened, Endangered and Sensitive Species List has been checked for botanical species added since then. No listed or proposed plant species are known to occur on the Mt. Hood National Forest. Of the newly listed Sensitive species, none of them have potential habitat in the Slinky project area. The Slinky Botany Biological Evaluation as amended is in the appendix and is incorporated by reference and summarized below.

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.

The closest known population of a listed Sensitive plant, *Corydalis aque-gelidae* (cold water corydalis), is located approximately one half mile from the project area. Potential threats to this species include alteration of site habitat and hydrology. None of the proposed actions in any of the alternatives would adversely affect this population site.

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

Survey and Manage Botanical Species

Surveys were conducted for species requiring pre-disturbance surveys in and adjacent to the proposed timber harvest units and proposed temporary roads. No species were found.

There are no documented sites of Survey and Manage vascular plant, lichen, bryophyte or fungi species that require the management of known sites, in or near the proposed units.

None of the alternatives would have any adverse effects on survey and manage species.

MANAGEMENT OF COMPETING AND UNWANTED VEGETATION

This analysis is guided by the Record of Decision and Mediated Agreement for the "Managing Competing and Unwanted Vegetation" Final Environmental Impact Statement (referred to as VEG EIS). The purpose of this analysis is to provide information to decision makers and interested publics about proposed treatments and how they might affect unwanted vegetation. Of particular interest is the question of herbicide use. Since slash is considered unwanted vegetation, another key question is what post harvest and road construction treatments of slash and brush would be needed to achieve reforestation goals. Noxious weeds would also be addressed.

Appropriate design criteria would be identified and incorporated into any vegetation management project work to minimize potential adverse impacts to the environment, project workers, and public.

The use of herbicides is not being proposed for any of the activities associated with the Slinky project.

Site Analysis For Site Preparation
Site-specific vegetation management objectives have been developed. The following list of objectives will be used to identify the "damage thresholds" for vegetation management, vegetation management strategies and the feasible treatment methods.

Site Specific Objectives:
- Meet the recommended stocking levels within five years after harvesting.
- Meet standards for minimizing soil erosion and soil degradation.
- Maintain adequate levels of downed woody debris and snags.

Nature and Role of Associated Vegetation
Currently, the overstory in the stands proposed for site preparation treatment is comprised of mixed conifers with some heavy mistletoe infestation in some areas. Harvest operations would put slash on the ground creating physical barriers to planting. Some units have an understory of rhododendron, which could compete very strongly with the planted tree seedlings for light, nutrients, and moisture. Removal of this live vegetation prior to planting would be necessary in order to meet management objectives for conifer seedling establishment. The large woody debris contributes to the productivity of the site by providing a long-term source of nutrients.

Damage Thresholds
Post-treatment/preplanting "damage thresholds" have been identified for this site based upon operational experience and the site-specific management objectives. If slash or live vegetation exceeds the following levels prior to planting, treatment would be needed.

Damage thresholds:
1. Greater than 20% cover of live vegetation.
2. Less than 350 well-distributed planting spots per acre.
3. Greater than 15 tons/acre of slash in the 0-3" size class (could exceed 15 tons per acre if the arrangement of the fuels do not present a fire hazard).

Harvest units are expected to need treatment of both live vegetation and slash so that management objectives can be attained. Past experience in this area shows that if trees are established immediately after site preparation, no release treatments from competing brush are required to meet the stand growth objectives. This past experience includes professional expertise of local silviculturists and monitoring data from plantation survival exams and precommercial thinning exams from adjacent plantations.

Strategies
Five strategies for controlling unwanted vegetation are identified in the FEIS and Exhibit A of the Mediated Agreement. These are prevention, early treatment, maintenance, correction and no action. The following analysis will focus on the prevention, correction and no action strategies (refer to Section II-72 through 11-74 in the *Vegetation Management FEIS*). The prevention strategy is a required element and the preferred strategy in the VEG EIS to consider and analyze.

No Action Strategy
"No Action" means that after harvest, planting would occur with no site preparation activity and slash and brush would be left unaltered on the site. It would be the appropriate strategy anytime there is evidence that the damage thresholds would not be exceeded. Within the Slinky harvest units, there is evidence that the no-action strategy would not meet management objectives and standards and guidelines because the damage thresholds would be exceeded.

Prevention Strategy
The prevention strategy would not involve direct treatment but would detect and ameliorate the conditions that cause or favor the presence of competing or unwanted vegetation before damage thresholds are reached. Prevention is the selected strategy for herbicide use. Early corrective action to reduce slash and brush prior to planting (described below) would result in successful reforestation and no herbicide treatments now or in the future would be needed.

Correction Strategies
Vegetation management action would likely be necessary to reduce the amount of post-harvest live vegetation and slash to a point below the damage threshold. A post-harvest review would be conducted to make a final determination because there may be small areas where the no-action strategy is appropriate. Grapple piling and burning or other mechanized equipment similar to a slashbuster that is capable of masticating slash and brush may occur where the correction strategy is selected.

- Mechanical Treatment and Burning - This method could use a track-mounted vehicle with a grapple-type device to pile a large portion of the slash. It would also be used to pull out the larger live vegetation and pile it with the slash. This method could also use a track-mounted vehicle with a masticating device to crush and/or chip slash and cut brush. Grapple piling and burning is a very effective corrective method on sites with less than 30% cover of larger vegetative plants such as vine maple or rhododendron. Mechanized equipment using a masticating type device is a very effective corrective method on sites with more than 30% cover of larger vegetative plants such as vine maple or rhododendron. Both of these treatments would remove the larger vegetation, but are not very effective on the smaller individual plants or species such as beargrass. They are both very effective at reducing fire hazards on slopes less than 40%. More than 500 well-distributed planting spots per acre would be made available. Piles would be

burned prior to planting. Piles can be burned in the fall when smoke dispersal conditions are favorable and pile burning has a relatively low level of safety concern for workers doing the burning and there is low risk of escaped fire situations. This method would cost approximately $300 per acre.

Design Criteria
In addition to the design criteria for the Slinky project, the following general guidelines from the Vegetation Management FEIS (Chapter II) should be followed:

- Develop a silvicultural prescription, approved by a certified silviculturist with a site-specific diagnosis and treatment needs.
- Develop a site specific prescribed burning plan approved by a line officer.
- A job hazard analysis would be developed and discussed by workers to reduce exposure to hazards such as use of power tools, fire and walking in difficult terrain.

Human Health Effects
The human health effects of mechanical treatments would be very low and would be limited to the operator who is inside a protected machine. Risks would increase as slopes increase. The risk to the general public would be very low.

Prescribed burning has the potential for both short and long-term effects to both workers and members of the public. There is the possibility of an escaped fire situation. Burning is only conducted during specific parameters of fuel moisture, humidity and wind speeds when the risk of catastrophic fire is low.

Alternatives

Alternative A
The No Action Strategy for vegetation management would apply. Rhododendron brush would continue to thrive.

Alternatives B and C
A combination of prevention and correction strategies would be most effective. The corrective strategy would reduce both the amount of live vegetation presently on site and the expected level of fuel loading and/or fire hazard following harvesting. Successful completion of this treatment would prevent the need for the use of herbicide to control unwanted vegetation at a later date.

Alternative D
The strategy and effects of Alternative D would be similar to those of Alternative B or C, with the following exceptions. Because of the large number of trees being left and the close spacing, there would be an increase in damage to the leave trees from equipment during the site preparation and piling phase. In addition, the tighter spacing presents an increased risk of damage to the residual trees when the piles are burned. The cost of

treatment would be higher due to the extra time that would be necessary to work around the larger number of leave trees.

Project Monitoring
Post treatment monitoring would be conducted to determine the effectiveness of site preparation and survival rates for planted trees.

Site Analysis for Noxious Weeds

Existing Situation - A review of known noxious weed population maps was conducted and surveys were conducted in the proposed project area. In addition, all potential sources of off-site weed seed were considered. These off-site sources with the potential to transport weed seed into the area include equipment used for logging and road maintenance and seed and mulch used in erosion control. There are no grazing permits in the area.

Noxious weeds found within the proposed timber sale area include *Cirsium arvense* (Canada thistle), and *Cirsium vulgare* (bull thistle). Both species are documented within Units 1, 8, and 9. These weeds are considered to be Oregon State "B" designated weeds (ODA 2002). They are defined as regionally abundant, but with limited distribution in some counties and are limited to intensive control at the state or county level on a case-by-case basis. On the Mt. Hood National Forest, control is limited to manual control (handpulling, clipping) and biocontrol where infestation in the immediate project site is determined to be of moderate to high risk.

Other noxious weeds of concern known to occur on the Clackamas River Ranger District, which have the potential to invade the project area, include *Cytisus scoparius* (Scot's broom), *Centaurea diffusa* (diffuse knapweed), *Centaurea maculosa* (spotted knapweed), *Hypericum perforatum* (St. Johnswort), and *Senecio jacobaea* (tansy ragwort). These weeds occur in areas adjacent to the proposed timber sale area.

The two thistle species that occur within the proposed timber sale units are considered to be well-established weeds throughout the United States. Biological controls (thistle stem gall fly, *Urophora cardui* for Canada thistle and bull thistle gall fly, *Urophora stylata* for bull thistle) have been utilized by the Oregon State Department of Agriculture Weed Control Program to reduce infestations in some areas of the Mt. Hood National Forest (under a Memorandum of Understanding) and on other state and federal lands. Biological controls have not been used specifically in the proposed timber sale area but are one of the integrated methods that are considered in the treatment of noxious weeds.

Forest Service policy for projects that may affect noxious weeds includes (1) determine the factors that favor establishment and spread of noxious weeds, (2) analyze weed risks in resource management projects, and (3) design management practices to reduce these risks. The February 1999 Executive Order 13112 on Invasive Species requires federal agencies to use relevant programs and authorities to prevent the introduction of invasive species.

Invasive plants can displace native plant species and affect terrestrial and aquatic diversity. Noxious weeds can also reduce productivity of forest systems by displacing desirable species and capturing and utilizing valuable resources (ODA 2002).

Effects – Including Direct, Indirect and Cumulative Effects
With Alternative A, the current rate of introduction and spread of weed species to the project area would continue. Road maintenance activities such as brushing and blading as well as road use by vehicles are some ways weeds may spread.

There would be the potential for the introduction or spread of noxious weed species to the project area due to ground disturbance resulting from logging operations and site preparation in Alternative B, C, and D, and the building of temporary roads in Alternative B. Weed seed sources may include off-road equipment brought in from infested areas and seed or mulch used for erosion control that are contaminated with weed seeds.

The design criteria that are incorporated into the project would reduce the risk of noxious weed introduction and establishment in the action alternatives. The *Guide* to Noxious Weed Prevention Practices, (USDA 2001a) contains greater detail on the implementation of these practices.

With the implementation of the design criteria, the risk of spreading existing noxious weeds or of introducing new species in the project area would be low.

Other foreseeable projects such as Batwings and Oak Grove Thin would utilize some of the same roads as Slinky. These projects would include similar requirements to reduce the risk of spreading noxious weeds.

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 20-30 tons per acre.

Effects – Including Direct, Indirect and Cumulative Effects
Alternatives B, C and D

Dust from vehicles would not pose an air quality problem. 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.

Burning would occur with the action alternatives. All harvest units would have existing slash, the branches and tops of harvest trees and brush piled with a grapple machine or treated with a mastication type device. Harvest would increase fuels by 20 tons per acre for Alternatives B and C and 10 tons per acre for Alternative D. Slash piles in the units and at landings would be burned. Burning has the potential to degrade air quality for short periods of time. The principal impact to air quality from burning of slash piles 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 on air quality should be minimal due to the burning being scheduled in the fall (October - December) or during periods of inclement weather.

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 the 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 risks 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.

Alternative A

In the short term, Alternative A would not change air quality. However, the current fuel accumulation of 20-30 tons per acre would remain. If a wildfire were to burn through the project area, Alternative A would generate more smoke than the action alternatives.

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 Slinky 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

Mt. Hood Forest Plan References
Forest Management Goals - 19, page Four-3
See FEIS page IV-112

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 purpose of this analysis is to provide a comparison of alternatives. The analysis tiers to the Northwest Forest Plan Final Environmental Impact Statement, which 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.

For all alternatives, most of the costs for planning have already occurred. 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. No funding would be available for other projects, including the reconstruction of Forest Road 5720, which is in need of repair. By not funding this reconstruction now, future costs for the road repair may increase due to continued deterioration. As the table below shows, there would be no return on the planning costs already used for this project.

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 incremental contribution of each million board feet of timber is approximately 8.3 jobs.

A timber sale would be appraised just prior to advertisement, so the figures below would likely change in today's fluctuating markets, but the relative difference between the alternatives would remain approximately the same. Competitive bidding may result in increased value. This section displays costs and economic returns for a timber sale.

Costs and Benefits

	Alternative A	Alternative B	Alternative C	Alternative D
Administrative Costs and Essential KV	$213,000	$730,000	$730,000	$730,000
Estimated Bid Value	0	$1,146,000	$867,000	$283,000
Net Present Value	-$213,000	$348,000	$122,000	-$405,000
Benefit Cost Ratio	0	1.53	1.19	.38

(Data source – economic analysis spreadsheets located in analysis file)

Administrative Costs and Essential KV: This figure (undiscounted) is based on Regional and Forest averages. For the action alternatives it includes costs that have not yet occurred such as sale administration and planting costs.

Net Present Value: This is the present day project value where estimated administrative costs and essential KV costs (discounted), are subtracted from total revenue generated (discounted).

Benefit Cost Ratio: This is a ratio derived from dividing the estimated bid value (discounted) by the estimated administrative and essential KV costs (discounted). A benefit/cost ratio greater than 1.0 indicates that benefits exceed costs.

Comments were received questioning the need to offer timber from public lands when market conditions were poor. Between September 2001 and June 2003, nineteen separate timber sales were auctioned on the Mt. Hood National Forest. Decoy Resell was the only sale that did not sell. It is the re-offer of the remaining helicopter units of a partially logged sale that was not completed. The sale will be auctioned at a later date when the price of aviation fuel comes down.

The highest bids on 12 out of the 18 sales sold were in excess of the minimum required bid. The highest bids on 6 out of the 18 sales were almost double the minimum required bid. 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 Slinky 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.

TRANSPORTATON

The Roads Analysis process is designed to inform decision makers about road management issues. A Roads Analysis is currently being developed at the Forest scale. In the interim, road management decisions would be informed by project-level analysis.

This project-level roads analysis tiers to efforts already completed. Watershed Analysis began this process and it was further developed by the Forest-level Access and Travel Management Plan (ATM) that was completed in 1999. The proposed action is consistent with the ATM plan. 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 Access and Travel Management Plan of 1999 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 desired future road system is 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 Slinky project are 2 and 7.

Existing Situation

There are no inventoried roadless areas near the Slinky project. The Roaring River roadless area is approximately 2 miles away from Slinky with at least 6 roads between the two. The Slinky project area can be accessed from several directions but road 5720 is the primary haul route. Roads 5710, 5731 and 5730 could also be used as haul routes.

Road 5720 between road 57 and the 5710 junction, is a paved road that is identified in the ATM as a secondary mainline route, being needed for the long-term road system. It has an operational maintenance level of 3 and an objective maintenance level of 2. Through the years, cracks and settling have occurred along portions of the road. The road is need of deep patch repairs, leveling courses, drainage repairs and surface treatment. The long-term goal is to convert the asphalt surface to aggregate as opportunities arise.

All of the other existing roads are considered local roads and have aggregate surfacing. The timber from units 1, 2 and 5 is tributary to 5720 via 5720.190 and 5720.200. The timber from units 8, 9, 15, 151, 31 and one landing of unit 17 is also tributary to 5720 via 5710, 5710.170 and 5710.130. There is a second landing on unit 17 on road 5710.125. This road has an intersection that does not allow trucks to follow the same haul route as the other units. The timber from this landing would be hauled west on 5710 to road 57.

The 5720.190 road would also be used by the Batwings Timber Sale. The Oak Grove Thinning has units in the vicinity of unit 15 along 5710 and the timber would likely be hauled along the same route as the Slinky units.

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

Alternative A

No roads would be built or repaired. Budgets for road maintenance and repair are declining. Road 5720 would continue to deteriorate (if no other source of funding becomes available), eventually resulting in resource damage and an elevated safety hazard to the public.

Alternative B

Approximately 0.4 miles of temporary roads would need to be constructed to access landings. Three roads would be constructed: 300 feet to unit 31, 350 feet to the northeast part of unit 5, and 1400 feet to the southwest part of unit 5. The 1400-foot long road would be built on the alignment of an existing skid trail. All lengths are approximate.

The proposed roads are located on gentle landforms near ridge tops that serve the long-term need for access with skyline and ground based systems. They also avoid streams and wet areas. These temporary roads would be obliterated and revegetated upon completion of the project. All of these roads would likely be needed again in the future for timber management.

Reconstruction needs along haul routes include approximately $150,000 for deep patch repairs on 5720, $10,000 for spot rock and brushing on 5710, and $12,000 for aggregate surface replacement on 5720.190.

Alternatives C and D

Alternative C and D would be similar to alternative B but would build no new roads. Helicopters would be used where necessary to remove logs. Portions of unit 5 and 31 would be helicopter logged to landings on existing roads. A portion of unit 5 can still be logged with ground-based systems with a much longer skidding distance to an existing road.

Reconstruction costs would be the same as alternative B however for Alternative D, given the reduced timber volume there may not be sufficient value to pay for all of the reconstruction.

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 we shouldn't call the roads 'temporary' because they would last a long time. It is not likely that these questions of semantics can ever be resolved. The temporary roads would be obliterated by the purchaser upon completion of operations.

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 number 99-03-14. There are no anticipated affects 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.

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 Slinky 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 "Slinky area" is used to include the timber sale units and approximately 6 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 Slinky Project. The town of Estacada (the nearest community) is approximately 25 miles away. Other more distant communities that may have an interest in the Slinky 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 Slinky area. There are no known special places for minority or low-income communities in the Slinky 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 Slinky area.

Potentially Affected Workers

Many people work in the Mt. Hood National Forest. In the Slinky 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 C

would provide employment to woods workers on the Forest as well as mill workers in adjacent communities. Alternative D provides ½ the timber volume of the other action alternatives and would supply ½ the 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.

Some minorities and low-income people work in the forest gathering products. In the Slinky area, the primary products would include boughs, firewood and beargrass. Other products that are harvest at much lower levels, with few if any harvested in the Slinky area, 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 Slinky Timber Sale units have not specifically been requested for gathering permits. The Slinky 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 Slinky 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 Slinky area there are no campgrounds, trails or other destination recreation features. The Slinky 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 Slinky 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 affect. See recreation section.

Potential Affect to Health

The Slinky 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 affect. 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

In the Slinky area there are no campgrounds, trails or other destination recreation features. The Slinky area is used for dispersed camping as well as hunting. Several fire rings are present at old landings and road junctions, including one near units 8 and 9 at the junction of 5710 and 5710-180. Based on inspection of fire rings and other recreation indicators, the Slinky 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 Slinky Timber Sale units do not represent a special or unique recreational opportunity that is not available elsewhere. The regularly used dispersed camping area at the junction of 5710 and 5710-180 would not be affected. The no-action alternative would not have this affect.

Hunting opportunities within the harvest units may increase over the next 10 to 15 years, as more early-seral vegetation is available as forage for deer or elk. The no-action alternative would not have this affect.

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.

Other Disclosures

Some of the comments received during the 30-day public comment period included references to research papers, reports, letters and other documents that relate to forest management issues. The commenters wanted the agency to consider this information and to make the decision maker aware of other points of view. However, most commenters did not specify what details they wanted the agency to consider that would be relevant to the Slinky project. The documents have been examined and the agency is aware of the information contained in them.

The following eight research papers were referenced by commenters.

> Coats, Robert, et al. 1979. Assessing Cumulative Effects of silvicultural Activities.
>
> Harr, R. Dennis, et al. 1975. Changes in Storm Hydrographs after Road Building and Clear-Cutting in the Oregon Coast Range. 11 Water Resour. Res. 436-44.

Harr, R. Dennis, et al. 1979. Changes in Stream-Flow Following Timber Harvest in Southwestern Oregon. Pacific Northwest Research Station. USDA Forest Service. PNW-249.

Harr, R. Dennis, et al. 1989. Effects of Timber Harvest on Rain-on-Snow Runoff in the Transient Snow Zone of the Washington Cascades. Pacific Northwest Research Station. USDA Forest Service. PNW 88-593.

Jones, J., and G. Grant. 1996. Peak Flow Responses to Clear-Cutting and Roads in Small and Large Basins, Western Cascades, Oregon. 32 Water Resour. Res. 959-74.

Lyons, K., and L. Beschta. 1983. Land Use, Floods, and Channel Changes: Upper Middle Fork Willamette River, Oregon (1936-1980). 19 Water Resour. Res. 463-71.

Reid, M., and T. Dunne. 1984. Sediment Production from Forest Road Surfaces, 20 Water Resour. Res. 1753-61.

Johnson, D. H. and T. A. O'Neil. 2001. Wildlife-Habitat Relationships in Oregon and Washington. Oregon State University Press. Chapter 24. Decaying Wood in Pacific Northwest Forest: Concepts and Tools for Habitat Management. Rose, et al. < http://nwhi.org/nhi/whrow/overview.asp>

These eight research papers were reviewed and found to contain no new information. This information has been available for a long period of time. The analysis in the EA considers this information. Much of the information contained in the reports that predate 1990 was also available during development of the Forest Plan.

The following four research papers were also referenced by commenters.

Duncan, S. 1999. Dead and Dying Trees: Essential for Life in the Forest. Science Findings, Nov. 1999. Pacific Northwest Research Station. USDA Forest Service.

Boleyn, P., E. Wold, and K. Byford. 2000. Created Snag Monitoring on the Willamette National Forest. PSW-GTR-181.

Beschta, R., et al. 1995. Cumulative Effects of Forest Practices in Oregon: Literature and Synthesis. Prepared for the Oregon Department of Forestry. Chapter 7.

Christner, J. 1982. Appendix C: Water resource recommendation for controlling the amount of timber harvest in a sub-drainage. Willamette National Forest.

These documents were reviewed and found to contain no new information. Within the EA there is some additional clarification to explain how this information was considered when making the determination of effects.

The following two letters that were addressed to the Regional Interagency Executive Committee were referenced in comments.

> Perry, D. A. et al. 2001. Letter from Scientists to the Regional Interagency Executive Committee. Contains recommendations regarding management of late-successional and old growth forests. September 4, 2001.
>
> Hagen, D. A. et al. 2002. Letter from Economists to the Regional Interagency Executive Committee. Contains recommendations regarding management of late-successional and old growth forests. February 15, 2002.

These two letters do not present new scientific information.

In the letter dated September 4, 2001 the summary states, "we believe the science is clear: saving all remaining LSOG (late succession old growth) significantly enhances the probability of LSOG-dependent species persisting through this period of extreme habitat bottleneck. Moreover, the social and economic scene in the Pacific Northwest has changed sufficiently during the 1990's to make this an acceptable and, judging from the polls, even popular decision. We hope you will give it serious consideration."

The letter dated February 15, 2002 concludes, "that there is insufficient economic justification to warrant further logging of the region's late-successional and old growth forest. We urge you to protect all remaining late-successional and old-growth forest throughout the Pacific Northwest Region."

The authors are mostly environmental scientists, with experience in the Pacific Northwest and expertise that includes conservation biology, disturbance ecology, geomorphology, zoology, ecosystem science and the ecology of lichens, fungi, invertebrates, and mollusks, as well as economists who are familiar with the situation in the Pacific Northwest. The information presented in these letters is not new science since the development of the NFP. The authors present their suggested policy principles and land management recommendations based on their opinion. The NFP considered the issues presented in these letters. The NFP analyzed the probability of maintaining viable populations of organisms as well as the effect to the regional economy. An alternative was considered and evaluated when developing the NFP that did what these letters requested. The Record of Decision and the FEIS for the NFP explains the rational for the decision as well as the trade-offs and risk associated with this decision. The Slinky EA is consistent with the NFP and its standards and guidelines, which address the issues presented in these letters.

The following unpublished papers were referenced by commenters.

> Niemi, E. and A. Fifield. 2000. Seeing the Forest for Their Green; Economic Benefits of Forest Protection, Recreation and Restoration. ECONorthwest and Sierra Club.
>
> Talberth, J. and K. Moskowitz. 2003. The Economic Case Against Logging. available from the Forest Conservation Council, Santa Fe, New Mexico.
>
> Niemi, E., E. Whitelaw and A. Johnston. 1999. The Sky Did Not Fall: The Pacific Northwest's Response to Logging Reductions. ECONorthwest prepared for Earthlife Canada Foundation and Sierra Club of British Columbia.
>
> Lorah, P. and R. Southwick. 2000. Historical Economic Performance of Oregon and Western Counties Associated with Roadless and Wilderness Areas. Prepared by Southwick Associates for the Oregon Natural Resource Council and the World Wildlife Fund.

These papers were reviewed and found to contain no new information. While the information may be interesting it is not within the scope of this analysis. The reports were prepared for or funded by interest groups known to oppose most logging within the National Forest. The issues presented in these documents are not new issues or new information. The Northwest Forest Plan considered these issues.

The following document was referenced by commenters.

> Shipiro, N. 2002. Roads to Ruin, 1,500 miles of destruction; a study on roads, ecosystems and the Mt. Hood National Forest. BARK

This document was reviewed and found to contain no new information. This document surveyed closed "system" roads that have been used by the public in the past. The Slinky project proposes to build a total of 0.4 mile of "temporary" roads, which would never have public travel allowed and only be available on a short-term basis for logging. What this document does capture is the amount of vandalism and illegal use of closed roads on the Clackamas River Ranger District. The analysis shows that roads that have been closed or obliterated that were once open for public use and a specific pattern of use has developed, i.e. hunting or ATV use, are difficult to keep closed with devices such as guardrails. Our ID team members, as well as our road management staff and decision makers are aware of this situation and have been working on solutions.

The document contains the suggestion to cease using guard rail gates for closing roads and instead use a steep berm with ripping of the first 50 feet. This suggestion similar to the method that would be used for closing the Slinky temporary roads upon project completion.

The following research paper has been made available.

> Berlick, M. M., D. B. Kittredge and D. R. Foster. 2002. The Illusion of Preservation: A Global Environmental Argument for the Local Production of Natural Resources. Harvard University. Harvard Forest Paper No. 26.

This document was reviewed. While the analysis conducted in this paper is outside the scope of the Slinky EA, it presents information that supports Northwest Forest Plan goals. It makes an argument for the "local production of natural resources" and puts into context how the proposed action in the Slinky EA may fit into the global environment.

The research points out that the United States and other affluent countries consume vast quantities of global natural resources, including forest products, but contribute proportionately less to the extraction of many raw materials. This imbalance is due, in part, to domestic attitudes and policies intended to protect the environment. It goes on to state that citizens of affluent countries may imagine that preservationist domestic policies are conserving resources and protecting nature, but heavy consumption rates necessitate resource extraction elsewhere and oftentimes under weak environmental oversight. A major consequence of this "illusion of natural resource preservation" is greater global environmental degradation than would arise if consumption were reduced and a larger portion of production shared by affluent countries. It concludes that environmental policy should consider the global distribution and consequences of natural resource extraction. One of the recommended solutions is to encourage a sustainable level of production at the local and regional level.

The following research paper has been made available.

> Helvoigt, T. L., D. M. Adams and A. L. Ayre. 2003. Employment Transitions in Oregon's Wood Products Sector During the 1990's. Journal of Forestry, June 2003.

This document was reviewed. While the analysis conducted in this paper is outside the scope of the Slinky EA, it presents information that supports Northwest Forest Plan goals. 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. At least 30% of those separated from the wood products sector in the less populous southwestern and eastern portions of the state found new employment in the more urban northwestern region. The report expressed a concern that many of those who remained in rural areas are chronically underemployed.

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 September 1998. The project first appeared in the Forest's spring 1998 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 notice was sent to a list of persons and organizations known to be interested in this project. Comments were received on the 2003 proposed action that was made available for its 30-day comment period. Responses to substantive comments are included in Appendix A. A list of persons and organizations that were sent notice is in the analysis file along with a list of commenters and the complete text of comments.

List of Preparers

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 26 years as a hydrologist for the Forest Service in California and Oregon.

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 34 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.

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 23 years.

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 18 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 14 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 10 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 24 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 25 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 25 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 26 years. He is a specialist in the preparation of environmental documents under the National Environmental Policy Act.

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 24 years as a forestry and engineering technician.

Susan Rudisill - Archaeological Technician. Susan has worked for the Forest Service for 20 years. She has served as an Archaeological Technician for the Forest Service for 13 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.

References

Austin, K. and K. Mellon. 1995. Cavity-Nesting Bird Habitat Guide: Western Cascades. Mt. Hood National Forest and Gifford Pinchot National Forest. USDA Forest Service. Pacific Northwest Region.

Beschta, R., et al. 1995. Cumulative Effects of Forest Practices in Oregon: Literature and Synthesis. Prepared for the Oregon Department of Forestry. Chapter 7.

Boleyn, P., E. Wold, and K. Byford. 2002. Created Snag Monitoring on the Willamette National Forest. USDA Forest Service. Pacific Southwest Research Station. Gen. Tech. Rep. PSW-GTR-181. p. 765-775. < http://www.fs.fed.us/psw/publications/documents/gtr-181/056_Boleyn.pdf>

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Hammond, Paul E., K. Manning Geyer, and J.L. Anderson. 1982. Preliminary Geologic Map and Cross Sections of the Upper Clackamas and North Santiam Rivers Area. Department of Earth Sciences, Portland State University.

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Oliver, Chadwick D., and B. C. Larson. 1990. Forest Stand Dynamics. McGraw-Hill, Inc.: p. 83, 84 &105.

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USDA Forest Service. 1990b. Mt. Hood National Forest Land and Resource Management Plan. (Forest Plan).

USDA Forest Service.1995. Upper Clackamas Watershed Analysis. Final Report. Pacific Northwest Region, Mt. Hood National Forest.

USDA Forest Service. 1996. Oak Grove Watershed Analysis. Final Report. Pacific Northwest Region, Mt. Hood National Forest.

USDA Forest Service. 1998a. Final Environmental Impact Statement on Managing Competing and Unwanted Vegetation and the Record of Decision and the Mediated Agreement. Pacific Northwest Region.

USDA Forest Service. 1998b. North Willamette Late Succession Reserve Assessment. Pacific Northwest Region, Mt. Hood National Forest.

USDA Forest Service. 2001a. The *Guide* to Noxious Weed Prevention Practices. 7/2001

USDA Forest Service. 2001b. Memorandum finding no lynx habitat on the Mt. Hood National Forest. August 2, 2001.

USDA Forest Service and USDI Bureau of Land Management. 1994a. Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl (Northwest Forest Plan). Portland, Oregon.

USDA Forest Service and USDI Bureau of Land Management. 1994b. Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl; Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest related Species within the Range of the Northern Spotted Owl (Northwest Forest Plan). Portland, Oregon.

USDA Forest Service and USDI Bureau of Land Management. 2001. Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines. (Survey and Manage Plan)

USDA Forest Service and USDI Bureau of Land Management. 2002. Memorandum on implementation of 2001 Survey and Manage Annual species Review.

USDI Fish and Wildlife Service. 1998. Biological Opinion For The Willamette Province Fiscal Year 1999 Habitat Modification Biological Assessment For Effects To Listed Species.

WDW, Washington Department of Wildlife. 1993. Status of the North American lynx (LYNX CANADENSIS). Unpublished Report, Washington Department of Wildlife. 101p.

Other References

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

GIS shape files:	Snag.shp	(snag data)
	Veg2000.shp	(timber type and age data, elk habitat data, owl habitat data)
	Roads.shp	(road data)
Spreadsheets:	Arp Slinky.xls	(Aggregate Recover Percentage model)
	Cover Slinky.xls	(Deer and elk optimal and thermal cover calculations)
	Econ_altB.xls	(Economic analysis for Alternative B)
	Econ_altC.xls	(Economic analysis for Alternative C)
	Econ_altD.xls	(Economic analysis for Alternative D)
	Open road density Slinky.xls	(Deer and elk open road density calculations)
Text Documents:	Sold Sale Analysis.doc	(Status of bidding on recent timber sales)
	BA_1998.doc	(The Willamette Province, Fiscal Year 1998 Habitat Modification Biological Assessment For Effects To Listed Species)
	Slinky Preliminary Assessment.doc	

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

Text Documents: Biological Opinion For Listed Species, Letter from U.S.D.I. Fish and Wildlife Service, dated September 29, 1998

Lynx Effects Determination memo, dated August 2, 2001

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