United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Tillamook Resource Area Office
P. O. Box 404
4610 Third Street
Tillamook, Oregon 97141

IN REPLY REFER TO:
1790 (086)

November 15, 2002

Interested Public:

The Bureau of Land Management is proposing to implement Alternative 1 of the ReBear Density Management and Watershed Restoration Project which was analyzed in EA (Environmental Assessment) Number OR-086-03-01. This alternative would entail the performance of a variable density management thinning on approximately 443 acres of 42- to 58 year old relatively dense, mixed Douglas-fir and western hemlock stands and the decommissioning of approximately two and one-half miles of road within the Nestucca and Trask River watersheds. This project would occur within Township 3 South, Range 7 West, Sections 5, 7, 8, 11 and 12, Willamette Meridian.

Enclosed for your inspection are the EA and preliminary FONSI (Finding of No Significant Impact). **I encourage you to provide substantive comments in writing regarding this proposed decision and preliminary FONSI on or before December 20, 2002 to Andy Pampush, Project Lead, at the above address.** Comments received will be considered in making the final decision for this project. It is anticipated the decision (i.e., Notice of Sale) for the density management and road decommissioning project would be issued in late September, 2003. Legal notices of this final decision are anticipated to be published in the *Headlight Herald* newspaper of Tillamook, Oregon.

Comments, including names and addresses of those who comment, will be considered part of the public record and will be available for public inspection. Also, names of those who comment may be published as an addendum to the EA. Individual respondents may request confidentiality. If you wish to withhold your name or street address from public review or from disclosure under the Freedom of Information Act, you must state this prominently at the beginning of your written comment. Such requests will be honored to the extent allowed by law. All submissions from organizations or businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses, will be made available for public inspection in their entirety.

For additional information, contact Andy Pampush at the above address or telephone (503) 815-1100.

Sincerely,

Dana R. Shuford

Dana R. Shuford
Field Manager

Enclosure (2)

Rediscover Your Public Lands

# ENVIRONMENTAL ASSESSMENT

## ReBear Density Management and Watershed Restoration Project

OR-086-03-01

November 13, 2002

USDI Bureau of Land Management
Oregon State Office
Salem District
Tillamook Resource Area
Tillamook County, Oregon


| | |
|---|---|
| Responsible Agency: | USDI Bureau of Land Management |
| Responsible Official: | Dana Shuford, Field Manager<br>Tillamook Resource Area<br>4610 3rd Street<br>Tillamook, OR 97141<br>(503) 815-1100 |
| For further information, contact: | Andy Pampush, Team Leader<br>Tillamook Resource Area<br>4610 3rd Street<br>Tillamook, OR 97141<br>(503) 815-1143 |

**Contents**

# CHAPTER 1.0 PROJECT SCOPE

For the reader=s convenience, terms defined in the Glossary are shown in ***bold italics*** the first time they appear within the text of this ***environmental assessment*** (EA).

## 1.1_ Project Location

The proposed project area is located in Township 3 south, Range 7 west, sections 5, 7, 8, 11 and 12. These sections are approximately 12 miles east-northeast of the town of Beaver, Oregon. The project area is generally on the divide between the Nestucca and Trask rivers on the southern fringe of the historic Tillamook Burns.

See attached Project Location maps.

The proposed project is located on ***O&C lands*** (Oregon and California Railroad Land) and are in the ***Late Successional Reserve (LSR), Adaptive Management Area (AMA)*** and ***Riparian Reserve (RR)*** land-use allocation as identified in the ***Salem District Record of Decision and Resource Management Plan (1995),*** also referred to as the ***RMP***. The objectives of the LSR are to protect and enhance conditions of late-successional and old-growth ecosystems, which serve as habitat for late-successional and old-growth related species including the spotted owl and marbled murrelet (RMP page 15). The objectives of the AMA are to develop and test new management approaches to integrate and achieve ecological and economic health. AMAs are intended to restore and maintain late-successional habitat, as well as provide a stable timber supply (RMP, page 19). RR are portions of watersheds where riparian-dependant resources receive primary emphasis. Activities within RR should not prevent or retard the attainment of ***Aquatic Conservation Strategy (ACS) Objectives.*** Since this project would occur within AMA that is overlain with the LSR land use allocation, the LSR objectives would take precedence over AMA objectives where objectives for the two land use allocations conflict ***(Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl(ROD)*** also known as the ***Northwest Forest Plan (NFP)*** page A-5***)***.

As directed by the Standards and Guidelines for the *Northwest Forest Plan* an assessment was prepared for the LSR and is titled the ***Late-Successional Reserve Assessment for Oregon=s Northern Coast Range Adaptive Management Area (LSRA)***. The LSRA describes management objectives and desired future condition for the LSR in which this project would occur. This project would fall within the *Core Mixed Seral* landscape zone and cell as defined in the LSRA**.**

The project would also be located within designated critical habitat for the marbled murrelet and the Northern spotted owl, the evolutionary significant unit for coastal coho salmon and is also in the Upper Nestucca Tier 1 Key watershed.

## 1.2_ Background

In February of 2002, an ***interdisciplinary team*** (***IDT***) from the Tillamook Field Office**,** analyzed LSR lands within the Tillamook Resource Area and produced a preliminary identification of stands that if treated with density management would meet the goals and objectives of the LSR land use allocation within the Resource Area. The areas being considered for the ReBear project rated as high priority for density management that could be implemented in the next 3-5 years. This assessment primarily looked at project types that would require stand manipulation to maintain or improve forest conditions so that they continue on a trajectory toward late-successional forest. In May of 2002, the Tillamook Field Manager selected these areas from a list of potential high priority LSR projects for possible management actions, hereafter called the proposed action, described in Chapter 2. The proposed action contains areas that were previously offered for sale under the project name Borderline Bear Density Management Project. The Borderline Bear project was not bid on at the time of sale. In addition, some of the ***road***s that would be used as part of this project and would be decommissioned at the completion, have been evaluated and analyzed under the *Coastal Road Stabilization and Watershed Restoration, and Storm-Damage Road Repair Projects* EA (EA # OR-086-00-04) and a decision pertaining to the treatment of those roads has been rendered. As such, the affects analysis associated with the decommissioning of previously analyzed roads would not be included in this EA, except in the cumulative affects sections where activities occurring spatially and temporally to the ReBear project are analyzed along with the ReBear project for landscape level impacts. The proposed ReBear project would be consistent with the management opportunities for federal lands suggested in the Nestucca Watershed Analysis (October 1994) by conducting a variable spaced thinning to promote stand diversity and by implementing a prescription that promoted the development of ***Coarse Woody Debris (CWD)***.

Approximately 40 acres of the proposed project would occur within the Trask River watershed for which a watershed analysis which meets BLM standards for content is currently being prepared. The anticipated date of completion for the watershed analysis is August 2003 and the planned implementation (sale) date for the Rebear project if the proposed action is selected would be September 2003. The significance of completing the watershed analysis prior to implementing the project is that a portion of the area within the Trask watershed is riparian reserve and is proposed for density management. According to the Salem District RMP watershed analysis addressing the affects of actions on riparian reserves must be completed prior to implementing harvest actions within the riparian reserves. If watershed analysis were not completed for some reason before the project is expected to be implemented, then actions within the Trask portion of the riparian reserves would not occur.

This EA is intended to provide the Tillamook Field Manager sufficient information for reaching an informed decision and determining whether an action may have significant environmental effects. Should the selected action(s) have significant environmental effects, an ***environmental impact statement*** will be prepared. If the selected action(s) do not have significant environmental effects, ***a finding of no significant impact (FONSI)*** will be prepared.

## 1.3_ Purpose and Need for Action

### 1.3.1 Density Management and Watershed Restoration

Density Management

Portions of the Tillamook burns occurred in the Trask and Nestucca River watersheds in 1933, 1939 and 1945. These fires were followed by salvage logging operations. The result of the fires and subsequent salvage is a mosaic of young forest stands with varying amounts of large Coarse Woody Debris left on the ground. In the absence of an overstory canopy, the younger trees grew rapidly with very close spacing. Today these stands are approximately 40-60 years old. The average diameters of the trees are from 10 to 14 inches with a few trees in the 20 inch range. Within the last ten years, the high tree density has notably reduced the growth rate of the trees and slowed the ultimate development of the desired late-successional forest character. These stands are at the optimal stage for density management since the tree crowns of the potential reserve trees are still reasonably long and therefore in good condition to respond to the reduced competition for site resources. If intervention does not occur soon the individual tree crowns will continue to shorten relative to the height of the tree and make the trees less stable and therefore more susceptible to being wind thrown. Additionally, the stands where the treatment would occur have a light infestation of Swiss needle cast, a native foliage disease that can seriously affect a Douglas-fir trees growth potential. The project would be designed to minimize the potential for negative impacts to the development of late-successional forest habitat by favoring species and individual trees that appear to be more tolerant of the disease. The proposed action would also implement density management in some portion of the RR to foster conditions for rapid tree growth near the ***riparian zone***s since large trees are an important component of riparian systems and function in the system much longer than smaller ones. Much of the proposed action area has western hemlock seedling and saplings in the understory that are waiting to be released, and when released would grow to occupy a second canopy layer, an important component of late-successional forest.

The Bureau of Land Management is managing these stands to eventually function as late-successional habitat. Features of late-successional habitat include: large old trees, a multi-storied canopy, large ***snag***s and pieces of down wood, canopy gaps and a diversity of tree species.

Watershed Restoration

Most of this project is in the Upper Nestucca Tier 1 Key Watershed. Management direction from the RMP requires that the BLM AReduce existing road mileage within key watersheds. If funding is insufficient to implement reductions, neither construct nor authorize through discretionary permits a net increase in road mileage in Key Watersheds@ (Pg.63).

The project area is laced with tractor skid roads and unsurfaced secondary haul roads from the salvage operations of the 1950's. For purposes of evaluating the extent of existing road mileage within the project area, those roads that were constructed for the salvage operations, both for truck haul and tractor skidding, that are still interrupting the natural hydrologic flow regime and preventing optimal vegetative production, are considered to be existing roads known as legacy roads. These roads can potentially pose an erosion hazard if they are deeply cut into the ground, have little vegetation and tend to channel run-off, leading to erosion and gullies.

Other components of watershed restoration include the restoration of large conifers within the RR, which is addressed in Chapter 2 and the input of fresh, decay class 1 and 2, CWD. The project plans to leave some fresh CWD in the action area. Many of the trees in the proposed action stands are too small to be worth leaving as down wood since they tend to decay much faster than large logs. The general strategy for the development of new large CWD will be to allow trees to grow to a larger size before creating new CWD. However, there may be cases where there are trees greater than 20 inches that need to be felled to facilitate the density management activities that would be left on site in order to be consistent with the guidance found in the LSRA pertaining to ***Regional Ecosystem Office (REO)*** criteria exempting certain commercial thinning activities. The exemption criteria found in appendix I.2 of the LSRA requires that if trees greater than 20 inches would be cut and removed then the project is subject to review from REO.

The desired condition is to improve and/or maintain the soil productivity throughout the project area. This could be accomplished through decommissioning most of the existing unsurfaced roads and many of the major skid trails in the proposed action area and reducing the road density in the watershed, as well as following the ***Best Management Practices (BMP)*** as outlined in the RMP (located in appendix C).

### 1.3.2 Project Objectives

By comparing existing resource conditions to desired resource conditions and the management objectives contained in the Nestucca Watershed Analysis, RMP, LSRA and the Northern Coast Range AMA guide, the IDT identified several management opportunities. The following objectives were developed to address those opportunities:

a. Accelerate the development of some late-successional forest characteristics such as large green trees, trees with deformities such as broken tops, large limbs, cavities, large snags, down logs, a variety of species, and gaps in the canopy which provide room for establishment of multiple canopy layers.

b. Within the younger, more densely stocked portions of the project area, improve stand stability, maintain or increase tree growth rates, and prepare the stand for future management.

c. Retain existing desirable habitat features such as snags, trees with deformities and CWD to the greatest extent possible and allow for the development and maintenance of natural processes that produce complex forest features.

d. Add CWD in the early decay classes to some areas to accentuate habitat for those late-successional forest-related species that require early decay class CWD and/or prey base for such species.

e. Include prescriptive consideration for development of large snags that are not available currently by planning to leave a few extra trees per acre now for conversion to snags in the future.

f. Reduce road density and existing levels of compaction by removing roads that are no longer needed. Reduce existing compaction levels when possible.

g. Provide social and economic benefits to local communities by providing opportunities for employment of wildlife and botanical surveyors, equipment owners and operators, equipment and material suppliers, logging contractors, mill owners/operators and their employees and businesses that service all of the above.

h. Implement management actions to maintain the existing watershed condition or lead to improved conditions in the long term, to meet the intent of the ACS objectives.

i. Apply techniques learned through research, adaptive management and monitoring to develop late-successional forest characteristics such as canopy gaps, multiple canopy layers and other structural features desirable to wildlife; and manage those factors that may retard attainment of late-successional forest such as Swiss needle cast.

## 1.4 Proposed Action

The proposed action would consist of a variably spaced density management thinning on approximately 443 acres of 42 to 58 year old mixed Douglas-fir and western hemlock stands. Included in the proposal are aspects of watershed restoration entailing the creation of some fresh CWD**,** and decommissioning of many roads in the project vicinity. The proposed action was specifically designed to achieve the objectives listed in section 1.3.2. A detailed description of the proposed action (i.e., Alternative 1) under analysis in this document is contained in sections 2.2.1.

## 1.5 Decisions to be Made

Dana Shuford, Tillamook Field Manager, is the official responsible for deciding whether or not to prepare an environmental impact statement, and whether to approve the density management and watershed restoration project as proposed, not at all, or to some other extent.

## 1.6 Issues and Units of Measure

In compliance with ***NEPA***, the proposed action was listed in the April and July 2002 editions of the quarterly *Salem District Project Update* which was mailed to over 1,000 addresses, as well as a letter mailed on July 3, 2002 to 124 potentially affected and/or interested individuals, groups, and agencies (Project Record, Document 11). A total of one letter was received as a result of this ***scoping*** (Project Record, Documents 14). This public input was assigned a number and filed in the Project Record. The one comment received pertained to water quality and fisheries and the potential impacts of the proposed action on those resources. The suggestions made by the commentor are essentially consistent with the best management practices for the sorts of projects proposed here, as found in the Salem District RMP. In essence, the consideration of the resources of interest to the commentor and the suggestions made would by design be incorporated into the project.

Considering public comment, the IDT did not identify any ***major issues***. As such, chapter 3 of the analysis will contain a discussion of the standard elements of the environment that are subject to analysis (i.e. vegetation, soil, water, wildlife, including fisheries and air quality). The standard elements of the environment are each associated with a specific unit of measure**.** The ***units of measure*** were selected to evaluate attainment of project objectives, and/or describe environmental impacts.

### 1.6.1 Vegetation

Vegetation resources have been divided into three categories to facilitate analysis. These categories include special status species, noxious weeds, and forest vegetation (within LSR/AMA and RR land use allocations). The units of measure selected are a narrative and/or acres treated.

### 1.6.2 Soil

The units of measure selected include: acres of ***soil compaction*** and a narrative of the effects of an action on soil productivity.

### 1.6.3 Water

The units of measure selected include: a narrative of the effects of an action on water quality and hydrology.

### 1.6.4 Wildlife (including Fisheries)

<u>Wildlife</u>: The wildlife resources have been divided into three categories to facilitate analysis. These categories include wildlife species listed or proposed under the ***ESA***

(***Endangered Species Act***), wildlife species included in the Special Status Species policy covered under BLM Manual 6840, and other wildlife species of concern, including ***survey and manage*** species. The unit of measure selected for each wildlife species listed or proposed under the ESA is a narrative that describes whether there would be: (a) no effect; (b) may affect, beneficial; (c) may affect, not likely to adversely affect; or (d) may affect, likely to adversely affect. The unit of measure selected for the wildlife species included in the Special Status Species policy is a narrative that describes whether an action would result in a trend toward federal listing or loss of population viability. The unit of measure selected for other wildlife species is a narrative.

Critical Habitat: The unit of measure selected for critical habitat of wildlife species listed under the ESA is a narrative that describes whether or not there would be: (a) no effect, or (b) may affect. The may affect finding may result from positive or negative effects. If the may affect finding is the result of a negative impact, the narrative would discuss whether or not the action would result in adverse modification.

Fisheries: To facilitate analysis the fisheries resources have been divided into three categories (i.e, fish species listed or proposed under ESA, fish species listed under **the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) with its requirements for AEssential Fish Habitat@ (EFH)**, and fish species included in the Special Status Species policy covered under BLM Manual 6840. The unit of measure selected for each fish species listed or proposed under the ESA is a narrative that describes whether there would be: (a) no effect; (b) may affect, not likely to adversely affect; or (c) may affect, likely to adversely affect. The unit of measure selected for each fish species listed or proposed under the **Magnuson-Stevens Act** (MSA) is a narrative that describes whether there would be impacts to Essential Fish Habitat (EFH) : (a)would not adversely affect EFH (b) may adversely affect EFH. The unit of measure selected for the fish species included in the Special Status Species policy is a narrative that describes whether an action would result in a trend toward federal listing or loss of population viability.

**Critical Habitat: NMFS designated critical habitat for Oregon Coast coho salmon on February 16, 2000 ; however, the U.S. District Court for the District of Columbia approved a NMFS consent decree withdrawing critical habitat designations for this and 18 other salmon and steelhead populations on April 30, 2002. Therefore, at this time there is no designated or proposed critical habitat for Oregon Coast coho salmon and as such will not be discussed further.**

### 1.6.5 Air Quality

The units of measure selected is a narrative of the affects of an action on air quality.

## CHAPTER 2.0 ALTERNATIVES

## 2.1 Alternative Development

Scoping, as described in chapter 1.6, did not result in the identification of any major issues. Since there were no major issues, there was no procedural requirement to develop additional action alternatives. As such, the alternatives approved by the responsible official on August 15, 2002 (Project Record, Document 17) included the required "no action" alternative and "proposed action" alternative.

## 2.2 Description of Alternatives

*(NOTE: These design features are provided for impact analysis purposes and are assumed to be implemented in the majority of the project area. Some of the design features may be modified during the layout phase of the project should actual on-the-ground conditions warrant, and if determined by the responsible official to be consistent with the Project Objectives identified within Chapter 1.3.2 and within the scope of the analysis contained in Chapter 3. As appropriate, final design features determined during the layout phase will be tracked and documented in the Project Record in order to demonstrate they are consistent with project objectives and within the scope of the analysis.)*

### 2.2.1 Alternative 1 (Proposed Action)

Density management thinning

In order to meet objectives a, b, c, e, and g as described in chapter 1.3.2 above, the proposed action is to implement a variably spaced density management thinning, using a commercial timber sale on approximately 443 acres, in 5 units within the LSR**,** AMA and RR land-use allocations. This initial entry is primarily intended to increase the average tree diameter, increase the growing space dedicated to crown and limb development, and enhance the existing tree species diversity. Density management thinning would greatly increase the rate at which these younger stands developed larger, more windfirm, overstory trees. Thinning would tend to increase the tree crown size and the size of individual limbs. Larger limb size is an important element of marbled murrelet habitat. Larger individual trees would eventually develop into larger size snags and down wood, both of which are lacking in the more recent decay classes. In addition, the project would reserve approximately 10% of the unit areas in unthinned clumps ranging from approximately 1/4 up to several acres and may create canopy gaps up to 1/4 acre in size to provide additional components of stand structural diversity. The project is expected to result in the production of approximately 5.54 ***mmbf*** of commercial timber products. The timber sale would be the tool through which the habitat development work is accomplished. The density management treatments are summarized in Table 1.

Table 1. Treatment Area Summary. This table summarizes the treatment area information associated with the Density Management proposals. Information is based on preliminary treatment area examination.

| Unit | Density Management Treatment Acres (approx) | Potential volume removed | Stand Birth Date | Treatment Description |
|---|---|---|---|---|
| 5-1 | 4 ground-based | 0.048 mmbf | 1961 | Variable spaced thinning would occur to encourage windfirmness, increase tree size, develop larger limb size, and promote stand structural diversity. |
| 7-1 | 134 cable logging | 1.6 mmbf | 1945, 1950 and 1961 | Variable spaced thinning would occur to encourage windfirmness, increase tree size, develop larger limb size, and promote stand structural diversity. |
| 7-2 | 70 ground-based | 0.840 mmbf | 1945 and 1959 | Variable spaced thinning would occur to encourage windfirmness, increase tree size, develop larger limb size, and promote stand structural diversity. |
| 11-1 | 135 cable logging | 1.80 mmbf | 1945, 1950 and 1960 | Variable spaced thinning would occur to encourage windfirmness, increase tree size, develop larger limb size, and promote stand structural diversity. |
| | 5 ground-based | | | |
| 12-1 | 74 cable logging | 1.25 mmbf | 1945, 1950 and 1960 | Variable spaced thinning would occur to encourage windfirmness, increase tree size, develop larger limb size, and promote stand structural diversity. |
| | 21 ground-based | | | |
| total | 443 acres | 5.54mmbf | | |

Specific Treatment Prescriptions

**Density Management Units 5-1, 7-1, and 7-2**

1. Upland Treatments

a. Douglas-fir/hemlock stand, 58 years of age, sections 7 and 8

Approximately 10 percent of the stand would be thinned to an average density of 40 trees per acre. Another 80 percent would be thinned to an average of 90 trees per acre, and the remaining 10 percent, primarily very dense portions of the stand which were not precommercially thinned, would not be treated. The unthinned areas would vary from 1/4 acre up to several acres in size.

b. Douglas-fir stand, 42 years of age, section 5 and 8:

This stand would be thinned to an average of 110 trees per acre. By age 55, the stand density levels would likely be such that another thinning should be considered to maintain stand growth and vigor.

Within each residual density level the spacing between trees would be variable. Some trees would be provided room to grow on all sides, while others would be reserved in clumps of various sizes. A variety of growing conditions would thus be provided for development of all sizes of residual trees and other understory vegetation. Generally, the wider-spaced thinning would be located in areas where the trees are currently least crowded, because trees in those areas are more windfirm, have fuller crowns, and are more capable of responding to an increase in available growing space.

When hemlock is reserved, it would be reserved where possible in various-sized groups or as individual trees surrounded by Douglas-fir reserve trees or old-growth stumps, to lessen the likelihood of logging damage and decrease the potential of annosus root disease transmission via cut stumps and stem wounds.

In areas currently infected with laminated root rot, no treatment is recommended at this time. These openings would continue to provide an element of early successional vegetation and a potential source of snags and down logs within the stand. The patches of red alder that would not have to be removed to provide access into the project area, would also be reserved from cutting.

Treatment would be accomplished using a combination of ground based and cable yarding systems.

2. <u>Riparian Reserve Treatments</u>

Riparian Reserves in these treatment areas are approximately 220 feet in width (slope distance each side of the stream). There are no fish bearing streams within 1/2 miles of the treatment areas and therefore only a one site potential tree height riparian reserve width is prescribed. Within the Riparian Reserves in these treatment units a Ano-harvest[1]@ buffer of approximately 50 feet (slope distance) on each side of intermittent streams and seeps, and 100 feet on each side of perennial streams, and the small wet meadow in the southeast 3 of the northeast 3 of section 7 would be established.

Within the Riparian Reserves, the following treatments are proposed:

a. Retain unthinned areas of the stand dominated by red alder, or the patches of very dense

[1] Within the "no-harvest" buffer there would be trees that need to be cut to allow yarding corridors to pass across them. The number of trees cut would be kept to a minimum and all of the trees would remain on site, i.e. none would be harvested.

conifers which did not receive precommercial thinning. These areas occupy an estimated 60 percent of the Riparian Reserve along the perennial streams.

b. From the outer edge of the Ano-harvest@ buffers (both intermittent and perennial streams) out to the first site potential tree distance (220 feet), thin approximately 75 percent of the areas to be treated to a residual density of not less than 120 trees per acre. Another 15 percent would be thinned to an average of 40 trees per acre in scattered pockets up to 1/4 acre in size, and the remaining 10 percent would not be treated.

Thinning within some parts of the Riparian Reserve is proposed for the following reasons:

Growth rates of the retained trees will be maintained or increased, thus speeding up general stand development and providing larger trees for eventual recruitment of large wood into the riparian area and potentially into the stream itself.

A lighter thinning as proposed, rather than the heavier thinning levels planned elsewhere in the project area, will continue to provide protection for species and communities associated with the riparian zone, while allowing for some level of accelerated tree growth in that zone.

Added diversity of stand characteristics would be provided across the project area by varying treatment types and intensities.

The purposes of the 50- and 100-ft. no-harvest buffers are to assure the protection of water quality and to provide protection for species and communities associated with the riparian zone.

**Density Management Units 11-1 and 12-1**

1. Upland Treatments

   a. Thin the 51-year-old mixed Douglas-fir/western hemlock stand in a variable-spaced manner removing about 44% of the basal area and just over 66% of the trees ≥ 6 inches dhb to achieve an average Curtis Relative Density level of about 34. The target average residual basal area would be 140 sq ft per acre. In this stand type, the anticipated volume of timber harvested as a result of this thinning is expected to be between 15,000 and 16,000 board-feet per acre.

   b. Thin the other 42-year-old conifer-dominated stands by removing approximately 44% of the existing basal area in a variable-spaced manner to achieve a target Curtis Relative Density level of about 34.

The following silvicultural recommendations would guide the implementation of the density management treatment in these units:

Maintain or increase the proportion of western hemlock in the stand and retain those Douglas-fir trees that have the greatest needle retention and greenest color to increase stand resistance to the effects of Swiss needle cast (this is most important for the upper-elevation areas and on south-facing slopes).
Leave primarily the larger-diameter conifers with relatively high live crown ratios and healthy appearing crowns (preferably with live crown ratios exceeding 35%), even at the expense of spacing. These trees will respond most favorably to the thinning and will also be more windfirm.

Because there is a relatively high proportion of western hemlock in the stand and its susceptibility to annosus root disease and other stem decays, various-sized clumps of hemlocks should be established, and where possible, these would be surrounded by Douglas-firs or residual large stumps to reduce logging damage and to break up western hemlock root continuity, which should decrease the potential for future losses from annosus root disease as well as other decay-causing fungi.

Although no western hemlock trees with hemlock dwarf mistletoe were observed, infected trees should be retained because the branch proliferations they produce can provide nesting platforms for marbled murrelets.

Reserve two relatively closely spaced trees (≤ eight feet apart or less) at the rate of approximately two such Agroups@ per acre. At a future date, one of these trees would be converted into a snag, thus creating a "protected" snag for use by wildlife.

Leave unthinned clumps of about 10 to 15 trees at the rate of about one such clump per two acres. Western hemlock would be the preferred species to leave in clumps because of its relative shade tolerance. These larger-sized clumps are not considered as part of the target basal area to remain after harvest.

In general, no reforestation treatments are recommended for the few small scattered areas that are infested with *P. weirii*. These areas are serving as sources of larger down wood and relatively short-lasting snags. In addition, having the infected trees blow over pulling a large part of their root systems out of the ground will help to reduce the spread of the disease. In addition, western hemlock is readily seeding into the openings created by the disease. The most severe and extensive root disease infection observed was in the eastern portion of the project area in section 12. Old-growth Douglas-fir stumps containing the disease along with more recent Douglas-fir windthrow and standing dead Douglas-fir were observed. The root disease in the area south of the Dovre Peak road was especially severe. Western hemlock, western redcedar, and/or hardwoods should be selected as leave trees in areas infected with *P. weirii* root disease. Root disease-caused openings larger than 2 -acre that are not naturally seeding in with less susceptible tree species should be considered for reforestation with less susceptible tree species (western hemlock, western redcedar, or hardwoods).

Reserve large trees with deformities at least in proportion to their occurrence in the stands.

Do not subsoil newly constructed skid roads. Subsoiling skid roads where residual tree spacing remains close has the potential to cause damage to the root systems of trees adjacent to them. Western hemlock is especially vulnerable to such damage because of its relatively shallow root system. The closer the trees are to the skid roads, the greater the potential root damage. If more than one-third of the tree=s root system is injured as a result of subsoiling, the trees will likely experience severe stress and be highly susceptible to attack and killing by opportunistic insects (primarily the Douglas-fir beetle) and diseases (primarily armillaria). When one-half or more of the tree=s root system has been severely impacted, tree mortality is likely.

Plant any subsoiled roads and landings with red alder seedlings (1-0 bare root or one-year-old containerized planting stock) to supplement natural alder regeneration.

2. Riparian Reserve Treatments

Riparian Reserves in these treatment areas are approximately 180 feet in width (slope distance). The nearest fish bearing streams are approximately 700 feet outside of the edge of the proposed treatment unit and therefore only a one site potential tree height riparian reserve width is prescribed within the treatment units. Within the Riparian Reserves in these treatment units a Ano-harvest@ buffer of at least 50 feet (slope distance) on each side of streams and seeps would be established.

Density management is recommended for portions of the stands within the Riparian Reserves, but outside of established Ano cut@ buffers and actual riparian zones. The prescription for the riparian reserves is similar to that prescribed for the upland areas and would maintain a Curtis Relative Density level of $\geq$30 on the average after thinning.

Silvicultural treatment within the Reserves is appropriate to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives found on page B-11 of the Northwest Forest Plan (NFP) (USDA Forest Service and USDI Bureau of Land Management 1994).

The objectives of the 50 foot no-harvest buffers include, but are not limited to the following:

Assure the protection of water quality.

Provide protection for native plant, invertebrate and vertebrate species and communities associated with the riparian zone. This includes adequate thermal regulation, connectivity and a continued source of snags and down wood.

Provide a diversity of stand characteristics across the area.

Treatment of some of the outer portions of the Riparian Reserve (the area beyond the no-treatment buffers) is proposed for the following reasons:

Maintain or increase the growth rates, vigor and crown development of many of the reserve (residual) trees, thus speeding up the general stand development process and providing larger trees for eventual recruitment of large wood into the riparian area and potentially into the stream itself (Curtis Relative Density to be $\geq$30 on the average after thinning).

Provide improved growing conditions for any conifer regeneration present in the understory, and the development or stimulation of vigorous shrub and herbaceous understory layers.

Increase the wind-firmness of the reserve trees within the outer portion of the Riparian Reserves. This will help provide long-term protection for species and communities associated with the riparian zone.

Treatment of the outer portion of some of the Riparian Reserves would add to the long-term diversity of stand characteristics throughout the Riparian Reserves and across the general project area.

Density management of some of the outer portions of the Riparian Reserves and leaving the portions in the Ano-harvest@ buffers untreated will increase the level of structural complexity within the Reserves and would be consistent with the objectives of the Aquatic Conservation Strategy contained in the Standards and Guidelines of the NFP (USDA Forest Service and USDI Bureau of Land Management 1994). Treatment as proposed within the Riparian Reserves would help to maintain and restore: (1) the distribution, diversity, and complexity of the forest types within the watershed while ensuring protection of the aquatic systems; (2) the species composition and structural diversity of plant communities within the Reserves; and (3) a future supply of larger-sized trees, which could become longer-lasting coarse woody debris.

**Features Common to All Density Management Units.**

1. Seasonal Restrictions:
All activities associated with these units would be conducted during the dry season from July 15 until approximately September 30. These dates are estimates only and the actual periods of work would be dependant on the dates when soils are dry enough in early summer to support ground based yarding (but would not be prior to July 8) and when fall rains begin thus ending the harvest season. These seasonal restrictions are prescibed to reduce the degree of soil compaction associated with ground-based yarding that cannot

otherwise be mitigated and to reduce the possibility of increased sedimentation in watercourses and thus maintain water quality; and also to reduce potential noise related impacts to the spotted owl during the critical portion of the breeding season (March 1-July 7). If Bear Creek road is used for hauling, the period available for use may be further restricted if road conditions become such that the Authorized Officer feels that the potential exists for an unacceptable increase in sediment input to Bear Creek. The proposed action would be implemented using the BMPs as described in the RMP. The BMPs are intended to improve water quality and soil productivity, and prevent or mitigate adverse impacts while meeting other resource objectives.

In addition, the following restrictions would apply to the individual units to reduce potential noise related impacts to the marbled murrelet:

a. Units 5-1, 7-1 and 7-2

Because the haul routes to the south (Bear Creek, Elk Creek, Clarence Creek or Bear Ridge roads) would pass within 1/4 mile of unsurveyed suitable marbled murrelet habitat, hauling activities conducted between July 15 and September 15 (coincides partially with the critical and wholly with the non-critical breeding season) would be restricted to the daily time period between two hours after sunrise to two hours before sunset. Haul routes to the north (Trask River drainage roads) would not pass through murrelet habitat and therefore daily time restriction would not be required.

b. Units 11-1 and 12-1

Because the treatment units and the haul routes associated with these units are within 1/4 mile of unsurveyed suitable marbled murrelet habitat, all activities that generate noise above the ambient forest noise level (e.g., brushing roads, felling, yarding, hauling, etc.) between July 15 and September 15 (coincides partially with the critical and wholly with the non-critical breeding season) would be restricted to the daily time period between two hours after sunrise to two hours before sunset.

2. At least one-end suspension of the logs would be required regardless of yarding system. Full suspension of logs would be required within 50 feet either side of the riparian zone (edge of stream channels).

3. Retain all non-merchantable western hemlock saplings in the understory. Many of these may be able to accelerate their growth in response to the increased light following density management and begin the formation of a second canopy layer. Establish the widest overstory tree spacing around patches of western hemlock saplings which will promote their growth and increase the structural diversity of the stands.

4. Retain all hardwood trees to the extent possible through contract stipulation and

administration.

5. Retain and protect to the greatest extent possible green trees with characteristics desirable to wildlife (broken or forked tops, hollow cavities, large limbs, etc.), and all existing snags with the exception of those that pose a safety hazard, and all existing down wood.

6. Retain and protect existing coarse woody debris to the greatest extent possible by reserving trees around high quality clumps of CWD and designing logging systems to minimize disturbance of existing CWD to the extent feasible.

7. Retain all reserve trees greater than 20 inches ***DBH*** that need to be cut to facilitate density management activities on site to augment current CWD levels of Decay class 1 and 2 coarse wood.

8. Log lengths would be limited to 40-feet plus trim to minimize damage to the reserved trees during yarding operations.

9. Reserved trees along skid trails and cable yarding corridors that are damaged during yarding would be retained uncut. A moderate amount of damaged green trees can be beneficial in the development of complex forest structure.

10. If the quantity of slash at the landings is sufficient, it would be made available for public firewood removal permits following the expiration or relinquishment of the purchasers right to the material. Landing debris could also be burned if it is determined by the BLM to be a fire hazard. Burning would be considered in accordance with the Oregon State Implementation Plan and the Oregon Smoke Management Plan.

11. Ground-based yarding areas (slopes less than 35%)

    Operations would be conducted in such a manner as to assure that associated impacts would not exceed those allowed under the Best Management Practices identified in the Salem RMP (Appendix C-2).

    a. No new road or skid trail construction would occur within riparian reserves. Ground-based yarding equipment would generally be prohibited within RR except where the use of winch cable or track mounted equipment with booms, are able to be operated from roads that currently exist with the riparian reserve.
    b. Existing skid trails would be utilized to the greatest extent possible.
    c. Where new skid trails must be constructed, generally they would be spaced at least 150 feet apart and the width would be 14 feet or less, measured between the trunks of the reserved trees. All skid trails would be subject to approval by the Authorized Officer.
    d. **The purchaser may elect to cut and yard by a harvester/forwarder type**

**equipment provided that the following measures are met:**

- **Harvester would have a minimum boom reach of 27 feet and ground pressure rating of 6 psi (pounds per square inch) or less.**
- **Forwarding operations would be restricted to trails approved by the Authorized Officer. Generally, forwarding trails would not exceed 14 feet in total width, and would be spaced no closer than 150 feet apart.**
- **Harvester trails would generally not exceed 14 feet in width, nor be spaced less than 60 feet apart from center to center.**
- **Equipment would be confined to existing skid trails and roads as much as possible, minimize the number of passes, and the created slash from limbing and bucking would be placed onto the skid trails for the harvester and forwarder to walk on.**
- **Yarding would be done with equipment capable of lifting and carrying logs fully suspended off the ground.**
- **Log landings and transfer points would be limited to existing roads and turnouts, unless otherwise agreed to by the Authorized Officer.**

12. Cable Yarding Areas (generally slopes exceed 35%)

    a. Generally cable corridors would be spaced no closer than 150 feet apart at one end and be limited in width to that necessary for yarding, generally 12 feet measured between boles of reserved trees.

    b. All yarding would be done with a carriage equipped skyline system capable of lateral yarding at least 75 feet from the yarding corridor.

    c. To take advantage of the more open stand conditions created where yarding corridors converge near landings, the area within 100 foot radius downhill of the landing would be planted with suitable shade tolerant conifer trees.

    d. The number of landings and their size would be kept to a minimum required to reasonably harvest the units. Landings would be located by the purchaser and approved by the BLM. Generally new landings would be constructed a minimum of 150 feet apart.

13. Road Construction and Improvement

    The proposed action would require the use of approximately 3.8 miles of natural surface roads, in addition to the rocked roads that currently exist in the project area. Road locations would, to the greatest extent possible, re-use the existing legacy roads inside the project area, although approximately 1.5 miles of new natural surface road construction would be required. The additional 2.3 miles of necessary road would be improved legacy roads.

Road clearing limits would typically be 30 feet measured between tree trunks to minimize soil disturbance, disturbance to existing CWD, and canopy openings. These limits will also help reduce the possibility of introduction and spread of noxious weeds. Exceptions to this limit may occur where safety concerns and topography require greater clearing limits, such as blind curves, turnouts and side-slope road cuts. All road improvement and construction would be done in accordance with the Best Management Practices found in the Salem District RMP and the Standards and Guidelines of the ROD.

In order to minimize the number of seasons newly constructed or improved natural surface roads are exposed to wet weather, build or improve only as much road as is necessary to complete harvest activities for a given years dry season (i.e. ABuild-as-you-go@). At the end of each harvest season, all natural surfaced roads and major skid trails constructed or improved for harvest would be blocked to vehicle traffic and waterbarred to minimize sediment run-off.

14. Equipment Washing

Prior to entering the sale area each work season, or before returning to the watershed after leaving it, any heavy machinery (with the exception of log trucks and pickup trucks used for daily personnel travel) would have all dirt and adhering vegetation cleaned from it to prevent the spread of noxious and/or invasive weeds. Mechanically propelled brush cutters would be spray washed, at an approved site, to remove all adhering weed seeds, vegetation and dirt prior to moving into the action area. Machinery would not be washed in an area where run-off could flow into adjacent streams.

**<u>Watershed Restoration</u>**

**In order to meet objective d, e, f and h as described above, the Bureau of Land Management proposes to provide some new CWD to the forest and decommission most of the roads in the project area.**

**1. CWD Augmentation**

**The stands where the proposed action would occur currently have moderate levels CWD with 86% of it in decay class 4 and 14% in decay classes 1,2 and 3. The greatest majority of the CWD is in the form of down wood. These stands are currently in mid-seral stage and are composed of relatively small trees, therefore there is currently very little opportunity to create high quality decay class 1 and 2 large down wood and snags. Therefore the proposed action would implement Coarse Woody Debris Management Strategy #2 found on page 97 of the LSRA. Strategy #2 strives to balance long-term and short-term needs by supplying a steady input of CWD over time and by allowing most trees intended for CWD to grow larger before being converted to either a snag or a down log. At this time the stands where the proposed action would occur would benefit**

**most by growing trees larger before inputting large quantities of fresh CWD. Consequently, the proposed action would only input a little at this time by leaving those trees greater than 20 inches DBH that are necessary to cut to facilitate the density management action, all of the trees cut for yarding corridors through Ano-harvest@ riparian buffers, and by leaving all of the reserved Arub@ trees that are damaged by the harvest operations (See *Features Common to all Density Management Units* above).**

2. Road Decommissioning

Upon completion of the project all of the natural surface roads and many of the tractor skid trails would be decommissioned by decompacting the road surface (subsoiling), water-barring where appropriate and blocking to vehicle and ATV traffic; and approximately one mile of existing gravel road would be decommissioned according to specifications found in the *Coastal Road Stabilization and Watershed Restoration, and Storm-Damage Road Repair Projects* decision. The net decrease in road density at project completion would be approximately 2.8 miles. **The proposed road work is summarized in Table 2.**

**Table 2. Summary of Road Work Associated with Proposed Action**

| Unit Number | New Temporary Road Construction (mi.) | Road Improvement (mi.) * | Roads Decommissioned (mi.) | Net Road after completion of the project (mi)** |
|---|---|---|---|---|
| 5-1 | 0 | 0 | 00 | 0 |
| 7-1 | 0.75 | 1.5 | 2.6 (includes an additional 1,500 ft existing road not used by the project) | -1.9 |
| 7-2 | 0.1 | 0.05 | 0.25 | -0.05 |
| 11-1 | 0.5 | 0.25 | 0.75 | -0.25 |
| 12-1 | 0.15 | 0.5 | 0.60 (includes an additional 500 ft of existing road not used by the project) | -0.6 |
| Total | 1.5 | 2.3 | 4.2 | -2.8 |

*** Roads that are Aimproved@ are existing roads that need to be brought up to standard to meet logging operations needs and construction standards. Most of these roads are from the previous salvage logging operations, are easily discernible on the ground, and are still compacted, these roads are also known as legacy roads.**
****All roads used will be decommissioned after the density management project is completed. Compaction levels are**

**assumed to return to near pre-construction levels.**

### 2.2.2 Alternative 2 (No Action)

The BLM would not implement the density management and watershed restoration project at this time. The local plant and animal communities would be dependent on and respond to ecological processes that would continue to occur based on the existing condition.
This alternative serves to set the environmental baseline for comparing effects of the action alternatives.

## CHAPTER 3.0 AFFECTED ENVIRONMENT and ENVIRONMENTAL CONSEQUENCES

### 3.1 Introduction

This Chapter shows the present condition (i.e., affected environment) within the project area and the changes that can be expected from implementing the action alternatives or taking no action at this time. The Ano action@ alternative sets the environmental base line for comparing effects of the action alternatives. The environmental effects (changes from present baseline condition) that are described in this chapter reflect the elements of the environment ( vegetation, soil, water, wildlife, including fisheries and air quality). For those other resources or values which review is required by statute, regulation, Executive Order, or policy, Appendix 1 contains the appropriate documentation as to the effects of the proposed action on those resources or values.

For a full discussion of the physical, biological, and social resources of the Salem District, refer to the FEIS (Final Environmental Impact Statement), dated September, 1994, for the Salem District Resource Management Plan. The discussion in this document is site-specific and supplements the discussion in the FEIS.

### 3.2 Vegetation

The proposed project area consists of 42-55yr old Douglas-fir *(Pseudotsuga menziesii*) forests. They are densly stocked stands creating a canopy closure of 60-80%, with Western hemlock (*Tsuga heterophylla*) as a common species often attaining canopy dominance through out all units. Areas of less significant canopy density commonly contained well established mixed stands of red-alder (*Alnus rubra*), big-leaf maple *(Acer macrophyllum*), and western red cedar (*Thuja plicata*). All units are mesic with gentle to steep slopes from 5 to 20% with the exception of one unit which contained slopes up to 80 %. The dominant under story species is vine maple (*acer circinatum*). The abundance of *Acer circinatum* is directly related to canopy density. Many of the units have abrupt stand edges bordering a clear-cut, young stands and/or roads. common under story species such as *Alnus rubra*, *acer macrophyllum*, *Acer circinatum,* *Holodiscus discolor, Corylus cornuta, Polystichum munitum, Berberis nervosa, Gaultheria shallon and Pteridium aquilinum* were found in abundance along these edges, canopy gaps, moist draws and riparian areas.

The majority of the areas contain riparian habitat. The stand composition of this habitat area changed to *Alnus rubra*, *Acer macrophyllum*, *Acer circinatum*, *Polystichum munitum*, *Oxalis oregana*, *Oplopanax horridum* and occasionally *Lysichitum americanum*, *Pseudotsuga menziesii*, *Tsuga heterophylla* and *Thuja plicata*.

Draws, steep ravines, and shallow gullies are common throughout the project areas. These features allow for a thicker under story and shrub layer due to the patchiness in the canopy.

The total botanical species richness of the project area based on complete vascular plant, lichen and bryophyte surveys is 92 species. The mosses and liverworts were generally more diverse than the lichens throughout the survey area. The areas of greatest diversity are always in stands with a dense *Acer circinatum* under story as well as in moist/mesic sights with decay class 4-5 logs common and canopy closure <70%. The diversity of micro habitat is greater within the larger, non-fragmented units allowing for a greater richness and diversity of lichen and bryophyte species.

### 3.2.1 Special Status Species .

#### 3.2.1.1 Affected environment

Botanical surveys for Lichens, Bryophytes and Vascular plants at the Re Bear project area began in September 2001. Special status plant species surveyed for included: Species listed under the BLM Manual 6840 policy, Survey & Manage Species listed under the Salem District RMP as amended by the 2001 Annual Species Review as provided for in the *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines* (January 2001) also known as the S&M ROD, and threatened or endangered (T&E) species listed under the Endangered Species Act. Surveys were conducted to protocol. No special status or survey and manage species were found. Survey records are available for review upon request at the Tillamook Resource Area field office.

#### 3.2.1.2 Environmental Consequences

##### 3.2.1.2.1 Alternative 1 (Proposed Action)

In this alternative ground base and cable yarding would be used as harvesting techniques. Ground base yarding can be expected to disturb the litter layer, soil, and coarse woody debris to a greater extent than would cable yarding. Because most of the species the S&M program is concerned with are found to grow on those substrates, there would be the potential to negatively impact them by implementing the proposed action. However, since no Special Status Species, T&E or S&M species were found by the field surveys, the proposed action would not have any effect on those species.

##### 3.2.1.2.2 Alternative 2 (No Action)

No impacts to Special Status Species would be expected to occur under this alternative.

### 3.2.2 Noxious Weeds

#### 3.2.2.1 Affected Environment

Botanical surveys for Noxious weeds at the Re Bear project area began in August 2001. All noxious weeds identified within the project area are Priority III, *Cirsium vulgare*, *Cytisus scoparius*, *Senecio jacobaea*, *Rubus discolor*, *Hypericum perforatum*. These weed species are commonly found throughout Western Oregon. ***New road construction*** and other ground-disturbing activities offer the most likely places for noxious/exotic weeds to become further established. Some degree of noxious/exotic weed introduction or spread is probable as management activities occur in the project areas. Skid trails, landings, and bank stabilization, (soil disturbance), would be the most likely places for weed establishment

#### 3.2.2.2 Environmental Consequences

##### 3.2.2.2.1 Alternative 1 (Proposed Action)

Most Priority III noxious weed species found were located along existing roadways. Initial increase in population size and new establishment should be confined to disturbance areas as described above in Aaffected environment@ and would be expected to decrease over time as native species re-vegetate and the recovery of canopy closure occurs. The noxious weed species identified do not tolerate overtopping and can be negatively affected by competition for light.

##### 3.2.2.2.2 Alternative 2 (No Action)

Most Priority III species found were located along existing roadways. No appreciable increase in the noxious weed populations identified during the field surveys is expected to occur.

### 3.2.3 Forest/Riparian

#### 3.2.3.1 Affected Environment

**Forest health**

There are no major threats to forest health in this portion of the area proposed for density management treatment. Laminated root rot, caused by the fungus *Phellinus weirii*, is a native root pathogen that is a natural part of many forest ecosystems (Thies and Sturrock 1995). *P. weirii* probably affects about 5 percent of the area. Douglas-fir and grand fir are highly susceptible to *P. weirii*, (they are readily infected and killed by it); western hemlock is intermediately susceptible; western redcedar is tolerant or resistant; and all hardwoods are immune (Hadfield et al. 1986). *P. weirii* kills trees directly or makes them prone to windthrow because the disease decays their root systems. Diseased stands usually contain twice as many infected trees as those that are dead or exhibiting crown symptoms (Thies 1984). Tree-to-tree spread is through root contacts with infected trees or stumps (Hadfield et al. 1986). Disease centers are believed to expand radially at the rate of about one foot per year (Nelson and Hartman 1975). *P. weirii* attacks susceptible hosts regardless of tree size, age, or vigor.

Tree killing by *P. weirii* creates openings in the canopy where shrubs, hardwoods, or shade- and disease-tolerant conifer species may occupy these various-sized gaps (Thies and Sturrock 1995). Because infected trees are windthrown or die standing, the disease can be a source of down wood and snags. Most disease centers appear to be less than **3**-acre size and appear to be increasing the level of diversity within the stand. The most severe and extensive root disease infection observed was in the eastern portion of the project area in section 12. Old-growth Douglas-fir stumps containing the disease along with more recent Douglas-fir windthrow and standing dead Douglas-fir were observed over several acres. The root disease in the area south of the Dovre Peak road was especially severe. Western hemlock dominates the species composition in this area and appears to have increased as Douglas-fir has been gradually falling out of the stand because of the disease.

Fresh down Douglas-fir trees encourage the build-up of Douglas-fir beetle populations, which subsequently attack and kill Douglas-fir trees. Douglas-fir trees weakened by root disease infection are more likely to be attacked by the Douglas-fir beetle (Hadfield 1985). When the number of windthrown Douglas-fir trees greater than 12 inches in diameter is three or more per acre, the numbers of beetles produced is sufficient to cause infestation and mortality of standing live Douglas-fir trees (Hostetler and Ross 1996). Based on past windthrow events, they estimate that the number of live standing trees infested and killed by Douglas-fir beetles will be approximately 60% of the number of infested down trees.

Swiss needle cast was observed on Douglas-fir in these stands. The disease severity level tends to vary within the stands, with trees showing the greatest symptoms occuring on ridgetops and southern exposures. Overall, the level of Swiss needle cast disease appeared to range from low (2.6 to 3.5 years of foliage retained) to moderate (1.6 to 2.5 years of foliage retained). Relatively light thinning (density management) and retention of non-Douglas-fir species is a recommended silvicultural treatment for such stands (Filip et al. 2000).

Annosus root disease, caused by *Heterobasidion annosum*, may result in substantial butt decay in western hemlock that is over 150 years old, and mortality resulting from stem breakage (Buckland et al. 1949, Foster et al. 1954). Spores of the fungus colonize freshly exposed wood on stump surfaces and stem wounds, and then the disease spreads to adjacent healthy trees most commonly by root contacts (Hadfield et al. 1986). Although the rate of disease infection was nearly twice as high in commercially thinned 40- to 120-year-old western hemlock stands in western Oregon and Washington compared to unthinned stands, losses due to decay were very low (Goheen et al. 1980).

There is some risk of windthrow from severe winter storms, or to some extent, wildfire. Following partial-cut harvest, the potential for windthrow would be greater for the next decade (generally the first few years following density management). The upper lee slopes of major southeast- to northwest-running ridges generally experience the highest degree of windthrow in the Oregon Coast Range.

**<u>Section 11 and 12</u>**

**Overstory stand conditions**

According to the stand exam data collected in 1998, the majority of the proposed treatment area supports a dense 51-year-old mixed Douglas-fir/western hemlock stand (Table 1). The species composition of trees $\geq$6 inches and greater in diameter at breast height (dbh) by basal area averages about 63% Douglas-fir and 37% western hemlock, and the species composition by trees per acre is approximately 53% Douglas-fir and 47% western hemlock. Red alder is generally a minor stand component. There is considerable variation in the relative proportions of Douglas-fir and western hemlock throughout the stand, however. The stand has an estimated Curtis Relative Density value of 81, indicating that trees are competing quite strongly with each other for the available site resources. The majority of the stands appears to have been precomercially thinned, which increased the average tree diameter and enhanced the ability of the trees to respond favorably to density management at this time. Average live crown ratio of the Douglas-fir trees is about 34% and the average crown ratio of the western hemlock trees is about 49%, with the overall crown ratio averaging about 42%. The overstory canopy has now nearly closed, as indicated by crown closure values ranging from 81 to 89%. The diameter growth trend of the dominant trees seems to be slowing down as tree-to-tree competition intensifies because of increasing stand density. No stand data was collected for the well-stocked 42-year-old mixed western hemlock/Douglas-fir stands in sections 11 and 12, and for the well-stocked 57-year-old Douglas-fir stand in the northern portion of the area proposed for treatment in section 11. Visual observation of these stands, however, indicates that are also quite dense, but should respond favorably to density management at this time, and therefore, should be considered as part of the proposal.

Table 3. Current stand attributes for the dense 51-year-old mixed Douglas-fir/western hemlock stand in the ReBear Density Management Project.

| Stand component | Quadratic mean diameter (in.) | Trees/ ac | Basal area/ac ( sq ft) | Curtis Relative Density |
|---|---|---|---|---|
| Western hemlock ≤ 6 inches dbh[1] | 2.3 | 188 | 5 | --- |
| Douglas-fir and western hemlock ≥ 6 inches dbh | 13.1 | 270 | 252 | --- |
| Total | 10.1 | 458 | 257 | 81 |

[1]Diameter at 4.5 feet above ground level (breast height).

The stands occupying the riparian zone along permanent stream in the northwest portion of section 11 generally do not appear to need density management treatment. The density is less than in the surrounding stands, there is a mixture of conifers and hardwoods, and there are concentrations of large wood in and along the stream channel. The 50-year-old mixed red alder/Douglas-fir stands in the north-central portion of Section 12, generally are not in need of thinning. Most of these areas are generally fairly moist, there are scattered larger-sized conifers that are above the alder canopy, and this stand type adds to the overall level of diversity in the area.

**Understory trees, shrubs, and herbs**

There is an average of nearly 190 understory conifers per acre with an average dbh of 2 inches in the 51-year-old mixed Douglas-fir/western hemlock stand. Almost all of there understory conifers are western hemlock. Included in this total are an average of 63 understory western hemlock trees per acre that average about 11 feet tall. Many of these trees should respond favorably to the reduced overstory density provided by the proposed density management treatment and help to enhance the vertical structure of the stands. Thinning the overstory will encourage additional western hemlock seedlings to become established. The density of the understory conifers varies throughout the stand. There are also occasional western redcedar trees in the understory. Swordfern, red huckleberry, vine maple, and salal are the most common non-conifer understory species. Non-conifer understory cover averages between 15 and 35%. Density management of this stand would stimulate growth of these understory species, particularly vine maple, further contributing to the structural diversity. Salmonberry occurs near streams, and in other lower slope positions in the 50-year-old mixed red alder/Douglas-fir stands.

**Coarse woody debris**

The weighted average total conifer coarse woody debris levels (includes both down wood and snags) is 1,873 cubic feet per acre, which is near the upper end of the moderate level (1,100 to

1,980 cubic feet per acre) for stands within the age ranges included in the proposed treatment area, according to Table 24 in the Late-Successional Reserve Assessment for Oregon's Northern Coast Range Adaptive Management Area (USDA Forest Service and USDI Bureau of Land Management 1998). The weighted average total down wood quantity in pieces greater than or equal to 5 inches in diameter at the point of intersection and 16 feet in length is 1,751 cubic feet per acre, with 86% of this volume in decay class 4, and 14% in decay classes 1, 2, and 3. Most of the decay-class 4 coarse woody debris, however, is relatively large. Examination of the size-class distribution of the down wood data indicates that the majority of the volume is in pieces averaging between 20 and 31 inches in diameter. The source for much of the relatively large-diameter down wood appears to be snags that were felled for fire prevention following the Tillamook burn. The majority of the recent down wood being contributed tends to be from occasional, larger-sized windthrown Douglas-fir trees have been added to the site as a result of *Phellinus weirii* root rot infection.

There is a weighted average of about 10 conifer snags per acre that average about 12 inches dbh and just over 45 feet in height. These snags are in decay classes 1, 2, and 3 and are most likely smaller-sized Douglas-fir trees that have died as a result of suppression by the overstory trees or have been killed by root disease. Total snag volume averages 122 cubic feet per acre. In addition, there are an average of approximately 9 conifers per acre between about 9 and 12 inches dbh with top damage caused by ice and snow that may become snags in the near future. The weighted average volume for these ice- and snow-damaged trees is 226 cubic feet per acre.

## Section 5, 7 and 8

This portion of the project area encompasses approximately 240 acres, and is located in the headwater areas of Bear Creek and Elk Creek. Elevation ranges from about 2,160 to about 2,460 feet, with a wide variety of slopes ranging from over 90% (including a few short pitches that are nearly vertical) on the southwest face of the prominent northwest- to southeast-running ridge in the southwest part of the treatment area to 30% or less on portions of the rather broad east- to west-running ridge along the northern boundary of section 7 and the lower slope positions. Overall, slopes probably average 40 to 50%.

Soils appear to be productive, moderately deep, and silt loam in texture, except on the steeper south- to southwest-facing slopes where there is a significant component of coarse fragments. Old skid trails occur throughout most of the area. After 40 years, soils on these trails are still exhibiting evidence of compaction. There is a tremendous amount of large decaying logs on the forest floor, except for the relatively small portion of the area in section 5. The primary source of this wood was the old-growth snags that were felled during salvage logging operations following the Tillamook burn. In addition, there is still some small wood on the ground in places from the precommercial thinning that occurred about 25 years ago.

### Stand history and description

The northern portion of the proposed treatment area in section 7 appeared to have been heavily impacted by the Tillamook burn in 1939. This fire also appeared to have affected approximately 25% of the southern portion of section 7 as well. The old timber sale records for the area indicate that most of the portion within section 7 was logged between 1941 and 1943, and again between 1956 and 1957. A combination of fire-killed timber (which included a small percentage of beetle-killed timber), and green timber was harvested under these timber sales. Advance regeneration was noted in 1943.

The area included in section 5 appeared to have been impacted by the both 1939 and 1951 fires. Harvest of fire-killed Douglas-fir was done in 1948, and another timber sale contract for Douglas-fir salvage was completed during 1956 and 1957.

The portion of the proposed treatment area in section 8 was probably impacted only by the 1951 fire. In 1956 to 1958, a combination of salvage and green Douglas-fir was harvested from this area.

In the 1940's, the logging was probably done with a cable system. In the 1950's, the logging was done with crawler-tractors.

The entire area was aerially seeded with Douglas-fir in 1958 to 1960. The seed was apparently collected from mid-elevation sources in the vicinity of Vernonia, Oregon. Because of inadequate stocking in section 5, the area was also planted with Douglas-fir in 1962. A more detailed account of the history of this area is available at the Tillamook Resource Area Office.

The current 57-year-old Douglas-fir/western hemlock forest stand that encompasses most of the area (approximately 78%), probably originated from a combination of mostly natural regeneration and some aerial seeding. The 42-year-old Douglas-fir stand in section 5 and the north part of section 8, which comprises about 17% of the area, however, probably regenerated mainly from the aerial seeding and planting efforts.

There are generally three distinct forest types represented within the proposed treatment area in section 7 and most of section 8. There are approximately 200 acres included in this portion. The majority (perhaps as much as 80% or more) is a 57-year-old, even-aged Douglas-fir/western hemlock stand that was precommercially thinned about 25 years ago. In the precommercial thinning, Douglas-fir was favored for retention, but because there appeared to have been a large proportion of hemlock regeneration in the stand, it is still a major stand component. The residual trees responded well to the thinning, but growth rates have been slowing down over the past 10 years or so because of strong tree-to-tree competition.

Typically this stand type contains about 125 Douglas-fir trees averaging 14 inches DBH and about 120 western hemlock trees averaging 13 inches DBH. Occasionally, red alder occurs as a very minor stand component. The overall density is too high to maintain maximum stand volume growth and vigor for both species. The diameter growth of a small sample of the dominant Douglas-firs averages 3.3 inches (range 1.8 to 5.3 inches) over the past 10 years. For the most part, the trees are fairly uniform in size and in spacing, and form a single canopy layer. The relative proportions of Douglas-fir and hemlock vary throughout, with Douglas-fir tending to be more abundant on the drier south-, southwest-, and west-facing slopes. As a result of the precommercial thinning and the abundance of down wood on the forest floor, hemlock advance regeneration is common. Most of it is less than 5 to 6 feet tall and because it has persisted for many years under a relatively dense overstory, much of it appears to have lost epinastic control, so its ability to resume normal growth following release is questionable. In addition, because of the very limited amount of light reaching the forest floor, there are few understory shrubs and herbs.

Old-growth Douglas-fir stumps (most of which are well over 50 inches in diameter) are common throughout the area. A small survey of the stumps of the old-growth Douglas-firs that appeared to be reasonably sound at the time of harvest indicated that the spacing between the trees was highly variable and averaged about 46 feet, with a range of 25 to 75 feet.

Imbedded within this matrix of even-aged Douglas-fir/western hemlock are the two other forest types, both of which contribute significantly to the overall diversity of the area. Between 10 and 15% of this area consists of extremely dense, slow-growing conifer patches that were not treated during the precommercial thinning. These trees have relatively low crown ratios and high height/diameter ratios, indicating stand instability. These areas are often supporting over 830 trees per acre, with an average stand diameter of about 9 inches. Because of the very high density, there is no understory vegetation and the stand is actively self-thinning. The diameter growth rate over the past 10 years, even for some of the dominant Douglas-firs, was only 0.8 inches.

In addition, patches of red alder (approximately 5% of the area) dominate old skid roads and landing areas, and disturbed moist sites near streams. The alder appears to be about 40 years old. These alder patches are also currently serving to encourage large limb development of the surrounding conifers and will affect the distribution pattern of conifers in the future. These alder stands contain over 500 stems per acre that average about 8 inches DBH. Together, the very dense conifer and the alder stands provide a sharp contrast to the rather uniform Douglas-fir/hemlock stand that dominates the area. Also, there are some areas where the conifers established and grew at a rather low density (less than 100 trees per acre). These trees have relatively large diameters (average 17 inches) and high live-crown ratios (typically more than 50%).

Four stand types occur in the portion occurring in section 5 and the north part of section 8. Approximately 40 acres are contained within this portion. Three stand types are dominated by 42-year-old Douglas-fir, and comprise about 90% of this area. A small portion of the area (about 4 to 5 acres) consists of relatively open-grown trees. Because of their open-grown condition, these trees often have crown ratios of more than 60%. Laminated root rot, caused by *Phellinus weirii*, appears to be responsible the low stocking in this area (about 150 trees per acre averaging about 14 inches DBH). A large part of the area is well stocked. Typically, there are nearly 320 trees per acre averaging 11 inches DBH. Diameter growth has slowed over the past 5 years, and the density is now above the level where stand growth and vigor are maintained. The understory here is very sparse. Live crown ratios on the larger trees average 35% or more and those of the smaller trees average 25% or less. In places, there are areas that are extremely dense (1,200 stems per acre averaging 7 inches DBH). There is not enough light to support any understory vegetation and the areas are actively self-thinning. Disturbed moist sites (less than 10% of this area) support stands of red alder similar to those described for the portions in sections 7 and 8.

The project area contains two main perennial 1st- and 2nd-order streams. Where past disturbance occurred, red alder is a major, often dominant, stand component of the associated riparian areas. However, the great majority of the riparian areas have a large component of conifers, and the streams have an abundant supply of large wood in them. Therefore, no silvicultural treatments were considered to increase conifer stocking in these areas. In addition, there is a wet meadow, about 1/4-acre in size, in the northeast part of section 7 that adds to the overall diversity of the area.

## Stand exam data

A detailed stand exam covering 160 acres of the proposed treatment area in section 7 was conducted in May, 1994. Results for this area as a whole are summarized in Table 1. Additional stand data for the Douglas-fir stands in section 5 and the northern portion of section 8 were collected in February, 1995.

The 50-yr site index (King 1966) is 124 ft, which is higher than average for the local area. The Relative Density for the area is 73, indicating that the density over the area as a whole is high. The live crown ratio for the entire area averages 26%, which is rather low. However, the larger Douglas-firs (19 to 26 inches dbh) have crown ratios ranging from 36 to 56%, and the larger western hemlocks (14 to 27 inches dbh) have crown ratios ranging from 35 to 75%. These trees should be able to respond fairly rapidly to release. Although not specifically measured during the stand exam, the canopy closure appears to be over 95% in most areas. The lack of snags is quite apparent, especially in areas that were precommercially thinned.

Table 4. Summary of stand exam data collected in section 7 of the Bear Creek proposed project area.

| | Tree species | | | | |
|---|---|---|---|---|---|
| Element | DF[1] | RA[2] | WRC[3] | WH[4] | All |
| Trees/ac | 146 | 20 | 1 | 117 | 284 |
| Trees/ac (%) | 52 | 7 | < 1 | 41 | 100 |
| Basal area/ac | 158 | 11 | < 1 | 93 | 262 |

| | | | | | |
|---|---|---|---|---|---|
| Basal area/ac (%) | 60 | 4 | < 1 | 36 | 100 |
| Net MBF/ac | 28.9 | 1.7 | < 1 | 13.6 | 44.2 |
| Net MBF/ac (%) | 65 | 4 | < 1 | 31 | 100 |
| Quadratic mean diameter[5] | 14.1 | 10.2 | 11.0 | 12.1 | 13.0 |
| Average tree height (ft) | 83 | 63 | 64 | 70 | 76 |

[1]Douglas-fir. [2]Red alder. [3]Western redcedar. [4]Western hemlock.
[5]Diameter of the tree of average basal area.

### 3.2.3.2 Environmental Consequences

#### 3.2.3.2.1 Alternative 1 (Proposed Action)

As a result of thinning these stands, the average stand diameter would increase, crown ratios and limb development of the residual trees would increase, growth of understory shrubs and herbs would be stimulated, windfirmness of the residual trees would increase, and mortality of the smaller-sized trees would decrease. By thinning in a variable-spaced manner, some trees would be given more room to grow and others would be given less. This would increase overstory canopy heterogeneity and result in a more uneven pattern of understory development. Because of the abundant western hemlock seed source and quantity of large decay-class 4 down wood on the site, the proposed density management treatment should result in a substantial increase in western hemlock reproduction and stimulate the development of a second canopy layer. The larger-sized trees retained would result in higher quality down logs and snags as the trees eventually die or are converted to snags or down logs through planned management actions. As an on-site demonstration of the growth-promoting effect that density management could have in these stands, we observed Douglas-fir trees surrounding an opening created by *P. weirii* that had wide, long (50% live crown ratios), and full crowns. These trees had responded to the release provided by these openings and contrasted rather sharply with the similar-aged trees in the intact stand. In a study of operational thinnings in western Oregon, Bailey and Tappeiner (1998) found that thinning initiates and encourages tree regeneration, shrub growth, and multi-storied stand development even though the treatments were primarily done to manage the overstory density and spacing.

Table 5. Comparison of trees per acre, basal area per acre, quadratic mean diameter, Curtis Relative Density, and mean crown ratio for trees ≥6 inches dbh in the 51-year-old mixed Douglas-fir/western hemlock stand in selected stands of the ReBear Density Management Project with and without treatment over time as projected by ORGANON (Hann et al. 1997).

| | Trees/ | Basal area/ | QMD | Curtis Relative | Mean crown |
|---|---|---|---|---|---|

| Stand condition and age | acre | acre (sq ft) | (in)[1] | Density[2] | ratio |
|---|---|---|---|---|---|
| Pre-treatment at the present time (age 51years) | 270 | 252 | 13.1 | 81 | 0.42 |
| No treatment after 25 years (age 76 years) | 226 | 339 | 16.6 | 86 | 0.26 |
| Post-treatment at the present time (age 51 years) | 91 | 140 | 16.8 | 34 | 0.40 |
| Post-treatment after 25 years (age 76 years) | 90 | 239 | 22.2 | 51 | 0.32 |

[1]Quadratic mean diameter. [2]Determined for all trees in the stand.

#### 3.2.3.2.2 Alternative 2 (No Action)

**Stand development prognosis without density management**

The density of these mixed Douglas-fir/western hemlock stands proposed for density management is relatively high, as indicated by a Curtis Relative Density level of up to 81. It is anticipated that the density of these stands will continue to increase and eventually stabilize at a very high level without density management treatment. Projections using the growth and yeild model, ORGANON (Hann et al. 1997) show this as well. Stand projection data indicates that the Curtis Relative Density level will reach 86 after 25 years without thinning.

Above Relative Density 55, Douglas-fir growth and vigor begins to decline as tree-to-tree competition intensifies. Development toward late-successional forest conditions in these stand types is expected to continue to slow unless some form of disturbance occurs that creates openings in the stand to permit accelerated growth of some overstory trees and provides an opportunity for understory trees, shrubs, and herbs to develop. When the level of competition among the trees remains high, live crown ratios will decrease, diameter growth can be expected to decline, competition-related mortality will increase, coarse woody debris additions will be from the small trees that slowly die from suppression (except in a few small areas where *P. weirii* infection has resulted in windthrow of some larger-sized Douglas-fir trees), and further understory development will be limited.

## 3.3 Soil

### 3.3.1 Affected Environment

The project area is composed of low rugged mountainous ridges and sideslopes, bench mid-slopes, and narrow valleys.  Elevations range from 1,900 to 2,700 feet.   Units 5-1, 7-1, 11-1 and 12-1 are located mainly on ridgetops and upper sideslopes and with multiple aspects.  Slopes generally range from 5 to 60% however there are a few small, scattered areas with short, steep slopes up to 85%.  The northeast part of Unit 12-1 is located on broken terrain with small narrow drainages. Unit 7-2 consists of old inactive, rolling slump/earthflow terrain with predominantly westerly aspects.  The terrain is strongly undulating with slopes ranging mostly from 4% to 30% and there are several short (less than 100 feet) steep (50 to 60%) slopes.

The predominant soils within the project area are the Murtip, Caterl, and Hemcross soil series. They developed from basalt, diorite or breccia with a component of volcanic ash.  They are 20 to 60 inches in thick, textures are mainly loam, gravelly loam, or silt loam and are well-drained soils.  High organic matter and volcanic ash contents make these soils low in bulk density, high in porosity, and low in strength.  There are also small inclusions of poorly drained soils and shallow gravelly/rocky soils.  Much of the area is covered by large quantities of coarse woody debris (CWD. Soils are easily detached and have a severe erosion risk to sheet and rill erosion on slopes greater than 35% when more than half of the affected area is in a bared condition.  Soils are at a severe risk of compaction when operated over with heavy equipment, multiple equipment passes, and during wet or moist conditions.  Severe compaction and displacement can reduce conifer growth, increase erosion, and alter hydrologic properties.  Soil surfaces are usually moist; they are usually dry less than 45 days with the four months following June, in 6 years out 10.  The narrow dry window for these soils make contract administration more difficult increasing the risk of compaction.

Project soils have a high capacity for growing forest vegetation (Site Index 109-111 for 50 yr Douglas-fir) and are generally able to sustain substantial manipulation and still maintain their high productivity.  Normally following a disturbance the vegetation quickly re-establishes and the site productivity rapidly recovers.  However, re-establishment of vegetation and soil recovery on fragile sites such as shallow rocky soils and heavily disturbed and compacted soils is much slower, sometimes taking several decades to recover.

Wildfires and past forest management activities, primarily in the 1940s to 1980s, caused extensive soil disturbance resulting in large-scale erosion, massive sediment input to stream channels, and reductions in soil productivity. The area has since largely recovered and is now covered by dense stands of 50-year Douglas fir and western hemlock.  However, there remains a dense network of 40 to 60 year old tractor skid trails and haul roads in portions of the project area, especially in Unit 7-2 and extending along a broad ridge top in northeastern portion of Unit 11-1 into the western portion of Unit 12-1.  Most of the major skid trails and haul roads are still compacted and are partially covered by brush with some young trees.  In many places old logs fill in roads are exposed and rotting and could fail at anytime.  A few small areas of roads have minor rills.  Based on a review of 1962 aerial photos and field reconnaissance, it is estimated that 20% of the proposed for ground-base logging area is currently compacted or displaced, reducing the soils capacity to grow vegetation and altering the natural water flow.

### 3.3.2 Environmental Consequences

Direct effects to soils from proposed forest management activities include compaction, rutting, topsoil mixing and displacement due to road construction and development of skid trails, and removal of protective soil cover (vegetation) and organic material from timber harvest. Indirect effects include accelerated erosion, altered nutrients distribution, and influence on soil biota. Direct and indirect effects can result in loss in long-term productivity, the ability of a soil to establish and grow a plant species and community over time.

Soil productivity can be reduced in heavily trafficked areas, such as roads, landings, and main skid trails. Ground-based systems have the greatest potential for soil and litter disturbance and associated degradation of forest soil productivity. Organic matter removal and compaction are generally considered to be the most important determinants in which forest management activities can affect future forest soil productivity.

Cumulative effects occur when the effects of two or more activities, from the same or different projects over space and time, combine to produce a significant decrease in the soils capacity to grow vegetation. Soil compaction may result in cumulative effects if harvest rotation is shorter in time than the recovery time from soil compaction. For the purposes of soil effects analysis, the geographic area for considering effects will be the activity areas, or proposed treatment units and roads.

#### 3.3.2.1 Alternative 1 (Proposed Action)

Introduction

Project planning and implementation of BMPs would minimize the magnitude and duration of disturbance and help maintain beneficial properties of soils. Fragile areas such as landslide prone areas and highly erosive soils that potentially could be degraded by intensive forest management were removed from management consideration during pre-planning and project development. This analysis does not include those existing roads that were earlier evaluated and analyzed under the BLM 2000 Coastal Road Stabilization and Watershed Restoration, and Storm-Damage Road Repair Projects EA. However, those previously analyzed roads will be considered in relation to the ReBear project from a cumulative affects perspective (see cumulative affects sections below).

Direct and Indirect Effects

1. Roads.

There would be no new ***permanent road*** construction. All roads used for the timber harvest would be decommissioned. Project action would include constructing approximately 1.32 miles of new temporary roads and improving approximately 4.02 miles of existing road. To further reduce compaction, an additional 0.38 miles of existing old haul roads would be decommissioned. Methods of decommissioning would generally include blocking, sub-soiling, water barring, and planting.

In the short-term (1 to 5 years), temporary road construction road and decommissioning would result in the loss of some vegetation, increase compaction and erosion and reduce soil productivity. However, these short-term road related soil impacts should be relatively small. About three-quarters of the roads already exist. Improvement of these existing roads should cause only minimal impact since most of the compaction and displacement have already occurred. Roads to be used would be located mainly on gentle slopes on mountain ridges and benches; soils would be exposed for only short period (at most 3 winters); and, erosion control measures would be implemented soon after harvesting.

In the long-term, road decommissioning would remove 2.7 miles of roads in the watershed, decreasing compaction levels and accelerating the recovery of existing roads to a forested condition.

2. Logging.

Cable yarding 343 acres would result in mainly light compaction in 4 feet wide yarding corridors and small amount of moderate or heavy compaction on landings. Most of the landings would be located wholly or partially within roadbeds. Water baring areas on steep slopes where gouging occurs, would reduce soil erosion levels from high to moderate. Cable yarding would disturb about 2 to 5% of the harvest unit (7 to 18 acres) and result in minimal soil productivity loss (less than 1%).

Ground-based units yarding on approximately 100 acres (including about 8 acres within RRs) would require approximately 30,000 feet of skid trails and about 1 or 2 acres of landings. This would result in soil disturbance on about 9 or 10% of the unit, which is within the BMP limits set in Salem District RMP. Ground-based equipment would not be allowed within RR except where they are able to operate from existing roads located within the RR. Assuming that yarding would occur when soils are dry, ground-base yarding would result in mostly moderate amount of soil compaction and displacement on skid trails and mostly heavy compaction and displacement on landings. Much of Unit 7-2 is strongly undulating. Logging in some areas is likely to result in higher than normal surface displacement. In many areas, CWD will need to be moved and/or cut.

CWD serve as important reservoirs for moisture and soil- and litter-dwelling organisms. Disturbing CWD will have a negative impact on soil productivity and biodiversity, although the magnitude of the impact is unknown. Soil erosion levels are expected to be low since most of the ground slope is less than 30%. Exposed soils on steeper slopes will be hand water barred.

It is expected that about 50% of the skid trails used would be on existing, compacted skid trails. Skid trails would not be sub-soiled after harvest to avoid root damage to trees that have grown adjacent to the skid trails. Not sub-soiling would increase compaction on approximately 15,000 feet of skid trails (0.41 acres.) A soil compaction study (Powers, 1974) on 50 to 60 year old Douglas-firs in the BLM Salem District found a reduction of 40% in volume in compacted landings and roads compared to adjacent undisturbed areas. It is assumed that a similar reduction would occur from the project action on new skid trails. Since half of the skid trails that would be used have already been impacted, the loss would be less. Overall, ground-base yarding on approximately 100 acres would result in less than 3% (3 acres) loss in productivity.

THIS ANALYSIS IS BASED UNDER THE ASSUMPTION THAT IF A HARVESTER/FORWARDER SYSTEM IS USED, FORWARDER TRAILS WILL BE SPACED AT LEAST 150 FEET APART.

Cumulative Effects

1. Roads

Existing road mileage within the watershed would be reduced by approximately 2.7 miles (6 acres) at completion of the project.

2. Logging

Logging will increase the overall compaction on the ground-base harvest units from the construction of approximately 15,000 feet of new skid roads and reuse of 15,000 feet of existing trails. Skid trails would not be subsoiled. It is estimated that this would increase overall compaction level within the 100 acres of ground-based units by about 5% (5 acres) above the current 20%. Depending upon the severity of compaction, another entry into the ground-based units within 10 to 20 years would likely have a cumulative impact on soil compaction.

THIS ANALYSIS IS BASED UNDER THE ASSUMPTION THAT IF A HARVESTER/FORWARDER SYSTEM IS USED, FORWARDER TRAILS WILL BE SPACED AT LEAST 150 FEET APART.

### 3.3.2.2 Alternative 2 (No Action)

Direct and Indirect Effects

As no management activities will be implemented under this alternative, no direct or indirect effects to soils due to management treatments would occur. Potential soil disturbance, displacement, erosion, compaction and soil productivity loss associated with road building/decommissioning and timber harvest would be avoided. Current soil processes would continue to occur based on the existing conditions; soils would gradually become more porous and productive. However there would be minimal soil productivity recovery on the 2.4 miles of existing roads that would be decommissioned under the proposed action.

Cumulative Effects

As no management activities will be implemented under this alternative, no cumulative effects to soils due to management treatments would occur.

## 3.4 Water

### 3.4.1 Affected Environment

1. Physical Setting

The proposed project area lies on the western flank of the northern Oregon Coast Range, approximately 28 air miles southeast of downtown Portland, Oregon. The vast majority of the project area is located within the Nestucca River watershed (HUC #1710020302). The Nestucca River watershed, one of eleven 5$^{th}$ field watersheds in the Tillamook Bay sub-basin, occupies approximately 371 square miles. The Nestucca River, the major water contributor of the watershed, is about 50 miles long and flows in a southwest direction into the Pacific Ocean via the Nestucca Bay. The Upper Nestucca River watershed, which includes the project area, has been designated a Tier 1 Key Watershed under the Northwest Forest Plan to serve as refugia for at-risk stocks of anadromous salmonids and resident fish species. Approximately 33 acres of the project area lie within the headwater area of the South Fork Trask River (HUC#1710020304).

The climate is characterized by wet winters, relatively dry summers, and mild temperatures throughout the year. The area receives occasional very high winds. Annual precipitation averages 100 to 150 inches, falling mainly as rain. The mean 2-year precipitation event is 5 to 6 inches in a 24-hour period (N.O.A.A. Precipitation-Frequency Atlas for Oregon, Volume X). About 80% of the precipitation falls during October through March. Most of the project area is located in the transient snow zone, an area where snow occasionally falls but does not normally accumulate. Water flow is dominated by direct storm runoff as subsurface flow. Overland flow is rare on undisturbed forest floors due to the soils inherent high infiltration capacity. Stream flow normally respond quickly to rainfall and is notably higher in late fall and winter than in summer. Maximum streamflow normally occurs between November and March, the highest generally in December or January, and is usually associated with rainfall melting shallow snowpacks.

The geology of the upper watershed consists primarily of marine basalt (Siletz River Volcanics) in stream valleys and a mixture of marine basalt/breccia, siltstone and sandstone (Nestucca and Yamhill formations) in the uplands. Rocks are typically highly sheared and deeply weathered. An active mass movement known as the Bear Creek soil creep is slowing moving downslope and encroaching onto Bear Creek, about 2.2 miles southeast of Unit 7-2. The project area is underlain mainly by basalt with small amount of intrusive basalt or diabase on narrow ridges. There are no known areas of actively moving landslides or high-risk sites to landsliding within the project area.

2. Project Area Streams

All proposed timber harvest units were surveyed for streams and wetlands. There are approximately 8,100 feet of perennial streams and 10,000 feet of intermittent streams immediately adjacent to the proposed treatment areas. Most are Rosgen type AA channels with high gradients, entrenched, low width depth ratios, and low sinuosities confined by steep hillslopes. The largest stream is an unnamed tributary to the Nestucca River (within Ginger Creek subwatershed), located in the northeastern portion of Unit 12-1. It is a 2$^{nd}$ order, perennial, stream and has a Rosgen type AB4 channel with 2 to 8 percent gradient, moderately entrenched, moderate width depth ratios, and moderate sinuosities confined by steep hillslopes. The stream banks are generally stable, little bank erosion is apparent.

Project streams drain into four 4$^{th}$ order streams: Bear Creek, Elk Creek/Tucca Creek, unnamed Nestucca tributary (Ginger Creek subwatershed), and Middle East Fork of South Fork Trask River. Their main channels are predominantly Rosgen AB stream types (gradients 2-10%, moderately to steeply constrained AV shaped valleys with no or little river terrace development, no floodplain development, low and moderate sinuosity, and dominated by bedrock, boulders, cobbles, and gravel substrates).

3. Current Land Use and Ownership

Nearly all of the upper Nestucca River and upper Trask watersheds are forested and managed primarily for timber production and on federal lands under the Northwest Forest Plan the primary emphasis is restoration and maintenance of late-successional forest habitat. Approximately 64% of the land in the Nestucca River 5$^{th}$ field watershed is in federal ownership. BLM manages approximately 79% of the land draining Bear Creek, Elk Creek, and Ginger Creeks and 1% of the Middle East Fork of South Fork Trask River.

4. Roads

The road density within the Nestucca River 5$^{th}$ field watershed is 3.85-miles/sq. mi. Within the five 7$^{th}$ field watersheds, there are approximately 134 miles of road with a road density ranging from 4.0-to 5.8-miles/sq. mi. These values are based on the current GIS ground transportation coverage. Many of the natural surface roads and most of the abandoned legacy logging roads however are not on the coverage.

Portions of the project area, especially on more gently sloping lands, are laced with undocumented tractor skid roads and unsurfaced roads and are not on the coverage. By analyzing old aerial photographs it is estimated that there are approximately 3 miles of tractor skid roads within 75 acres proposed for ground-base yarding in Unit 2. These roads remain compacted interrupting the natural hydrologic flow regime and preventing optimal vegetative production.

5. Beneficial Uses

The primary beneficial uses of surface water in the project area vicinity include anadromous fish passage, salmonid fish spawning and rearing, resident fish and aquatic life, and wildlife. Based on water rights GIS coverage provided by the Oregon Water Resources Department, there are no municipal, domestic, or irrigation water surface water diversions within 10 miles downstream of the project area. The nearest municipal water supply is the McGuire Reservoir, located on the upper Nestucca River about 3.3 miles upstream of the confluence of Ginger Creek. Project area streams are too small and/or too steep to support fish populations. Based on BLM fish distribution surveys, the nearest fish-bearing stream reach is inhabited by cutthroat trout about 440 feet downstream of the southwest corner of Unit 12-1. The upper extent of reaches containing anadromous salmonids is in the Bear Creek and Elk Creek, approximately 2 mile to 5 miles downstream of the project area.

6. Water Quality

The Oregon Department of Environmental Quality (ODEQ) 1998 303(d) List identifies two stream reaches within and immediately below the project area as being water quality limited; Nestucca River and Trask River (Table ? ). Water quality limited streams do not fully support their uses and therefore do not fully meet water quality standards. To address this problem the ODEQ has set pollution limits called ***TMDL***s (***Total Maximum Daily Loads***) and developed watershed recovery plans called WQMP (Water Quality Management Plan) for these streams (refer to the 2002 Nestucca Bay Watershed TMDL & WQMP and 2001 Tillamook Bay Watershed TMDL & WQMP). For BLM, the primarily method by which the plan will be implemented is the Northwest Forest Plan and Salem District RMP.

Table 6. 1998 303d Database and TMDL Applicable to the Project Area and Vicinity

| **Stream/Water Quality Parameter** | **River Mile** | **Season** | **Listing Status** |
|---|---|---|---|
| Nestucca River | | | |
| Temperature | 0 to 53.8 (Powder Cr) | Summer | 1998 303(d) |

| | | | |
|---|---|---|---|
| | 0 to 53.8 (headwaters) | Summer | TMDL Approved |
| Sedimentation | 28.9 to 53.8 | Year Around | 1998 303(d) TMDL Approved |
| Bacteria (Fecal Coliform) | 0 to 3.2 | Year Around | 1998 303(d) TMDL Approved |
| Dissolved Oxygen | 0 to 28.9 | Sept 15 to May 15 | 1998 303(d) |
| Habitat Modification | 28.9 to 53.8 | Year Around | 1998 303(d) |
| Flow Modification | 0 to 28.9 | Year Around | 1998 303(d) |
| Trask River | | | |
| Dissolved Oxygen | 0 to 10.2 | Sept 15 to May 15 | 1998 303(d) |
| Temperature | 0 to 18.6 | Summer | 1998 303(d) TMDL Approved |

Sediment loads in the upper Nestucca River watershed are much different now from the past, particularly during the mid-20th century, when wildfires, logging, and extensive road building resulted in large-scale erosion on hillslopes and stream banks. Recent data compare favorably to current targets for substratum sediment composition. There have been no significant fires since then and no significant timber harvest in the upper Nestucca River watershed since 1990. In addition, forest management and road construction practices have greatly improved under the Northwest Forest Plan and Forest Practices Act. BLM has begun repairing storm-damaged roads and stabilizing or decommissioning over 80 miles of BLM controlled roads in the Nestucca River, Trask River, Wilson River and Kilchis River watersheds (Coastal Road Stabilization and Watershed Restoration, and Storm-Damage Road Repair Projects EA- OR-086-00-04). The majority of the work is planned in the Nestucca watershed. Approximately 1.8 miles of the 3-7-6.1 and 18.2 BLM roads in the project vicinity were stabilized in 2001. Action included removing live stream culverts, installing water bars, removing sidecast material and blocking roads to all vehicles. More road stabilization work in the project vicinity is planned. BLM has nearly completed conducting a fish passage culvert inventory and has asked for funding to upgrade culverts.

While project streams are listed for temperature and sediment, current water quality and habitat conditions in the project area and vicinity are generally good to excellent. This assessment is based on observation and inference since there is little water quality data. Stream channels within the project area appear to be well shaded by conifer or deciduous vegetation. Water temperatures are expected to be near reference condition for this area. Stream banks are generally stable and streams have little fine sediment in substrates. These small headwater streams, however, are lacking somewhat in large woody debris (LWD).

Good fish habitat conditions in the upper Nestucca are due in part to recent BLM restoration work. Since the mid 1980s, BLM has been installing and maintaining instream structures in the upper Nestucca River, Bear Creek and Elk Creek. Last summer BLM began enhancing salmonid spawning and rearing habitat on approximately 10 miles of the upper Nestucca River in a three to five year time. The project includes maintenance of existing stream structures (log), and placement of new stream structures (log and boulder). Side channels have been excavated in the Nestucca River to provide winter refuge for juvenile coho. In addition, conifers have been underplanted in several riparian areas on Bear Creek and the upper Nestucca River.

Turbidity is generally quite low in the upper Nestucca watershed except for short periods, primarily during first large fall storms and very large winter storms. Bear Creek soil creep is thought to be a chronic source of suspended sediment for lower Bear Creek and the Nestucca River below Bear Creek (1994 Nestucca WA).

### 3.4.2 Environmental Consequences

#### 3.4.2.1 Alternative 1 (Proposed Action)

**<u>Direct and Indirect Effects</u>**

**1. Sediment Delivery and Turbidity**

**Forest roads. In the short-term (1 to 5 years) sediment and turbidity impacts from temporary road construction, road improvement, and road decommissioning should be minimal for the following reasons: 1) Most existing roads and planned roads are on ridgetops or benches, on mostly gentle slopes located far from drainage channels; 2) Untreated RRs would effectively filter most sediment coming off roads before reaching streams; 3) Ground disturbing activities would be restricted to dry periods and low surface runoff; 4) None of the new road construction and very little of the existing roads to improved are within RRs; and, 5) Roads would be built or improved upon when they are needed to complete harvest activities (i.e. build-as-you-go) rather than all at once. (This will shorten the time the roads are exposed to weather thereby minimizing potential erosion and hydrologic impacts.)**

**In the long-term, decommissioning all roads used in the project would increase soil infiltration, disperse surface water, encourage vegetation recovery, and reduce sediment delivery and turbidity. This would remove approximately 2.7 miles of road in the upper Nestucca River Key 1 Watershed, a Salem District RMP requirement.**

**Logging. Sediment impacts from timber harvest activities are expected to be minimal for the following reasons: 1) Steep slopes near streams would not be logged where there is high potential for mass wasting; 2) Skid trails and ground-based yarding equipment would generally be prohibited within RR (Machinery would not be allowed within the RR except where it could be operated from an existing road or compacted skid trail); 3) RR would have no harvest buffers (a minimum 50 feet on non-fish bearing streams and 100 feet on fish-bearing streams); 4) Erosion would be reduce in cable yarding corridors by leaving some of the felled reserve trees on the site; 5) Most of the sediment produced from timber harvesting would travel short distances before being trapped by duff, woody materials and other obstructions.**

**Timber Hauling. Increases in sediment delivery due to timber hauling are expected to be small and short-term because hauling would be restricted to the dry season over mostly forest gravel roads.**

**2. Water Temperature**

**The project action is expected to maintain the current canopy and shade over streams and therefore is unlikely to alter water temperatures. Stream buffers or no-harvest buffers (a minimum 50 feet) that will be applied to all stream channels in the project area would retain direct overhead shading. A majority of streams adjacent to proposed units are intermittent and provide little or no surface flow during the summer time when elevated stream temperatures are of concern.**

**3. Stream flows**

**Proposed action would thin less than 0.2% of the area within the Nestucca River watershed and less than 0.03% within the Trask River watershed. Therefore changes to water capture, infiltration and routing is likely to be very small at most and not substantial enough to alter stream flow. Any changes would return to pre-treatment conditions as the forest fills out in 10 years (see also Cumulative Effects for water later in this section).**

**4. Channel Stability and Function**

**No harvest buffers applied to all streams and wetlands and limited thinning within stream influence areas would maintain stream-adjacent slope stability (including headwalls) and protect channel banks. Thinning in RRs is expected to accelerate the growth rate of trees in RRs, although it is expected to have little affect on the CWD recruitment to local streams due to the areas low susceptibility to landsliding and topographic constraints.**

**<u>Cumulative Effects</u>**

**The proposed action plus past, present, and reasonably foreseeable forest management actions have been analyzed to determine cumulative effects in the Bear Creek, Elk Creek,**

**Ginger Creek, and the Middle East Fork of the South Fork of Trask River sub-watersheds.**

**The following conditions were observed:**

4. This proposal for a thinning is approximately 443 acres, all within the Rain-On-Snow Zone .

5. No-harvest buffers will be placed on all project streams (a minimum of 100-feet on both sides of perennial streams in Sections 7 and 8, and 50-feet on all non-fish bearing streams).

6. BLM manages over 3/4 of the area within the Bear Creek, Elk Creek, Ginger Creek sub-watersheds. The crown closure is 75% or higher for the vast majority of these BLM lands. Practically all of these BLM lands has more than 30% crown closure. After proposed treatment, the crown closure is expected to be around 60% for treatment areas.

7. A BLM project similar to the proposed action covering approximately 1000 acres located primarily in the rain dominated zone is planned for 2005.

8. The percent of land within sub-watersheds of private and State land subject to Rain-On-Snow processes is small, ranging from 2 to 33% and averaging 14%. Forest vegetation is very mixed varying from grass-forb or non-forest condition to mature. More intensive timber management actions on private and state lands within the sub-watersheds, including clear-cutting and broadcast burning, are occurring and are likely to continue.

9. Project area streams are stable. Current water quality and habitat conditions in the project area and vicinity are generally good to excellent. Except for being somewhat deficient in CWD, they are functioning near to reference conditions.

10. Most streams miles in the upper Nestucca River and the upper South Fork of the Trask River watersheds are not sensitive to increases in flow. ( Steep Rosgen headwater A type channels and mid-gradient B type channels with rock or CWD control are stable, even with increases in flow.)

11. The amount of existing roads in the Upper Nestucca River Key 1 Watershed would be reduced by approximately 2.7 miles (6 acres).

12. None of the existing roads and planned temporary roads under the proposed action that would be used in the project area crosses any streams. One existing road, that was analyzed under the BLM 2000 Coastal Road Stabilization and Watershed Restoration, and Storm-Damage Road Repair Projects EA and would be used as part of this project, crosses two small streams. The two existing culverts will be removed along with decommissioning part of the road.

13. The amount of compaction in ground-based units would be increased by approximately 5 acres.

Table 7. Summary of Existing Conditions by Sub-Watershed

| Sub-Watershed | Bear Creek | Elk Creek | Ginger Creek | ME Fork of S Fork of Trask River | Total Area |
|---|---|---|---|---|---|
| Land within sub | 3,914 AC | 6,472 AC | 2,706 AC | 4,810 AC | 17,902 AC) |
| BLM forest land (area/ % of sub-watershed) | 3,438 AC 88% | 5,268 AC 81% | 1,599 AC 59% | 66 AC 1% | 10,371 AC 58% |
| BLM land proposed thinning (area/ % of sub-watershed) | 70 AC | 242 AC | 102 AC | 29 AC | 443 AC |
| Private and State land subject to Rain-On-Snow[1] **processes (area/ % of sub-watershed)** | **85 AC 2%** | **660 AC 10%** | **880 AC 33%** | **940 AC 20%** | **2,565 AC 14%** |
| | **780 AC 20%** | **4,010 AC 62%** | **1,920 AC 71%** | **1,010 AC 21%** | **7,720 AC 43%** |
| **Roads length/ Road density** | **30.8 mi /5.0 mi per sq mi** | **48.2/ 4.8 mi per sq mi** | **24.7/ 5.8 mi per sq mi** | **30.2/ 4.0 mi per sq mi** | |
| **Area in road[2]** | **2.2%** | **2.1%** | **2.5%** | **1.8%** | |
| **Land with slope gradients less than 40%** | **2,800 AC** | **3,960 AC** | **1,780 AC** | **2,678 AC** | |

**1 Transient snow zone for this analysis is defined as 1,900 feet to 2,900 feet**
**2 Assumes an average road width of 23 feet.**

**While timber harvest and road construction can contribute to increased stream flows, the**

**proposed action is not expected to measurably affect stream flows within the affected sub-watersheds. Most studies showing stream flows increases were done in the 1950s, 60s, and 70s on small watersheds that had been extensively clear-cut often ridge top to stream edge and roads. Few studies has been done in the Pacific Northwest at looking at affects of thinnings and the retention of stream side buffers on stream flows. One research project near the city of Newport Oregon, studied a small watershed was treated using three clearcuts while retaining a stream buffer of 50-100 feet on each side of the stream along the main channel. Researchers found no changes in peak flows, even during fall and spring storms (Hall *et al.* 1987).**

**The project action is for thinning, not full harvest, while leaving 50-100 feet no harvest stream buffers. About 50% of the canopy would be retained with the treatment. This amount of vegetation removal should have little or no effect of greater snow accumulation and snow melt.**

**Most of the affected sub-watersheds are covered by immediate or mature forests and that condition is unlikely to change in the future because most of the land is managed by BLM for late-successional forest habitat. The Oregon Watershed Assessment Manual has developed a method adapted from the Washington State Department of Natural Resources to estimate risk of peak-flow enhancement to subwatershed. Using Figure 3 in the Hydrology and Water Use section and assuming the worst scenario where all non-federal lands within the Rain-On-Snow area will be less than 30% crown closure and all federal land will have a crown closure of more than 30%, the potential risk of peak-flow enhancement is low, well below the line representing peak-flow increases of 8 to 10% which represents the lower boundary of detectability.**

**In summary, considering the above factors, and the fact that most of the water quality indicators are good to excellent, and considering the known and anticipated actions within the Nestucca River and Trask River watersheds, the risk for this proposal to cumulatively contribute to overall negative effects to hydrologic processes or water quality in these watersheds is low. The anticipated actions are expected to maintain the condition of these indicator, except for the road density. Any alterations in peak flows, storm flow, and low flows are not likely to measurably increase as a result of logging and road building.**

#### 3.4.2.2 Alternative 2 (No Action)

Direct and Indirect Effects

As no management activities will be implemented under this alternative, no direct effects to water resources due to the proposed management treatments would occur. Hydrologic processes such as annual yield, low flows, and peak flows would continue to respond to existing conditions. Water quality will continue to be negatively affected by sediment delivery from legacy roads and natural surface roads. Approximately 4.02 miles of road that would be decommissioned under the proposed action would not occur. There also would be a missed opportunity to accelerate the development of some late-successional forest characteristics and improved conditions for rapid tree growth near riparian zones (an important ACS objective) on lands that would be treated in Alternative 2

Cumulative Effects

As no management activities will be implemented under this alternative, no cumulative effects to water resources due to management treatments would occur.

## 3.5 Wildlife

### 3.5.1 Terrestrial Wildlife

#### 3.5.1.1 Affected Environment

The Proposed Action would occur in a mixed Douglas-fir/western hemlock ranging in age form approximately 42 to 58 years old. The area is along the southern fringe of the Tillamook burns that occurred in 1933, 1939, 1945 and possibly 1951. During the 1950's extensive salvage logging and subsequent snag felling resulted in an extensive area devoid of overstory canopy and standing snags, but did create a legacy of down large coarse woody debris.

In addition to natural seeding of the area, aerial seeding and even some seedling planting was done resulting in the current stand composition. From a wildlife perspective, perhaps the most interesting aspect of the proposed project area is the amount and size of the down wood in the area. Much of what remains today is in the two to four foot size class but is mostly in decay class 4 (86%). There is little coarse wood in the more recent decay classes represented (14%), and what is there, is small. Large coarse wood is an important ecological component of forests. Not only does it provide habitat for a myriad of species including mollusks and amphibians, it also acts as a substrate for moss and lichen colonies and, when decayed enough, a rooting platform for conifer seedlings above the brush layer. Large down logs also play an important role in moderating warm temperature and low humidity in the forest environment during the summer by soaking up moisture during the wet season and doling it out slowly during the dry season.

The current distribution of CWD within the proposed project area is patchy with an average of approximately 1900 cu.ft./ acre of down wood which falls within the moderate level for mid-seral stands as defined by the LSRA, and approximately 10 snags/ acre, averaging 12" DBH. Snags of this small size do not provide much in the way of habitat for cavity dependant species and do not persist as snags in the long term.

Due to the relatively young age of the stands, the area is currently good spotted owl dispersal habitat but is not suitable nesting, foraging and roosting habitat. Likewise due to the young age of the stands and lack of legacy trees from the previous stand the area is not suitable marbled murrelet habitat.  In unit 11-1 there is suitable murrelet nesting habitat within approximately 200 feet of the boundary of the proposed density management unit.  According to stand exam data, the average canopy height of the stand to be treated is approximately 82 feet and is therefore less than 1/2 the height of the site potential tree (180 feet).  This fact is important only from the perspective that there is some belief that once stands reach a height greater than 1/2 the height of a site potential tree then those stands become a component of suitable murrelet habitat even those young stands do not contain suitable nesting platforms themselves.

There is moderate deer and elk use in the area.  Browse species are plentiful in the shrub layer of the stands proposed for density management.

The following table lists those species of concern that could possibly, although may not, occur within the proposed project area and a synopsis of the potential for impact to any of those species.  Those species for which a "Yes" appears in the Impact Synopsis column will be evaluated further in this document.

Table 8.

**Project:** ReBear Density Management and Watershed Restoration Project

| Common Name | ESA | NFP | BLM | Impact Synopsis |
|---|---|---|---|---|
| **Mammals:** | | | | |
| Columbian White-tailed Deer | FE | - | FE | No - Not in Range |
| Fisher | - | - | BS | Yes - Hab. Mod.  Unlikely to occur in area |
| Fringed Myotis | - | ROD | BT | Yes - Mod. of forest environment |
| Long-eared Myotis | - | ROD | BT | Yes - Mod. of forest environment |
| Long-legged Myotis | - | ROD | BT | Yes - Mod. of forest environment |
| Red Tree Vole | - | S&M | - | Yes - Surveys not triggered, Poor habitat. |
| Silver-haired Bat | - | ROD | BT | Yes - Mod. of forest environment |
| Townsend's Big-eared Bat | - | - | BS | No - No habitat.  Cave and structure dwellers. |
| **Birds:** | | | | |
| Bald Eagle | FT | - | FT | Yes - Hauling through unoccupied nest territory. |
| Brown Pelican | FE | - | FE | No - No habitat |
| Harlequin Duck | - | - | BA | No - No habitat |
| Lewis' Woodpecker | - | - | BS | No - No habitat |
| Marbled Murrelet | FT | - | FT | Yes - Disturbance |
| Northern Spotted Owl | FT | - | FT | Yes - Disturbance and dispersal habitat mod. |
| Northern Goshawk | - | - | BS | Yes - Habitat mod. |
| Peregrine Falcon | - | - | BS | No - No habitat |
| Purple Martin | - | - | BS | No - No habitat |
| Yellow-breasted Chat (WV) | - | - | BS | No - No habitat |
| **Reptiles and Amphibians:** | | | | |
| Columbia Torrent Salamander | - | - | BS | No - No activities in very restricted habitat |
| Cope's Giant Salamander | - | - | BA | No - Not in range |
| Oregon Spotted Frog | FC | - | FC | No - No habitat |
| Painted Turtle | - | - | BS | No - No habitat |
| Western Pond Turtle | - | - | BS | No - No habitat |

| Invertebrates: (arthropods and worms) | | | | |
|---|---|---|---|---|
| American Acetropis Grass Bug | - | - | BS | No - No habitat |
| Insular Blue Butterfly | - | - | BS | No - No habitat |
| Oregon Giant Earthworm | - | - | BS | No - No habitat, not in range. |
| Oregon Silverspot Butterfly | FT | - | FT | No - No habitat |
| Roth=s Blind Ground Beetle | - | - | BS | No - No habitat |
| Taylor=s Checkerspot Butterfly | - | - | BS | No - No habitat |
| Valley Silverspot Butterfly | - | - | BA | No - No habitat |
| Willamette Callippe Fritillary Butterfly | - | - | BS | No - No habitat |
| **Invertebrates: (mollusks)** | | | | |
| Evening Fieldslug | - | S&M | BS | Yes - Disturbance to CWD and veg. |
| Oregon Megomphix | - | S&M | - | Yes - Disturbance to CWD and veg. |
| Puget Oregonian | - | S&M | - | Yes - Disturbance to CWD and veg., not likely in range |

**ESA** - Endangered Species Act: **FE** - Federal Endangered; **FT** - Federal Threatened; **FC** - Federal Candidate
**NFP** - Northwest Forest Plan: **S&M** - Survey and Manage; **ROD** - Bat species whose roost sites are protected in the ROD
**BLM** - 6840 Policy list: **BS** - Bureau Sensitive; **BA** - Bureau Assessment; **BT** - Bureau Tracking
**Impact Synopsis:** **NO**- No appreciable impacts to the species or it=s habitat, no further analysis will be conducted in the EA. **YES** - Impacts to a species or it=s habitat will occur and further analysis will be conducted in the EA.

### 3.5.1.2 Environmental Consequences

#### 3.5.1.2.1 Alternative 1 (Proposed Action)

Under this alternative there would be 443 acres of light to moderate thinning of 42-58 year old trees in a variable spaced manner. There would also be a short term (temporary) increase in road density associated with the density management treatment, but an overall decrease in road density of approximately 2.7 miles at the completion of the project. There would also be the creation of a modest amount of fresh, relatively small CWD in the form of both snags and down wood associated with the implementation of the density management treatment.

<u>Affects to Species Listed Under ESA:</u>

The ReBear project is consistent with the *light to moderate thinning* category from the Biological Assessment and concurred with in the Biological Opinion for *Formal and informal consultation on FY 2003-2004 projects within the North Coast Province which may modify habitat of bald eagles, northern spotted owls, and marbled murrelets (FWS* reference: *1-7-02-F-958).*
Marbled Murrelet

The nearest known occupied murrelet site is in the Elk creek drainage, approximately one mile southeast of the southeastern boundary of the nearest project unit. There is no murrelet habitat within the project area and the nearest potential suitable habitat is approximately 200 feet southwest of the project unit in Section 11.

Since the most likely haul routes would pass within **3** mile of unsurveyed suitable murrelet habitat and a corner of one of the proposed units is also within 1/4 mile of unsurveyed suitable habitat, and the actions would occur during a portion of the critical breeding season the proposed action **May Affect**, and is **Likely to Adversely Affect** the marbled murrelet. All activities that generate noise above the ambient level within 1/4 mile of suitable habitat during any part of the breeding season would be restricted to the period between two hours after sunrise to two hours before sunset. Since there will not be any modification to murrelet habitat, the project would have **No Effect** on marbled murrelet critical habitat.

Spotted Owl

The nearest known historic owl site is approximately 1.5 miles southeast of the Section 7 project area. The project area was surveyed during the Nestucca river density study for the years 1990 - 1993 with no detections in the vicinity. In 1994, additional survey stations were added to the north (in the Trask river drainage) out to a 1.5 mile radius from the project area, also yielding no detections. The proposed project area is outside of any spotted owl reserve pair areas as described in the supplemental guidance for the LSRA dated June 1, 2000. The area currently is good dispersal habitat, but the forest is too young to be considered suitable foraging, roosting and nesting habitat. After completion of density management, the project area would continue to be suitable for dispersal habitat because of the average 60 to 70 percent residual canopy closure. In 1994, 1995 and 1996 the haul route along Bear Creek road was surveyed by the BLM and Oregon Dept. Of Forestry. There were no detections.

Since survey data is considered out of date, there may be the possibility of owls occurring within the suitable habitat along the potential haul routes, there is the possibility of disturbing owls (if present) during the non-critical breeding season. As such the proposed action **May Affect** but is **Not Likely to Adversely Affect** the spotted owl. Due to the expected beneficial effects of the project on forest habitat, the action **May Affect** spotted owl designated critical habitat.

Bald Eagle

The nearest known eagle nest site is in the Elk creek drainage, approximately one mile southeast of the southeastern boundary of the Section 7 project unit. This nest had been active for many years, although the last year that young were fledged was 1982. The last year that the pair was observed at the nest was in 1994, but they did not attempt to nest. The pair have not been observed since then. Two monitoring visits in every year since 1994 have not detected any eagles in the vicinity of the nest. Due to the apparent lack of nesting and the distance from the nest site this project would have **No Effect** on the bald eagle.

<u>Special Status Species:</u> (6840 Policy Species)

Fisher

The fisher is a secretive animal, primarily nocturnal and, the literature suggests that fishers prefer "deep forests" and "cedar swamps" containing considerable down wood. The project area contains good amounts of large down wood with many opportunities for den sites. The overstory is somewhat younger than that of preferred habitat, but it is dense and offers the seclusion that fishers appear to favor. Although it is unlikely that the fisher is currently occupying the project area, there was a sighting of a fisher in Lincoln County on the Hebo Ranger District in October of 1991.

Fishers are apparently sensitive to human disturbance and may move out of an area if that disturbance is too great. The implementation of the proposed action would most likely disturb fishers and probably cause them to leave the area if they are in fact present. However, the proposed action is not expected to alter the habitat enough to make it unsuitable for continued use by fishers unless the roads are maintained for travel after harvest, therefore allowing for continued human disturbance. As such the proposed action would not result in a trend toward federal listing or in population viability.

Northen Goshawk

Goshawks are extremely rare in the coast range and, though it is thought to be possible, there has been no documented breeding of goshawks in the northern Oregon Coast Range. The project area currently provides only marginal foraging habitat for goshawks due to the young stand age, high tree density, and lack of canopy gaps. Reducing tree density while maintaining stand diversity would benefit the goshawk over time and consequently would not result in a trend toward federal listing or in population viability.

<u>Survey and Manage Species:</u> (Including Bats)

Mollusks

The proposed project area was surveyed to protocol for terrestrial mollusks in the spring and fall of 2001 and completed in the spring of 2002. One former S&M species that was found in abundance is the warty jumping slug *Hemphillia glandulosa*, a species that is highly dependant on CWD. Surveys were initiated and completed prior to the issuance of the 2001 Annual Species Review as provided for in the *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines* (January 2001) also known as the S&M ROD. The 2001 Annual Species Review removed the warty jumping slug from the S&M list and there is no requirement to manage sites known prior to the removal, consequently there are no known S&M mollusk sites within the project area. The three S&M mollusk species that do occur within the range of the project area tend to be associated with CWD, hardwoods, particularly big-leaf maple and to some degree more moist sites; none of these species were found during surveys. Although the specific conditions favored by the listed S&M species do exist within the project area they are somewhat restricted and therefore the proposed action would not only have no impact on S&M mollusk species, there would be little degradation of the favored habitat of those species.

Red Tree Vole

The red tree vole is thought to prefer late seral Douglas-fir stands although vole nests have been documented in stands as young as 35 years. Those areas where red tree voles are found in younger stands tend to be juxtaposed with stands containing older Douglas-fir trees that are legacies from previous stands. Stand disturbances such as the Tillamook burns are so catastrophic as to eliminate vole habitat completely. There are no live legacy trees resulting from the Tillamook burns anywhere near the proposed project area. The red tree vole protocol requires surveys in stands with average diameter larger than those found in the proposed project area, or stands with legacy trees present. Consequently, red tree vole surveys are not required and were not conducted in the project area.

The overall effect to vole habitat from implementing the project would be insignificant since the stands would continue to have much Douglas-fir and a relatively high canopy closure. In the long term, the proposed action would benefit the red tree vole by promoting the older forest structures that are prevalent in their favored habitat.

Bats

Of the five bat species of concern to the S&M program four of them, the fringed myotis, the long-eared myotis, the long-legged myotis, and the silver-haired bat occur in forested environments within the range of the proposed project. The project area does not contain any known sites or suitable habitat for any of these bat species, although it is possible that these bat species may forage in the vicinity of the project area near ponds, openings and forest edges. The project in the short term would not have a negative effect on these species and in the long term (greater than 25 years) would have a beneficial effect on these species by promoting more diverse crown structure of individual trees and by reserving damaged trees that may continue to grow with scars and potentially hollows that may be used by bats for roost sites.

#### 3.5.1.2.2 Alternative 2 (No Action)

Under this alternative no density management would occur within the proposed project areas at this time and forest stand would continue to grow and develop without management intervention. However, there would not be the added pulse of fresh CWD provided by the density management project to the forest system that would otherwise have had beneficial affects to species that are directly and indirectly dependant on more recent down wood. The identified impacts of the proposed action would not occur at this site. Selection of the ANo Action@ Alternative would be of **NO EFFECT** (as it pertains to ESA) upon the marbled murrelet, spotted owl, and bald eagle. There would also be no impacts, either positive or negative, to other special status species or survey and manage species.

### 3.5.2 Fish

#### 3.5.2.1 Affected Environment

**Fish distribution surveys have been done in the Elk Creek drainage to the northeast of the project area and resident cutthroat trout and sculpins have been found in the perennial streams there. When Bear Creek was surveyed in 2002, the stream and aquatic habitat conditions in the Bear Creek drainage near the project area were excellent but no resident cutthroat trout or sculpins were present in the perennial portions of those streams. Further downstream, both Bear Creek and Elk Creek contain anadromous salmonids. Both streams have had fisheries habitat restoration work done in the recent past to improve overwintering conditions for juvenile salmonids. On the Trask side anticipated coho distribution is a mile downstream of thinning unit 11-1. The unnamed tributary that drains into the Nestucca River from Unit 12-1 was found to contain cutthroat well outside of the project area, this stream has two barriers at its confluence with the Nestucca preventing access by any anadromous salmonids.**

Table 9. Fish Species and Status within the Nestucca Watershed

| Common Name | Scientific Name | Status |
|---|---|---|
| **coho salmon<br>Oregon Coast** | ***Oncorhynchus kisutch*** | federally listed - threatened **and MSA EFH species** |
| **steelhead trout<br>Oregon Coast** | ***Oncorhynchus mykiss*** | **Federal candidate** |
| **chinook salmon<br>Oregon Coast** | ***Oncorhynchus tshawytscha*** | **MSA EFH species.** |
| **cutthroat trout<br>Oregon Coast** | ***Oncorhynchus clarki*** | **Federal candidate** |
| **Pacific lamprey** | ***Lampetra tridentatus*** | **Bureau tracking** |
| **river lamprey*** | ***Lampetra ayresi*** | **Bureau tracking** |
| **western brook lamprey** | ***Lampetra richardsoni*** | |
| **redside shiner** | ***Richardsonius balteatus*** | |
| **reticulate sculpin** | ***Cottus perplexus*** | |
| **torrent sculpin** | ***Cottus rhotheus*** | |

***presence not verified**

### 3.5.2.2 Environmental Consequences

#### 3.5.2.2.1 Alternative 1 (Proposed Action)

With the use of no harvest buffers on all streams, the use of dry season harvest and haul generally (June through September), the use of authorized haul routes, no new road construction within the Riparian Reserve and distances to coho habitat from the harvest units that vary from 2 to 5 miles there is negligible potential for adverse impacts to Oregon Coast coho salmon. The potential of adverse impacts from the proposed project on Oregon Coast coho salmon are related to short-term increases in sediment into Bear or Elk Creeks due to the hauling of materials to or from the project area where haul routes are closer to coho habitat however with the use of dry season harvest and haul any inputs of fine sediments should be negligible. This project for the reasons stated above is considered to be ***May Affect -Not Likely to Adversely Affect*** Oregon Coast coho or their habitat. This project will have similar effects on Oregon Coast steelhead trout , and sea-run cutthroat trout with no loss of population viability or trend toward federal listing for these or any other Bureau sensitive fish species. There are also no adverse impacts to Essential Fish Habitat for Oregon Coast chinook and coho as described in the Magnuson-Stevens Act anticipated by this proposed action.

Conferencing is expected to be initiated with NOAA Fisheries, National Marine Fisheries Service for Oregon Coast coho in February 2003. Concurrent consultation would also occur for the Essential Fish Habitat for chinook and coho salmon as required by the Magnuson-Stevens Fishery Management and Conservation Act. A Biological Assessment will be prepared for a may affect - not likely to adversely affect ESA call and a letter of concurrence will be requested of NOAA Fisheries.

#### 3.5.2.2.2 Alternative 2 (No Action)

No action would occur under Alternative 1, therefore no direct effects would occur to fish or fish habitat. The potential adverse impacts to impacts to fish and aquatic habitat that could occur if any of the action alternatives were implemented would be avoided As this is a "no action" alternative, no ESA or MSA EFH call would be made. For all Bureau Sensitive fish species there would be no trend toward federal listing or loss of population viability.

## 3.6 Air Quality

### 3.6.1 Affected Environment

The major sources of air pollutants associated with BLM resource management activities in the Nestucca River watershed are smoke from prescribed burning, and dust from the use of unsurfaced roads and road construction and maintenance.

The project area is approximately 18 miles south-east of Tillamook and 17 miles north of

Willamina. The anticipated haul routes to the south are Bear Creek, Elk Creek and/or Bear Ridge Roads which are gravel and the Nestucca River Access Road and possibly Bible Creek roads which are asphalt surfaced roads. The anticipated haul routes to the north would be down the South and East forks of the Trask River road systems which are all gravel surfaced roads.

### 3.6.2 Environmental Consequences

#### 3.6.2.1 Alternative 1 (Proposed Action)

Dust created from vehicle traffic on gravel or natural-surface roads, road construction, and logging operations would contribute short-term effects to air quality. These effects would be localized to the immediate vicinity of the operations.

If the landing debris associated with the cable landings is determined by the BLM to be a fire hazard, then it would be burned which would create smoke. Since burning would be conducted in accordance with the *Oregon State Implementation Plan* and *Oregon Smoke Management Plan*, the effects of smoke on air quality is predicted to be local and of short duration. As such, the activities associated with the proposed action would comply with the provisions of the Clean Air Act.

Cumulative effects: Prescribed burning used for other fuels reduction in active or planned timber sales within the Nestucca River watershed would have an impact on air quality. All burning would comply with burning prescriptions designed to reduce effects while meeting resource objectives and would comply with the *Oregon State Implementation Plan* and *Oregon Smoke Management Plan*.

Increased human activity from gathering of special forest products such as firewood, mushrooms, etc. and general recreation would increase the chances of road dust entering the air. However, road dust is a short-term, localized problem and would not have an adverse impact on air quality.

#### 3.6.2.2 Alternative 2 (No Action)

Air quality would not be affected since the activities (road construction, hauling, burning, etc.) associated with the proposed action would not occur at this time. As such, this alternative would comply with the provisions of the Clean Air Act.

## 3.7 Conformance with Land Use Plans, Policies and Programs

Alternative 1 (Proposed Action), and Alternative 2 (No action), unless otherwise noted, are in conformance with the following documents which provide the legal framework, standards, and guidelines for management of BLM lands in the Tillamook Resource Area:

* *Salem District Record of Decision and Resource Management Plan, May 1995*, pages 5-6 (ACS Objectives), 9-11 (Riparian Reserves), 22 (Air Quality), 22-24 (Water and Soil), 24-27 (Wildlife Habitat), 28-32 (Special Status Species and Habitat), 36 - 37 (Visual Resources), 41-45 (Recreation), 49-50 (Special Forest Products), 62-64 (Roads), 64-67 (Noxious Weeds and Fire/Fuels Management), and Appendix C1-C8 (Best Management Practices).

    - ACS Objectives and Riparian Reserves Objectives: The action alternative is predicted to result in the maintenance and/or restoration of ACS objectives (Appendix 3). Both of the alternatives would be expected to meet the Riparian Reserve objective to Aprovide habitat for special status, SEIS special attention and other terrestrial species.@ The action alternative, which would thin approximately 92 acres of Riparian Reserve, would result in a more diverse, wider array of habitat types within the Riparian Reserves as the treated portions respond to the thinning with increased windfirmness, growth and vigor. Design features of the action alternative would help minimize the risk of adverse impacts to populations of concern.

    - AMA Objectives: Alternatives 1 would accelerate the development of some late-successional forest structural features, including large trees, gaps in the canopy, snags and down wood, various levels of overstory tree densities, and various levels of understory development, and would enhance the overall diversity of the area. Also, the action alternative would provide social and economic benefits to local communities through the supply of timber to local mills and contract work associated with the road decomissioning projects. Alternative 2 appears not to be in conformance because it does not contain a provision for the supply of timber or contract work that would contribute to the local economy.

- Air Quality Objectives: Any prescribed burning or burning of slash at roads and landings would adhere to smoke management/air quality standards.

- Water and Soils Objectives: Applicable Best Management Practices as described in the RMP, (Appendix C1-C10) are incorporated into the project design for the action alternatives and assure the maintenance of water quality and reduce the impacts to soil productivity while meeting other resource management objectives.

- Wildlife Habitat Objectives: Project design features for the density management proposals in Alternative 1 assure consistency with wildlife habitat objectives. These design features include but are not limited to providing snag, green tree and down wood habitat features as well as requirements to protect existing CWD and reserving all merchantable-sized hardwoods.

- Special Status and SEIS Special Attention Species and Habitat Objectives:

  Both of the alternatives are predicted not to contribute to the need to list or elevate their status to a higher level of concern (Chapter 3)

- Visual Resources Objectives: Both of the alternatives are consistent with the visual resources management objectives.

- Noxious Weeds: Both of the alternatives are predicted to avoid the introduction and spread of noxious weeds however they would likely result in an increase in the number and possibly diversity of weed species in the project area with these species returning to their low level as the native vegetation returns.

- Alternative 1 contains design features to minimize the introduction and spread of noxious weeds (Chapter 2).

- Fire/Fuels Management: Alternative 1 contains fuel management activities that would be conducted in such a manner as to adhere to smoke management/air quality standards and meet ACS objectives.

- Best Management Practices: Alternative 1 contains applicable Best Management Practices described in Appendix C1-C10 of the RMP.

* *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl (April, 1994).*

  - The RMP is consistent with the Record of Decision (*Salem District Resource Management Plan/Final Environmental Impact Statement, September, 1994*, Chapter 4-96). Since the action alternative is consistent with the RMP, this alternative is believed to be consistent with the Record of Decision.

* *Record of Decision for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines in forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl. (January, 2001)*

* Northern Coast Range Adaptive Management Area Guide, January 1997, pp. 7-14

and 49-50: Alternative 1 would accelerate the development of some late-successional forest structural features and provides social/economic benefit to local communities (Chapter 4).

* Late-Successional Reserve Assessment for Oregon=s Northern Coast Range Adaptive Management Area, January 1998, pp. 44-52, 82-83, 86-87, 92-98: Alternative 1 would accelerate the development of some late-successional forest structural features; would enhance the overall level of diversity within the area; and would develop windfirmness (Chapter 4; Appendix 2)

* *Nestucca Watershed Analysis:* The *Nestucca Watershed Analysis* (USDA Forest Service, USDI BLM, et. al. October 1994), supports the proposed activities. Recommendations contained on pages 62-65 of the WA were considered in the development the ReBear Project.

* *Coastal Zone Management Act*, as amended: The project area is **not** located within Oregon=s Coastal Zone boundary. However, the proposed action appears to be consistent with the applicable statewide planning goals identified in the Oregon Coastal Management Program.

* *Oregon Forest Practices Act*: Both of the alternatives are consistent with the Oregon Forest Practices Act. Various project design features within the alternatives assure this compliance.

* *Endangered Species Act*: As per BLM State Office Instructional Memorandum No. OR-97-061, the applicable Reasonable and Prudent Measures/Conservation Recommendations contained with in the National Marine Fisheries Service March 18, 1997 Biological Opinion and Conference Opinion were incorporated into the design features of Alternative 1 (Chapter 2).

  - Section 7 Consultation with the National Marine Fisheries Service is required because the proposed project action has been determined to be a AMay Affect@ to Oregon coast coho salmon. The proposed project has been determined to have no adverse impact to essential fish habitat of Oregon coast chinook salmon as determined by the Magnasum-Stevens Fishery Conservation and Management Act (2000). Informal consultation with NOAA Fisheries, NMFS is anticipated to occur project specifically in February of 2003.

  - In accordance with regulations pursuant to Section 7 of the Endangered Species Act of 1973, as amended, formal consultation with the USFWS concerning the potential impacts of the ReBear project upon the spotted owl, marbled murrelet and bald eagle has been completed. This was accomplished by including the

Rebear project within the annual programmatic habitat modification biological assessment prepared by the interagency Level 1 Team (terrestrial subgroup) for the North Coast Province, rather than the preparation of a project site-specific Biological Assessment. The proposed action alternative is consistent with definitions for *light to moderate thinning* as found in the programmatic BA.

## CHAPTER 4.0 LIST OF PREPARERS

The list of interdisciplinary team members that contributed to the preparation of the environmental assessment is contained in Table 10.

Table 10. List of preparers. This table contains a list of those individuals that prepared or contributed to the environmental analysis as documented in Environmental Assessment Number OR-086-03-01

| **Name** | **Title** | **Resource** |
|---|---|---|
| Andy Pampush | Biologist | Project lead, writer/editor, Wildlife |
| Kurt Heckeroth | Forestry Technician | Botany |
| Walt Kastner | Forester | Silviculture |
| Matt Walker | Fisheries Biologist | Fish |
| Dennis Worrel | Natural Resource Specialist | Soils and Water |
| Bill Wais | Forester | Logging Systems |
| Bob McDonald | Natural Resource Specialist | GIS (Graphic Information System) |
| Katrina Symons | NRSA | cultural resources and NEPA |
| Tim Livengood | Civil Engineering Tech. | Engineering |

# CHAPTER 5.0 CONSULTATION AND PUBLIC INVOLVEMENT

In accordance with regulations pursuant to Section 7 of the Endangered Species Act of 1973, as amended, formal consultation with the USFWS concerning the potential impacts of the ReBear project upon the spotted owl, marbled murrelet and bald eagle has been completed. This was accomplished by including the Rebear project within the annual programmatic habitat modification biological assessment prepared by the interagency Level 1 Team (terrestrial subgroup) for the North Coast Province, rather than the preparation of a project site-specific Biological Assessment. The proposed action alternative is consistent with definitions for *light to moderate thinning* as found in the programmatic BA.

Section 7 Consultation with the NOAA Fisheries, National Marine Fisheries Service is required because the proposed project action has been determined to be a AMay Affect@ to Oregon coast coho salmon. The proposed project has been determined to have no adverse impact to essential fish habitat of Oregon coast chinook salmon as determined by the Magnasum-Stevens Fishery Conservation and Management Act (2000). Informal consultation with NOAA Fisheries, NMFS is anticipated to occur project specifically in February of 2003.

Refer to section 1.6 for a discussion of the public involvement process used in the development of this environmental assessment.

**GLOSSARY**

**ACS** - See AAquatic Conservation Strategy.@

**Adaptive Management Area** - Landscape units designated for development and testing of technical and social approaches to achieving desired ecological, economic, and other social objectives.

**AMA** - See AAdaptive Management Area.@

**Aquatic Conservation Strategy** - The Aquatic Conservation Strategy was developed to restore and maintain the ecological health of watersheds and aquatic ecosystems contained within them on public lands. The strategy would protect salmon and steelhead habitat on federal lands managed by the Forest Service and the Bureau of Land Management within the range of the Northern Spotted Owl. The Aquatic Conservation Strategy is designed to meet nine objectives. Compliance with the Aquatic Conservation Strategy objectives means that an agency must manage the riparian-dependent resources to maintain the existing condition or implement actions to restore biological and physical processes within their ranges of natural variability.

**BMP -** see Best Management Practices

**Best Management Practices -** Those practices utilized by the Bureau of Land Management (located in appendix C of the ***RMP***) that are intended to maintain or improve water quality and soil productivity.

**Coarse Woody Debris** - Tree or portion of a tree that has fallen or was cut and left in the woods to contribute to a variety of ecosystem functions. Usually refers to pieces at least 20 feet long and 20 inches in diameter at the large end.

**CWD** - See ACoarse Woody Debris.@

**DBH** - See ADiameter at Breast Height.@

**Diameter at Breast Height** - The diameter of a tree 4.5 feet above the ground on the uphill side of the tree.

**Endangered Species Act (ESA)** - An Act of Congress in 1973 that defines the criteria for species that are in danger of extinction throughout all or a significant portion of its range.

**Environmental Assessment** - A systematic process of developing reasonable alternatives and predicting the probable environmental consequences of a proposed action and the alternatives.

**Environmental Impact Statement** - A formal document to be filed with the Environmental

Protection Agency that considers significant environmental impacts expected from implementation of a major federal action; a detailed written statement as required by section 102(2)(C) of the [National Environmental Policy] Act, as amended (40 CFR 1508.11).

**Finding of No Significant Impact - A document by a Federal agency briefly presenting the reasons why an action, not otherwise excluded (40 CFR 1508.4), will not have a significant effect on the human environment and for which an environmental impact statement therefore will not be prepared (40 CFR 1508.13).**

**IDT** - See AInterdisciplinary Team.@

**Interdisciplinary Team** - A group of resource specialists who conduct the environmental assessments.

**Major Issue - Also referred to as Asignificant issue.@ A major point of discussion, debate, or dispute about environmental effects of the proposed action. For the purposes of the National Environmental Policy Act, a major issue or significant issue is an issue within the scope of a proposed action, which is used to formulate alternatives, develop mitigation measures, or is important in tracking effects.**

**MMBF** - Million Board Feet. A board foot is a unit of measure used to quantify commercial lumber; it measures 1 foot x 1 foot x 1 inch.

**MBF** - Thousand Board Feet**.** A board foot is a unit of measure used to quantify commercial lumber; it measures 1 foot x 1 foot x 1 inch.

**National Environmental Policy Act - The basic national charter for the protection of the environment. It establishes policy, sets goals (section 101), and provides means (Section 102) for carrying out the policy.**

**NEPA - See "National Environmental Policy Act"**

**New road construction** - Construction of a road where there previously has not been a road. ie: no indication of an historic road bed (indicators may include: excavation scaring and human caused alteration of the topography; vegetation such as alder growing in or along the old road; indications of a rocked surface or soil compaction; or altered flow of surface water not attributed to natural causes.

**O&C Lands** - Lands which where granted to the Oregon and California Railroad Company in 1866 but which have been revested to the federal government.

**Permanent road** - Permanent roads are those roads that are used and/or not decommissioned after the contract is terminated**.**

**Road -** A transportation facility originally constructed to be used primarily by vehicles having four or more wheels. It is documented as such by the owner, and [may be] maintained for regular and continuous use (CFR 9100). The level of maintenance is generally dependent on available funding.

**RMP -** see Salem District Record of Decision and Resource Management Plan

**RR** - see riparian reserve

**Riparian Reserves** - A Federal (BLM or USFS) land-use allocation which overlays all other land allocations. They are lands along streams and unstable and potentially unstable areas where special standards and guidelines direct land use.

**Riparian Zones -** Those parts of the riparian reserves where actual riparian conditions exist.

**Salem District Record of Decision and Resource Management Plan (May 1995) -** The Management Plan that addresses resource management on all Bureau of Land Management administered land within the Salem District.

**Scoping - An ongoing process to determine the breadth and depth of an environmental analysis.**

**Snags** - Any standing dead, partially dead, or defective (cull) tree at least 10 inches in diameter at breast height and at least 6 feet tall. A hard snag is composed primarily of sound wood, generally merchantable. A soft snag is composed primarily of wood in advanced stages of decay and deterioration, generally not merchantable.

**Soil compaction** - The increase in soil density (reduction of total porosity) that results from the rearrangement of soil particles in response to applied external forces such as traffic by heavy machinery.

**Survey and Manage (S&M)** - A group of species that were defined in the Northwest Forest Plan that have special protection measures associated with them.

**TMDL - Total Maximum Daily Load** is the total amount of a pollutant that can enter a waterbody without violating water quality standards.

**Units of Measure - A measure is an indicator of a variable; a yardstick to determine how the**

**variable is moving (being changed or being altered) relative to an established base point and how the variable is being affected or the change occurring because of the proposed action/alternatives.**

# APPENDIX 1

## ENVIRONMENTAL ELEMENTS

Environmental Assessment Number OR-086-03-01

In accordance with law, regulation, executive order and policy, the ReBear interdisciplinary team reviewed the elements of the environment to determine if they would be affected by the proposed action described in Chapter 2 of the EA (environmental assessment). The following two tables summarize the results of that review. There were no major issues identified by the interdisciplinary team through scoping (EA, Chapter 1). The predicted environmental consequences are described in Chapter 3 of the EA.

**Table 1. Critical Elements of the Environment.** This table lists the critical elements of the environment which are subject to requirements specified in statute, regulation, or executive order and the interdisciplinary team=s predicted environmental impact per element if the proposed action described in Chapter 2 of the Environmental Assessment was implemented.

| CRITICAL ELEMENTS OF THE ENVIRONMENT | ENVIRONMENTAL EFFECT | INTERDISCIPLINARY TEAM=S COMMENTS |
|---|---|---|
| Air Quality | **Minimal effect** | This element was not identified as a major issue. The major sources of potential air pollutants associated with the proposed action are smoke from prescribed burning (e.g. burning of landing debris or other fuels concentrations determined to be a fire hazard), and dust from the use of unsurfaced roads and road maintenance (Salem District Resource Management Plan Final Environmental Impact Statement, Chapter 4-8). The project area is approximately 15 air miles southeast of the city of Tillamook. The proposed haul routes would require hauling approximately 5 miles on gravel roads before reaching paved roads. Also, there are several rural residences located |

| CRITICAL ELEMENTS OF THE ENVIRONMENT | ENVIRONMENTAL EFFECT | INTERDISCIPLINARY TEAM=S COMMENTS |
|---|---|---|
| | | along the proposed haul route but only along the paved portions. The project area is not within an Oregon Smoke Management designated area. Since burning would be conducted in accordance with the *Oregon State Implementation Plan* and *Oregon Smoke Management Plan*, the impact of smoke on air quality is predicted to be local and of short duration. Dust created from vehicle traffic on gravel or natural-surface roads, from road construction, road improvement, road decommissioning, road maintenance, and logging operations is predicted to be localized and of short duration. As such, the proposed action would have no adverse impact on air quality and would comply with the provisions of the Clean Air Act. |
| Areas of Critical Environmental Concern | None | This element was not identified as a major issue. There is no ACEC located within the project area. |
| Cultural, Historic, Paleontological | None | This element was not identified as a major issue. There are no known cultural sites located within the project area. Pursuant to the August 1998 protocol for managing cultural resources on lands administered by the BLM in Oregon, the Coastal Range Inventory Plan only required post harvest surveys. As such, surveys will not be conducted until the harvest activity is completed. If during the implementation of the project cultural resources are found, the project (s) may be redesigned to protect the cultural resource values present, or evaluation |

| CRITICAL ELEMENTS OF THE ENVIRONMENT | ENVIRONMENTAL EFFECT | INTERDISCIPLINARY TEAM=S COMMENTS |
|---|---|---|
| | | and mitigation procedures would be implemented based on recommendations from the District Archaeologist. |
| Native American Religious Concerns | None | This element was not identified as a major issue. Tribes were contacted during scoping and no Native American religious concerns were identified. |
| Threatened or Endangered Plant Species or Habitat | None | This element was not identified as a major issue. There are no known threatened or endangered plant species or habitat located within the project area. |
| Threatened or Endangered Wildlife Species or Habitat | See Chapter 3 of the EA | This element was not identified as a major issue. However, refer to Chapter 3 of the EA for a discussion of the environmental effects. |
| Threatened or Endangered Fish Species or Habitat | See Chapter 3 of the EA | This element was not identified as a major issue. However, refer to Chapter 3 of the EA for a discussion of the environmental effects. |
| Prime or Unique Farm Lands | None | **This element was not identified as a major issue. There is no prime or unique farm land located within the project area.** |
| Flood Plains | None | **This element was not identified as a major issue. There are no flood plains in or near the project area. Refer to Chapter 3 of the EA for a discussion of the effects.** |
| Hazardous or Solid Wastes | None | **This element was not identified as a major issue. There is not predicted to be any environmental effects associated with this element due to the implementation of the Best** |

| CRITICAL ELEMENTS OF THE ENVIRONMENT | ENVIRONMENTAL EFFECT | INTERDISCIPLINARY TEAM=S COMMENTS |
|---|---|---|
| | | **Management Practices contained in the Salem RMP and the terms and conditions of the timber sale contract. Failure to comply with the terms and conditions of the timber sale contract can result in violations, suspension or cancellation of the contract per section 10.** |
| Water Quality (Surface and Ground) | **See Chapter 3 of the EA** | **Impacts to water quality was not identified as a major issue. Refer to Chapter 3 of the EA for a detailed analysis of the impacts to water quality.** |
| Wetlands/Riparian Zones (Executive Order 11990, Protection of Wetlands, 5/24/77) | **Minimal Effect** | **This element was not identified as a major issue. While the density management thinning project proposes to treat approximately 92 acres of Riparian Reserve, project design features, such as the maintenance of ANo-Harvest @ buffers and the restriction upon the use of ground-based equipment assure the protection of wetland and riparain zones. Also see Appendix 3 for a discussion of Aquatic Conservation Strategy objectives.** |
| Wild and Scenic Rivers | None | **This element was not identified as a major issue. There is no wild and scenic river located within the project area.** |
| Wilderness | None | **This element was not identified as a major issue. There is no wilderness located within the project area.** |
| Invasive, Nonnative | **See chapter 3 of the** | **This element was not identified as a** |

| CRITICAL ELEMENTS OF THE ENVIRONMENT | ENVIRONMENTAL EFFECT | INTERDISCIPLINARY TEAM=S COMMENTS |
|---|---|---|
| Species (includes Executive Order 13112, Invasive Species, 2/3/99) | **EA** | **major issue. However, refer to Chapter 3 of the EA for a discussion of the environmental effects.** |
| Environmental Justice (Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations, 2/11/94) | **Minimal Effect** | **This element was not identified as a major issue. The density management thinning would yield approximately 5.5 million board feet of merchantable timber over a 3 year period which would result in minimal impact to local economies. The proposed action is not anticipated to have disproportionately high and adverse human health of environmental effects on minority populations and low-income populations.** |
| Adverse Energy Impact (Executive Order 13212) | None | **The proposed action will have no adverse impact on energy development, production, supply and/or distribution.** |

**Table 2. Other Elements of the Environment.** This table lists other elements of the environment which are subject to requirements specified in law, regulation, policy, or management direction and the interdisciplinary team=s predicted environmental impact per element if the proposed action described in Chapter 2 of the Environmental Assessment was implemented.

| ELEMENTS OF THE ENVIRONMENT | ENVIRONMENTAL EFFECT | INTERDISCIPLINARY TEAM=S COMMENTS |
|---|---|---|
| Land Uses (including mining claims, mineral leases, etc.) | None | **This element was not identified as a major issue. There are no known mining claims or mineral leases within the project area.** |
| Minerals | None | **This element was not identified as a major issue. The proposed action does not include the extraction of any** |

| ELEMENTS OF THE ENVIRONMENT | ENVIRONMENTAL EFFECT | INTERDISCIPLINARY TEAM=S COMMENTS |
|---|---|---|
| | | **mineral resource. As such, this element would not be affected by the proposed action.** |
| Recreation | None | **This element was not identified as a major issue.** Recreation in this area is of the dispersed type such as hunting and mushroom gathering. The recreational value of the area will be unaltered by implementing the proposed action. |
| Soils | **Minimal effects - See chapter 3 of the EA** | **This element was not identified as a major issue. However, refer to chapter 3 of the EA** for a discussion of the environmental effects. |
| Visual Resources | None | **This element was not identified as a major issue.** |
| Water Resources (including Aquatic Conservation Strategy Objectives, beneficial uses [Salem FEIS Chapter 3-9], DEQ 303d listed streams, water temperature, sedimentation, water quantity, etc.) | **Minimal effects - see chapter 3 of the EA** | **This element was not identified as a major issue. See chapter 3 of the EA, and appendix 3** |
| Bureau Sensitive and Special Attention Plant Species/Habitat (including Survey and Manage, and protection buffer species) | **Minimal effects - see chapter 3 of the EA** | **This element was not identified as a major issue. See chapter 3 of the EA** for a discussion of the environmental effects. |
| Bureau Sensitive and Special Attention Wildlife Species/Habitat (including mammal | **Minimal effects - see chapter 3 of the EA** | **This element was not identified as a major issue. See chapter 3 of the EA** for a discussion of the environmental effects. |

| ELEMENTS OF THE ENVIRONMENT | ENVIRONMENTAL EFFECT | INTERDISCIPLINARY TEAM=S COMMENTS |
|---|---|---|
| Survey and Manage and mollusks) | | effects. |
| Fish Species with Bureau Status and Essential Fish Habitat | **Minimal effects - see chapter 3 of the EA** | **see chapter 3 of the EA** |
| Rural Interface Areas | **None** | **This element was not identified as a major issue. There are no rural interface areas in the vicinity of the project area.** |
| Coastal Zone (affect on Aany land or water use or natural resource of the coastal zone.@ The determination of effects should include Adirect, indirect, cumulative, secondary, and reasonably foreseeable effects@) | None | **This element was not identified as a major issue. The project area is not located within Oregon=s Coast Zone boundary.** |
| Other (specify) | | |

# APPENDIX 2a

## SILVICULTURAL PRESCRIPTION for Units 5-1, 7-1 and 7-2

## ReBear Density Management

Location: SW1/4, SW1/4, Sec. 5; NE1/4, NW1/4; and NE1/4 Sec. 7; W1/2, NW1/4 Sec. 8, T.3S., R.7W.

Prepared by: Walt Kastner (Silviculturist) and Steve Bahe (Wildlife Biologist)
Date: March 16, 1995

I. Introduction

A. Management direction and objectives

The proposed project is within a Late-Successional Reserve (LSR) and the Northern Coast Range Adaptive Management Area (AMA), as identified in the *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* (ROD) and the *Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest-Related Species Within the Range of the Northern Spotted Owl* (S&Gs), dated April, 1994. LSRs are to be managed for the protection and enhancement of old-growth forest conditions which serve as habitat for late-successional and old-growth-related species, including the northern spotted owl. Stand management activities in LSRs are subject to review by the Regional Ecosystem Office (REO). Silvicultural systems planned in LSRs shall have the following primary objectives: (1) developing old-growth forest characteristics including snags, down logs, large trees, and gaps in the canopy allowing the establishment of multiple tree layers and a variety of species; and (2) preventing large-scale disturbances that would limit the ability of the reserves to maintain viable populations of forest species.

Within AMA's, agencies are encouraged to undertake new management approaches and evaluate their outcomes. The purposes of this Northern Coast Range AMA are primarily to restore and maintain late-successional forest habitat, consistent with marbled murrelet guidelines. The maximum age for thinning in this LSR (within the Northern Coast Range AMA) is 110 years.

Some of the silvicultural treatments proposed here may be considered somewhat experimental; however, they are within the range of treatments currently under study through various research projects in this region. The objectives of the treatments contained in this prescription are to accelerate the development of some late-successional forest structural features, including large trees, which can serve as sources of snags and down logs; gaps in the canopy and various levels of overstory tree density, which would permit a variable degree of establishment and growth of multiple tree layers and other understory species; and preventing large-scale disturbances that would restrict the capacity of the reserves to maintain viable populations of forest species. Implementation of this prescription will enhance the overall level of diversity in this area. In addition, it will set the stage for future treatments that could continue this process, if such treatments were determined to be necessary at that time.

B. Watershed perspective

The area lies within the Nestucca River watershed. The Nestucca River Watershed Analysis (NRWA) was completed in October, 1994. According to the NRWA, about 60% of the watershed is in early-seral habitat; 40% is in early- to mid-seral habitat, consisting of immature to mature stands ranging in age from 30 to 100 years; and less than 1% of the stands are more than 130 years old. Most of the mature forest stands are in the 80- to 100-year-old range, very fragmented, and dominated by even-aged Douglas-fir. These stands are typically quite uniform, and are deficient in snags and down logs. Therefore, little habitat is available in the watershed for species that depend on late-successional forest habitat.

The NRWA also identifies opportunities to hasten the development of some late-successional features through site-specific silvicultural treatments such as "variable-spaced thinnings," which are the kinds of treatments proposed in this prescription.

This area was selected for treatment because the majority of it consists of relatively dense, single-storied stands that are of an age and condition that could respond favorably to careful intervention designed to increase the development of late-successional forest features. Without intervention at this time, the rate of development toward late-successional conditions would be relatively slow because the overstory is becoming increasingly dense and uniform.

II. Site and Stand Description

A. Physical features

The project area (see attached map) encompasses over 240 acres, and is located in the headwater areas of Bear Creek and Elk Creek, both of which are tributary to the Nestucca River. The area is also within a Tier 1 Key Watershed.

Elevation ranges from about 2,160 to about 2,460 feet, with a wide variety of slopes ranging from over 90% (including a few short pitches that are nearly vertical) on the southwest face of the prominent northwest- to southeast-running ridge in the southwest part of the treatment area to 30% or less on portions of the rather broad east- to west-running ridge along the northern boundary of section 7 and the lower slope positions. Overall, slopes probably average 40 to 50%.

Soils appear to be productive, moderately deep, and silt loam in texture, except on the steeper south- to southwest-facing slopes where there is a significant component of coarse fragments. Old skid trails occur throughout most of the area. After 40 years, soils on these trails are still exhibiting evidence of compaction. There is a tremendous amount of large decaying logs on the forest floor, except for the relatively small portion of the area in section 5. The primary source of this wood was the old-growth snags that were felled during salvage logging operations following the Tillamook burn. In addition, there is still some small wood on the ground in places from the precommercial thinning that occurred about 25 years ago.

B. Plant associations

The plant associations described for the Siuslaw National Forest by Hemstrom and Logan (1986), are generally applicable to this area. Because of the rather high overstory tree density, the understory is very sparse in most places, making accurate determination of the plant associations difficult at best. Based on the relative proportions of the indicator species present, however, the most likely plant associations appear to include western hemlock/salal, western hemlock/vine maple-salal, and western hemlock/Oregongrape-salal on the steeper south-, southwest-, and west-facing slopes; western hemlock/swordfern on the upper-elevation north-facing slopes and broader ridge tops; western hemlock/Oregon oxalis on the lower slope positions on the north-facing slopes; and western hemlock/salmonberry and western hemlock/devil's club along the perennial streams.

C. Stand history and description

The northern portion of the proposed treatment area in section 7 appeared to have been heavily impacted by the Tillamook burn in 1939. This fire also appeared to have affected approximately 25% of the southern portion of section 7 as well. The old timber sale records for the area indicate that most of the portion within section 7 was logged between 1941 and 1943, and again between 1956 and 1957. A combination of fire-killed timber (which included a small percentage of beetle-killed timber), and green timber was harvested under these timber sales. Advance regeneration was noted in 1943.

The area included in section 5 appeared to have been impacted by the both 1939 and 1951 fires. Harvest of fire-killed Douglas-fir was done in 1948, and another timber sale contract for Douglas-fir salvage was completed during 1956 and 1957.

The portion of the proposed treatment area in section 8 was probably impacted only by the 1951 fire. In 1956 to 1958, a combination of salvage and green Douglas-fir was harvested from this area.

In the 1940's, the logging was probably done with a cable system. In the 1950's, the logging was done with crawler-tractors.

The entire area was aerially seeded with Douglas-fir in 1958 to 1960. The seed was apparently collected from mid-elevation sources in the vicinity of Vernonia, Oregon. Because of inadequate stocking in section 5, the area was also planted with Douglas-fir in 1962. A more detailed account of the history of this area is available at the Tillamook Resource Area Office.

The current 45-year-old Douglas-fir/western hemlock forest stand that encompasses most of the area (approximately 78%), probably originated from a combination of mostly natural regeneration and some aerial seeding. The 37-year-old Douglas-fir stand in section 5 and the north part of section 8, which comprises about 17% of the area, however, probably regenerated mainly from the aerial seeding and planting efforts.

There are generally three distinct forest types represented within the proposed treatment area in section 7 and most of section 8. There are approximately 200 acres included in this portion. The majority (perhaps as much as 80% or more) is a 45-year-old, even-aged Douglas-fir/western hemlock stand that was precommercially thinned about 25 years ago. In the precommercial thinning, Douglas-fir was favored for retention, but because there appeared to have been a large proportion of hemlock regeneration in the stand, it is still a major stand component. The residual trees responded well to the thinning, but growth rates have been slowing down over the past 10 years or so because of strong tree-to-tree competition.

Typically this stand type contains about 125 Douglas-fir trees averaging 14 inches DBH and about 120 western hemlock trees averaging 13 inches DBH. Occasionally, red alder occurs as a very minor stand component. The overall density is too high to maintain maximum stand volume growth and vigor for both species. The diameter growth of a small sample of the dominant Douglas-firs averages 3.3 inches (range 1.8 to 5.3 inches) over the past 10 years. For the most part, the trees are fairly uniform in size and in spacing, and form a single canopy layer. The relative proportions of Douglas-fir and hemlock vary throughout, with Douglas-fir tending to be more abundant on the drier south-, southwest-, and west-facing slopes. As a result of the precommercial thinning and the abundance of down wood on the forest floor, hemlock advance regeneration is common. Most of it is less than 5 to 6 feet tall and because it has persisted for many years under a relatively dense overstory, much of it appears to have lost epinastic control, so its ability to resume normal growth following release is questionable. In addition, because of the very limited amount of light reaching the forest floor, there are few understory shrubs and herbs.

Old-growth Douglas-fir stumps (most of which are well over 50 inches in diameter) are common throughout the area. A small survey of the stumps of the old-growth Douglas-firs that appeared to be reasonably sound at the time of harvest indicated that the spacing between the trees was highly variable and averaged about 46 feet, with a range of 25 to 75 feet.

Imbedded within this matrix of even-aged Douglas-fir/western hemlock are the two other forest types, both of which contribute significantly to the overall diversity of the area. Between 10 and 15% of this area consists of extremely dense, slow-growing conifer patches that were not treated during the precommercial thinning. These trees have relatively low crown ratios and high height/diameter ratios, indicating stand instability. These areas are often supporting over 830 trees per acre, with an average stand diameter of about 9 inches. Because of the very high density, there is no understory vegetation and the stand is actively self-thinning. The diameter growth rate over the past 10 years, even for some of the dominant Douglas-firs, was only 0.8 inches.

In addition, patches of red alder (approximately 5% of the area) dominate old skid roads and landing areas, and disturbed moist sites near streams. The alder appears to be about 40 years old. These alder patches are also currently serving to encourage large limb development of the surrounding conifers and will affect the distribution pattern of conifers in the future. These alder stands contain over 500 stems per acre that average about 8 inches DBH. Together, the very dense conifer and the alder stands provide a sharp contrast to the rather uniform Douglas-fir/hemlock stand that dominates the area. Also, there are some areas where the conifers established and grew at a rather low density (less than 100 trees per acre). These trees have relatively large diameters (average 17 inches) and high live-crown ratios (typically more than 50%).

Four stand types occur in the portion occurring in section 5 and the north part of section 8. Approximately 40 acres are contained within this portion. Three stand types are dominated by 37-year-old Douglas-fir, and comprise about 90% of this area. A small portion of the area (about 4 to 5 acres) consists of relatively open-grown trees. Because of their open-grown condition, these trees often have crown ratios of more than 60%. Laminated root rot, caused by *Phellinus weirii*, appears to be responsible the low stocking in this area (about 150 trees per acre averaging about 14 inches DBH). A large part of the area is well stocked. Typically, there are nearly 320 trees per acre averaging 11 inches DBH. Diameter growth has slowed over the past 5 years, and the density is now above the level where stand growth and vigor are maintained. The understory here is very sparse. Live crown ratios on the larger trees average 35% or more and those of the smaller trees average 25% or less. In places, there are areas that are extremely dense (1,200 stems per acre averaging 7 inches DBH). There is not enough light to support any understory vegetation and the areas are actively self-thinning. Disturbed moist sites (less than 10% of this area) support stands of red alder similar to those described for the portions in sections 7 and 8.

The project area contains two main perennial 1st- and 2nd-order streams. Where past disturbance occurred, red alder is a major, often dominant, stand component of the associated riparian areas. However, the great majority of the riparian areas have a large component of conifers, and the streams have an abundant supply of large wood in them. Therefore, no silvicultural treatments were considered to increase conifer stocking in these areas. In addition, there is a wet meadow, about 1/4-acre in size, in the northeast part of section 7 that adds to the overall diversity of the area.

D. Riparian Reserve widths:

The appropriate site-potential tree height to be used in determining the Riparian Reserve widths specified in the S&Gs is 220 feet, according to the most recent BLM guidance.

E. Stand exam data

A detailed stand exam covering 160 acres of the proposed treatment area in section 7 was conducted in May, 1994. Results for this area as a whole are summarized in Table 1. Additional stand data for the Douglas-fir stands in section 5 and the northern portion of section 8 were collected in February, 1995.

The 50-yr site index (King 1966) is 124 ft, which is higher than average for the local area. The Relative Density for the area is 73, indicating that the density over the area as a whole is high. The live crown ratio for the entire area averages 26%, which is rather low. However, the larger Douglas-firs (19 to 26 inches dbh) have crown ratios ranging from 36 to 56%, and the larger western hemlocks (14 to 27 inches dbh) have crown ratios ranging from 35 to 75%. These trees should be able to respond fairly rapidly to release. Although not specifically measured during the stand exam, the canopy closure appears to be over 95% in most areas. The lack of snags is quite apparent, especially in areas that were precommercially thinned.

Table 1. Summary of stand exam data collected in section 7 of the Bear Creek proposed project area.

| Element | Tree species | | | | |
|---|---|---|---|---|---|
| | DF[1] | RA[2] | WRC[3] | WH[4] | All |
| Trees/ac | 146 | 20 | 1 | 117 | 284 |
| Trees/ac (%) | 52 | 7 | <1 | 41 | 100 |
| Basal area/ac | 158 | 11 | <1 | 93 | 262 |
| Basal area/ac (%) | 60 | 4 | <1 | 36 | 100 |
| Net MBF/ac | 28.9 | 1.7 | <1 | 13.6 | 44.2 |
| Net MBF/ac (%) | 65 | 4 | <1 | 31 | 100 |
| Quadratic mean diameter[5] | 14.1 | 10.2 | 11.0 | 12.1 | 13.0 |
| Average tree height (ft) | 83 | 63 | 64 | 70 | 76 |

[1]Douglas-fir. [2]Red alder. [3]Western redcedar. [4]Western hemlock.
[5]Diameter of the tree of average basal area.

F. Forest health

There are few present threats to forest health other than the risk of windthrow from severe winter storms, or to some extent, wildfire. There are scattered infection centers of laminated

root rot (well under 5% of the area), most of which seem to occur on upper slopes and ridges. The association of this disease with upper slopes and ridges is typical for this area (Kastner et al. 1994). Considering the area as a whole, the disease is generally not causing significant losses at present, and most infection centers appear to be less than 1/2-acre in size. Laminated root rot spreads through stands of susceptible species, such as Douglas-fir, by root contacts (Thies 1984, Hadfield et al. 1986). In the 4- to 5-acre, open-grown Douglas-fir stand in the northern part of section 8, however, laminated root rot was probably largely responsible for the open-grown conditions.

Annosus root disease, caused by *Heterobasidion annosum*, may result in substantial butt decay in western hemlock that is over 150 years old and mortality resulting from stem breakage (Buckland et al. 1949, Foster et al. 1954). Spores of the fungus colonize freshly exposed wood on stump surfaces and stem wounds, and then the disease spreads to adjacent healthy trees most commonly by root contacts (Hadfield et al. 1986). Although the rate of disease infection was nearly twice as high in commercially thinned 40- to 120-year-old western hemlock stands in western Oregon and Washington compared to unthinned stands, losses due to decay were very low (Goheen et al. 1980).

Following any partial-cut harvest, the potential for windthrow would be greater for the next decade. The upper lee slope of the major southeast- to northwest-running ridge seems especially prone to windthrow. Most windthrow of dominant or codominant trees is associated with pockets of laminated root rot at the present time.

### G. Stand development prognosis

Because of the relatively high density, development toward late-successional forest conditions is expected to continue to slow down, unless some disturbance occurs that creates openings in the stand that permits accelerated growth of some overstory trees and provides an opportunity for understory trees, shrubs, and herbs to develop. Under the current high level of competition, crowns will likely continue to recede, diameter growth can be expected to decline, competition-related mortality will increase, and growth of understory conifers and other vegetation will be extremely limited. Without planned stand intervention or another form of disturbance, development of late-successional forest structure in this area will probably be very slow for at least the next 75 to 100 years or more.

## III. Proposed Action

### A. Desired future conditions

The goal of this proposal is to increase the level of diversity already developing in the area by increasing the degree of contrast among and within the various stand types. The desired future condition for this area includes dense conifer patches (approximately 15 to 20%); alder/brush-dominated areas (approximately 5%); small stand openings (less than 5%); large, snag-topped, living trees with deformities; large snags (many of which would be contributed by the death of snag-topped trees); down wood; regularly spaced, vigorous, even-aged Douglas-fir stands (about 10%); and mixed-species stands with multi-storied canopies containing some large trees and various levels of understory development (approximately 65%).

Both the extremely dense conifer types and the alder-dominated areas are not recommended for treatment at this time. Both stand types contribute to the overall structural diversity of the area. In addition, the alder are helping to reduce the compaction on the former skid roads and landings. Areas infested with laminated root rot are creating various-sized openings on their own, so no treatment is recommended for these areas as well. Because of the tremendous amount of large wood on the forest floor, there is no need to add more at this time. Therefore, the proposed treatments will be focused on increasing the level of structural diversity in the relatively uniform, conifer-dominated portions (most of which were previously precommercially thinned), by encouraging development of large overstory trees; understory trees, shrubs, and herbs; large, snag-topped, living trees with deformities; large snags; and small stand openings.

1. Overstory development

Following a variable-density thinning in the precommercially thinned Douglas-fir/western hemlock stands (approximately 15% of this stand type thinned to an average residual density of 40 trees/acre in 1/2- to 1-acre patches, approximately 75% thinned to an average residual density of 90 trees/ac, and 10% untreated in 1/2- to 1-acre patches), a variety of growing conditions would be provided for the residual trees and for a variable degree of understory development. Leave trees would be unevenly spaced, with some interspersed clumps ranging in size from two or three trees up to a dozen or so.

Maximum development of large trees with large crowns would occur in the wider-spaced areas, while development would be slowest in the narrower-spaced areas (untreated areas and larger clumps). At the same time, not treating the unthinned areas and the alder-dominated portions would increase the level of structural diversity over the area as a whole.

The well-spaced Douglas-fir stand in section 5 and the northern part of section 8 (approximately 17% of the total area) would be thinned in a more traditional manner to maintain maximum stand growth and vigor, and increase the overall diversity level within the treatment area.

2. Understory development

By opening up the overstory to various degrees, more light would be provided to the forest floor. This would create an opportunity for the establishment and growth of tree seedlings of a variety of species, (especially western hemlock which readily regenerates on down logs) and begin the development of multiple canopy layers in the forest. It would also permit establishment and growth of many other kinds of shrubby and herbaceous vegetation on the forest floor.

3. Large, living, snag-topped trees with deformities, and snags

To help provide standing live and dead tree habitat, for a variety of wildlife species, the tops of some (about 1 tree per acre) existing live trees would be girdled in the live crown at the time of harvest (if none were created as a result of the logging operation), creating living, snag-topped trees that would develop various kinds of deformities as they continue to grow. Eventually, these trees would become snags. Other trees would be left to grow to larger diameters before they would be treated. This would assure a continued supply of such trees and snags in the long term.

4. Small openings

On areas currently infected with laminated root rot, no treatment is recommended at this time. These openings are, and would continue to provide an element of early successional vegetation within the stand.

B. Recommended treatments

To be consistent with the experimental and adaptive approach intended for AMAs and the overall objectives of the LSR, the proposed action is to thin the previously precommercially thinned Douglas-fir/western hemlock stand to a wide range of residual densities that vary throughout the area. This would allow for evaluation over time of the differences in stand development between treatments and would accelerate the level of structural complexity that is slowly developing at the present time. Selection of the 1/2- to 1-acre patches where the density will be to be reduced to an average of 40 trees per acre will be based on the windfirmness of the residual trees. Within each residual density level the spacing between trees would be variable. Because of the relatively high proportion of hemlock in the stand and its susceptibility to annosus root disease and other stem decays, various-sized clumps of hemlocks would be established, and where possible, these would be surrounded by Douglas-firs or residual old-growth stumps to reduce logging damage and to break up root continuity, which should decrease the potential for future losses from annosus root disease as well as other decay-causing fungi. To provide future "protected" snags, occasionally trees spaced less than 4 feet apart would be left together as a group (one of the two trees could be converted into a snag at a future date).

Within the Riparian Reserves, the following treatments are recommended:

1. Do not thin areas of the stand dominated by red alder, or the patches of very dense conifers which did not receive precommercial thinning. These areas occupy an estimated 60 percent of the length of the perennial streams.

2. Establish a no-treatment buffer in the first 100 feet (slope distance) on each side of perennial streams, seeps, and the small wet meadow in the southeast portion of section 7.

3. In the next 100 feet on each side of the streams (i.e., from 100 to 200 feet), thin approximately 75 percent of the areas to be treated to a residual density of not less than 120 trees per acre. Another 15 percent would be thinned to an average of 40 trees per acre in scattered pockets up to 1/4 acre in size, and the remaining 10 percent would not be treated.

4. Outside of these zones, the Riparian Reserve area would be treated similar to the upslope areas.

Treatment of selected stand types in this rather conservative manner within the Riparian Reserves (and leaving others untreated) to increase the level of structural complexity would be consistent with the objectives of the Aquatic Conservation Strategy contained in the S&Gs. Treatment as proposed within the Riparian Reserves would help to maintain and restore (1) the distribution, diversity, and complexity of the forest types within the watershed; and (2) the species composition and structural diversity of plant communities within the Reserves and to provide a future supply of coarse woody debris.

Treatment is not expected to retard restoration and maintenance of (1) spatial and temporal connectivity within and between watersheds; (2) the physical integrity of the aquatic systems; (3) water quality necessary for the support of healthy riparian, aquatic, and wetland ecosystems; (4) the sediment regime under which aquatic ecosystems developed; (5) in-stream flows needed to create and sustain riparian, aquatic, and wetland habitats and to retain sediment, nutrient, and wood routing patterns; (6) the timing, variability, and duration of floodplain inundation and water table elevation in wetlands and meadows; (7) habitat to support well-distributed populations of native, invertebrate, and vertebrate species that are riparian-dependent; and (8) species composition and structural diversity of plant communities in riparian areas and wetlands.

The silvicultural objectives of each density treatment are described generally in the following section. Detailed treatment prescriptions are contained in part VI.

**Well-spaced 45-year-old Douglas-fir/western hemlock stand:**

1. 40 trees per acre average residual tree density in 1/2 to 1 acre patches (approximately 15% of the area contained within this stand type)

(a) Through a variable-density thinning (leaving 36 to 45 trees per acre), accelerate live crown development and diameter growth rates on residual trees. The intent is to produce large trees (average greater than 24 inches) in a relatively short time. The reserved trees would not be considered available for any future harvest. In this treatment, approximately 59% of the trees and 50% of the basal area would be removed on the average. The Relative Density would be reduced to about 19.

(b) Provide a future source of large, snag-topped trees with deformities, large snags, and large down logs from the rapidly-growing overstory trees.

(c) Provide an opportunity for natural conifer regeneration of western hemlock and some Douglas-fir, as well as establishment of understory shrubs and herbs in areas of 1/2 to 1 acre in size. This will begin development of multiple canopy layers. Apply treatments as needed to maintain survival and growth of the conifer regeneration. Future density management will likely include precommercial and commercial thinning of the developing understory trees. The small openings created would enhance the overall level of diversity.

2. 90 trees per acre average residual tree density (approximately 75% of the area contained within this stand type)

(a) Accelerate growth of residual trees in order to grow large overstory trees more quickly. By means of variable leave-tree retention levels (70 to 121 trees per acre), increase within-stand habitat diversity. Select leave trees in the wider-spaced areas from among the larger, more windfirm trees in the stand. Leave clumps of two or three trees to up to a dozen or so scattered throughout. Reserve mostly hemlock in clumps, where available, surrounded by Douglas-fir to reduce residual tree damage and the potential spread of annosus root disease. Plan to re-evaluate and possibly remove some of the reserved trees in a future thinning to maintain growth rates on the remaining trees. In this treatment, approximately 62% of the trees (range 50 to 69%) and 53% of the basal area (range 43 to 59%) would be removed on the average. The Relative Density would be reduced to about 31 (range 26 to 38).

(b) Provide a source of future large snags and large down logs.

(c) Permit establishment of an understory of mostly western hemlock in wider-spaced areas within the stand. Shrubs and herbs should also respond to the temporary opening. Without future intervention to thin the overstory, however, development of the regeneration layer will be limited.

3. Untreated

(a) By providing small patches (1/2 to 1 acre in size covering approximately 10% of the area contained within this stand type) scattered throughout the area to be thinned, the level of stand structural diversity will be enhanced. These areas are expected to become very dense and therefore unstable, so future thinning of these areas is not recommended.

(b) Provide a source of smaller-sized snags as trees die slowly from suppression.

**Well-spaced, 37-year-old Douglas-fir stand:**

To add to the overall diversity of the area, thin this stand type to an average of 144 trees per acre by selecting the larger trees in the stand as leave trees. In this treatment, approximately 54% of the trees and 46% of the basal area would be removed on the average. The Relative Density would be reduced to about 35. This is expected to maintain stand volume growth and vigor for the next 20 years or so. By that time, when the stand reaches 54 years of age, the stand density levels will likely be such that another thinning should be considered to maintain stand growth and vigor.

IV. Anticipated Effects on Future Development

Estimates of future stand development as a result of these treatments were aided by projections made by the Stand Projection System (SPS) computer stand simulation model (Arney 1984-1991).

**Well-spaced 45-year-old Douglas-fir/western hemlock stand:**

1. 40 trees per acre average residual tree density in 1/2- to 1-acre patches (approximately 15% of the area contained within this stand type):

Through the variable-density thinning (leaving 36 to 45 trees per acre), accelerated live crown development and diameter growth rates on residual trees is expected. Within 30 years, the overstory average stand diameter for Douglas-fir is expected to exceed 28 inches. On the average, it is estimated that there will be 36 large overstory conifer trees per acre and over 250 understory conifers averaging between 8 and 9 inches DBH). At this time, additional reduction of the overstory density (possibly through snag creation) and the understory tree density will probably be needed as the overstory Relative Density reaches 29, to continue the development process. An additional understory tree cohort could possibly be established at this time in patches.

2. 90 trees per acre average residual tree density (approximately 75% of the area contained within this stand type)

By varying the leave-tree retention levels (70 to 121 trees per acre), and reserving trees in various-sized clumps, it is anticipated that 30 years from now (stand age 72 years), the average DBH will increase from about 13 to 23 inches (range 22 to 25 inches), the average number of trees per acre will be 76 (range 61 to 93 trees per acre), the average amount of basal area per acre will be 227 $ft^2$/acre (range 206 to 253 $ft^2$/acre), and the Relative Density will average 47 (range 41 to 53). Within these average ranges, individual trees at wider spacing will grow faster and trees in clumps will grow slower. Crowns of leave trees will lengthen and become more dense in response to increased growing space. In addition, understory development will be variable throughout; more growth in the wider-spaced areas, and slower growth in the closer-spaced areas. However, for significant understory growth, more overstory trees would have to be removed. In 30 years, further stand intervention should be considered to continue the stand development process.

3. Untreated

By providing small patches (1/2 to 1 acre in size covering approximately 10% of the area contained within this stand type) scattered throughout the area to be thinned, the level of stand structural diversity will be enhanced and there will be an opportunity to evaluate the effectiveness of the treatment in hastening the development of late-successional forest characteristics. Over the next 30 years, these areas are expected to remain dense enough to prevent much understory development. Self-thinning will occur, providing mostly smaller-diameter snags. After 30 years, the average stand diameter is expected to be about 21 inches, with an average of about 118 trees per acre, and a basal area level of 278 $ft^2$/acre. The stand Relative Density is expected to be 61, which is too dense for optimal stand growth for this stand of Douglas-fir and western hemlock. Live crown ratios can be expected to recede somewhat from their present levels.

**Well-spaced, 37-year-old Douglas-fir stand:**

Thinning this stand to 144 trees per acre at age 35 years will maintain stand growth and vigor for the next 20 years. At this time, it is expected that there will be 136 trees per acre averaging between 17 and 18 inches DBH. The stand will be supporting a basal area level of 231 $ft^2$ per acre. Only limited understory development is expected at this time. The density will have increased to a level that will require another thinning to maintain stand growth and vigor. The stand should be thinned to about 78 trees per acre in the second thinning.

**Open-Grown, 37-year-old Douglas-fir stand:**

Because of the strong influence of laminated root rot on the current development of this stand type, it is difficult to speculate on the development of this stand in the future. It is expected that the disease will continue to spread through the stand and kill Douglas-firs. The rate of disease spread has been estimated at about 1 foot per year (Nelson and Hartman 1975). The larger trees that become infected later in life may be able to survive for 20 years or more before being killed. As trees are killed more growing space may be available to the remaining trees; however, their ability to respond to the release may be reduced because of the disease infection. Douglas-fir productivity levels in disease centers are typically less than half of those in healthy portions of stands (Lawson et al. 1983, Goheen and Goheen 1988). If disease impacts become too severe, interplanting the area with disease-resistant species may be worth considering.

**Extremely dense, 37-year-old Douglas-fir and 45-year-old Douglas-fir/western hemlock stands that were never precommercially thinned:**

These very dense stand types, which occur as scattered patches of up to about 8 acres in size, are expected to grow slowly over the next 50 years or so as they continue to actively self-thin. They appear to be maintaining density levels that are close to the maximum. For example, after 30 years, the mixed Douglas-fir/western hemlock stand still had nearly 400 trees per acre. Understory development under these situations will probably be almost non-existent because of lack of sufficient light reaching the forest floor.

**Alder-dominated disturbed areas:**

Over the next 30 years, the alder density is expected to decrease to about 330 trees per acre with an average diameter of just over 11 inches. By age 80, the alder canopy should begin to disintegrate and the understory shrub component will respond readily to the increased growing space. By age 100 years, most of the alder canopy will be gone, and the areas will be dominated by shrubs. Over-topping conifers surrounding these areas, however should have developed large limbs because their crowns have been expanding into these areas.

Taken together, the treated areas combined with the untreated areas should greatly enhance the overall level of structural diversity in the area.

## V. Prescription implementation Guidance

### A. General considerations

1. Because of the hazard from windthrow on the upper lee side of the prominent northwest- to southeast-running ridge, a higher reserve tree density should be maintained on the upper one-half of the slope. The high component of western hemlock in the stand also increases the potential for windthrow.

2. The untreated areas (red alder-dominated sites, the extremely dense conifer patches, and the stream buffers) should be identified and excluded from the areas to be marked.

3. Because of the relatively high proportion of hemlock in the stand and its susceptibility to annosus root disease and other stem decays, establish various-sized groups of hemlocks, where possible surrounded by Douglas-firs, or residual old-growth stumps, to reduce logging damage and to break up root continuity which should decrease the potential for future losses from annosus root disease as well as other decay-causing fungi.

4. The ID Team should conduct a field review of the flagged boundaries before tree marking begins. Members of the ID team should also participate, at least occasionally (especially at the start), to help ensure the concepts behind the treatments are incorporated into the actual marking. Within the Douglas-fir/western hemlock stand, ID team members should locate and mark the areas to be reduced to 40 trees per acre, and consider marking sample areas throughout to ensure consistency.

5. Don't change the overall species composition, but the distribution of the species will be changed somewhat by clumping hemlocks. Concentrate clumps and establish untreated areas where the proportion of hemlock is relatively high.

6. Mark the leave trees. This should provide a better result since the emphasis in marking will be on the trees to be retained. This will be much more practical since most of the untreated areas will be posted out of the area to be marked.

7. Hemlock trees growing on nurse logs or that appear to be growing in rotten wood should be left within a clump, rather than as single trees to reduce the potential for windthrow.

8. Retain all hardwood trees and do not consider them in the count of reserve trees.

9. Remove trees from around scattered clumps of vine maple.

10. In the timber sale contract, do not require the falling of unmerchantable stems and do not

fall trees into areas to be left untreated.

11. Within the Riparian Reserves:

- Do not thin areas of the stand dominated by red alder, or the patches of very dense conifers which did not receive precommercial thinning. These areas occupy an estimated 60 percent of the length of the perennial streams.

- Establish a no-treatment buffer in the first 100 feet (slope distance) on each side of perennial streams, seeps, and the small wet meadow in the southeast portion of section 7.

- In the next 100 feet on each side of the streams (i.e., from 100 to 200 feet), thin approximately 75 percent of the areas to be treated to a residual density of not less than 120 trees per acre. Another 15 percent would be thinned to an average of 40 trees per acre in scattered pockets up to 1/4 acre in size, and the remaining 10 percent would not be treated.

- Outside of these zones, the Riparian Reserve area would be treated similar to the upslope areas.

B. Marking guides

**Well-spaced 45-year-old Douglas-fir/western hemlock stand:**

1. 40 trees per acre in 1/2- to 1-acre patches (approximately 15% of the area contained within this stand type)

Ave. residual spacing: 33 feet (range 31 to 35 feet)
Ave. residual basal area: 82 $ft^2$ per acre
Ave. residual stand diameter: 19.5 in
Ave. estimated volume per acre removed: 13.2 ***MBF***
Est. acres: 25
Est. volume removed: 330.0 MBF

Notes:

- Selection of the areas to receive this treatment will be based on the windfirmness of the residual stand.
- Where two trees are growing within four feet of each other and are left as a 2-tree clump, count the clump as a single leave tree.

2. 90 trees per acre average residual tree density (approximately 75% of the area contained

within this stand type)

Ave. residual spacing: 22 feet (range 19 to 25 feet)
Ave. residual basal area: 123 $ft^2$ per acre
Ave. residual stand diameter: 15.9 in
Ave. estimated volume per acre removed: 17.9 MBF
Est. acres: 126
Est. volume removed: 2,255.4 MBF

Notes:

- Count all leave trees in a clump in the total number of leave trees, except where two trees are growing within four feet of each other are left as a 2-tree clump. In this case, count the clump as a single leave tree.
- Vary the size of clumps from 2 to 3 up to a dozen trees or so.
- Where two trees are growing within 4 feet of each other, leave both trees as a 2-tree clump at the rate of up to 5 such clumps per acre.
- Try to leave hemlocks in groups surrounded by Douglas-fir to reduce the potential for damage caused by annosus root disease.
- Leave primarily Douglas-firs with high crown ratios and relatively large diameters away from clumps to reduce the potential for windthrow.
- Leave up to two broken-topped, large-diameter trees per acre and protect them within a clump of leave trees.
- Vary the density throughout, at an approximate scale of 125 to 250 feet.
- In areas infested with laminated root rot, mark all of the trees or none.

**Well-spaced, 37-year-old Douglas-fir stand:**

Ave. residual spacing: 17 to 18
Ave. residual basal area: 124 $ft^2$ per acre
Ave. residual stand diameter: 12.6 in
Ave. estimated volume per acre removed: 11.7 MBF
Est. acres: 25
Est. volume removed: 292.5 MBF

Notes:

- Select the larger trees in the stand as leave trees.
- This a traditional thinning.

D. Recommended harvest system

The silvicultural concerns regarding harvest systems are centered on preventing impacts to the site and the residual stand. The ID team felt that helicopter logging was the appropriate method of harvesting the timber in this stand. Because of this harvesting method and the relatively small size of the trees, it shouldn't be necessary to restrict the season of operation to reduce the potential for tree damage. However, whole-tree harvesting should not be permitted because this may result in excessive crown damage to the residual trees. Helicopter logging should also facilitate having continuous variation in residual tree density without excessive tree damage.

E. Site Preparation

At this time there is no need for site preparation. Over most of the area, there is abundant down wood that had decayed sufficiently to serve as an excellent seedbed for natural western hemlock regeneration. In the 40 tree per acre treatment areas, there will be an adequate seedbed for natural regeneration of Douglas-fir as well as western hemlock. When the stand becomes ready for future intervention, perhaps in 30 years or so, the need for site preparation for reforestation purposes will be assessed at that time.

F. Stand maintenance and understory density management

Because of the lack of competing vegetation, no vegetation management treatments are recommended. Density management of the understory conifers should be done at age about 12 years in the areas thinned to 40 trees per acre and probably in areas where the residual density averages 70 trees per acre to maintain tree growth and make adjustments to species composition. Favor Douglas-fir for retention only in the most open areas.

# APPENDIX 2b

## Silvicultural Prescription for Units 11-1 and 12-1

### ReBear Density Management Project

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October 10, 2002

### Introduction

The proposed Re-Bear Density Management Project consists of two portions. The first portion is in T. 3S., R. 7W., sections 5, 7, and 8, W.M. This is former Borderline Bear Density Management Project that was previously offered as a timber sale, but did not sell. The majority of the area in this portion is dominated by relatively dense 56-year-old mixed Douglas-fir and western hemlock stands with the remainder consisting of predominantly 42-year-old relatively dense Douglas-fir stands. The stand exam data collected in 1994 and 1995 for this portion showed that the Curtis Relative Density of these stands is such that density management would be beneficial in assisting these stands meet the management objective of developing older forest characteristics. Without treatment, attainment of older forest characteristics would likely be delayed for an indefinite period as trees intensely compete with each other for the available site resources. Because the stands are now between 7 and 8 years older, the level of competition has most certainly increased. The treatments proposed for the Borderline Bear portion are consistent with the management objectives for the area, are still applicable, and have been thoroughly analyzed through the environmental assessment process. Therefore, we recommend that the stands in this portion of the proposed Re-Bear density management project be treated as originally recommended in the silvicultural prescription for the Borderline Bear Density Management Project. It may be advisable, however, to inventory the amount of down wood in this portion because at the time of the stand exam, there was no down wood inventory protocol associated with it. After the down wood inventory data is collected and analyzed, develop an appropriate down wood management strategy following the guidelines contained in the Late-Successional Reserve Assessment for Oregon's Northern Coast Range Adaptive Management Area (USDA Forest Service and USDI Bureau of Land Management 1998). Based on a visual assessment of the area, there are substantial quantities of large down logs, many of which were the result of snag falling for fire prevention following the Tillamook burn.

The second portion is in T. 3S., R. 7W., sections 11 and 12, W.M. The combination of both portions is the proposed Re-Bear Density Management Project. The remainder of this document will focus on managing the stands in the *second* (previously unanalyzed) portion of the project area to assist in accomplishing the applicable land-use management objectives.

**Management Direction and Objectives**

The area included in the second portion is within the Northern Coast Range Adaptive Management Area (AMA) and is also designated as Late-Successional Reserve (LSR) in the Salem District Record of Decision and Resource Management Plan (USDI Bureau of Land Management 1995). LSR management direction is applicable to these lands at this time. LSR management direction includes protecting and enhancing late-successional and old-growth forest conditions, which provide habitat for late-succesional and old-growth forest-related species, including the northern spotted owl and marbled murrelet.

The Late-Successional Reserve Assessment for Oregon's Northern Coast Range Adaptive Management Area identified the area as part of the Upper Nestucca (Core) Mixed-Seral landscape cell and zone (USDA Forest Service and USDI Bureau of Land Management 1998). The management goals for the core landscape zone are: (1) minimize fragmentation**C**provide large, contiguous areas of late-successional habitat to maximize interior forest habitat; and (2) increase connectivity and dispersal habitat within the large interior habitat blocks and develop late-seral habitat in mixed-seral areas next to large interior blocks. The overall management goals for mixed-seral landscape cells located in the core landscape zone (includes management goals for the late-seral landscape cells) are: (1) "grow out" from adjacent large blocks of late-seral forest in the Late-Seral Landscape cells; (2) create new and enlarge existing patches of late-seral forest within the zone (follow sub-series environment successional pathways in prescribing treatments); (3) manage existing late-successional habitat to avoid actions that could damage or degrade late-successesional characteristics; (4) treat the entire range of seral stages**C**accelerate development of late-successional characteristics in stands which lack those characteristics using a limited number of stand entires; (5) leave untreated stands in each of the seral stages; and (6) identify Key Watersheds and anadromous fish "core areas" needing restoration and apply silvicultural treatments that have a high degree of certainty of success and will accelerate the development of late-successional habitat.

The objectives of the proposed density management treatment project are to accelerate the development of some late-successional forest structural features, including larger-sized trees with deeper crowns and larger limbs, snags and down logs, various levels of overstory tree densities, and various levels of understory development. Implementation of this proposal will enhance the overall level of diversity in this area, and it will set the stage for future treatments that could continue this process, if such treatments were determined to be necessary at that time.

**Watershed perspective**

The majority of the area lies within the Nestucca River Watershed Analysis area (USDA Forest Service et al. 1994). According to the Nestucca River Watershed Analysis, about 60% of the watershed is in early-seral habitat; 40% is in early- to mid-seral habitat, consisting of immature to mature stands ranging in age from 30 to 100 years; and less than 1% of the stands are more than

130 years old. Most of the mature forest stands are in the 80- to 100-year-old range, very fragmented, and dominated by even-aged Douglas-fir. These stands are typically quite uniform, and are deficient in snags and down logs. Therefore, little habitat is available in the watershed for species that depend on late-successional forest habitat.

The Nestucca River Watershed Analysis also identifies opportunities to hasten the development of some late-successional features through site-specific silvicultural treatments such as "variable-spaced thinnings," which are the kinds of treatments proposed for this project area.

A small portion of the area in the northeast part of section 11 is in the Trask River watershed. To date, no watershed analysis has been prepared for the area containing the Trask River.

**Selection of Density Management Treatment Areas in T. 3S., R. 7W., Sections 11 and 12, W.M.**

All of the additional areas proposed for treatment consist of relatively dense, single-storied Douglas-fir or mixed Douglas-fir/western hemlock stands that are of an age and condition that should respond favorably to careful intervention designed to increase the development of late-successional forest features. Density management treatment will help to promote the development of larger blocks of stands with older forest conditions. Potential future treatments in these stands could include augmentation of coarse woody debris through snag creation and tree felling, and/or additional density management. Without treatment at this time, the development of many late-successional forest structural features would occur at a much slower rate because the overstory is becoming increasingly dense and uniform.

**Overstory stand conditions**

According to the stand exam data collected in 1998, the majority of the proposed treatment area supports a dense 51-year-old mixed Douglas-fir/western hemlock stand (Table 1). The species composition of trees ≥6 inches and greater in diameter at breast height (dbh) by basal area averages about 63% Douglas-fir and 37% western hemlock, and the species composition by trees per acre is approximately 53% Douglas-fir and 47% western hemlock. Red alder is generally a minor stand component. There is considerable variation in the relative proportions of Douglas-fir and western hemlock throughout the stand, however. The stand has an estimated Curtis Relative Density value of 81, indicating that trees are competing quite strongly with each other for the available site resources. The majority of the stands appears to have been precomercially thinned, which increased the average tree diameter and enhanced the ability of the trees to respond favorably to density management at this time. Average live crown ratio of the Douglas-fir trees is about 34% and the average crown ratio of the western hemlock trees is about 49%, with the overall crown ratio averaging about 42%. The overstory canopy has now nearly closed, as indicated by crown closure values ranging from 81 to 89%. The diameter growth trend of the dominant trees seems to be slowing down as tree-to-tree competition intensifies because of increasing stand density. No stand data was collected for the well-stocked 42-year-old mixed western hemlock/Douglas-fir stands in sections 11 and 12, and for the well-stocked 57-year-old Douglas-fir stand in the northern portion of the area proposed for treatment in section 11. Visual observation of these stands, however, indicates that are also quite dense, but should respond favorably to density management at this time, and therefore, should be considered as part of the proposal.

**Table 1. Current stand attributes for the dense 51-year-old mixed Douglas-fir/western hemlock stand in the Rebear Density Management Project**

| Stand component | Quadratic mean diameter (in.) | Trees/ ac | Basal area/ac ( sq ft) | Curtis Relative Density |
|---|---|---|---|---|
| Western hemlock ≤ 6 inches dbh[1] | 2.3 | 188 | 5 | --- |
| Douglas-fir and western hemlock ≥ 6 inches dbh | 13.1 | 270 | 252 | --- |
| Total | 10.1 | 458 | 257 | 81 |

[1]Diameter at 4.5 feet above ground level (breast height).

The stands occupying the riparian zone along permanent stream in the northwest portion of section 11 generally do not appear to need density management treatment. The density is less than in the surrounding stands, there is a mixture of conifers and hardwoods, and there are concentrations of large wood in and along the stream channel. The 50-year-old mixed red alder/Douglas-fir stands in the north-central portion of Section 12, generally are not in need of thinning. Most of these areas are generally fairly moist, there are scattered larger-sized conifers that are above the alder canopy, and this stand type adds to the overall level of diversity in the area.

**Understory trees, shrubs, and herbs**

There is an average of nearly 190 understory conifers per acre with an average dbh of 2 inches in the 51-year-old mixed Douglas-fir/western hemlock stand. Almost all of there understory conifers are western hemlock. Included in this total are an average of 63 understory western hemlock trees per acre that average about 11 feet tall. Many of these trees should respond favorably to the reduced overstory density provided by the proposed density management treatment and help to enhance the vertical structure of the stands. Thinning the overstory will encourage additional western hemlock seedlings to become established. The density of the understory conifers varies throughout the stand. There are also occasional western redcedar trees in the understory. Swordfern, red huckleberry, vine maple, and salal are the most common non-conifer understory species. Non-conifer understory cover averages between 15 and 35%. Density management of this stand would stimulate growth of these understory species, particularly vine maple, further contributing to the structural diversity. Salmonberry occurs near streams, and in other lower slope positions in the 50-year-old mixed red alder/Douglas-fir stands.

**Coarse woody debris**

The weighted average total conifer coarse woody debris levels (includes both down wood and snags) is 1,873 cubic feet per acre, which is near the upper end of the moderate level (1,100 to 1,980 cubic feet per acre) for stands within the age ranges included in the proposed treatment area, according to Table 24 in the Late-Successional Reserve Assessment for Oregon's Northern Coast Range Adaptive Management Area (USDA Forest Service and USDI Bureau of Land Management 1998). The weighted average total down wood quantity in pieces greater than or equal to 5 inches in diameter at the point of intersection and 16 feet in length is 1,751 cubic feet per acre, with 86% of this volume in decay class 4, and 14% in decay classes 1, 2, and 3. Most of the decay-class 4 coarse woody debris, however, is relatively large. Examination of the size-class distribution of the down wood data indicates that the majority of the volume is in pieces averaging between 20 and 31 inches in diameter. The source for much of the relatively large-diameter down wood appears to be snags that were felled for fire prevention following the Tillamook burn. The majority of the recent down wood being contributed tends to be from occasional, larger-sized windthrown Douglas-fir trees have been added to the site as a result of *Phellinus weirii* root rot infection.

There is a weighted average of about 10 conifer snags per acre that average about 12 inches dbh and just over 45 feet in height. These snags are in decay classes 1, 2, and 3 and are most likely smaller-sized Douglas-fir trees that have died as a result of suppression by the overstory trees or have been killed by root disease. Total snag volume averages 122 cubic feet per acre. In addition, there are an average of approximately 9 conifers per acre between about 9 and 12 inches dbh with top damage caused by ice and snow that may become snags in the near future. The weighted average volume for these ice- and snow-damaged trees is 226 cubic feet per acre.

**Forest health**

There are no major threats to forest health in this portion of the area proposed for density management treatment. Laminated root rot, caused by the fungus *Phellinus weirii,* is a native root pathogen that is a natural part of many forest ecosystems (Thies and Sturrock 1995). *P. weirii* probably affects about 5 percent of the area. Douglas-fir and grand fir are highly susceptible to *P. weirii*, (they are readily infected and killed by it); western hemlock is intermediately susceptible; western redcedar is tolerant or resistant; and all hardwoods are immune (Hadfield et al. 1986). *P. weirii* kills trees directly or makes them prone to windthrow because the disease decays their root systems. Diseased stands usually contain twice as many infected trees as those that are dead or exhibiting crown symptoms (Thies 1984). Tree-to-tree

spread is through root contacts with infected trees or stumps (Hadfield et al. 1986). Disease centers are believed to expand radially at the rate of about one foot per year (Nelson and Hartman 1975). *P. weirii* attacks susceptible hosts regardless of tree size, age, or vigor.
Tree killing by *P. weirii* creates openings in the canopy where shrubs, hardwoods, or shade- and disease-tolerant conifer species may occupy these various-sized gaps (Thies and Sturrock 1995). Because infected trees are windthrown or die standing, the disease can be a source of down wood and snags. Most disease centers appear to be less than 3-acre size and appear to be increasing the level of diversity within the stand. The most severe and extensive root disease infection observed was in the eastern portion of the project area in section 12. Old-growth Douglas-fir stumps containing the disease along with more recent Douglas-fir windthrow and standing dead Douglas-fir were observed over several acres. The root disease in the area south of the Dovre Peak road was especially severe. Western hemlock dominates the species composition in this area and appears to have increased as Douglas-fir has been gradually falling out of the stand because of the disease.

Fresh down Douglas-fir trees encourage the build-up of Douglas-fir beetle populations, which subsequently attack and kill Douglas-fir trees. Douglas-fir trees weakened by root disease infection are more likely to be attacked by the Douglas-fir beetle (Hadfield 1985). When the number of windthrown Douglas-fir trees greater than 12 inches in diameter is three or more per acre, the numbers of beetles produced is sufficient to cause infestation and mortality of standing live Douglas-fir trees (Hostetler and Ross 1996). Based on past windthrow events, they estimate that the number of live standing trees infested and killed by Douglas-fir beetles will be approximately 60% of the number of infested down trees.

Swiss needle cast was observed on Douglas-fir in these stands. The disease severity level tends to vary within the stands, with trees showing the greatest symptoms occuring on ridgetops and southern exposures. Overall, the level of Swiss needle cast disease appeared to range from low (2.6 to 3.5 years of foliage retained) to moderate (1.6 to 2.5 years of foliage retained). Relatively light thinning (density management) and retention of non-Douglas-fir species is a recommended silvicultural treatment for such stands (Filip et al. 2000).

Annosus root disease, caused by *Heterobasidion annosum*, may result in substantial butt decay in western hemlock that is over 150 years old, and mortality resulting from stem breakage (Buckland et al. 1949, Foster et al. 1954). Spores of the fungus colonize freshly exposed wood on stump surfaces and stem wounds, and then the disease spreads to adjacent healthy trees most commonly by root contacts (Hadfield et al. 1986). Although the rate of disease infection was nearly twice as high in commercially thinned 40- to 120-year-old western hemlock stands in western Oregon and Washington compared to unthinned stands, losses due to decay were very low (Goheen et al. 1980).

There is some risk of windthrow from severe winter storms, or to some extent, wildfire. Following partial-cut harvest, the potential for windthrow would be greater for the next decade (generally the first few years following density management). The upper lee slopes of major southeast- to northwest-running ridges generally experience the highest degree of windthrow in the Oregon Coast Range.

**Stand development prognosis without density management**

The density of the 51-year-old mixed Douglas-fir/western hemlock stand proposed for density management is relatively high, as indicated by a Curtis Relative Density level of 81. It is anticipated that the density of these stands will continue to increase and eventually stabilize at a very high level without density management treatment. Projections using the growth and yeild model, ORGANON (Hann et al. 1997) show this as well. Stand projection data indicates that the Curtis Relative Density level will reach 86 after 25 years without thinning.

Above Relative Density 55, Douglas-fir growth and vigor begins to decline as tree-to-tree competition intensifies. Development toward late-successional forest conditions in these stand types is expected to continue to slow unless some form of disturbance occurs that creates openings in the stand to permit accelerated growth of some overstory trees and provides an opportunity for understory trees, shrubs, and herbs to develop. When the level of competition among the trees remains high, live crown ratios will decrease, diameter growth can be expected to decline, competition-related mortality will increase, coarse woody debris additions will be from the small trees that slowly die from suppression (except in a few small areas where *P. weirii* infection has resulted in windthrow of some larger-sized Douglas-fir trees), and further understory development will be limited.

**Silvicultural objectives for density management**

In the areas proposed for density management in this portion of the project area, the objectives are to: (1) accelerate the development of some late-successional forest structural features, including large trees, gaps in the canopy, snags and down logs, various levels of overstory tree densities, and various levels of understory development; (2) enhance the overall level of diversity in this area; and (3) develop stand windfirmness so that future density management treatments that could continue this process, if such treatments were determined to be necessary at that time.

**Density management treatment recommendations**

$ Thin the 51-year-old mixed Douglas-fir/western hemlock stand in a variable-spaced manner removing about 44% of the basal area and just over 66% of the trees ≥ 6 inches dhb to achieve an average Curtis Relative Density level of about 34. The target average residual basal area would be 140 sq ft per acre. In this stand type, the anticipated volume of timber harvested as a result of this thinning is expected to be between 15,000 and 16,000 board-feet per acre.

$ Thin the other 42-year-old conifer-dominated stands by removing approximately 44% of the existing basal area in a variable-spaced manner to achieve a target Curtis Relative Density level of about 34.

$ Maintain or increase the proportion of western hemlock in the stand and retain those Douglas-fir trees that have the greatest needle retention and greenest color to increase stand resistance to the effects of Swiss needle cast (this is most important for the upper-elevation areas and on south-facing slopes.

$ Leave primarily the larger-diameter conifers with relatively high live crown ratios and healthy appearing crowns (preferrably with live crown ratios exceeding 35%), even at the expense of spacing. These trees will respond most favorably to the thinning and will also be more windfirm.

$ Because there is a relatively high proportion of western hemlock in the stand and its susceptibility to annosus root disease and other stem decays, various-sized clumps of hemlocks should be established, and where possible, these would be surrounded by Douglas-firs or residual large stumps to reduce logging damage and to break up western hemlock root continuity, which should decrease the potential for future losses from annosus root disease as well as other decay-causing fungi.

$ Although no western hemlock trees with hemlock dwarf mistletoe were observed, infected trees should be retained because the branch proliferations they produce can provide nesting platforms for marbled murrelets.

$ Reserve two relatively closely spaced trees ($\leq$ eight feet apart or less) at the rate of approximately two such Agroups@ per acre. At a future date, one of these trees would be converted into a snag, thus creating a "protected" snag for use by wildlife.

$ Leave unthinned clumps of about 10 to 15 trees at the rate of about one such clump per two acres. Western hemlock would be the preferred species to leave in clumps because of its relative shade tolerance. These larger-sized clumps are not considered as part of the target basal area to remain after harvest.

$ Density management is also recommended for portions of the stands within the Riparian Reserves, but outside of established Ano cut@ buffers and actual riparian zones (maintain a Curtis Relative Density level of $\geq$30 on the average after thinning).

$ In general, no reforestation treatments are recommended for the few small scattered areas that are infested with *P. weirii*. These areas are serving as sources of larger down wood and relatively short-lasting snags. In addition, having the infected trees blow over pulling a large part of their root systems out of the ground will help to reduce the spread of the disease. In addition, western hemlock is readily seeding into the openings created by the disease. The most severe and extensive root disease infection observed was in the eastern portion of the project area in section 12. Old-growth Douglas-fir stumps containing the disease along with more recent Douglas-fir windthrow and standing dead Douglas-fir were observed. The root disease in the area south of the Dovre Peak road was especially severe. Western hemlock, western redcedar, and/or hardwoods should be selected as leave trees in areas infected with *P. weirii* root disease. Root disease-caused openings larger than 2-acre that are not naturally seeding in with less susceptible tree species should be considered for reforestation with less susceptible tree species (western hemlock, western redcedar, or hardwoods).

$ Do not fell the non-merchantable western hemlock saplings in the understory. Many of these may be able to accelerate their growth in response to the increased light following density management and begin the formation of a second canopy layer. Establish the widest overstory tree spacing around patches of western hemlock saplings which will promote their growth and increase the structural diversity of the stands.

- Retain all hardwood trees. Do not mark hardwoods for retentionChave them reserved under a contract stipulation in the timber sale contract.
- Reserve large trees with deformities at least in proportion to their occurrence in the stands.
- In areas to be logged with ground-based equipment, try to use existing skid roads to the extent possible to reduce the potential soil impacts by concentrating them on areas that have already been impacted.
- Do not subsoil newly constructed skid roads. Subsoiling skid roads has the potential to cause damage to the root systems of residual trees adjacent to them. Western hemlock is especially vulnerable to such damage because of its relatively shallow root system. The closer the trees are to the skid roads, the greater the potential root damage. If more than one-third of the tree=s root system is injured as a result of subsoiling, the trees will likely experience severe stress and be highly susceptible to attack and killing by opportunistic insects (primarily the Douglas-fir beetle) and diseases (primarily armillaria). When one-half or more of the tree=s root system has been severely impacted, tree mortality is likely.
- Felling and yarding operations should be restricted during the peak bark-slip period (generally May 1 to July 15) if excessive leave tree damage occurs.
- Retain existing coarse woody debris (snags and down logs).
- The following requirements should be applied to augment current down wood levels: In skid roads or skyline yarding corridors $\leq$ 500 feet in length (slope distance), two of the larger-sized leave trees cut to create the skid roads or skyline corridors should be left on site in a well-distributed pattern along the length of the skid roads or skyline corridors. In skid roads or yarding corridors > 500 feet in length (slope distance), four of the larger-sized leave trees cut to create the skid roads or skyline corridors should be left on site in a well-distributed pattern along the length of the skid roads or skyline corridors. In addition, *any* leave trees cut to create skyline yarding corridors within the Ano cut@ riparian buffers shall be left on site for coarse wood enhancement.
- Leave trees used as Arub@ trees shall be left standing following yarding. These can be a potential source of sound snags.
- Surround any existing large snags (greater than 24"dbh and 20 feet tall) with two or more leave trees to provide some protection from logging.
- Coarse wood strategy #2 as described in the Late-Successional Reserve Assessment for Oregon's Northern Coast Range Adaptive Management Area identified the area as part of the Buffer/Mixed Seral landscape cell and zone (USDA Forest Service and USDI Bureau of Land Management 1998) seems most appropriate for the treatment area.
- To take advantage of the more open stand conditions created where cable yarding corridors converge near the landings, the area within a 100-foot radius downhill of the landings will be planted with shade-tolerant conifer seedlings such as western hemlock or western redcedar.
- In near-term and future supplementation of existing down wood levels, the following measures adapted from Hostetler and Ross (1996) are recommended to reduce the probability of Douglas-fir beetle-related mortality in the residual stands: (1) do not add more than three fresh Douglas-fir logs per acre greater than 12 inches in diameter in a three-year period and

(2) Fell trees between July and the end of September.

$ Plant any subsoiled roads and landings with red alder seedlings (1-0 bare root or one-year-old containerized planting stock) to supplement natural alder regeneration.

**Near-term post-harvest follow-up reforestation treatments**

$ In any planted *P. weirii* root rot pockets and planted areas around landings, follow-up vegetation management treatments will probably be needed within the first 5 to 8 years after planting. Up to three vegetation management treatments may be needed to assure seedling growth and survival and eventual conifer domination of the planting sites.

$ Precommercial thinning of planted root disease pockets, planted areas around landings, and other areas of dense natural regeneration (this will probably over most of the thinned area) may be appropriate at age 12 to 15 years to promote understory tree growth and manage species composition.

**Monitoring stand development in the density management area**

To monitor the development of the stand as a result of implementing this prescription, forest stand surveys (stand exams) using the Atterbury stand exam program (or the equivalent) should be done at one, 10, 20, and 30 years following treatment. Data collected in the stand exam should include the following:

$ Overstory tree data: Tree species, number of trees per acre, diameter at breast height, diameter growth for the last 5 years in tenths of an inch, basal area per acre, live crown ratio, canopy closure, height of the dominant trees, volume per acre, and tree damage.Snags: Tree species, number of snags per acre, diameter at breast height, total height, volume (cubic feet per acre), and decay class.

$ Down wood: tons per acre, volume per acre (cubic feet), pieces per acre, and total length per acre by log type (conifer or hardwood) and decay class.

$ Understory shrubs and herbs: Species composition, canopy cover and height by layer, and frequency of occurrence.

$ Understory tree data: tree species, number of trees per acre, diameter at breast height, basal area per acre, and height.

**Anticipated results of density management treatment (Table 2)**

As a result of thinning these stands, the average stand diameter would increase, crown ratios and limb development of the residual trees would increase, growth of understory shrubs and herbs would be stimulated, windfirmness of the residual trees would increase, and mortality of the smaller-sized trees would decrease. By thinning in a variable-spaced manner, some trees would be given more room to grow and others would be given less. This would increase overstory canopy heterogeneity and result in a more uneven pattern of understory development. Because of the abundant western hemlock seed source and quantity of large decay-class 4 down wood on the site, the proposed density management treatment should result in a substantial increase in western hemlock reproduction. The larger-sized trees retained would result in higher quality down logs and snags as the trees eventually die or are converted to snags or down logs through planned management actions. As an on-site demonstration of the growth-promoting effect that density management could have in these stands, we observed Douglas-fir trees surrounding an opening created by *P. weirii* that had wide, long (50% live crown ratios), and full crowns. These trees had responded to the release provided by these openings and contrasted rather sharply with the similar-aged trees in the intact stand. In a study of operational thinnings in western Oregon, Bailey and Tappeiner (1998) found that thinning initiates and encourages tree regeneration, shrub growth, and multi-storied stand development even though the treatments were primarily done to manage the overstory density and spacing.

**Table 2. Comparison of trees per acre, basal area per acre, quadratic mean diameter, Curtis Relative Density, and mean crown ratio for trees ≥ 6 inches dbh in the 51-year-old mixed Douglas-fir/western hemlock stand in the Rebear Density Management Project with and without treatment over time as projected by ORGANON (Hann et al. 1997).**

| Stand condition and age | Trees/ acre | Basal area/ acre (sq ft) | QMD (in)[1] | Curtis Relative Density[2] | Mean crown ratio |
|---|---|---|---|---|---|
| Pre-treatment at the present time (age 51years) | 270 | 252 | 13.1 | 81 | 0.42 |
| No treatment after 25 years (age 76 years) | 226 | 339 | 16.6 | 86 | 0.26 |
| Post-treatment at the present time (age 51 years) | 91 | 140 | 16.8 | 34 | 0.40 |
| Post-treatment after 25 years (age 76 years) | 90 | 239 | 22.2 | 51 | 0.32 |

[1]Quadratic mean diameter. [2]Determined for all trees in the stand.

Silvicultural treatment within the Reserves is appropriate to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives found on page B-11 of the Northwest Forest Plan (NFP) (USDA Forest Service and USDI Bureau of Land Management 1994).

The objectives of the 50- or 100-feet no-treatment buffers include, but are not limited to the following:

$ Assure the protection of water quality.
$ Provide protection for native plant, invertebrate and vertebrate species and communities associated with the riparian zone. This includes adequate thermal regulation, connectivity and a continued source of snags and down wood.
$ Provide a diversity of stand characteristics across the area.

Treatment of some of the outer portions of the Riparian Reserve (the area beyond the no-treatment buffers) is proposed for the following reasons:

$ Maintain or increase the growth rates, vigor and crown development of many of the reserve (residual) trees, thus speeding up the general stand development process and providing larger trees for eventual recruitment of large wood into the riparian area and potentially into the stream itself (Curtis Relative Density to be ≥30 on the average after thinning).
$ Provide improved growing conditions for any conifer regeneration present in the understory, and the development or stimulation of vigorous shrub and herbaceous understory layers.
$ Increase the wind-firmness of the reserve trees within the outer portion of the Riparian Reserves. This will help provide long-term protection for species and communities associated with the riparian zone.
$ Treatment of the outer portion of some of the Riparian Reserves would add to the long-term diversity of stand characteristics throughout the Riparian Reserves and across the general project area.
$ Density management of some of the outer portions of the Riparian Reserves and leaving the portions in the Ano-treatment@ buffers untreated will increase the level of structural complexity within the Reserves and would be consistent with the objectives of the Aquatic Conservation Strategy contained in the Standards and Guidelines of the NFP (USDA Forest Service and USDI Bureau of Land Management 1994). Treatment as proposed within the Riparian Reserves would help to maintain and restore: (1) the distribution, diversity, and complexity of the forest types within the watershed while ensuring protection of the aquatic systems; (2) the species composition and structural diversity of plant communities within the Reserves; and (3) a future supply of larger-sized trees, which could become longer-lasting coarse woody debris.

Treatment is not expected to retard restoration and maintenance of: (1) spatial and temporal connectivity within and between watersheds; (2) the physical integrity of the aquatic systems; (3) water quality necessary for the support of healthy riparian, aquatic, and wetland ecosystems; (4) the sediment regime under which aquatic ecosystems evolved; (5) in-stream flows needed to create and sustain riparian, aquatic, and wetland habitats and to retain sediment, nutrient, and wood routing patterns; (6) the timing, variability, and duration of floodplain inundation and water table elevation in wetlands and meadows; (7) habitat to support well-distributed populations of native, invertebrate, and vertebrate species that are riparian-dependent; and (8) species composition and structural diversity of plant communities in riparian areas and wetlands.

The following table is a checklist that summarizes the expected effects from implementing the recommended treatments on the Aquatic Conservation Strategy objectives:

**Checklist for documenting determination of compliance with the objectives of the Aquatic Conservation Strategy.**

| Aquatic Conservation Strategy Objective | Aquatic Conservation Strategy objective compliance determination | |
|---|---|---|
| | Meets objective | Does not prevent attainment of objective |
| 1. Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted. | X | |
| 2. Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species. | | X |
| 3. Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations. | | X |
| 4. Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and mitigation of individuals composing aquatic and riparian communities. | | X |
| 5. Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport. | | X |
| 6. Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected. | | X |
| 7. Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands. | | X |
| 8. Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability. | X | |
| 9. Maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species. | X | |

**Site-potential tree height for Riparian Reserve width determination**

The site potential tree height determined from the stand exam is 180 feet for all of the sampled area except the 19-acre portion in the north-central part of section 12 that contains a mixture of stand types (D3RA = 1950, HC_RA3D = 1950, and D3H - = 1945) and is largely in Riparian Reserves, where the site-potential tree height is 220 feet.

**Additional data needs for silvicultural prescription preparation**

To prepare the silvicultural prescription for the portion in T. 3S., R. 7W., sections 11 and 12, W.M., stand exam data will need to be collected for the well-stocked 42-year-old mixed western hemlock/Douglas-fir stands in sections 11 and 12, and for the well-stocked 57-year-old Douglas-fir stand in the northern portion of the area proposed for treatment in section 11. For a more accurate coarse wood prescription for the original Boderline Bear portion of this project ( T. 3S., R. 7W., sections 5, 7, and 8, W.M.), down wood transect data should be taken using the minimum piece size standards of 5 inches for the intersect diameter and 8 feet for the log length.

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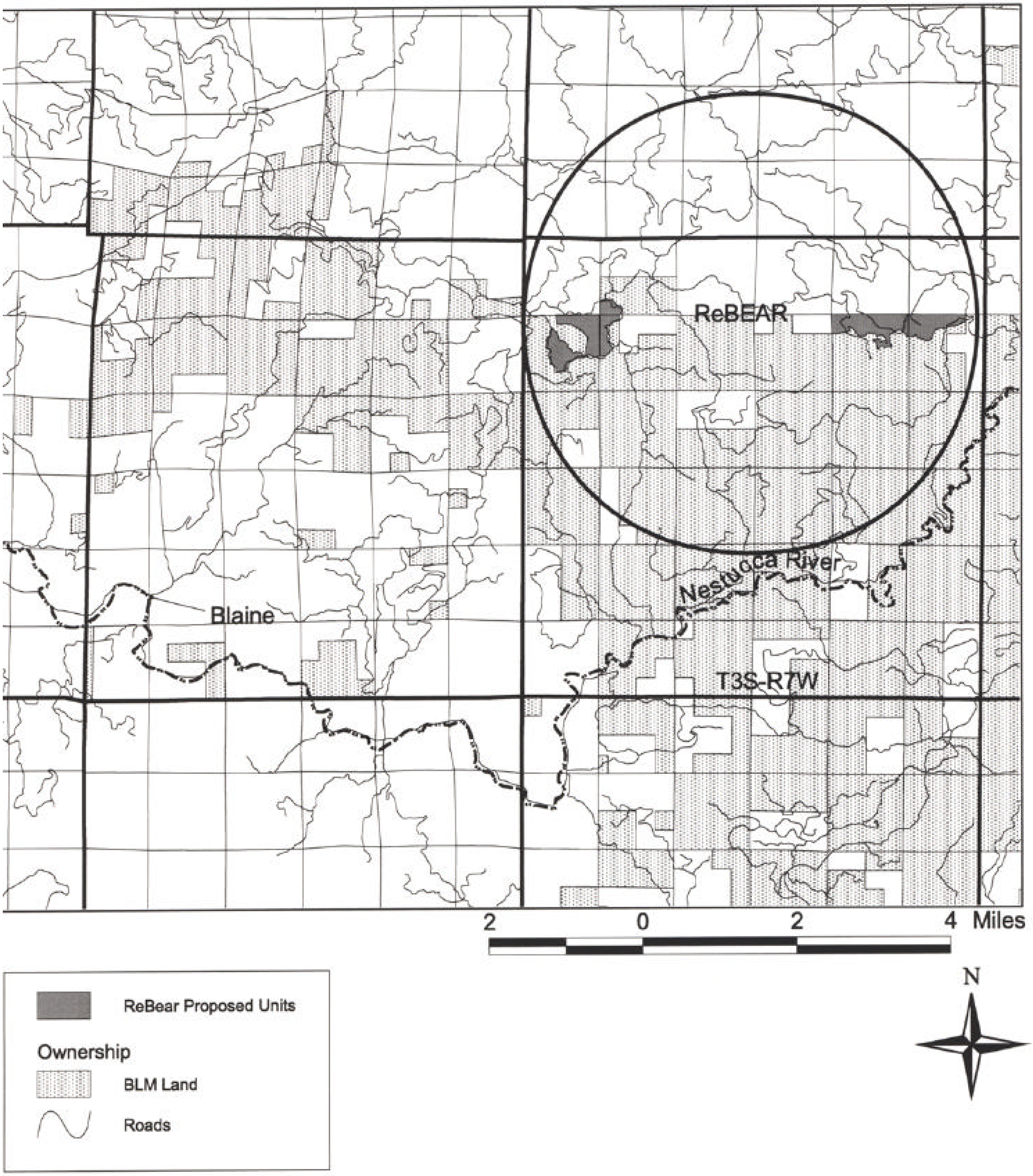
# APPENDIX 3

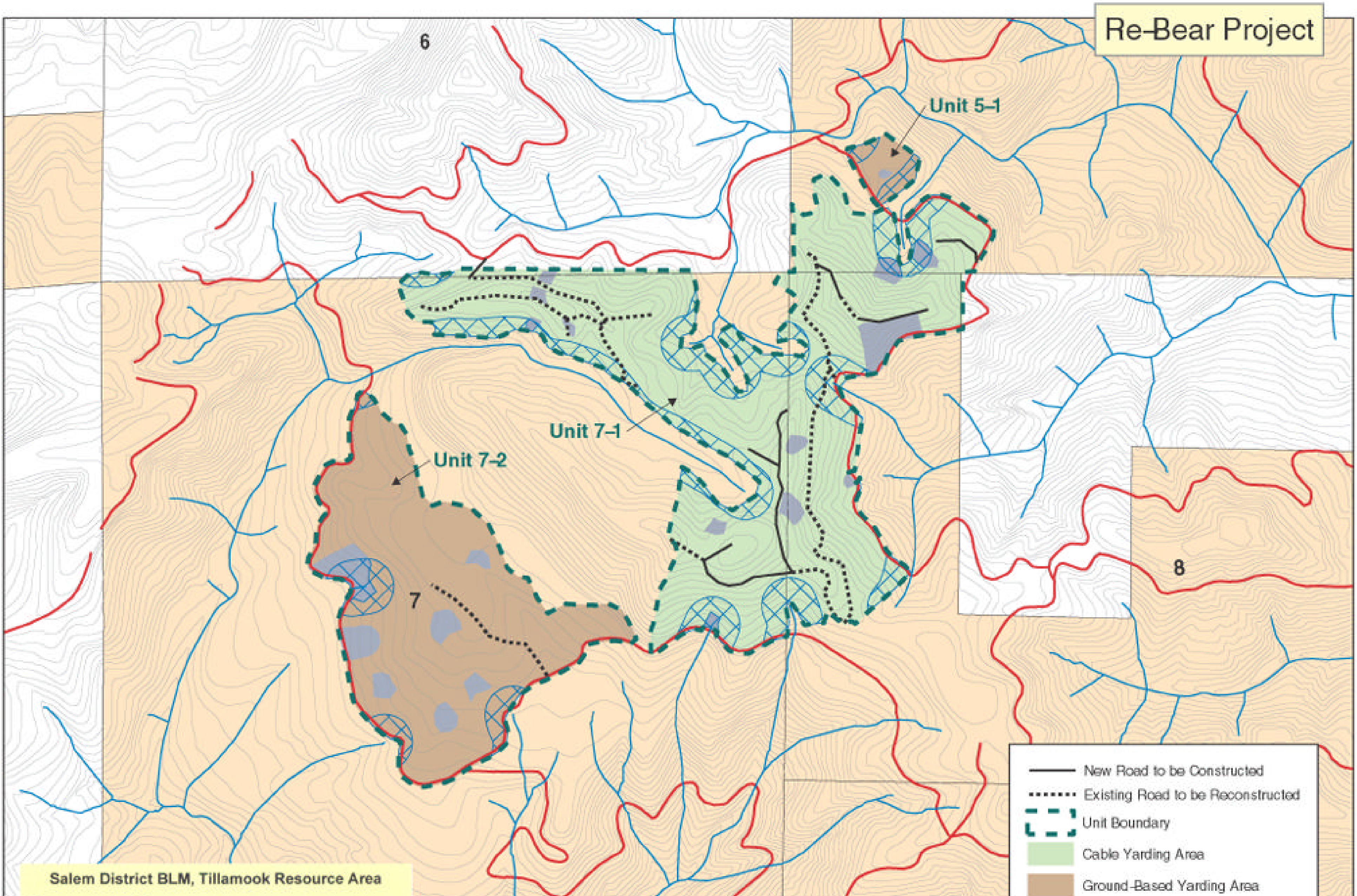
## Aquatic Conservation Strategy Objectives

**Treatment of selected stand types in this rather conservative manner within the Riparian Reserves (and leaving other stand types untreated) to increase the level of structural complexity would be consistent with the objectives of the Aquatic Conservation Strategy contained in the S&G=s. Treatment as proposed within the Riparian Reserves would help to maintain and restore (1) the distribution, diversity, and complexity of the forest types within the watershed; and (2) the species composition and structural diversity of plant communities within the Reserves and provide a future supply of coarse woody debris.**

**Treatment is not expected to retard restoration and maintenance of (1) spatial and temporal connectivity within and between watersheds; (2) the physical integrity of the aquatic systems; (3) water quality necessary for the support of healthy riparian, aquatic, and wetland ecosystems; (4) the sediment regime under which aquatic ecosystems developed; (5) in-stream flows needed to create and sustain riparian, aquatic, and wetland habitats and to retain sediment, nutrient, and wood routing patterns; (6) the timing, variability, and duration of floodplain inundation and water table elevation in wetlands and meadows; (7) habitat to support well-distributed populations of native, invertebrate, and vertebrate species that are riparian-dependent; and (8) species composition and structural diversity of plant communities in riparian areas and wetlands.**

# ReBear Density Management and Restoration Project

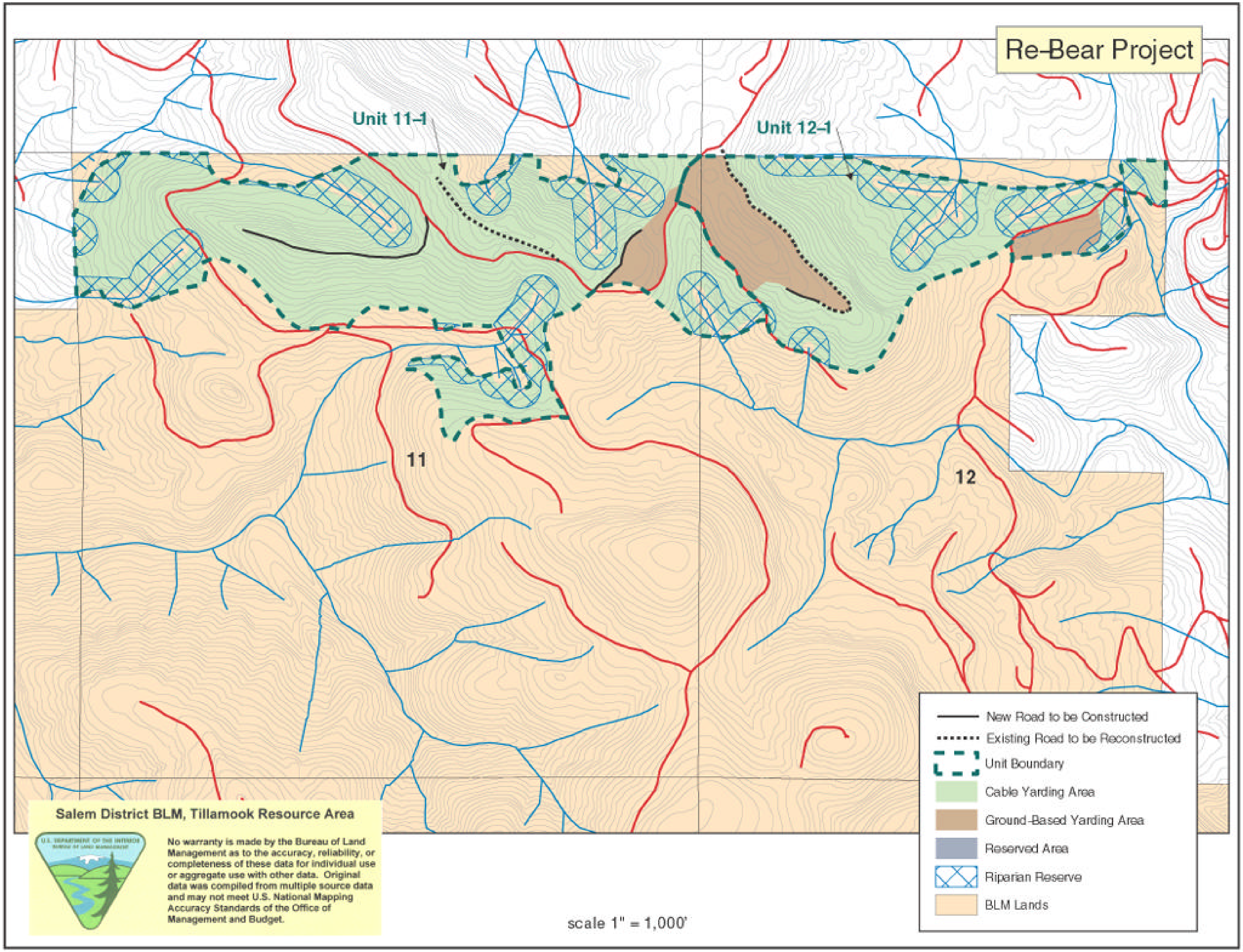





**Salem District BLM, Tillamook Resource Area**

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data. Original data was compiled from multiple source data and may not meet U.S. National Mapping Accuracy Standards of the Office of Management and Budget.

scale 1" = 1,000'



Re-Bear Project
Unit 11-1
Unit 12-1
11
12
New Road to be Constructed
Existing Road to be Reconstructed
Unit Boundary
Cable Yarding Area
Ground-Based Yarding Area
Reserved Area
Riparian Reserve
BLM Lands
Salem District BLM, Tillamook Resource Area
No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data. Original data was compiled from multiple source data and may not meet U.S. National Mapping Accuracy Standards of the Office of Management and Budget.
scale 1" = 1,000'