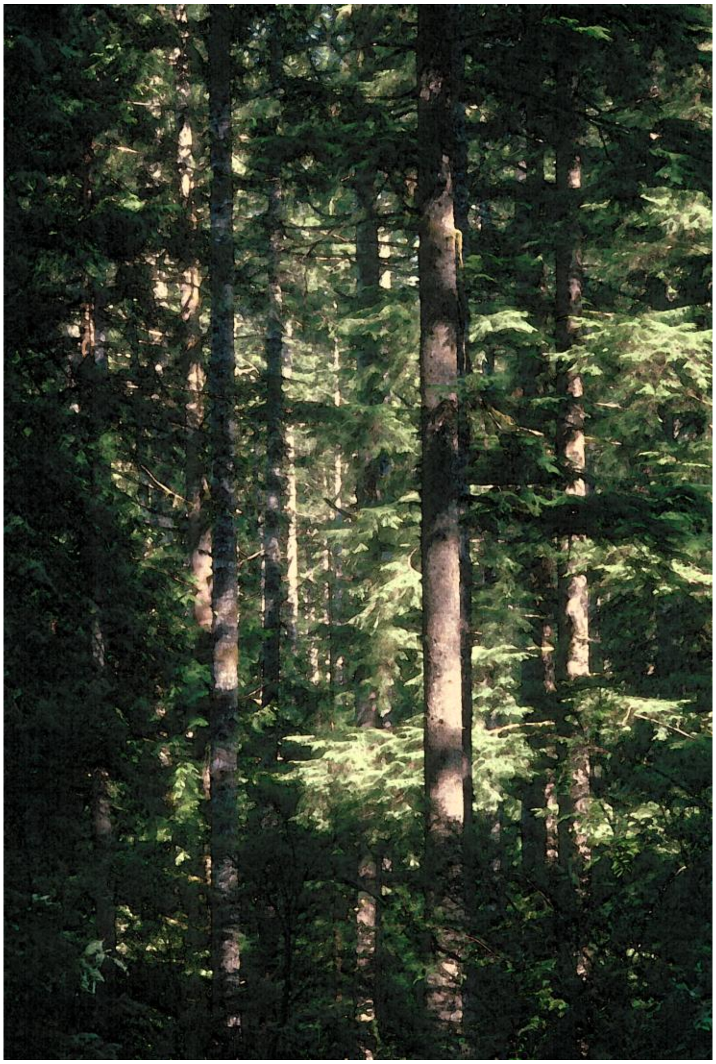

North Soup and Blue Retro Density Management Study

ENVIRONMENTAL ASSESSMENT
EA: OR125-08-01

Umpqua Field Office
Coos Bay District
Bureau of Land Management

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BUREAU OF LAND MANAGEMENT

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CHAPTER I.: PURPOSE OF AND NEED FOR ACTION

BACKGROUND

The following excerpt from the ***BLM Density Management and Riparian Buffer Study: Establishment Report and Study Plan*** (Cissel et al 2006) provides a project overview and summary of the first phase of the study:

> *The Bureau of Land Management (BLM), Pacific Northwest Research Station (PNW), US Geological Survey (USGS), and Oregon State University (OSU) established the BLM Density Management and Riparian Buffer Study in 1994 to demonstrate and test options for young stand management to meet Northwest Forest Plan objectives in western Oregon. The primary objectives of the Density Management Study are to evaluate the effects of alternative forest density management treatments in young stands on the development of important late-successional forest habitat attributes and to assess the combined effects of density management and alternative riparian buffer widths on aquatic and riparian ecosystems.*
>
> *The Density Management Study consists of three integrated studies: initial thinning, rethinning, and riparian buffer widths. The initial thinning study was installed in 50 to 80-year-old stands that had never been commercially thinned. Four stand treatments of 30 to 60 acres each were established at each of seven study sites: 1) unthinned control, 2) high density retention (120 trees per acre (TPA), 3) moderate density retention (80 TPA), and 4) variable density retention (40-120 TPA). Small (1/4 to 1 acre in size) leave islands were included in all treatments except the control, and small patch cuts (1/4 to 1 acre in size) were included in the moderate and variable density treatments. An eighth site, Callahan Creek, contains a partial implementation of the study design.*
>
> *The rethinning study was installed in four 70 to 90-year-old stands that previously had been commercial thinned. Each study stand was split into two parts: one part as an untreated control and the other part as a rethinning (30-60 TPA).*
>
> *The riparian buffer study was nested within the moderate density retention treatment at each of the eight initial thinning study sites and two rethinning sites. Alternative riparian buffer widths included: 1) streamside retention (one tree canopy width, or 20–25 ft), 2) variable width (follows topographic and vegetative breaks, 50 ft slope distance minimum), 3) one full site-potential tree height (approximately 220 ft), and 4) two full tree heights (approximately 440 ft). . . .*
>
> *Remeasurement, data management, and analysis are ongoing for three long-term, core components of the Density Management Study: vegetation, microclimate, and aquatic vertebrates. In addition, several short-term collaborative studies have been completed on these sites including leave island effectiveness as refugia, treatment response of terrestrial and aquatic arthropods, and smaller-scale studies of fungal, lichen, and bryophyte community response. Additional collaborative studies are encouraged on Density Management Study sites.*

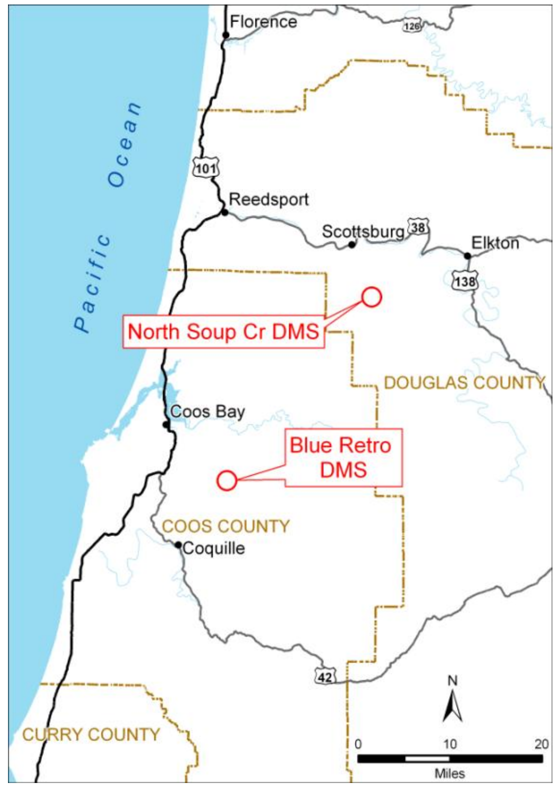

Figure I–1: Locations of the Coos Bay District Density Management Study sites.

Instruction Memorandum No. OR-2005-083, dated August 12, 2005, directs the BLM Districts, with established study sites, to implement the next phase of the Density Management Study. This EA covers the next phase of the Density Management and Riparian Buffer Study research project for those sites on the Coos Bay District. The North Soup is one of the sites in the initial thinning part of the study. Blue Retro is one of the sites in the rethin part of the study.

Researchers at Oregon State University and the Pacific Northwest Research Station have identified the next series of treatments to meet the research objectives that have been established for the Density Management Studies (DMS) Project. The research objectives (Cissel et al 2006) are:

- *Evaluate effects of alternative forest density management treatments on important stand and habitat attributes (large trees; standing and down dead wood; understory trees, shrubs, and herbs; vertical distribution of tree canopy; and spatial distribution of trees, shrubs, herbs, and dead wood)*
- *Determine treatment effects on selected plant and animal taxa (amphibians, arthropods, mollusks, nonvascular plants, and fungi)*
- *Assess the combined effects of density management and alternative riparian buffer widths on aquatic and riparian ecosystems*
- *Use DMS sites to develop operational approaches to implement new prescriptions and improve methods for effectiveness monitoring of plant and animal taxa*
- *Use DMS sites to share results of on-the-ground practices and findings with land managers, regulatory agencies, policy-makers, and the public*
- *Use results from DMS to conduct a long-term adaptive management process where management implications and policy changes are regularly evaluated and changed as needed*

The proposed project addressed in this EA includes re-thinning, and coarse woody debris creation. This treatment would be done in accordance with the phase two study design published in the *BLM Density Management and Riparian Buffer Study: Establishment Report and Study Plan* (Cissel et al 2006). The *Establishment Report and Study Plan* (Cissel et al 2006) also describes the history, objectives, study sites, component studies, collaborative studies, treatment schedule, and measurement schedule. Executing the next phase of the Density Management Study would enable researchers to collect data on the effects of multiple-entry treatments, analyze the data, and in time, publication of findings.

Location of the Project

Table I-1: Proposed Project Locations

Site	North Soup	Blue Retro
Legal Description	Sec. 16, T.23S., R09W., WM	Sec. 25, 26, 35, & 36, T.26S., R.12W., WM
Latitude-Longitude	N43°33’57.0” – W123°46’38.0”	N43°16’49.0” – W124°04’57.0”
Watershed	Mill Creek-Lower Umpqua River [HUC 1710030305]	North Fork Coquille River [HUC 1710030504]
Subwatershed	Lower Lake Creek-Loon Lake [HUC 171003030502]	Woodward Creek-Hudson Creek [HUC 171003050403]
County	Douglas	Coos
Distance from ocean	Approximately 19 air miles	Approximately 14 air miles
Distance from a major community	Approximately 17 air miles to Reedsport, OR	Approximately 9 air miles to Coos Bay, OR

PURPOSE OF AND NEED FOR ACTION

Need for the Project

The need for this project is to implement the next phase of the Density Management and Riparian Buffer Study project on the North Soup and Blue Retro sites. Researchers at Oregon State University and Pacific Northwest Research Station have identified the next series of treatments that meet the research objectives established for the

Density Management and Riparian Buffer Study Project. This research project is designed to evaluate design criteria through which restoration could develop future forest habitat.

In addition, the proposed project would improve stand health, restore desired forest habitats within the Riparian Management Area and Late-Successional Management Area land-use allocations, and provide a commercial product to support local communities. Other than the "no action" alternative, in order for an alternative to be seriously considered, it must be designed to satisfy the objectives described below.

Purpose (Objectives) of the Project

A reasonable action alternative must meet the objectives provided in the *Coos Bay District 2008 Western Oregon Plan Revision Record of Decision and Resource Management Plan* [ROD/RMP] (USDI-BLM 2008a) for projects to be implemented within the planning area. The ROD/RMP and applicable statutes specify the following objectives to be accomplished in managing the lands in the project area:

1. Provide for research to support the management of lands and resources administered by the BLM in western Oregon (p.56) by:
    - Ongoing research projects will be continued according to current or updated study plans. Management directions on existing study sites that conflict with research objectives will be deferred until the research is complete. New research projects will require study plans that are consistent with the resource management plan or a plan amendment if they are not consistent with the resource management plan (p 56).

2. Manage Late-Successional Management Areas to promote development of habitat suitable for nesting, roosting, or foraging for the northern spotted owl in stands that do not currently meet suitable habitat criteria (p.31) by:
    - Applying thinning harvest and other silvicultural treatments to: promote development of habitat suitable for nesting, roosting, or foraging for the northern spotted owl; promote development of nesting habitat for the marbled murrelet; or reduce the potential for uncharacteristic wildfire (p.32).
    - Retaining snags and coarse woody debris during thinning harvest of stands, except for safety or operational reasons. Create new snags and coarse woody debris when existing levels of snags and CWD do not meet the levels defined in Table 5 (p.32).
    - Making timber to be cut from thinning, tree-falling, and salvage operations available for sale (p.33).

3. Manage Riparian Management Areas to provide for riparian and aquatic conditions that supply stream channels with shade, sediment filtering, leaf litter and large wood, and streambank stability (p.34) by:

    For Perennial and Intermittent Fish-Bearing Streams and Perennial Non-Fish-Bearing Streams (p.34):
    - Applying thinning and other silvicultural treatments to speed development of large trees to provide an eventual source of large woody debris to stream channels and to reduce the potential for uncharacteristic wildfire. These treatments will retain a minimum of 50 percent canopy closure.

    For Intermittent Non-Fish-Bearing Streams (p.34):
    - Applying thinning and other silvicultural treatments to speed the development of large trees to provide an eventual source of large woody debris to stream channels (p.34).
    - Retaining all snags and coarse woody debris in thinning operations, except for safety or operational reasons (e.g., maintaining access to roads and facilities) (p.34).
    - Making timber to be cut in thinning, tree-falling, and salvage operations available for sale (p.34).

4. Manage the Timber Management Area to achieve continuous timber production that could be sustained through a balance of growth and harvest (p.36) by:
   - Offering annual timber volume for sale that does not vary more than ten percent from the declared annual productive capacity (allowable sale quantity) (p.37).
   - Offering timber for sale from commercial thinning harvest units (p.37).

5. Provide for the conservation of BLM special status species (p.60) by:
   - Managing species that are listed under the Endangered Species Act consistent with recovery plans and designated critical habitat. Wildlife species with currently approved recovery plans include the marbled murrelet and northern spotted owl (p. 60).

Decision Criteria

In choosing the alternative that best meets the purpose and need, consideration would be given to the extent to which each alternative would:

1. Meet the statistical design criteria for the Density Management and Riparian Buffer Study project;

2. Reduce competition-based mortality and increase tree vigor and growth specific to the Timber Management Area;

3. Improve Riparian Management Area and Late-Successional Management Area stand structure by thinning out excess trees in overstocked stands to enhance the growth and vigor of the residual trees while retaining structural and habitat components, such as large trees, snags, and coarse wood;

4. Provide timber resources and revenue to the government from the sale of those resources;

5. Provide cost effective management that would enable implementation of these management objectives while providing collateral economic benefits to society;

6. Comply with applicable laws and Bureau policies including, but not limited to: the Clean Water Act, the Endangered Species Act, the O&C Act, the Magnuson-Stevens Fishery Conservation and Management Act, and the Special Status Species Program.

CONFORMANCE WITH EXISTING LAND USE PLANS

This EA is in conformance with the *Coos Bay District 2008 Western Oregon Plan Revision Record of Decision and Resource Management Plan* [2008 ROD/RMP] (USDI-BLM 2008a). Additionally, this EA is tiered to the *2008 Final Environmental Impact Statement for the Revision of the Resource Management Plans of the Western Oregon Bureau of Land Management* [2008 Final EIS] (USDI-BLM 2008b).

This EA is also tiered to and in conformance with the following documents: the *Management of Port-Orford-cedar in Southwest Oregon Final Supplemental Environmental Impact Statement* (USDA-FS/USDI-BLM 2004a) and its *Record of Decision* (USDI-BLM 2004)[1]; the *Final Programmatic Environmental Impact Statement for Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western State* (USDI-BLM 2007a) and its *Record of Decision* (USDI-BLM 2007b) and the *Coos Bay Integrated Noxious Weed Program* (EA#OR-120-97-11 on file at the Coos Bay District Office).

[1] EIS prepared jointly by Forest Service and BLM. Records of Decision were signed separately by the two agencies

The first phase of the North Soup Density Management Study treatments was analyzed in Environmental Assessment OR125-96-08 (July 22, 1996) and phase one of the Blue Retro Density Management Study treatments was analyzed in Environmental Assessment OR 125-97-19 (July 17, 1997), herein incorporated by reference.

Additional Guidance Specific to this Research Project

Instruction Memorandum OR-93-145 and Information Bulletin OR-94-317, both issued by the Oregon State Office, provided the initial direction for implementing the Density Management Study. Instruction Memorandum OR-2005-083, dated August 16, 2005, initiates and provides direction for the second phase of the Density Management Study project to the western Oregon Districts with Density Management Study project areas.

USDI-USGS Scientific Investigations Report No. 2006-5087, *BLM Density Management and Riparian Buffer Study: Establishment Report and Study Plan* (Cissel et al 2006): This report contains the study plans, and provides the rationale for implementing this suite of density management thinning treatments and alternative riparian buffer widths.

BLM Oregon State Office memo to the State of Oregon Department of Environmental Quality (ODEQ): Bureau of Land Management Density Management and Riparian Buffer Study Effectiveness Monitoring, September 8, 2006. The memorandum describes the contributions of the Density Management Study to understanding the effects of active management in the attainment of Riparian Reserve restoration objectives, and the BLM's commitment to continue working with ODEQ regarding the assumptions and technical basis for the Northwest Forest Plan and Resource Management Plan standards and guidelines regarding Total Maximum Daily Loads.

Endangered Species Act

Informal consultation with the U.S. Fish and Wildlife Service (USFWS) as provided in Section 7 of the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1536 (a)(2) and (a)(4) as amended) is completed. The initial study treatment for the North Soup study area was determined to be a "not likely to adversely effect" on both spotted owl and murrelet and a Biological Opinion was issued on February 18, 1998 (Biological Opinion No. 1-7-98-F-079). A similar project adjacent to the North Soup Study Area was the 2004 Beaman Soup project. A Biological Assessment was prepared in 2004, which assessed potential impacts to all listed species and critical habitat within the fifth-field watershed. The U.S. Fish and Wildlife Service issued a Letter of Concurrence (No. 1-15-05-I-0065) supporting that the much larger Beaman Soup project area and actions in the fifth-field watershed were "not likely to adversely affect" any listed species or critical habitat.

The Blue Retro study site does not include critical habitat for any listed species. The effects determination for the Blue Retro Study Area would be "no effect" on northern spotted owls and marbled murrelets or their critical habitat.

Consultation with the National Marine Fisheries Service would not be requested as the proposed project has been determined to have "no effect" to threatened Oregon Coast coho salmon. Additionally, project activities would not adversely affect Essential Fish Habitat under the Magnuson-Steven Fishery Conservation and Management Act (16 U.S.C. 1855(b)).

PUBLIC INVOLVEMENT

The primary purpose of scoping is to identify agency and public concerns relating to a proposed project and helps define the issues and alternatives to be examined in detail in this EA. The scoping process began with an interdisciplinary team identifying potential issues that may result in the development of alternatives to the proposal. The public was notified of the proposed project and EA through publication of the District's semi-annual Planning Update. Additional scoping notices were sent to adjacent landowners, agencies that have requested these documents, and other interested parties on the District National Environmental Policy Act (NEPA) mailing list. The scoping period for the proposed project ran from January 25, 2008 through February 25, 2008.

Identified Issues

Several issues were raised during the public scoping period. Many of the comments were requests for additional information or opinions, some, however, pertained to the extent of the analysis. In summary, scoping identified the following major issues that are used to develop and analyze the alternatives:

Issue 1 – Cumulative effects of the North Soup project site in conjunction with adjacent timber sales.
Issue 2 – Effects of sediment on listed fish species.
Issue 3 – Effects of logging at the Blue Ridge site on the existing trail system trail use.
Issue 4 – Effects of the project on residual tree species composition and stand structure.

Potential Issues Identified and Eliminated from Further Analysis

Issue 1 – Clarification on Study Design

[W]*ouldn't the study be compromised by the edge effects of the adjoining timber sale?*

As in many other forest management studies, the size of each treatment area is larger than the sum total of the sample plot areas where data is collected. This allows for positioning sample plots where they are surrounded by stand conditions that are the same as those inside the sample plots.

While not part of the study design, the thinning of the adjacent stands decreases the contrast between the treated areas in the study and the surrounding forest.

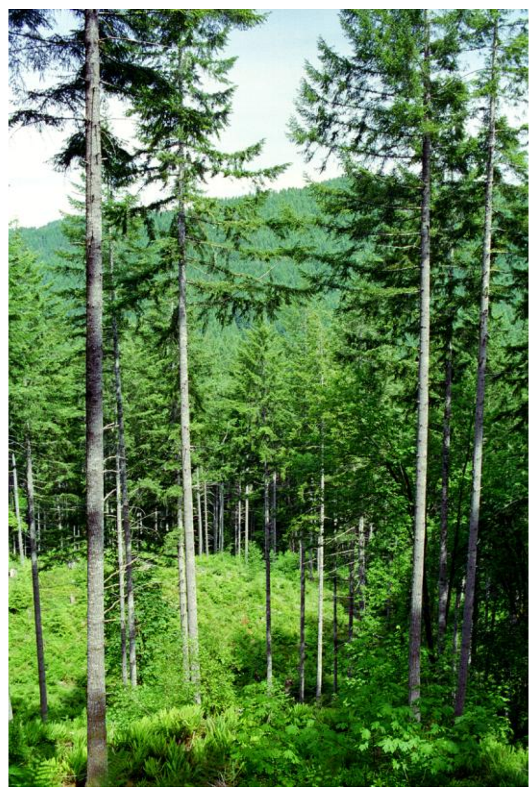

Figure I–2: In the foreground is a low-density (40 trees/acre) subtreatment patch in the variable treatment area of the North Soup Density Management Study site. Beyond is a gap created at the time of the initial thinning, and planted in 2000 with an even mix of western hemlock, western redcedar and Douglas-fir. A low-density patch is located on the far side of the gap and beyond that is a variable-width no-cut buffer on a stream. The distant low-density patch is in the Riparian Reserve.

Issue 2 – Low Stocking Levels

… caution in thinning to low density. . . . The Coos Bay BLM will have additional problem of blow down during high wind in the low-density units. . . .If the Coos Bay BLM's low density units from phase-one are also not looking good, the EA should document that, and consider an alternative to postpone reducing the density further, especially in riparian reserves.

Observations to date on the Density Management Study sites and on related studies "indicate that, in most cases, thinning to the prescribed initial densities would not cause high levels of stand damage due to storms or other events" (Cissel et al 2006, pg 23).

The basis for including low stocking levels in the Density Management Study design lie in the findings that "old-growth forests may have developed differently than current young managed stands (Tappeiner *et al.* 1997; Bailey and Tappeiner 1998; Poage and Tappeiner 2001). Many old-growth stands apparently initiated at relatively low densities, as evident by rapid diameter rates of growth over the first 100 years (Poage and Tappeiner 2001; Tappeiner *et al.* 1997; but see Winter *et al.* 2002). In contrast, trees in current young managed stands tend to grow more slowly at high densities" (Cissel et al 2006, pg 15).

The study looks at alternatives for achieving late-successional stand attributes. These include comparing varying numbers of thinning entries to attain low stocking targets. The study includes an understory vegetation and a coarse wood debris component. The array of density treatments, including the low-density treatment, in the study allows for the examination of the patterns of understory plant community response to different levels of overstory competition. The dead wood on the forest floor, including post treatment windfall, would be measured over time to determine if the amount and characteristics of coarse wood debris meet late-successional objectives (Cissel et al 2006, pg 22). The study is expected to provide information on the effects of thinning on growth and yield of residual trees, which would reflect the effects of windfall on the residual stands. The study would also document how different stand densities, including low densities, influence canopy layering, crown development, and crown sizes (Cissel et al 2006, pgs 22, 23).

The North Soup and Blue Retro units are not stand-alone studies. They are part of a large study that includes 12 sites located across an area from near Mount Hood to Coos Bay. The timing of treatments and adherence to the study design are essential if the researchers are to obtain statistically sound results and identify similarities and differences in responses among the different sites. Thus, a decision to make substantive deviations from the study plan can make data from North Soup and Blue Retro incompatible with the data from the other sites.

As shown in Figure I–2, the foliage on the trees in the low density treatment areas exhibit both good color and density indicating good health and vigor.

CHAPTER II.: ALTERNATIVES

NO-ACTION ALTERNATIVE

Under this alternative, the project areas on the Coos Bay District would not receive the treatments described in the proposed action, and this would reduce the number of treatment replications across western Oregon in the Density Management Study. This could affect the ability to identify statistically significant trends and cause-and-effect-relationships. Further, the southern Oregon Coast Range would not be represented in the data set derived from the second phase of the Density Management Study. Thus, locally unique conditions or responses to management would go undetected and would then remain undocumented in the science literature. Proposed road improvement, renovation, or culvert replacement would not occur. Forgoing the installation of the second phase of the Density Management Study on the North Soup and Blue Retro sites would result in those areas being returned to conventional management, consistent with the applicable land use allocations, following completion of phase one data collection.

Ongoing activities necessary to comply with laws, regulations, and projects covered by earlier records of decision, would continue. These include but are not limited to compliance with Oregon fire control regulations, construction of roads across BLM land under existing right-of-way agreements, routine road maintenance, control of noxious weeds, and silvicultural activities in young stands. This alternative also serves to set the environmental baseline for comparing effects to the Proposed Action.

PROPOSED ACTION ALTERNATIVE – IMPLEMENT THE PHASE TWO STUDY PLAN

Project Description

The proposed action is to implement silvicultural treatments on approximately 223 acres of BLM administered lands (Table II-1). This action would include thinning of conifer stands in the Timber Management Area (TMA), Late-Successional Management Area (LSMA), and Riparian Management Area (RMA) land-use allocations. All of the thinning treatments in this action would yield commercial wood products as a result of implementing the study prescription, however, thinning in the TMA is termed commercial thinning (CT) while thinning in the LSMA and RMA is termed density management thinning (DMT).

Table II-1: Project Acres by Land Use Allocation

Site	Treatment	Timber Management Area	Late-Successional Management Area	Riparian Management Area	Total
North Soup	60 Conifers/ Acre	0	56	4	60
	30 Conifers/ Acre	0	40	18	58
	Variable Density 60/30/20 Conifers/ Acre	0	44	13	57
	No Treatment Control	0	44	14	58
	Total Area	**0**	**184**	**49**	**233**
Blue Retro	Treated Area	47	0	1	48
	No Treatment Control	15	0		15
	Total Area	**62**	**0**	**1**	**63**

Note: Acres calculated in GIS and rounded to the nearest whole number.

In phase two of the study, the North Soup site would receive a second thinning in the high, moderate and variable density treatment areas, and along the stream reaches proposed for the "thin-through" riparian treatment. The Blue Retro site would receive a third commercial thinning treatment. Table II-2 summarizes proposed activities.

Table II-2: Summary of the Proposed Action

Site	North Soup	Blue Retro
Acres in the treatment replications including rethinning, gaps and leave patches/retention areas, stream buffers	175 acres	48 acres
Acres of no-treatment control	58 acres	15 acres
Road renovation	6.8 miles	4.5 miles
Road improvement	1.0 mile	None
New road construction	None	None
Road decommission	0.5 mile	None
Culvert installation on fish-bearing streams	None	None
Coarse wood debris recruitment (both sites)	Fall 2 dominant or co-dominant trees per acre to provide a pulse of coarse woody debris. Existing decay class I or II fallen trees can be used to satisfy this requirement.	
Snag recruitment (both sites)	Retain 5 trees per acre, in addition to stocking target, to be converted into snags if natural recruitment does not result in 5 snags per acre 10 years after thinning.	

Marking Prescription

Klaus Puettmann, Professor at Oregon State University and principal investigator for vegetation on the Density Management Study, prepared the marking guidelines that are the basis of the following prescriptions. A copy of Klaus Puettmann's document is in the appendix. Additional prescription details and clarifications are from the *BLM Density Management and Riparian Buffer Study: Establishment Report and Study Plan* (Cissel *et al.* 2006). The following prescription is derived from both of these sources and varies from the sources only to clarify, with respect to local conditions, and to drop those prescription elements that do not apply to the Coos Bay District sites.

Goals

Maintain or increase the diversity of stand structural and compositional conditions through the thinning operation. Specific goals include:

- Maintain the full range of diameter distribution.
- Allow for a range of tree structures, including diverse crown sizes, and damaged or deformed trees.
- Increase the proportion of minor species by focusing the harvesting activities on the dominant species.

Leave Tree Selection

Hierarchy

To meet these goals the following general priorities are to be applied when making marking decisions:

1. Retain all tree improvement program parent trees, all bearing trees and all the plot center trees for the thinning plots. The thinning plots are alternately known as the BLM plots.
2. Residual conifer trees per acre. This includes conifer trees reserved to meet future snag and down wood recruitment targets. Retain all conifers smaller than 9 inches dbh. Conifers smaller than 9 inches dbh would not be counted when determining residual trees per acre.
3. Maintenance of minor species
4. Maintenance of unique trees, for example, wolf trees, broken-top trees, forked trees, and trees with deep crowns
5. Proportional across diameters to ensure representation of all size classes
6. Residual tree spacing

Trees that are always to be reserved

Reserve tree improvement parent trees. The North Soup site contains numerous trees selected by both the BLM and State Forestry for inclusion in tree improvement programs. These trees are marked with red paint and seed tree tags.

Reserve the bearing trees for the section corner situated inside the Blue Retro site.

Reserve plot center trees are marked with three or four spots of yellow paint.

Trees per acre targets

The conifer trees per acre (TPA) targets are determined by adding the requirements from three sources:

1. Desired residual green tree density:
    - 6**0 TPA** - High-density treatment and high-density subtreatment within the variable-density treatment
    - **30 TPA** - Moderate-density treatment, moderate-density subtreatment within the variable-density treatment, and the rethin treatment within the rethinning study
    - **20 TPA** - Low-density subtreatment within the variable-density treatment
2. **Five additional conifer trees** per acre retained on all treatments to be used for future snag recruitment
3. **Two additional conifer trees** per acre to be used for down wood debris recruitment in those areas with below target levels of large decay class 1 and 2 down wood.

Reserved hardwoods do not count toward the Trees per acre targets. Conifers smaller than 9-inches dbh also do not count toward the trees per acre targets.

Table II-3: Current and Target Stocking for the North Soup Site

Treatment	**Target Stocking of overstory trees, 8 inches DBH and larger, following entry completed Sept. 1998 (Actual Stocking)**	**Second Entry: Target Stocking of Conifers, Greater than 9 Inches DBH, by Treatment Area**					
		Target stand density in conifers greater than 9-inches dbh	**Conifers retained for future snag recruitment**	**Conifers retained for coarse wood debris recruitment**	**Total conifers/ acre designated for retention**	**Average spacing in of conifers greater than 9-inches dbh**	**Average conifer count on a 1/10-acre plot* (plot to plot variability)**
Unthinned Control	No treatment (144 trees/ acre)	No treatment	Not apply	Not apply	No treatment	Not apply	Not apply
High Density	120 conifers/ acre (115 trees/ acre)	60 conifers/ acre	5 conifers/ acre	2 conifers/ acre	67 conifers/ acre	26 X 26 ft	7 (6-8)
Moderate Density	80 conifers/ acre (80 trees/ acre)	30 conifers/ acre	5 conifers/ acre	2 conifers/ acre	37 conifers/ acre	34 X 34 ft	4 (3-5)
Variable Density	Depending on subtreatment, 120/80/40 conifers/ acre (105/86/45 trees/ acre)	60 conifers/ acre	5 conifers/ acre	2 conifers/ acre	67 conifers/ acre	26 X 26 ft	7 (6-8)
		30 conifers/ acre	5 conifers/ acre	2 conifers/ acre	37 conifers/ acre	34 X 34 ft	4 (3-5)
		20 conifers/ acre	5 conifers/ acre	2 conifers/ acre	27 conifers/ acre	40 X 40 ft	3 (2-4)

* A circular 1/10-acre plot has a 37.2-foot radius

Table II-4: Current and Target Stocking for the Blue Retro Site

Treatment	**Stocking following entry completed Jan. 1999**	**Third Entry – Target Stocking of Conifers, Greater than 9 Inches DBH, by Treatment Area**					
		Target stand density in conifers greater than 9-inches dbh	**Conifers retained for future snag recruitment**	**Conifers retained for coarse wood debris recruitment**	**Total conifers/ acre designated for retention**	**Average spacing of conifers greater than 9-inches dbh**	**Average conifer count on a 1/10-acre plot* (plot to plot variability)**
Unthinned Control	119 Trees/ acre**	No treatment	Not apply	Not apply	No treatment	Not apply	Not apply
Thinned Treatment	72 conifers/ acre	30 conifers/ acre	5 conifers/ acre	2 conifers/ acre	37 conifers/ acre	34 X 34 ft	4 (3-5)

* A circular 1/10-acre plot has a 37.2-foot radius
** 0.6 alders per acre with the rest being conifer

Table II-3 and Table II-4 show target stocking levels, plus allowances for trees that would be killed to provide snags and down wood. Also shown is residual tree average spacing. As indicated by the tree marking hierarchy above, the spacing distances are a general reference and are not meant as strict criteria for selecting leave trees. Figure II–1: North Soup Treatment Map and Figure II–2: Blue Retro Treatment Map shows the desired residual tree densities by treatment area.

Down wood
Two conifer trees per acre, with diameters larger than mean DBH would be marked for felling as part of the timber sale contract. Table II-5 shows the average stand diameters by treatment.

Existing Class I and II logs of diameter larger than mean DBH can be counted towards this requirement if there is sufficient material to warrant the effort. Clumps of existing Class I and II logs can contribute to down wood requirements for a larger area not to exceed five acres.

Existing merchantable decay class I and II logs would be marked to reserve from harvesting. All other down wood would be contractually reserved from harvest.

Table II-5: Average Stand Diameter by Treatment and Total Number of Trees to Recruit for Snags and Down Wood

Study Site	North Soup					Blue Retro
Treatment	High Density	Moderate Density	Variable Density			2nd Rethin
Target Stocking	60 Trees/ acre	30 Trees/ acre	60 Trees/ acre	30 Trees/ acre	20 Trees/ acre	30 Trees/ acre
Target Stocking plus Trees for Snag & Down Wood	67 Trees/ acre	37 Trees/ acre	67 Trees/ acre	37 Trees/ acre	27 Trees/ acre	37 Trees/ acre
Pretreatment Average Diameter	17.0 inches (17-inch class)	18.5inches (19-inch class)	17.1 inches (17-inch class)	17.4 inches (17-inch class)	19.2 inches (19-inch class)	20.5 inches (21-inch class)
Thinned Acres (area calculated by GIS)	55 Acres	34 Acres	21 Acres	17 Acres	6 Acres	48 Acres
Desired Total Snags by Treatment (at 5/ acre)	273	168	106	84	30	238
Desired Total Decay Class I& II Down Trees by Treatment (at 2/ acre)	109	67	42	33	12	95

From data from Oregon State University plots and provided by Klaus Puettmann, vegetation principle investigator, September 7, 2006.

Snags

Five additional conifer trees per acre, with diameters larger than mean DBH would be retained and would be used for future snag recruitment. Table II-5 shows the average stand diameters by treatment.

Retain snags where operationally feasible. Protect large, high-value snags by marking nearby trees for retention to protect the snag from logging operations.

Minor species

In general, all hardwoods are to be retained. However, dense hardwood patches may be marked for thinning to improve the vigor and longevity of the hardwoods. Under this circumstance, designate hardwoods for cutting only as necessary to benefit other hardwoods in the patch that are retained on site.

Coniferous species of very low occurrence on a site would be reserved. The Study Plan defines species of low occurrences as any tree species that makes up less than 10 percent of the overstory (Cissel *et al.* 2006). The current percent stocking by species in each treatment area is in Appendix C. Dense patches of minor conifer species may also benefit from thinning to improve their vigor and longevity. Under this circumstance, designate minor species trees for cutting only as necessary to benefit another minor species.

Leave extra growing space around retained minor species to improve their vigor and longevity.

Unique trees

Retain sufficient trees of unique structural characteristics (wolf trees, broken-top trees, forked trees, or trees with deep crowns) to ensure their representation in the stand.

Reserve large remnant trees from the previous stand.

Proportional marking

Marking should be proportional across diameters (9-inches DBH and larger) to foster development of a vertically complex canopy structure and to ensure a rough representation of each diameter class. Concentrate on removing trees that are in the intermediate and co-dominant crown classes. Take dominants only as necessary to achieve the desired density or to release a desired minor species tree. This should result in a d/D approaching one.

Reserve all trees less than 9 inches DBH.

Appendix C contains tables and graphs detailing the diameter distribution by species for each site prior to marking.

Residual tree spacing

The residual tree spacings, for each treatment, are provided in the prescription as a general reference and are not meant to be strict marking criteria. As indicated by the marking hierarchy, maintaining spacing uniformity is a lower priority than retaining the target tree per acre, maintaining minor species, maintaining unique trees, or maintaining representation of all diameter classes.

Other guidelines
Areas around patch cuts (gaps) would be marked using the same criteria as the rest of the stand, that is, as if the gaps were not there.

Maintaining the prescribed trees per acre throughout each treatment is critical for the maintaining the statistical value of the sites for research. Therefore, markers are to check their work by doing 1/10-acre plots at frequent and regular intervals during the day.

No treatment is proposed in the leave islands, patch cuts or streamside leave strips established during the first phase of the study.

Table II-6: North Soup Acres by Treatment and Subtreatment

Treatment	Subtreatment	Acres	Percent of Treatment Area
Control	Unthinned	58.3	100.0
High density	Thinned (60 Trees/ acre)	54.5	91.0
	Leave islands	5.4	9.0
Treatment Area Total		**59.9**	**100.0**
Moderate density	Thinned (30 Trees/ acre)	33.6	58.4
	Leave islands	5.3	9.2
	Patch cuts	5.8	10.0
	Streamside buffers	12.9	22.4
Treatment Area Total		**57.6**	**100.0**
Variable density	Thinned (60 Trees/ acre)	21.2	36.9
	Thinned (30 Trees/ acre)	16.7	29.1
	Thinned (20 Trees/ acre)	6.0	10.5
	Leave islands	5.6	9.8
	Patch cuts	5.6	9.8
	Streamside buffers	2.2	3.9
Treatment Area Total		**57.3**	**100.0**
Study Site Total		**233.0**	

Acres calculated in GIS

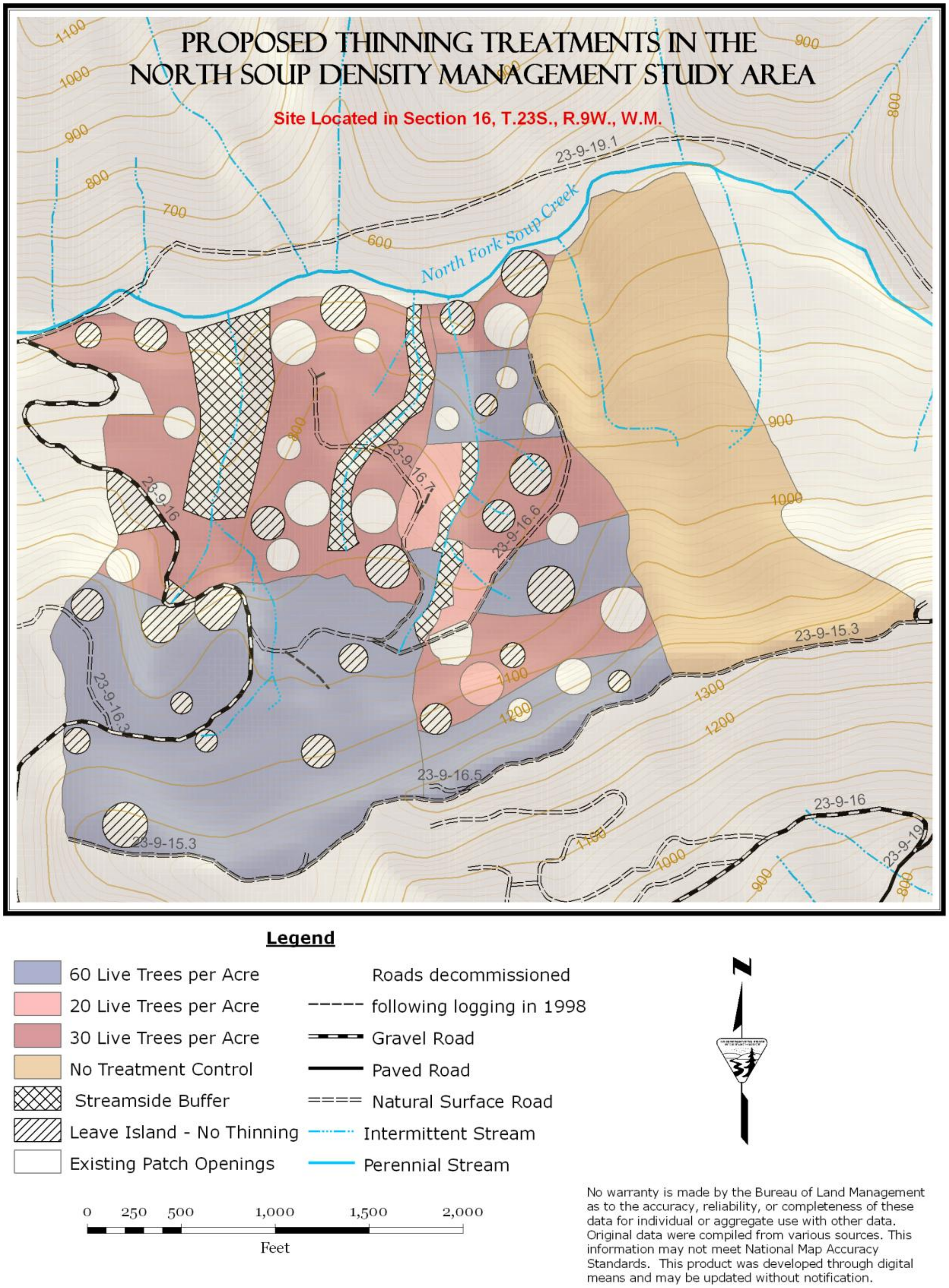

Figure II–1: North Soup Treatment Map

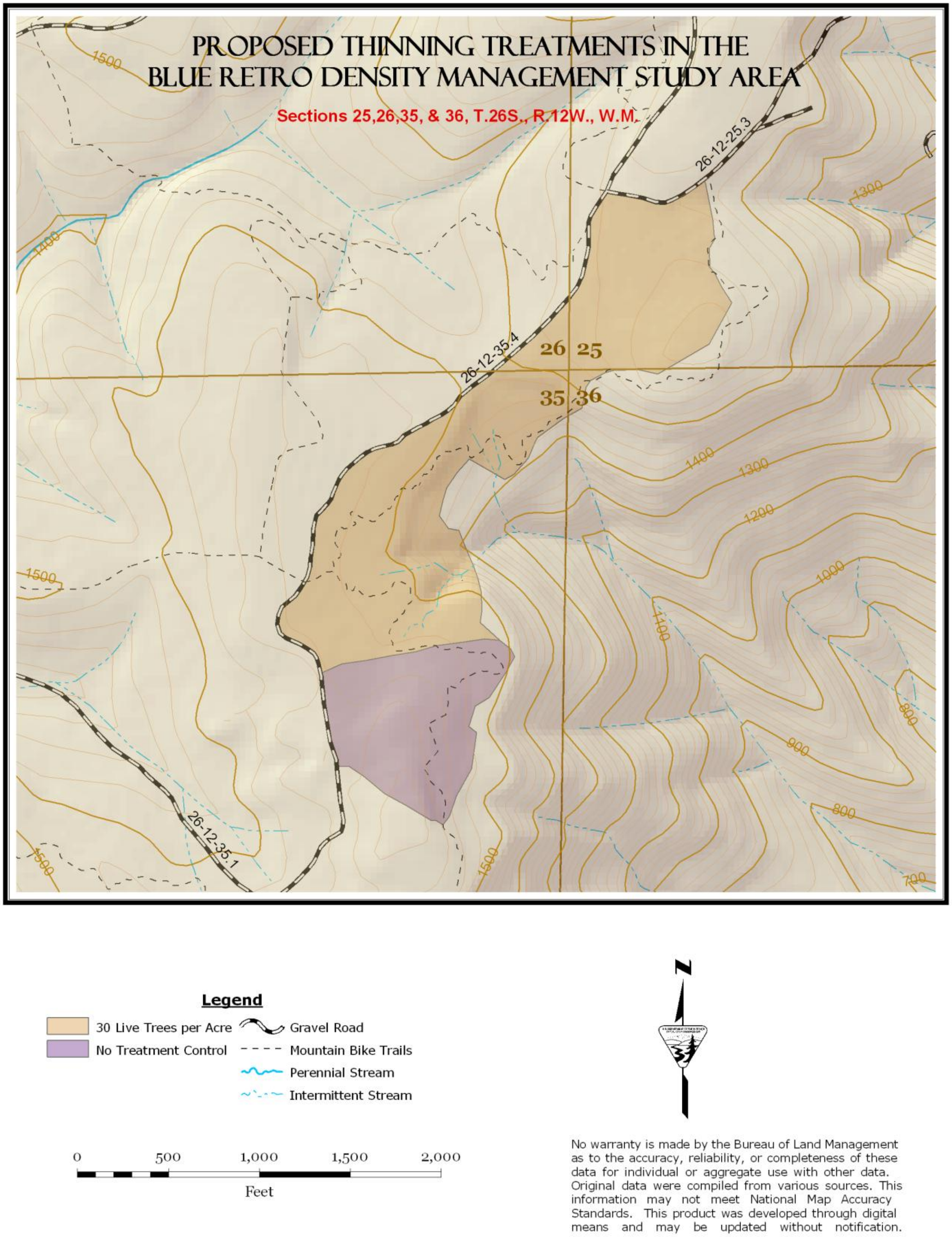

Figure II–2: Blue Retro Treatment Map

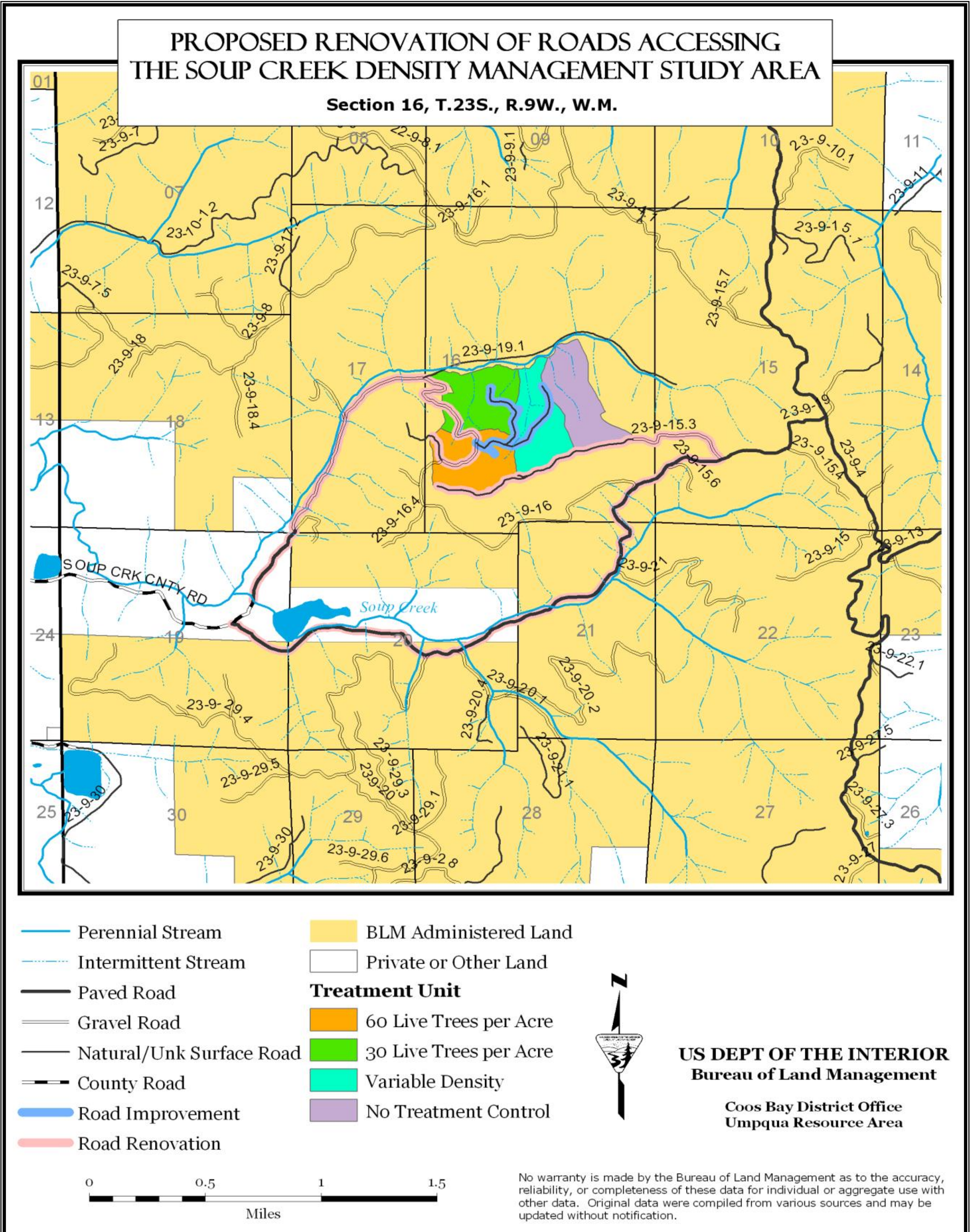

Figure II–3: Road surface types and proposed road improvements and renovation for the North Soup site

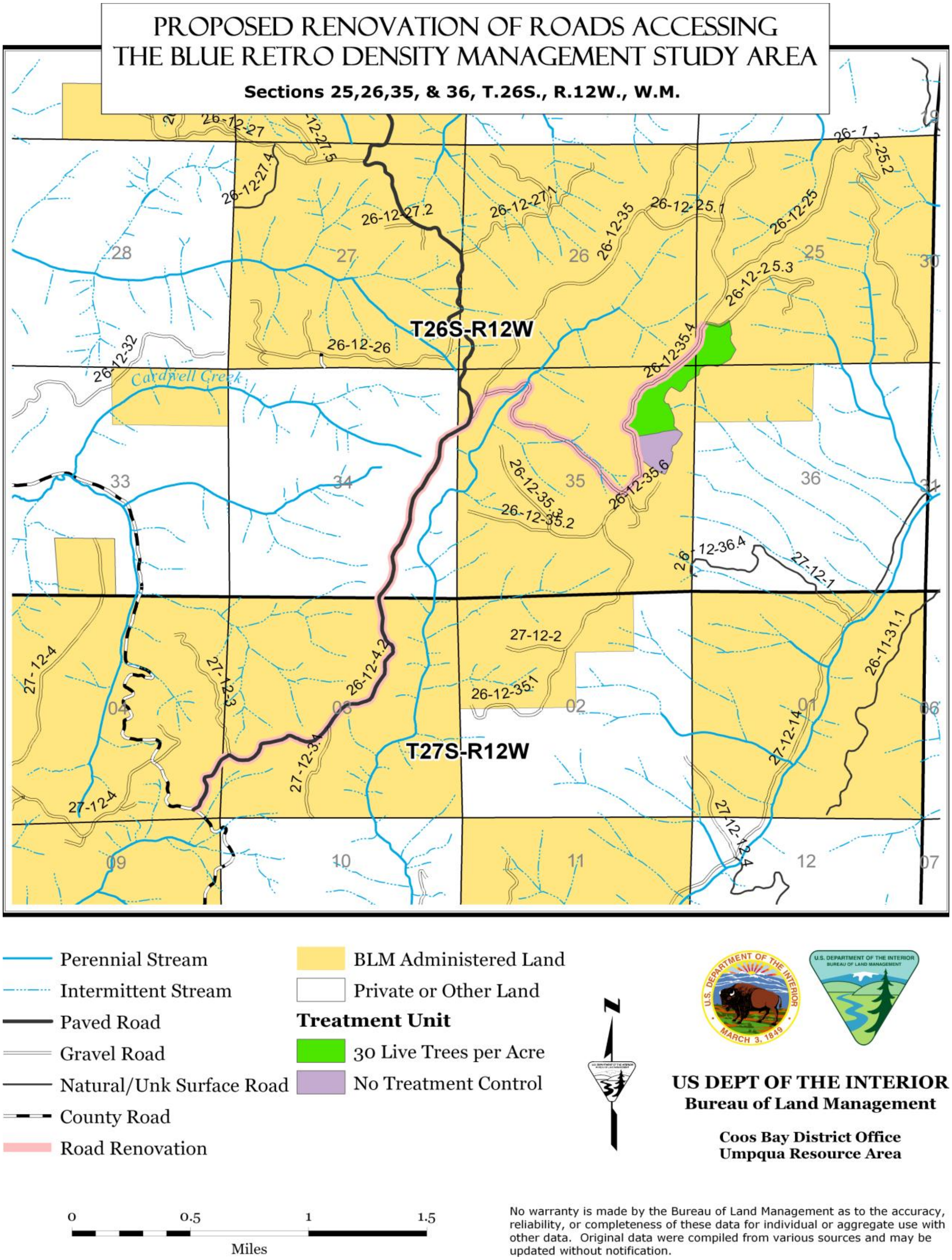

Figure II–4: Road surface types and proposed road renovation for the Blue Retro site

Streamside Retention Areas

Three streamside buffer widths are to be applied. These are a one-site-potential-tree wide buffer, a 50-foot minimum variable width buffer, and a 20-foot wide streamside retention area. As shown on Figure II–1: North Soup Treatment Map, the one-site-potential-tree wide buffer would be applied to the 2nd order reach of the stream in the northwest portion of the 30-tree per acre treatment area. A 50-foot minimum variable width buffer would be applied to the stream in the northeast of the 30-tree per acre treatment area, and along those stream reaches adjacent to the 20-tree per acre subtreatment portions of the variable density treatment area. A 20-foot wide streamside retention strip would be applied to all other streams in the North Soup unit, and to all streams in the Blue Retro unit. Figure II–5 shows a conceptual representation of the three riparian buffer treatments being evaluated in this study.

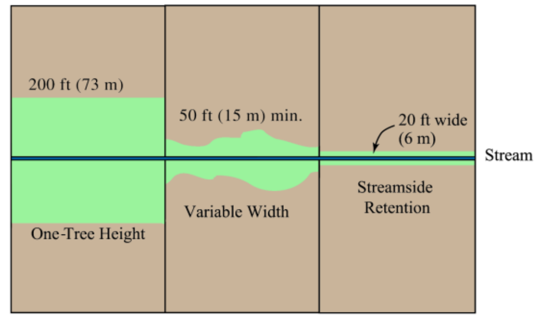

Figure II–5: Conceptual representation of the streamside treatments proposed for this project.

PROJECT DESIGN FEATURES

Seasonal Restriction Summary

Table II-7 below summarizes the seasonal restrictions of each unit for tree bark damage and soil protection.

Table II-7: Seasonal Restrictions

Activity	Reason for Restriction	Unit or road work affected	Restricted Dates	Dates Restrictions in Effect											
				J	F	M	A	M	J	J	A	S	O	N	D
Road renovation, improvement construction	Erosion & sediment production	Road work resulting in exposed soil	Rainy season, generally Oct. 15 – June 1	>	>	>	>	31					15	>	>
In channel work	Sediment production	Culvert installation	Sept 16 thru June 30	>	>	>	>	>	30			15	>	>	>
Conventional tree falling	Tree bark damage	Blue Retro & North Soup	April 1 thru June 30				1	>	30						
Cable yarding	Tree bark damage	Blue Retro & North Soup	April 1 thru June 30				1	>	30						
Hauling on dirt roads	Potential road surface damage in rainy season	North Soup	Oct. 16 thru June 30	1	>	>	>	>	30				16	>	31

Project Design Features to Facilitate Implementation of Study Design

These project design features are associated with implementing the Study Design but are not part of the Study Design. These project design features address site-specific issues and the operational aspects of the project.

The cutting and yarding would be completed between September 30, 2010 and March 31, 2012. This is so the time between treatments applied to the Blue Retro and North Soup sites would be the same as for the Density Management Study sites on other BLM Districts.

Yarders would be positioned to use the existing yarding corridors to the extent practical.

Obtaining the target stocking trees per acre in each treatment area is necessary for the statistical viability of the research project. Any additional trees marked for safety, or to facilitate logging operations would be offset by demarking an equal number of trees in each treatment area affected.

Roads

Road Renovation/Improvement

Road renovation and improvement activities that may cause soil displacement would be limited to the dry season. Table II-8 lists the miles of road renovation by surface type. Road renovation consists of returning existing roads back to their original construction design standards. It may include clearing brush and/or trees along roadsides, cleaning or replacing culverts, restoring proper road surface drainage, grading, surface replacement, or other maintenance.

Table II-8: Miles of Renovation by Surface Type

Study Area	Road Work	Miles Surface Type			Totals
		Paved	Gravel	Dirt	
Blue Retro	Renovation	2.5	2.0	0	4.5
North Soup Creek	Renovation	3.2	2.3	1.3	6.8
Totals		5.7	4.3	1.3	11.3

Road improvement consists of a capital investment that raises the condition of a road to a higher construction standard. The Proposed Action includes improving one mile of road on the bench that bisects the North Soup Creek Study Area. Road improvement would include installing seven culverts, brushing, and surfacing with rock if cable logging and hauling would occur during the winter. Roads selected for improvement would allow cable logging and hauling during the wet season and reduce sediment delivery from roads, and provide a greater window of operation in those areas subject to summer time seasonal restrictions.

In-water work, including culvert installation and replacement, would be limited to the period between July 1 and September 15.

Road Maintenance

Existing roads would be maintained during the life of the project to minimize road drainage problems and reduce the possibility of road failures. Maintenance may include, but is not limited to, grading to remove ruts, removal of bank slough, placement of silt trapping straw bales or other sediment control devices, and adding gravel lifts where needed such as stream crossings and soft spots in the road surface.

Dirt roads and landings would receive annual seasonal preventative maintenance prior to the onset of winter rains prior to the contractor leaving the project area during non-hauling periods. Seasonal preventative maintenance may include, but is not limited to cross-ditching, sediment control devices, removing ruts, mulching, and barricades. Bare soil areas created from landing and road construction would be mulched, seeded with native species, and fertilized. If native seed is not available, the area would be seeded with an approved District seed mix.

Maintenance of roadway ditch segments that drain directly into stream channels would be conducted only during the in-stream work period from July 1 to September 15. Work on these ditch segments can be conducted outside this period when appropriate protection of water quality and soils are applied to these specific sites.

Provide erosion control in ditch lines as they approach stream crossings to prevent sediment from entering stream channels. Use stabilization methods when approaches to stream crossings are steep such as seed and mulching, placing straw bales, and armoring with cobble/gravel for up to 50 feet of the approach.

Road Closure/Decommissioning

Following completion of harvest on the North Soup Study Area, the 23-9-15.3 road would be closed and decommissioned. The 23-9-16.3, -16.6, and -16.7 roads would be closed and fully decommissioned (including pulling in-stream culverts). Water barring, seeding, fertilizing, and mulching would be required as needed to reduce potential erosion and to help restore the natural hydrologic flow. Roads would also be blocked to prevent vehicle passage.

No road closures or decommissioning would be required on the Blue Retro Study Area.

Areas Excluded From Harvest:

No treatment is proposed in the leave islands, patch cuts or streamside leave strips established during the first phase of the study. Figure II–1: North Soup Treatment Map shows the locations of the no treatment areas

The widths and locations of streamside buffers would be the same as those used in the first phase of the study. Along intermittent streams, no trees would be harvested within 20 feet of the stream bank on vertically and laterally confined, entrenched and constrained channels or within 20 feet of the floodplain on unconstrained channels. Minimum 50-foot variable-width buffers and one-site potential tree buffers would be retained in the areas shown on Figure II–1: North Soup Treatment Map.

Trees Excluded from Harvest:

Reserve existing snags from cutting except those that must be felled to meet safety standards. Any snags felled or accidentally knocked over would be retained on site.

Reserve existing decay class 3, 4, and 5 down logs. Reserve decay class 1 and 2 down wood marked with pink paint.

Reserve tree improvement parent trees marked with red paint and seed tree tags. Numerous trees, selected for tree improvement programs by the BLM and State Forestry, are located in on the North Soup site.

Reserve the bearing trees for the section corner situated inside the Blue Retro site.

Reserve plot center trees are marked with three spots of yellow paint.

In general, all hardwoods are to be retained. However, dense hardwood patches may be marked for thinning to improve the vigor and longevity of the hardwoods.

Reserve trees less than 9 inches DBH to the extent practical.

Falling and Yarding

Trees would be directionally felled to lead of cable yarding corridors. Trees would be directionally felled away from all property lines, project area boundaries, wetlands, and roads not planned for closure or decommissioning.

No trees would be harvested within designated streamside retention areas described in the Proposed Action Alternative.

Within safety standards, all harvest trees would be directionally felled away from stream channels; however, trees that must be felled within the no-harvest buffer to provide cable yarding corridors would be felled toward or parallel to the stream channel and retained on site to provide bank armoring.

Require full log suspension when yarding over stream channels and lowland marsh habitat. Where full log suspension over stream channels is not possible, require one end suspension. Require purchaser to bring treetops and/or large branches to streambanks to armor banks to prevent bank damage from log bounce or drag and prevent exposed mineral soil.

All logs yarded to the landings would be bucked lengths that are 40 feet plus trim, or less.

Reuse existing yarding corridors. If extenuating circumstances require the repositioning of a yarding corridor, then:

- Limit corridor width to 12 feet.
- Place the corridors to avoid streams whenever possible. If corridors have to cross a stream, keep the corridors as perpendicular to the stream as possible to minimize adverse effects within the riparian area.
- Specific stocking targets are an integral part of the research design. When adjusting a yarding corridor location, compensate for the leave trees cut by decruising and retaining an equal number of trees from among those designated for harvest. This is to insure we meet the stock per acre levels, specified in the research plan.

Seed, fertilize, and mulch exposed soils at yarding corridors on streambanks.

Fuels Management

Directional falling away from property lines, all project area boundaries, mainline roads, or roads not planned for closure or decommissioning would be required.

Require landing pullback from around all cable landings prior to the removal of equipment. Material and debris swept off or accumulated around the landing should be pulled back. Material would be piled on top of the existing landing.

Landing and Roadside Hazard Reduction:

- Hazard reduction measures would be done on all landings and along roads within the project area that are not identified for closure or decommissioning after harvest operations.
- Post-harvest fuel loadings on landings and along primary and secondary forest roads would require fuels treatment for hazard reduction.
- If a ground based processor is used, ensure that, as much as is possible, the operator falls trees away from roads to reduce the necessity for and amount of roadside hazard reduction measures.
- Hand or machine pile all slash ½” to 4" in diameter within 20 feet each side of those roads within harvest areas not identified for closure or decommissioning after harvest. Cover piles of slash with black plastic and burn during late fall and winter months.
- Landing piles resulting from logging operations would be burned. Piles would need to be located a sufficient distance away from leave trees to minimize scorching when burning. Cover with black plastic and burn during late fall and winter months.
- If possible and if market conditions would support the action, chip and ship slash piles for bio-fuel or other products in lieu of burning. This activity is usually conducted at the Purchasers discretion.

Wildlife Trees, Snags, and Down Wood

Snags and large remnant trees would be reserved from cutting. Snags that must be felled to meet safety standards or are accidentally knocked over would be retained on site. Five trees per acre would be reserved for future snag recruitment in addition to those trees retained to meet the target stocking for each treatment. If less than 5 large snags per acre are present 10 years after thinning then snags would be created from live trees to bring the count up to five per acre (Cissel 2006 page 12).

Two dominant or codominant trees would be cut per acre, prior to termination of the timber sale, to provide down wood debris. Existing decay class 1 and 2 debris can be used to satisfy this target. All presently existing down logs in Decay Classes 3, 4, and 5 would be reserved from cutting and removal.

Wildlife T&E Species, and Special Status Species

Due to the distance of the project areas from occupied northern spotted owl or marbled murrelet sites and their suitable habitat, no seasonal or daily timing restrictions would be required.

All contracts for the proposed action will contain a standard provision covering all special status species including threatened and endangered species, which may be discovered after the contract is awarded. If sensitive, threatened, or endangered plant and animal species are found in the sale units, management guidelines for the species would be implemented.

Noxious Weeds

Machinery and equipment would be washed prior to entering contract areas to prevent the introduction and spread of noxious weeds during the contract period.

Vehicles and equipment would be required to stay on road and landing surfaces, except equipment specifically designated to operate off roads and landings (e.g. mechanical harvesters) to help prevent the introduction or spread of noxious weeds.

Bare soil areas from landing and road construction would be mulched and seeded with native plant species, if available, and fertilized, to reduce the chance of noxious weeds becoming established. If native seed is unavailable, bare road surfaces would be seeded with an appropriate seed mix.

Units would be monitored periodically after treatment, particularly along roadsides of open and decommissioned roads, for encroachment by noxious weeds.

Recreation on the Blue Retro Site

Debris from recent logging operations and any damage caused by logging operations to existing recreational trails and/or improvements such as the trailhead parking area, footbridges, and turnpikes would be cleared or repaired as needed. The intent is to return the trail and improvements to at least the same condition that existed prior to logging operations and to prevent erosion that may otherwise result from the effects of the logging operations on the trail system. Recreation staff would work with timber sale administrator to ensure repairs are accomplished and effective.

If the Blue Retro trail is impacted from yarding activities, the purchaser would be required to restore the surface of the trail to pre-project condition and disconnect the trail from the yarding corridor by placing slash downhill from the trail to limit erosion.

Seed and mulch exposed mineral soils in the yarding corridors intersecting or adjacent to the trail.

Place slash in the yarding corridors intersecting or adjacent to the trail to discourage recreationalists from traveling on the yarding corridors, and to prevent erosion.

Continue monitoring for unauthorized uses and block unauthorized access as necessary.

Information signs would be placed at the trailheads and key access points to give visitors information about the project and the location of activity. At minimum, the signs would address safety, when the trails would be unavailable and the locations of alternate trailheads and routes the recreationists can use.

Hazardous Materials

Activity resulting from the Action Alternative would be subject to State of Oregon Administrative Rule No. 340-108, *Oil and Hazardous Materials Spills and Releases,* that specifies the reporting requirements, cleanup standards, and liability that attaches to a spill, release, or threatened spill or release involving oil or hazardous substances. In addition, the Coos Bay District Hazardous Materials Contingency Plan and Spill Plan for Riparian Operations apply when applicable to operations where a release threatens to reach surface waters or is in excess of reportable quantities.

Cultural Resources

If cultural resources are encountered during this project, all work in the vicinity would be stopped and the District Archaeologist would be notified.

CHAPTER III.: AFFECTED ENVIRONMENT & ENVIRONMENTAL CONSEQUENCES

This chapter is organized by resources of the environmental components that could be affected by any of the alternatives if implemented and describes the expected impacts as they relate to the alternatives. Included in this chapter are the environmental effects of each alternative described in Chapter 2.

In the analysis of cumulative effects of the proposed action, the effects of past and present actions are incorporated into Chapter 3, the Affected Environment. Cumulative impacts are not separate from direct or indirect effects of individual actions, rather the scope of analysis is expanded to analyze the impacts in the context of all the actions reasonably known to have occurred or will occur regardless of the source of the action.

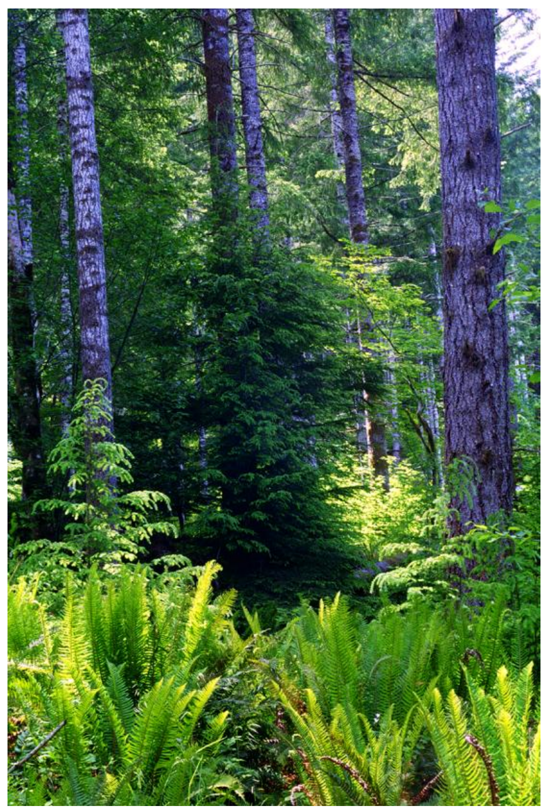

Figure III–1: View of the medium density treatment area in the North Soup Density Management Study site.

REASONABLY FORESEEABLE ACTIONS

The following list includes the reasonably foreseeable actions that are likely to occur within the project area.

- Timber management by other landowners would include road construction and timber harvest with an assumed rotation age of 40-50 years, and would be consistent with the Oregon Forest Practices

- The North Soup site is in the same general area as the sales covered by the Beaman Soup EA: OR125-04-06. The Beaman Soup project involves thinning 32- to 63-year-old stands, primarily of Douglas-fir and western hemlock, on lands in the Late-Successional Management Area, Riparian Management Area, and Timber Management Area. The Beaman Soup project would treat approximately 1,563 acres located in Sections 7, 8, 9, 15, 16, 17, 18, 20, and 21, T.23S., R.9W., W.M. Road work covered by the Beaman Soup EA includes 13.6 miles of renovation of existing drivable roads, reconstruction of 7.1 miles of old undrivable roads, 7.9 miles of new construction, and 18.6 miles of road decommissioning. The 23-9-19.1 road, temporarily opened for the North Soup DM Timber Sale No. 07-03, crosses two fish-bearing streams. One crossing is by a temporary bridge and the second is by a culvert. Both would be removed at the end of the project.

CUMULATIVE EFFECTS CONSIDERATIONS

The present condition of the land affected by the Proposed Action resulted from many natural events and human actions that have taken place over many decades. A list and analysis, comparison, or description of all the individual past actions and their effects that have contributed to the current environmental conditions would be practically impossible to compile and unduly costly to obtain. To separate out and list the effects of each of the individual past actions would be time consuming and expensive, and there is no analytical method that would describe the cumulative effect of past actions better than a description of the existing environment, which, by definition encompasses the cumulative action of every human and natural caused event on the landscape. Such a task would not add any clearer picture of the existing environmental conditions. Instead of incurring these excessive costs, it is possible to implement a more straightforward, more accurate, and less expensive way to obtain the information concerning past actions that is necessary for an analysis of the “impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions” (Definition of “cumulative impact” in 40 CFR § 1508.7).

A description of the current state of the environment naturally includes the effects of past actions. This would serve as a more accurate and useful starting point for a cumulative effects analysis than attempting to establish such a starting point by accumulating the described effects of individual past natural events and human actions. The importance of past actions is to determine the context for understanding the incremental effects of the proposed action.

This context is determined by combining the present conditions with available information on the expected effects of other present and reasonably foreseeable future actions. Here the description and analysis of the effects of other present and reasonably foreseeable actions relevant to the effects of the proposed action is necessary, and has been described below. By comparing this total effect of the No-Action Alternative to the effects described when adding the proposed action or any other action alternative, we can discern the cumulative impact resulting from adding the “incremental impact” of the proposed action to the current environmental conditions and trends.

The information on individual past actions is merely subjective, and would not be an acceptable scientific method to illuminate or predict the direct or indirect effects of the action alternatives. The basis for predicting the direct and indirect effects of the action alternatives should be based on generally accepted scientific methods such as empirical research. Scoping for this project did not identify any need to exhaustively list individual past actions or analyze, compare, or describe the environmental effects of individual past actions in order to complete an analysis that would be useful for illuminating or predicting the effects of the action alternatives.

VEGETATION AND STAND STRUCTURE

Affected Environment

Site Histories and Processes Influencing Stand Condition

Table III-1 summarizes the known histories for the Blue Retro and North Soup units prior to inclusion in the Density Management Study. Little information is available for conditions prior to the initial timber harvest on either site. Early vegetation maps show both sites supporting 25,000 to 50,000 board feet of timber in 1900[2], and "merchantable timber" in 1914[3]. The 1930 vegetation map shows "Douglas-fir Old Growth" on the North Soup Site, and classifies the land in and surrounding the Blue Retro site as "Recent Cutover" (Harrington 2003).

Table III-1: Early Stand Histories for the North Soup and Blue Retro Sites

Site	North Soup	Blue Retro
Harvest Method	Seed tree cut prior to 1948. Salvage sales in the project area in 1954 and/or 1956 likely resulted in removing some seed trees. Historic aerial photography shows scattered seed trees surviving until 1960 on the south boundary of the study area, with a block of residual trees on the south side of the control block.	Exact logging methods and dates are unknown, although photography shows railroad logging was complete by 1936. Timber in section 35 was sold under a timber patent in 1926; timber in section 25 was sold under timber patent in 1931; timber harvest dates for sections 26 and 36 are unknown.
Regeneration	Natural seeded	Natural seeded, established in the 1940s
Slash Treatment	Unknown	Unknown
Precommercial Thinning	None	None
Prior Commercial Thinning	None	Blue Ridge Eastside Thinning sale (TS80-16), logging completed in 1982 by tractor; trees were thinned from below retaining the best-formed conifers; an average of 59 trees per acre were removed averaging 7.7 MBF/acre; hardwoods were only retained where there were no suitable conifers on the desired spacing.
Other Early Stand History	BLM received the section containing the project area though a land exchange in 1948.	The project area burned in 1936 during the Fairview Fire; BLM received sections 26 and 36 through a land exchange in 1948.

The 1936 Fairview fire burned through the Blue Retro area killing any tree regeneration that may have been present at the time and postponing stand establishment until the 1940s-1950s. Figure III–2 is a photograph of the Blue Retro taken two months before the Fairview Fire.

The BLM acquired the North Soup site in a 1948 land exchange. The previous landowner clearcut the site prior to the exchange leaving seed trees along the south boundary. Most trees on the North Soup site established in the 1950s. Figure III–3 is a 1960 aerial photo of the North Soup site. Scattered seed trees were still standing at that time with a concentration of seed trees located in what is now the south end of the no treatment control.

[2] The following is from the metadata for the 1900 vegetation GIS map. Henry Gannet spent two years visiting almost all timbered areas in Oregon. He gathered the data township by township and provided an overall description of the timber status. The actual map was compiled by A. J. Johnson. The work began in 1898 and was finished 1902. The original map was hand drafted and so the scale is uncertain. The dimensions of the original map have changed due to medium shrinkage and expansion. This dimensional distortion is compounded by the photo-enlarging needed to increase the size of the map to make it suitable for digitizing. Some distortion was reduced by rubber-sheeting the map to correct latitude and longitude. The vegetation boundaries of the original map tend to follow township lines. This is likely a reflection of the data being compiled by township. These factors indicate the vegetation breaks shown on the map are approximations. The metadata does not cite the original source for the 1900 vegetation map, however it was likely part of a larger document titled: Annual Reports of the Department of Interior, for the Fiscal Year Ended June 30, 1900, Twenty-first Annual Report, U.S. Geological Service.

[3] In 1914, the Oregon State Forester, F. A. Elliott, allocated almost $7,000 to compile and print an Oregon forest type map. In 1954, a night dispatcher, rescued the only known copy of this map from a trash bin. The State of Oregon digitized the map and made a GIS file available to the BLM. The issues of medium stability, and the difficulties of collecting and compiling data for large geographic area documented for the 1900 vegetation map also apply to the 1914 map.

Figure III–2: View from the Blue Ridge Lookout, in 1936, toward the Blue Retro site. The top of Blue Ridge was logged without leaving seed trees. The Fairview fire burned though this area soon after this photo was taken.

Disturbance

Fire: The plant associations occupying the upper slopes in both study sites are typical of Maritime Dry-Mesic Douglas-fir Western Hemlock Forests. The plant associations occurring along draws, and in moist protected microsites, are typical of the Maritime Wet-Mesic Douglas-fir Western Hemlock Forests. This highly intertwined vegetation mosaic equates to a landscape subject to a temporally and spatially complex fire regime. The average stand replacement fire return interval for both the wet-mesic and dry-mesic sites is approximately 330 years. While the wet mesic areas are rarely visited by non-stand replacing fires, the dry mesic areas are characterized by mixed severity fires returning on intervals ranging from 50 to 150 years.

Both sites are in a region characterized by very large stand replacement fires. Although Blue Retro and North Soup are approximately 24 miles apart, they are both just a few miles east of the area burned by the 1868 Coos Bay Fire. The Coos Bay Fire burned approximately 250,000 acres. For comparison purposes, the North Coquille 5th Field Watershed, which contains the Blue Retro site, is 98,467 acres. The North Soup site is in the Mill Creek 5th Field Watershed, which encompasses 48,042 acres.

Other Disturbance Agents: Both sites are in landscapes where wind, insects, and root disease are chronic causes of mortality. In most years, these agents contribute to fine-scale diversity by creating small gaps and recruiting snags and down wood. During periods of extreme drought stress, insects and diseases can cause spikes in tree mortality and create somewhat larger gaps characterized by concentrations of snags and/or down wood. Extreme winds can also cause spikes in tree mortality by uprooting and snapping trees in patches ranging from a few tenths of an acre to well in excess of 100 acres. See sidebar "Stand Composition Following Blowdown" for additional discussion on stand replacement blowdown events. Certain management techniques can reduce but not eliminate the effects of chronic insect, disease and wind mortality. Consequently, these agents still cause both episodic and chronic gap, snag, and down wood recruitment in both wild and managed stands (Figure III–4).

Stand Composition Following Blowdown

Windthrow partially or completely removes the overstory while causing little disturbance to the understory vegetation or duff layer. This favors any already established shade tolerant seedlings and saplings, such as western hemlock and Sitka spruce growing in the understory. For example, the 1921 windstorm is responsible for 1,000's of acres of pure and nearly pure western hemlock stands in western Washington State. In addition, catastrophic blowdown is a major factor contributing to the dominance of Sitka spruce in the coastal fog belt prior to Euro-American management.

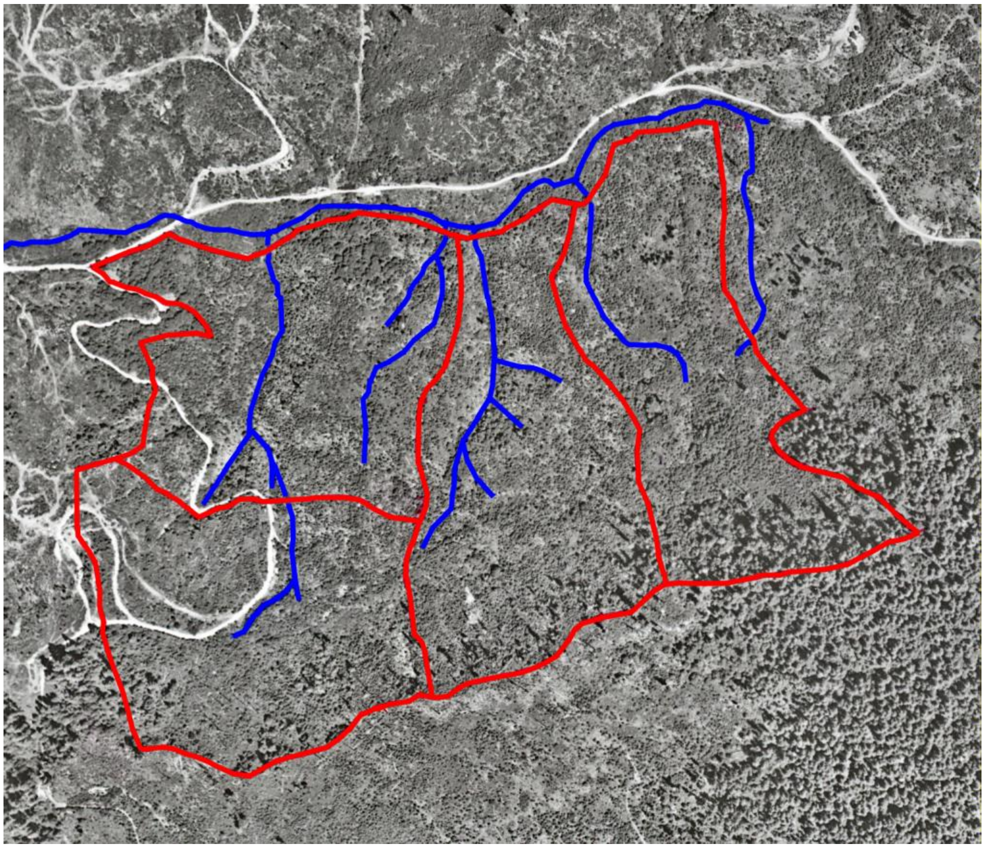

Figure III–3: The North Soup site in 1960. The red polygons mark the approximate boundaries of the treatment areas and control. The blue lines are streams. At the time of this photograph, scattered seed trees remained standing inside the area that would become the density management study area. The densest and largest cluster of seed trees is in the southeast portion of the study area in what is now the untreated control. The no-thin leave islands, in the treatment areas incorporate several of the other remnant seed trees that survived to 2008. The seed trees provided both seed source and influence on microclimate affecting the presence and distribution of the second-growth shade-tolerant trees on the study site.

Influence of Natural Disturbance on Species Composition

Fire: The overstory species composition, of natural stands, is controlled by the type of stand replacement disturbance and the available seed source. Douglas-fir is the tree species most likely to dominate a site following a stand replacing fire that kills all of the trees in a mature stand composed of Douglas-fir, western hemlock and western redcedar. This is provided the fire does not consume all of the organic litter layer. A red alder component may join the Douglas-fir where the fire consumes all of the litter layer (Agee 1991, page 26). In the 1920s, which was a time when artificial regeneration was rarely practiced, McArdle and Meyer (1930 [1961 edition, reprinted 1974], pg 6) observed,

> *Young forest, whether on old burns or on logged areas, consist to a high degree of Douglas fir, most stands being over 80 per cent, and many 100 per cent, of this species. This is due to the ability of Douglas fir to establish itself by natural means more successfully than any of its associates in open areas following fire or logging. These young forest as a rule are even aged, the larger trees in any one forest seldom varying by more than a few years.*

This statement is based in part on 2,052 sample plots in 20- to 160-year-old stands, visited in 1924 and 1925, and located in Westside Oregon and Washington (Mc Ardle and Meyer 1930 [1961 edition, reprinted 1974]. pgs 3, 4 & 6).

One possible reason for the abundance of Douglas-fir following a stand replacement fire is seed size. Douglas-fir's large seeds, with their greater food resources, give that species a competitive advantage over small-seeded hemlocks and cedars under the harsh conditions that prevail following a stand replacement fire. However, moist and shady microsites, such as seeps and riparian areas, can provide conditions where small seeded shade tolerant trees can establish and become a presence in a new stand. Large stand-replacement burn areas eliminating minor species seed sources, and reburns killing fire intolerant species missed by the initial burns, are other explanations as to why Douglas-firs dominant natural stands following stand replacement fires (Wimberly and Spies 2001).


Figure III–4: The down wood is most likely the result of wind and snow damage sustained in 2004. Swordfern, oxalis, and scattered western hemlock seedlings occupy the understory in the foreground. In the background, dense vine maple dominates the shrub layer.

Prior to fire exclusion on the Umpqua Resource Area, one or more reburns occurred within 80 years of stand replacement fires. This is indicated by fire scar dates and corresponding birth dates for trees that survived to become old-growth. The reburns created openings large enough to allow successful establishment of Douglas-firs, as indicated by the two or more age cohorts of Douglas-fir in the over story of old-growth stands (USDI-BLM 2002b). See sidebar, Fire History Effects on Stand Age Structure, for additional discussion on the effects of fire on stand age structure.

Other Disturbance Agents: Insect outbreaks, disease, extreme weather, and other such non-fire agents kill trees though out the life of the stand. However, during the stem exclusion stage of stand development, dominant and codominant trees exhibit rapid lateral growth such that they fill stand gaps created by the death of one or a few trees. This rapid growth plus ongoing suppression mortality masks the effects of chronic mortality within a few years. Only after the stand emerges from the stem exclusion stage and enters the understory reintroduction stage of development do the trees lose their capacity to reoccupy fully the growing space opened via chronic fine-scale mortality. It is this point in stand development that chronic mortality begins to have a discernable effect on horizontal spatial diversity and understory species richness.

Current Tree Species Distribution

Table III-2 summarizes the species distribution by treatment for the two study sites. The table also shows species distribution for the untreated control and for the untreated streamside retention area.

Douglas-fir currently represents 82% to 88% of the commercial tree species, 8-inches dbh and larger, observed in the thinned areas of the of the North Soup study area (Table III-2; and BLM data summarized in the Diameter distribution by treatment for North Soup in Appendix C). This is consistent with observations made in the 1920s on concerning species composition in natural stands that were up to 160-years-old, which regenerated following fire or logging (McArdle and Meyer 1930 [1961 edition reprinted 1974] page 6). Data collected by Oregon State University show Douglas-firs constitute 63% to 91% of the thinned stands, depending on treatment (Oregon State University data summarized in the Diameter distribution by treatment for North Soup Appendix C). The Oregon State University data includes noncommercial tree species, such as western dogwood, bitter cherry, and buckthorn.

Douglas-fir currently represents 60% of the tree species, 8-inches dbh and larger, observed in the thinned treatment area of the of the Blue Retro study area (Table III-2; and data summarized in the Diameter distribution by treatment for Blue Retro Appendix C). The percent Douglas-fir stocking is atypically low when compared with observations made in the 1920s in natural stands that were up to 160-years-old, which regenerated following fire or logging (McArdle and Meyer 1930 [1961 edition reprinted 1974] page 6).

Table III-2: Current Species Distribution of Overstory Trees on the North Soup and Blue Retro Sites by Treatment. Includes only trees 8 inched DBH and larger

	North Soup							Blue Retro	
Species	Control (no treatment)	120 trees/ acre treatment	80 trees/ acre treatment	Variable Density Treatment 120 trees/ acre	Variable Density Treatment 80 trees/ acre	Variable Density Treatment 40 trees/ acre	Streamside Retention (no treatment)	Control	Treated
Douglas-fir	60.1%	82.1%	83.9%	87.1%	87.5%	88.1%	88.2%	91.6%	59.9%
Western hemlock	31.7%	17.4%	12.9%	7.7%	5.7%	3.9%	0.7%	3.5%	18.9%
Western red cedar	0%	0.5%	0%	0%	0%	0%	0%	4.3%	21.2%
Grand fir	0%	0%	0.6%	0%	0%	0%	0%	0%	0%
Red alder	6.2%	0%	0%	2.9%	1.9%	0%	2.8%	0.6%	0%*
Bigleaf maple	2%	0%	2.6%	2.3%	5%	7.9%	8.3%	0%	0%

* Alder is present, but none fell in the plots

The high percent of minor species in the North Soup untreated control is attributable to large number of seed trees clustered in that area following the initial logging in the 1940s, as shown in Figure III–3: The North Soup site in 1960. The red polygons mark the approximate boundaries of the treatment areas and control. The blue lines are streams. At the time of this photograph, scattered seed trees remained standing inside the area that would become the density management study area. The densest and largest cluster of seed trees is in the southeast portion of the study area in what is now the untreated control. The no-thin leave islands, in the treatment areas incorporate several of the other remnant seed trees that survived to 2008. The seed trees provided both seed source and influence on microclimate affecting the presence and distribution of the second-growth shade-tolerant trees on the study site.. The seed trees provided both a seed source, and partial shade, favoring establishment of shade tolerant species. The lower percentage of minor species in the untreated streamside retention area is attributable to the full sun conditions and less abundant seed associated with the more widely spaced seed trees in that area at the time of stand regeneration.

Stage of Stand Development and Species Diversity

Most young, dense, single cohort stands, whether natural-seeded or artificially reforested by conventional methods, inherently have low species diversity. This is due, in large part, to the limited amount of light reaching down through the forest canopy.

Natural stands go through a two-step self-thinning process. The initial step begins after canopy closure, which is the onset of intense competition. At this stage, overtopped seedlings and saplings, and understory herbs and shrubs die. Loss of understory vegetation is most complete on the higher quality sites where light is the most limiting site condition, and on sites dominated by shade tolerant trees such as western hemlock. As a group, shade tolerant trees have foliage that persists under reduced light levels thus maintaining deep, dense light-intercepting canopies, which limit the amount of light reaching the forest floor. The second stage of self-thinning occurs when the more vigorous trees out grow less competitive neighboring trees. Trees with smaller crowns, lower root masses, or shorter stature, relative to neighboring trees, at the time of canopy closure are less able to compete and therefore are at high risk of dying as the result of competition associated stress and loss of growing space (Peet and Christensen 1987). Oliver and Larson (1990, pg. 146-149) call this period of stand development the "stem exclusion stage" because the intense competition prevents successful establishment of new individuals and because the less competitive individuals die and thus are excluded from the stand.

The stem exclusion stage continues until such time that the surviving trees are no longer capable of sufficient lateral growth to occupy fully the gaps created by the death of neighboring trees. This occurs when the respiring demands of the maturing trees reaches a level that limits the availability of the products of photosynthesis for rapid lateral limb extension. A related factor is as trees gain height they swing in wider arcs in response to storm winds. The abrasion of crown against crown during windstorms, combined with diminished resources for lateral growth, results in donut-shaped gaps around each of the trees. This, in turn, increases the amount of light reaching the forest floor thus allows the reestablishment of shade tolerant understory herbs, shrubs and trees, and results in the understory reinitiation stage of stand development (Oliver and Larson 1990, pg. 151-152). The transition from the stem exclusion stage of stand development to the understory reinitiation stage is also the period when the dominant agents

Fire History Effects on Stand Age Structure

The southern Oregon Coast Range old-growth stands are composed of several well-defined age cohorts corresponding to fire scar dates. The oldest stands on the Umpqua Resource Area established between 1534 and 1622. Fire scars and birth date clusters document reburns following the stand replacement fires during this period. Tree regenerated between 1534 and 1622 that survived to the end of the 20th century are all Douglas-firs. The second oldest stands regenerated following stand replacement fires between 1738 and 1790. Here too, fire scars and corresponding age groupings show reburns followed the stand replacement fires during this period. With very rare exception, trees that regenerated during this period that survived to the end of the 20th century are also all Douglas-firs. Fire scar and tree cohorts document periods of frequent fires from 1845 to 1855 and from 1880 to 1944. South of the Umpqua River, these fires were mixed severity events. Typically, they provided conditions allowing for recruitment of understory shade tolerant trees. However, on some upper southwest slopes and exposed ridges these fires were sufficiently severe to cause stand replacement, which lead to establishment of near-pure stands of Douglas-fir (USDI-BLM 2002b).

In the southern Oregon Coast Range, mixed severity fire was the dominant process resulting in understory stand recruitment prior to fire exclusion. Mixed severity fires result in conditions ranging from full sunlight in large gaps to no change in the canopy condition in areas either lightly burned or skipped entirely by the fire. Large gaps associated with suitable seedbeds, favored establishment of shade intolerant Douglas-fir. Fire created small canopy gaps, and associated reduction of herb and shrub competition, provided conditions favoring establishments of shade tolerant trees in the understory (Hofmann 1924 pg 27). In both cases, the seedlings germinate and establish during a period of a few years to a decade or so, typically in large numbers, resulting in a well-defined age cohort. These stands are eventually thinned via light competition, mechanical crushing as the result of windfalls, and by subsequent under burns. Established seedlings and saplings, typically shade tolerant species such as western hemlock, present in areas skipped by fire have a competitive advantage over plants that seed in after the burn. However, unburned areas fully occupied by shrub species would tend to remain treeless and shrub-dominated.

In addition to providing conditions favoring recruitment of shade tolerant understory trees, mixed severity fires also affect the tree species composition and age structure of stands by killing the fire intolerant tree species in the older cohorts. As it happens, the shade tolerant western hemlock, Sitka spruce, and grand fir are also fire intolerant. The shade tolerant western redcedar is fire intolerant when young but gains fire tolerance with age. Thus, repeated mixed severity fires simplify the species structure of the older cohorts in the overstory by killing fire intolerant trees, and contribute to overall tree species diversity by recruiting shade intolerant trees into the understory following the most recent burn. An extreme example of this occurs on the boundary between the North Fork Coquille River and East Fork Coquille River where the trees in the overstory are Douglas-firs with birthdates between 1534 and 1630 and the trees in the understory are western hemlocks with birthdates between 1912 and 1923 (USDI-BLM 2002b).

of tree mortality shift from being density-depended to becoming unrelated to competition[4]. During the understory reinitiation stage, and subsequent stages, disturbance events such as lightning strikes, ice damage, wind-caused top break, fire and drought, along with insect and disease, become the dominant cause of both random and episodic mortality (Peet and Christensen 1987).

The understory low light levels, during the stem exclusion stage, cause these stands to function as choke points eliminating many plant species from the site that survived the stand replacement event that precipitated the current stand[5], as well as many that regenerated during the stand initiation stage. Further, the low light conditions at the forest floor inhibit the establishment of new green plants for the duration of the closed-canopy condition. The corresponding deprivation of food and cover at the forest floor eliminates many wildlife species (Franklin and Spies 1991; Harris 1984 pages 59-64; Oliver and Larson 1990, page 151).

Oliver and Larson (1990, page 226) in their chapter on the stem exclusion stage observed,

> *Although both natural stands and plantations go through the stem exclusion stage, the way that single-species stands appear during this stage has given plantations a bad reputation with many groups. Some people . . . find the single-species stands in this stage less aesthetically pleasing than other types of stands. Many animal species cannot live in*

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4 Lutz and Halpern (2006) observed both suppression mortality and mechanical damage associated mortality occurring during the stem exclusion stage of stand development on their study site in the Oregon Cascades. Suppression mortality resulted in more than 2.5 times the number of tree deaths compared to mechanical damage associated deaths.

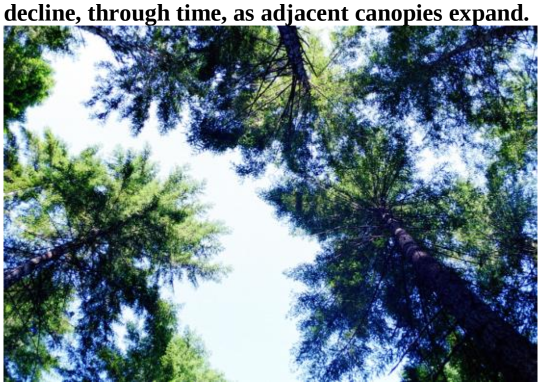
5 When viewed over the extreme long-term, periods of stem exclusion may contribute to forest health by causing pathogen loads to decline in response to the temporary exclusion of host plants. In addition, the die out of clonal plants in the understory forces a replacement of vegetatively regenerated plants that have a genetic makeup best adapted to site conditions as they existed 200 to 500 years ago. During the understory reinitiation stage of development, new plants regenerate from seed. Those plants that survive site hazards to become established are carriers of recombined genetic material that is adapted to current environmental conditions.

such stands because there is little food and cover near the forest floor. Few plantations progress far into the understory reinitiation stage before harvest, so many people assume that the stem exclusion structure is unique to plantations.

Thus, when we apply treatments to increase the percent stocking of tree species other than Douglas-fir or alder, we are not trying to restore species composition associated with young nature stands. Rather we are trying to impart attributes normally associated with older stands so that the treated younger stands are more permeable to species associated with late-successional forest.

All other things equal, the transition from a structurally simple single-story, single-cohort stand to a more structurally complex two-story, two-cohort stand occurs at a younger age when the overstory stand is composed primarily of shade-intolerant species, such as Douglas-fir, than when the overstory is dominated by shade-tolerant species such as western hemlock and western redcedar. This is because shade intolerant trees support less dense foliage, which allows more light to reach the forest floor (Sources summarized by Oliver and Larson 1990, page 257). Consequently, the transition to a structural more complex two-story stand is delayed when shade tolerant trees dominate the overstory (Stewart 1986). See also the “Fire severity influence on stand composition” side bar.

Figure III–5: Ten years after thinning on the moderate density site, in North Soup, lateral growth has resulted in the interlacing of branches of the closer-spaced trees. Gaps remain between wider-spaced trees. However, gap sizes continue to decline, through time, as adjacent canopies expand.



Emulating conditions associated with the understory stand reinitiation stage of stand development by thinning

The photographs, in Figure III–5, were taken 10-years following thinning in the North Soup moderate treatment area. As shown, the lateral branches of many trees in the stand have grown to point where they now extend into the crowns of the adjacent trees. The photographs also show lateral growth has not yet eliminated stand gaps created at the time the stand was thinned in 1998. The prescription did not require variable spacing in the moderate treatment area. Rather the variability seen here is the result in normal variation associated with conventional tree marking practices.

Initially, the different thinning treatments all resulted in gaps between trees and by that emulated the effects on understory light levels associated with the transition of stands to the understory reinitiation stage of development. This resulted in understory vegetation development akin to that typical for a stand that has recently entered into the understory reinitiation stage of stand development. However, the interlaced crowns, of closer spaced trees in Figure III–5, indicate the trees are still capable of the rapid lateral growth characteristic of trees in the stem exclusion stage of stand development. Crown expansion, subsequent to thinning, has resulted in a decline in size and numbers of crown gaps, and a corresponding decline in the amount of light reaching the forest floor and subsequent decline in understory vegetation vigor. The decline has been more rapid in the higher density treatments and slower in the lower density treatment. Light levels at the forest floor would continue to decline until either the stand is reopened by thinning or the stand reaches the level of maturity where it naturally transitions into the understory reinitiation stage of development.

In unmanaged stands, the transition from the stem exclusion stage to the understory initiation stage occurs when the trees are no longer capable of rapid lateral growth needed to capture growing space created by the death of adjacent trees. When this occurs, the trees are no longer capable of fully recapturing the space created between trees by crown abrasion during windstorms. The results are donut-shaped gaps around the trees allowing increased light levels on the forest floor.

Sharing of crown and root space

As shown in Figure III–5 the interlacing of lateral branches is a common feature of the trees in the 80-tree per acre treatment area ten years after thinning. This condition is also present in the denser 120-tree per acre treatment areas and in the Blue Retro site. As already discussed, the interlacing, or sharing, of crown space is a normal feature of stands of trees young enough to exhibit rapid lateral growth. Thus, the sharing of crown space by two young trees growing very close to each other does not represent an unusual or unique condition. As closely spaced trees mature, the sharing of crown space diminishes. Also as previously discussed, this is the result of maturing trees exhibiting reduced rates of lateral branch growth, and thus, being no longer being capable of replacing branch terminals as rapidly as they are lost to crown abrasion. In addition, mutual shading causes the trees to shift needle production to outer and upper crown areas where there is sufficient light to support net photosynthesis.

Proximity does play a role in intraspecific root grafts in that trees growing close together are more likely to develop grafted root systems. Extensive grafting between two trees would allow the roots and stump of a severed tree to draw sufficient sustenance, from the live tree(s) to which it is grafted, to remain alive for a period following cutting. Eis (1972) found 45% of the stumps in a British Columbian stand showed evidence of continued growth following a partial cut treatment. Eis also found living stumps drawing resources from donor trees as far as 32 feet away. Conversely, Eis observed that proximity of two trees of the same species did not guarantee that root grafts would develop; indicating graft compatibility is required in addition to root-to-root contacts.

When thinning from below, the effect on trees with grafted root systems is to add the roots of the smaller trees to those of the larger trees. This can be highly beneficial if the retained trees are vigorous, because those trees can then rapidly expand leaf area without having to grow the additional root mass needed to support an expanded photosynthetic surface (Eis 1972).

Stage of Stand Development and Diameter Distribution

Prior to the onset of substantial competition, the diameter size class distribution of a stand more or less fits a normal distribution. A normal distribution is alternately called a bell-shaped distribution. As competition intensifies, a few trees establish dominance. Meanwhile, the growth rate of an increasing large percentage of the stand falls behind that of the dominant trees. This causes the stand diameter class distribution to become progressively more skewed with a few dominate trees in the largest diameter classes and numerous trees filling out the smaller diameter classes. When competition begins to cause the smaller trees to die, the diameter classes begin shifting back toward a bell-shaped distribution. By the end of the stem exclusion stage, the diameter class arrangement returns to bell-shaped distribution with few if any small trees left alive (sources summarized by Long and Smith 1984; and by Peet and Christensen 1987).

After a stand emerges from the stem-exclusion stage, density related tree mortality declines, and disturbance or mechanical damage emerges as the dominant cause of mortality. As lateral branch growth rates decline, fine-scale disturbance, such as individual tree and small-patch blowdown, and lightning strikes, can now create gaps that become long-term features in the canopy. These gaps admit enough light to allow understory regeneration to establish where there is a suitable seedbed. In addition, disturbance mortality often occurs in pulses in response to major storm events, moderate severity fires, or through the interaction of extended drought with insects and disease. These damage agents operate at different scales producing a range of gap sizes. Regeneration of understory trees in these disturbance created gaps reverses the trend toward regular spacing and marks transition of the stand from single-aged to multi-aged. This also results in the stand developing increased diversity with respect to size, age classes, and species composition, which contribute to the development of late-successional and old-growth characteristics (Weisberg 2003). The addition of understory trees shifts the diameter distribution of the whole stand from a normal, or a bell-shaped curve, to initially bimodal, and eventually to a reverse J-shaped curve (sources summarized by Peet and Christensen 1987).

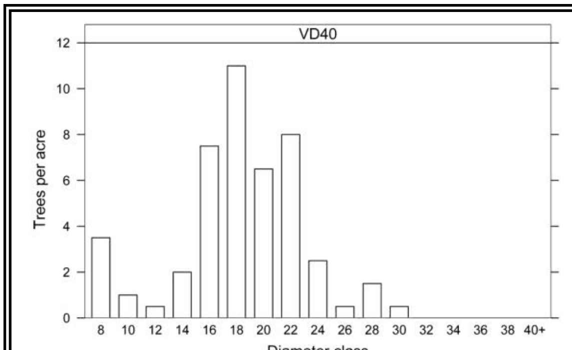


Figure III–6: Bimodal diameter distribution, for trees larger than 8-inches DBH, in the 40 tree/acre variable density subtreatment on the North Soup site.

Diameter distribution data, available for this analysis, includes only 8-inches DBH and larger trees. The lack of diameter data for trees smaller than 8-inches DBH results in an incomplete picture of the relative state development among the treatments. For example, with no data for trees smaller than 8-inches DBH, the diameter distribution for the North Soup untreated control appears to be skewed to the left (Appendix C). However, projecting the left tail of the curve to include the 2-inch diameter class suggests the distribution may be more likely bell-shaped. In some cases, the data suggest the previous thinning of merchantable trees from below, while retaining trees too small to be merchantable at the time of entry, has imparted a bimodal diameter distribution. Trees, which were not merchantable during the last thinning, benefited from the increased light levels. This has resulted in some of those trees growing into the 8- to 12-inch diameter classes. Figure III– illustrates this trend.

Blue Retro was first thinned in 1982 and rethinned in 1999. The effect on that site was to release small diameter trees during the first thinning and provide a boost in growing space as the result of the second entry. This has resulted in a strong bimodal diameter distribution as shown in Figure III–. The two thinning entries have also resulted in two pulses of understory regeneration, which have not yet grown into a merchantable diameter class. Observation on the Blue Retro site suggests a distribution curve that reflects trees smaller than 8-inches DBH would have a tall third peak.

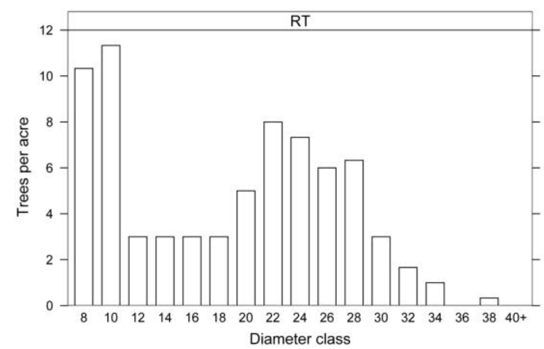


Figure III–7: Bimodal diameter distribution for trees larger than 8-inches on the Blue Retro site.

Spatial Diversity Trends in Unmanaged Stands

The risk of mortality for a given tree during the stem exclusion stage is not related to its absolute size but rather to its relative size compared to neighboring trees. The difference in relative size does not have to be initially large and may be traced to such conditions as which tree established first, subtle differences in microtopography, relative amounts of foliage lost to browsing during the establishment phase of stand development, or other forms of damage to the leader or bole.

Tree size is also related to proximity to other trees. All other things equal, patches with many trees growing close together would enter the stem exclusion stage of development sooner than would patches of scattered trees. The growing space of the higher stocked patches is fully occupied sooner than on less densely stocked areas supporting similar sized trees. Thus, with the finite site resources being divided among many trees, the individual trees would have slower growth rates, and therefore would be smaller than trees growing in the more open areas of a stand (Oliver and Larson 1990, pg. 211-217). This gives rise to the typical spatial pattern in young stands where small trees are more clumped than larger trees. However, an individual tree's risk of competition mortality increases with the proximity and size of neighboring trees. Therefore, during the stem exclusion stage, clumping progressively decreases with increasing size class (Peet and Christensen 1987; Moeur 1997 pg 181)), as illustrated in Figure III–8. Oliver and Larson (1990, page 219) explain the process of as follows:

> *A stand can begin as a mosaic of clumps of trees at wide, medium, and narrow spacings. Trees at wide initial spacings reach crown closure later; their crowns, too, recede; and differentiation and suppression occur later. Suppression and mortality occur sooner at narrower spacings, so the surviving trees end up at spacings similar to the initially widely spaced parts of the stand. In this way, spacing between trees becomes more uniform with age. A stand's horizontal spatial pattern tends to shift from a clumped, or patchy distribution to a more random, and then regular, distribution as it grows older. Dominating trees shift even more rapidly to the regular distribution. The originally clumped arrangement of trees is caused by the irregular sites for germination or other regeneration mechanisms, while the later more regular distribution results from differentiation and regular [competition suppression] mortality. The approach toward spatial regularity is unusual elsewhere in nature but has been observed in forests stands [citations deleted].*

Only after a stand enters the understory reinitiation stage of development does the trend toward uniformity reverse. In the understory reinitiation stage of stand development, the overstory trees become less effective at capturing growing space created by random mortality and by that allow the establishment of an understory stand. Thus, the new trend away from uniformity is attributable to large gaps associated random mortality and the clump/patchy nature of the understory regeneration (Oliver and Larson 1990, pages 254-259).

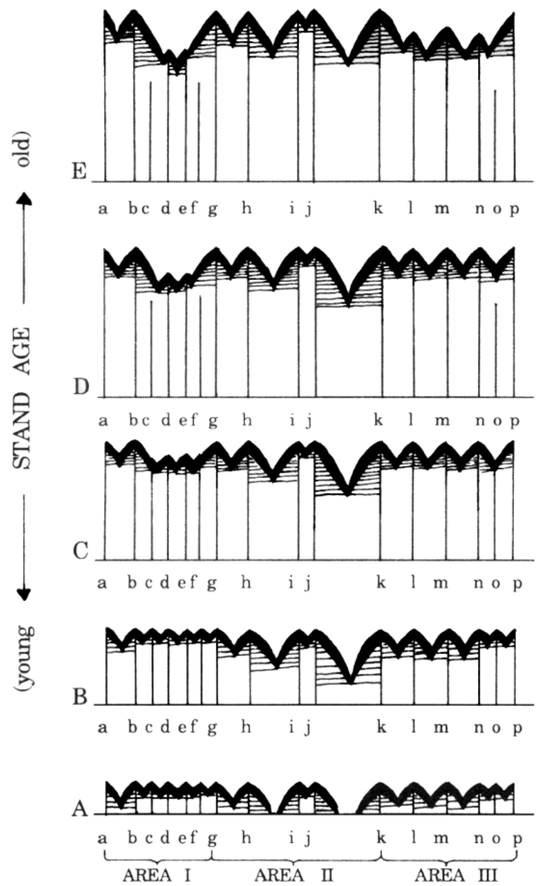


Figure III–8: This schematic shows how suspension mortality causes an irregularly spaced stand to develop increasingly regular spacing over time (from Oliver and Larson 1990 pg. 212). Area I and Area III are high-density patches, and thus they entered the stem exclusion stag before the more open Area II. Suppression mortality in the high-density areas thins out the trees resulting in fewer trees and increased distances between surviving trees. The trees in the initially wider spaced areas do not experience suppression mortality until somewhat later in the life of the stand. The net effect is decreasing spatial variability, at the stand scale, the longer the overall stand remains in the stem exclusion stage of development. The trend toward greater spatial uniformity reverses only after the stand emerges from the stem exclusion stage. During the understory reinitiation stage of stand development, patchy understory tree establishment signals a shift toward increasing spatial diversity, which is one of the characteristics of late successional forests (Oliver and Larson 1990, pages 254-259).

Stage of Stand Development and Structural Diversity

During the stem exclusion stage of stand development, suppression mortality kills the small trees in the stand. These trees lacked the mass needed to provide long lasting snags and down wood. These snags lacked sufficient diameter to provide cavity habitat for all but the smallest excavator species. Trees that fell into larger streams lack the size and strength to serve as key pieces of instream structure. The small diameter of trees that die during this stage of stand development also limits the range of arthropods that can inhabit the dead and dying trees. For example, a tree has to be at least 12 inches dbh before it can become suitable habitat for Douglas-fir bark beetles.

The replacement of suppression by random mortality as the dominant source of tree death in the understory reinitiation stage of stand development has a profound effect on the size and thus habitat value of snags and down wood. Generally, chronic random mortality produces fewer dead trees than suppression mortality. However, unlike suppression mortality, random mortality is independent of tree size. Thus, random mortality produces large as well as small snags and pieces of down wood. The larger snags and down wood produced through random mortality provide habitat values and stand structures unattainable through suppression mortality.

Initial Treatments for the Density Management Study

Table III-3 summarizes treatment applied to the units as part of the initial work on the Density Management Study sites from 1996 to 2000.

Understory Trees: Minor tree species were reserved from cutting on both sites during the first thinning entry accomplished for the Density Management Study. The prescription for the Blue Retro site was to thin the Douglas-fir to 45 trees per acre and reserve all minor species. Minor species added to the reserved Douglas-fir brought the average trees per acre up to 72. The prescription for the North Soup site was to reduce the tree stocking per acre in the high-density treatment area to 120, and to 80 in the moderate density treatment area. Target stocking levels in the variable density treatment were 120, 80, and 40 depending on the subtreatment area. The minor species trees were counted toward meeting the stocking targets for all treatments and subtreatments.

The species composition of a single story stand influences how rapid that stand would develop structural diversity. A component of shade tolerant trees in the stand overstory can provide a source for seeding an understory stand once the overstory canopy opens enough to allow an understory to establish. Data from the Density Management Study sites across Western Oregon show that even a small number of seed producing minor species trees in the overstory can dramatically change the understory tree regeneration patterns following thinning (Kuehne and Puettmann in press). The authors observed that overall understory tree seedlings were abundant in thinning treatment areas; however, the understory seedlings were also patchy. The average seedling stocking across the thinning treatments in the North Soup site is 794 seedlings per hectare (321 trees per acre). The authors also observed the majority of the inadequately stocked sample plots were in the untreated controls.

Table III-3: 1st Phase Density Management Study Treatment Histories for the North Soup & Blue Retro Sites

<table>
<tr><th>Site</th><th colspan="2">North Soup</th><th>Blue Retro</th></tr>
<tr><td>Sale Name</td><td colspan="2">North Soup Density Management Study</td><td>Blue Retro</td></tr>
<tr><td>Sale Number</td><td colspan="2">OR120-TS96-09</td><td>OR120-97-07</td></tr>
<tr><td>Sale Award</td><td colspan="2">10/08/1996</td><td>08/27/1997</td></tr>
<tr><td>Sale Termination</td><td colspan="2">03/06/2000</td><td>08/17/1999</td></tr>
<tr><td rowspan="3">Treatment Date</td><td>High retention area</td><td>North ½: 08/1998;
South ½: 09/1999</td><td rowspan="3">Completed 01/03/1999</td></tr>
<tr><td>Moderate retention area</td><td>08/1998</td></tr>
<tr><td>Variable retention area</td><td>North of road: 08/1998;
South of road: 09/1999</td></tr>
<tr><td>Logging System</td><td colspan="2">Cable yard, one-end suspension</td><td>Cable yard</td></tr>
<tr><td>Merchantability Standards</td><td colspan="2">Minimum top diameter limit set at 6 inches</td><td>Minimum diameter limit set at 10 inches DBH</td></tr>
<tr><td>Slash treatment</td><td colspan="2">Slash within 20 feet of roads was piled and burned</td><td>Hand pile and burn all logging debris 0.5 to 3.0 inches in diameter within 25 feet of road 26-12-25.0 and road 26-12-35.4</td></tr>
<tr><td>Underplanting Date</td><td colspan="2">02/2000</td><td>Not apply</td></tr>
<tr><td>Treatment of minor tree species</td><td colspan="2">The minor species trees were reserved and counted toward meeting the stocking targets for all treatments and subtreatments.</td><td>The minor species were reserved and their numbers were in addition to those prescribed for Douglas-fir. The Douglas-firs were thinned to 45 per acre.</td></tr>
<tr><td>Comments on Density Management Study Phase One Treatments</td><td colspan="2">1. All new roads are natural surface and were blocked following slash disposal to reduce risks to aquatic systems and reduce disturbance to wildlife.
2. A snow, ice, and windstorm in early 2004 resulted in top and stem breakage and blowdown of scattered patches and individual trees throughout the study site.</td><td>1. Felling and yarding operations were not permitted from March 1 to June 30, when the bark is most vulnerable to logging damage.</td></tr>
</table>

In 2000, BLM planted and tubed seedlings in the gaps, in areas thinned to 40 trees per acre, and under the stand canopy in other locations in the North Soup site designated by the lead researcher. The seedling mix was one third each Douglas-fir, western hemlock, and western redcedar. The Blue Retro site was not underplanted. However, understory trees seeded into Blue Retro site following the first thinning entry in 1982. The second thinning entry in Blue Retro in 1999 released existing understory trees and provided growing space for an additional catch of seedlings. We do not have stocking data for seedlings and sapling on the Blue Retro site. However, casual observation indicates the overall seedling and sapling abundance is high with a patchy distribution

Effects on Vegetation and Stand Structure

The purpose of restoration treatments in young stands, such as the approximately 60-year-old stands in the proposed project, is not to restore characteristics of young stands. Rather, it is to impart characteristics associated with older stands so that the young stands can provide late-successional habitat attributes normally associated with older stands. These include greater species and structural diversity. Light and moderate thinning treatments can speed the development of certain late-successional elements such as large tree diameters. Thinning also increases the light levels inside the stands. This slows the mortality of lower limbs, and allows establishment and improves the vigor of understory vegetation. However following thinning, lateral crown growth would recapture growing space between trees with a corresponding decline in light reaching the forest floor through time. The results include an eventual reverting back to decreasing crown depths, and a decline in understory vigor. This would continue until the stand canopy is reopened by disturbance or by thinning, or the stand reaches a stage of maturation where the lateral crown growth cannot keep up with the effects of crown abrasion or cannot recapture growing space created by tree mortality.

The fundamental difference in effects between the action and no-action alternatives is the action alternative would increase the amount of light reaching the forest floor, and increase growing space available to the overstory trees following treatment. The 30-tree and 20-tree per acre treatments would result in spaces between most tree crowns that are too wide to recapture through lateral growth alone. This would have the effect of completing the transition of the overstory stand into understory reinitiation stage of stand development. The increased understory light levels would allow for more rapid development of an understory stand and the accompanying benefits of spatial, species, and vertical structural diversity that comes with an understory composed of shade tolerant trees.

While the stands would eventually make this transition under the no-action alternative, the effects of not treating the units would be in general:

- A delay in the transition in a mortality pattern from one that increases spatial uniformity through time to one that results in increased spatial variation.
- Slower diameter growth of overstory trees. This in turn would result in smaller tree diameters relative to tree heights, which increases the risk of wind throw (Wonn and O'Hara 2001), and lowers the chances of obtaining height to diameter ratios comparable to existing old-growth trees. This would also slow the attainment of late-successional habitat characteristics associated with large tree diameters.
- A temporary period of declining growth of understory trees. Expansion of the overstory canopies would reduce the amount of light reaching the forest floor reducing understory tree growth and in time causing understory tree mortality in the denser portions of the stand. However, eventually the overstory trees in the stands would lose their capacity for rapid lateral growth and by that would no longer be capable of recapturing growing space created by crown abrasion or tree mortality. This heralds the beginning of the understory reinitiation stage of stand development and the associated increase of favorable growth conditions for understory plants.

Table III-4: North Soup and Blue Retro Trees per Acre and Average DBH by Treatment for Trees Greater than 10 Inches DBH

	DBH in inches	North Soup							Blue Retro	
		Control TPA	High Density 120 TPA	Moderate Density 80 TPA	Variable Density 120 TPA	Variable Density 80 TPA	Variable Density 40 TPA	Unthinned Streamside buffer TPA	Control TPA	Rethin Treatment TPA
	10	20.4	6.0	3.5	10.3	4.6	1.0	21.0	8.7	11.3
	12	17.2	16.0	4.5	8.6	9.7	0.5	19.0	11.3	3.0
	14	18.0	20.0	10.0	15.4	6.3	2.0	24.0	14.0	3.0
	16	20.4	14.5	11.0	16.6	18.9	7.5	28.0	16.7	3.0
	18	17.2	17.5	13.0	16.6	13.1	11.0	25.0	11.3	3.0
	20	12.4	17.0	14.5	10.8	13.1	6.5	17.0	12.0	5.0
	22	9.6	10.5	11.0	8.6	5.7	8.0	8.0	11.3	8.0
	24	6.8	5.0	6.5	9.1	5.1	2.5	2.0	10.7	7.3
	26	4.4	3.5	3.0	2.9	1.7	0.5	1.0	7.3	6.0
	28	2.8	0.5	0.5	0	1.1	1.5	1.0	4.7	6.3
	30	1.2	0	0	0.6	0.6	0.5	0	4.0	3.0
	32	0.8	0	0.5	0	0	0	0	1.3	1.7
	34	0.4	0	0	0	0	0	0	1.3	1.0
	36	0	0	0	0	0	0	0	0.0	0.0
	38	0	0	0.5	0	0	0	0	0.0	0.3
	40+	0.4	0	0	0	0	0	0	0.0	0.0
Total Trees per Acre Greater than 10 Inch DBH		132.0	110.5	78.5	99.5	79.9	41.5	146.0	114.6	61.9
Average DBH by Treatment in Inches		16.7	17.0	18.5	17.1	17.4	19.2	15.7	18.9	20.5

Data from BLM plots, provided by Klaus Puettmann, vegetation principle investigator, September 7, 2006.

Effects on Species Diversity

No-Action Alternative

The No-Action would not alter the current species composition of the overstory stand. The overstory tree canopies would continue to expand. This would result in declining light levels in the understory. Declining light levels would result in the decline of understory plant vigor and the eventual loss of some plants to light competition. However, the effect would be more pronounced in areas with high stocking and minor in the 40-tree per acre treatment areas. The overstory Douglas-firs on these sites are at a stage of development where their foliar arrangement is unlikely to intercept enough sunlight to cause a complete die out of all understory vegetation. As previously discussed, the stands would eventually transition into the understory reinitiation stage of stand development on their own.

Proposed Action

The prescriptions analyzed in this EA would result in the cutting of 9-inch dbh and larger trees in a manner that maintains or increases the percent stocking of trees species, other than Douglas-fir in the overstory. Treatment would also increase the amount of daylight reaching the forest floor. This, combined with disturbance setting back vegetation competition, would allow for a new pulse of understory regeneration. The increased sunlight would improve the vigor of understory vegetation. However, the observed wide variability in the heights of trees planted in the areas previously thinned to 40 trees per acre indicates the increased sunlight would not be spatially uniform. Thus, seedlings and saplings would experience moderate growth in some areas and poor growth in others.

Seedlings that germinate following treatment have potential to contribute to the age diversity if they are located in an area with little vegetation competition. However, new seedlings germinated in close proximity of older understory tree seedlings would likely experience death due to light competition (Oliver and Larson 1990, pages165-169).

In the first years, following thinning in the 20-tree and 30-tree treatment areas, shade intolerant plants would establish and grow on disturbed ground in the sunnier areas within the stands, and by that increase species diversity. However, as the overstory tree crowns expand and intercept more daylight, the increased shade would give shade tolerant plants a competitive advantage over shade intolerant plants. Conversely, most shade intolerant plants would lose vigor, fall behind the shade tolerant plants in terms of growth, and eventually experience suppression mortality. However, a minority of the shade intolerant seedlings would be in favorable locations allowing them to maintain position and contribute to the age structure diversity. In time, patches of understory trees would form closed canopies and enter into their own stem exclusion stage of stand development. During this period, understory herb and shrub diversity would go into a temporary period of decline just as had occurred when the overstory stand went through stem exclusion.

Thinning in the 60-tree per acre treatment areas would result in a sudden increase in light reaching the forest floor followed by a gradual decline as the crowns of the leave trees expand to recapture growing space. The resulting partial shade would favor shade tolerant vegetation over shade intolerant. The understory conditions and plant communities gradual decline in light levels cause understory plants to lose vigor with the loss of those plants unable to compete under declining light conditions. This process would in time reverse when the overstory trees lose their capacity for rapid lateral growth.

Thinning would increase the amount of lateral light reaching older red alders in the overstory stands, and by that, forestall the loss of that species from the treatment area via light competition. However, the loss of the scattered older alders while delayed by thinning is still inevitable due to their shorter height potential and life expectancy compared to its conifer associates. Erosional processes unrelated to the project, such as channel migration, periodically would provide conditions allowing for the regeneration of red alders through time. The retention of hardwoods while cutting a portion of the conifers would result in an increase in the percent of stocking composed of hardwood tree species.

Other effects: relative vulnerability to fire and development of old-growth character

If the history of fire, and fire effects on stand composition, for the last 500 years is indicative of fire effects during the next 500 years then the fire intolerant trees present in the study sites today have a low chance of surviving for 250 years and even less of a chance to survive for 500 years (USDI-BLM 2002b). Even though the fire intolerant trees, currently on the study site, have a poor chance of surviving to become old-growth trees, they can provide the species and vertical structural diversity that would give the stands certain old-growth forest characteristics in the mean time. These are two or more species in the stand, shade tolerant associates, and as the shade tolerant associates establish in the understory, this would result in multilayered canopies. Further, at such time as a moderate severity fire does occur, death of the fire intolerant species would release growing space for the regeneration of an additional cohort of trees. This would result in the development of a wide range of ages and tree sizes, which are also characteristic of old-growth forests (Franklin *et al.* 1986). The thinned area at the Blue Retro study site, with its high proportion of western hemlocks, and young western red cedars, is at greater risk of severe effects in the event of fire than would be a wild stand with a more typical species distribution.

Effects on Spatial Patterns

As previously discussed at length in the Affected Environment section, natural stands develop increasing spatial uniformity through time for as long as the dominant cause of tree death is competition mortality. Natural stands only start developing spatial diversity when two key changes occur within the stands. First, competition mortality declines to where the various forms of random mortality (i.e. insect, disease, weather damage, and mechanical damage) become the dominant causes of tree death. Random mortality is inherently patchy, thus the random mortality increases the spacing variability among the overstory trees by creating gaps. Second, conditions develop that allow understory trees to establishment and growth. Successful understory tree establishment is contingent on the availability of suitable growing space. Thus, understory trees would be abundant where competition is slight, and microsites and microclimates are favorable. This results in patchy reproduction where the distance between trees is measured in inches to feet within some patches, and several yards to chains between patches.

No-Action North Soup site
The high and moderate treatment areas carry sufficient stocking so that competition mortality would increase as the canopies close. The overstory stands would develop increasing spatial uniformity for as long as competition mortality remains the dominant cause of tree death. Even after random mortality replaces competition mortality as the dominant cause of tree death, competition would still exert an observable effect on tree diameter growth for some time into the future.

The increasing canopy closure in the 80 trees and 120 trees per acre areas would also result in increasing mortality among the understory tree seedlings and saplings that had established following the initial entry. In general, this would slow the development of interior spatial and vertical stand heterogeneity associated with understory tree clumps and patches.

The canopies in the low-density subtreatment areas would also expand. However, the overstory stand densities in those areas are low enough that random mortality has replaced suppression mortality as the primary cause of future tree death. This combined with understory tree regeneration would result decreasing stand uniformity as time passes.

No-Action Blue Retro site
The combined effects of the past two stand treatments has resulted in more horizontal, vertical diversity than is typical for a wild stand of the same age. This is attributed to the two pulses of understory tree regeneration that followed the thinnings in 1982 and 1999. Current overstory stand density is high enough that tree crown expansion would result in an increase of suppression mortality causing a trend toward increasing spatial uniformity in the overstory.

The increasing canopy closure would also result in increasing mortality among the understory tree seedlings and saplings. In general, this would slow the development of interior spatial and vertical stand heterogeneity associated with understory tree clumps and patches.

No-Action Both Sites
Angular light reaching under the canopy adjacent to the gap treatments, along the road right-of-ways, and along existing yarding corridors would allow for localized survival and growth of understory trees near these stand edges. In addition, understory tree survival would be higher where Douglas-firs predominantly occupy the overstory, and lower where western hemlock and western redcedar are the principle overstory trees.

Not treating the stands would forgo shortening the time until when random mortality replaces competition mortality as the dominant cause of tree death in Blue Retro and in the moderate and high-density areas in North Soup. On average, competition mortality results in more dead trees than random mortality during a given period. However, competition mortality kills the small trees in the stand, thus producing less durable snags and coarse wood debris. In addition, the smaller trees killed by competition mortality do not meet the needs of insect and wildlife species that depend on large snag or large down wood habitats. In contrast, random mortality recruits snags and down wood from all diameter classes including large trees, and by that, provides the habitats required by species dependent on large diameter snags and down wood. Examples include pileated woodpeckers and the carpenter ants that are their dietary mainstay.

In areas with dense overstory canopies, vertical growth by surviving understory trees would slow to a near stop while upper lateral branches would continue to grow resulting in a transition from a conical to an umbrella-like growth form. Following eventual transition of the overstory stand to the understory reinitiation stage of stand development, western hemlocks would resume the conical growth form. Upon successful resumption of vertical growth, the hemlocks would exhibit a characteristic kink in their trunks corresponding to the height of the tree at the time of release. Western redcedars also assumed the umbrella growth form under low light levels. However, following release, the upper lateral branches of the western redcedars continue their extensive horizontal growth (Oliver and Larson 1990, pages 57-60).

Proposed action

Following thinning stands to 20 or 30 trees/acre, random mortality would replace competition mortality as the dominant cause of tree death in the overstory. Random mortality, by its nature, creates gaps, thus contributing to increasing spatial diversity through time.

Thinning would create spaces between tree crowns simulating the effects of crown abrasion in the 60 tree/acre treatment areas. However, since the trees are still capable of rapid lateral growth, the gaps between trees would decrease as individual tree crowns expand. In time, many if not most overstory tree crowns are expected to again become interlaced on the 60-tree per acre treatment areas on the North Soup. Following the reclosing of the canopy, suppression would cause a measure of tree death and by that, cause increased spatial uniformity. As the trees in the 60 tree per acre treatment mature, their capacity for lateral growth would decline. As the stand loses capacity to recapture growing space, random mortality would replace competition mortality as the dominant cause of tree death resulting in an increase in spatial diversity.

Following thinning on all treated sites, higher understory light levels would result in additional understory tree recruitment and improved vigor of the understory trees already present. The patchy nature of understory tree recruitment would contribute to spatial diversity.

In the long-term, understory stand spatial development would parallel those previously exhibited by the overstory. Thus in time, the understory stands would shift from clumped to random. As the understory stand goes through its version of the stem exclusion stage, it too would go through a period of increasing uniformity as the result of competition mortality. Again, like the overstory, the dominant cause of tree death in the understory would shift competition mortality to random mortality as the understory trees mature.

The thinning prescription to retain representation of all diameter classes would maintain the skewed and bimodal diameter distribution patterns where they are present, in the near-term. In addition, thinning would increase light to the forest floor allowing retention and additional recruitment of understory trees that would create, and where already present, reinforce the bimodal diameter distribution.

HYDROLOGY

Affected Environment

The analysis area for hydrology consists of the two sixth-field subwatersheds, Woodward Creek-Hudson Creek and Lower Lake Creek-Loon Lake, which contain the treatment and control units. The term “site scale,” as used in the following analysis, means at the scale of an individual harvest unit.

Figure III–9: One of the two wooden footbridges in the Blue Retro Study Area.

Blue Retro Physical Setting

The Blue Retro Study Area is located east of the ridge between Steinnon Creek and Woodward Creek. The intermittent first and second order[6] streams within the study area have moderate gradients (< 20%), and they are narrow (wetted width < 5 feet), hillslope constrained and well shaded. Sword fern, salal, sedge, skunk cabbage, alder, hemlock, and redcedar provide shade in addition to the overstory Douglas-fir. The northern tributaries (Figure II-2) originate from seeps 50 to 100 feet above the trail and the southern tributaries originate from seeps immediately below the trail. Wetland habitats occur at southern tributary junctions on small flats that are less than 700 square feet. Two wooden footbridges span the northern tributaries (Figure III–9) and three turnpikes or log cribs filled with gravel stabilize the trail at the head of the southern tributaries (Figure III–10). There is no evidence that the trail is a chronic source of sediment to Blue Retro streams. Ponding does occur in low spots along the trail away from the stream channels and seven additional turnpikes are proposed to raise the trail and provide better drainage.

North Soup Physical Setting

Swales, seeps and marshy areas are found south of the 23-9-16.6 Road that bisects the North Soup Study Area. Intermittent streams that originate near the road flow north through moderate to steep hillslope constrained channels. These tributaries exhibit perennial flow near their confluence with main stem North Fork Soup Creek

Topography, large wood in and over all channels, and vegetation provide redundant layers of shade. Species in the draws include vine maple, salmonberry, sword fern, alder, hemlock, and overstory Douglas-fir. There are six stream crossings on the 23-9-16.6 Road and one crossing on the 23-9-16.7. With the exception of one six-foot section of 18-inch plastic pipe, all culverts were removed following the last harvest.

Precipitation

The hydrologic characteristics of the analysis area are controlled by rain and are typical of the Coast Range. Annual yield, peak and low flows, and ground water levels depend on the amount, intensity, and distribution of rainfall.

The Oregon Coast Range has a maritime climate characterized by wet and relatively warm winters and dry summers. From 1961 through 1990, the average annual precipitation at the Blue Retro Study Area was 74 inches versus 72 inches at the North Soup Creek Study Area (Oregon Climate Service 1995). Between 1960 and 1980,

Figure III–10: One of the three turnpikes (log cribs) on the trail system inside the Blue Retro Study Area.

6 First order headwater streams have no tributaries. When two first order channels join they form a second order stream. When two second order channels come together they form a third order stream, and so on. If two streams with different orders join then the higher order is retained. The main stem always has the highest order (Strahler 1957).

average dry season precipitation (May through September) was 7.5 inches at Blue Retro and 9.5 inches at North Soup Creek (McNabb *et al.* 1982).

Rain-on-snow events occur during cloudy periods when warm winds and rain combine to melt shallow snowpacks. Rain, combined with rapid snowmelt, can result in higher than normal stream flow potentially causing bed and bank erosion. Although rain-on-snow can occur in the Coast Range, it is more common in the lower and middle elevations of the western Cascades of Washington and Oregon (Harr and Coffin 1992). Rain is the predominant mechanism of peak flow generation in Oregon's Coastal region (Reiter and Beschta 1995, Greenberg and Welch 1998).

Both study areas are below 1,800 feet, the approximate lower limit of the transient snow zone on District (Price 2006). Transient snowpacks rarely remain longer than one to two weeks and usually melt in 3 to 4 days during subsequent rainfall (Harr 1983). Post-harvest peak flow augmentation resulting from rain-on-snow events in thinned areas is unlikely and will not be discussed further in this analysis.

Stream Flow

First and second order[7] headwater streams account for approximately 75% of the stream miles in the analysis area and all of the stream miles within the study areas. Table III-5 shows stream miles by stream order for the entire analysis area as well as stream miles by stream order within the Blue Retro and North Soup Creek units.

Table III-5: Miles of Stream, by Stream Order

Stream Order	Stream miles in analysis area	Stream miles		Percentage of stream miles in study areas
		Blue Retro	North Soup	
1	291	0.30	2.3	<1%
2	97	0.02	1.5	<1%
3	56	0	0	0%
4	23	0	0	0%
5	23	0	0	0%
6	28	0	0	0%
Totals	**518**	**0.32**	**3.8**	**<1%**

Annual Yield

Stream flow within the study areas follows a predictable seasonal pattern. Fall rains recharge soil moisture depleted by summertime evapotranspiration and base flow. During the winter, drainages rapidly translate rainfall into runoff because soils remain wet between frequent storms, evapotranspiration diminishes, and storage capacity, as either groundwater or surface water, is minimal. In the spring, discharge diminishes as transpiration increases and greater percentages of precipitation are lost to interception. Finally, as summer comes, both precipitation and discharge drop to seasonally low levels. The tributary downstream from Blue Retro is categorized as small according to the Oregon Department of Forestry, and small streams have an average annual flow of two cubic feet per second or less. The North Soup Creek streams likely fall into this same category.

Low Flow

Because rain is infrequent in the summer, study area tributaries exhibit extremely low base flows, discontinuous pools, or they dry entirely. Study area streams classified as perennial in prior environmental assessments are better described as intermittent based on field reviews by District personnel and information provided by researchers associated with the BLM Density Management and Riparian Buffer Study. In April 2008, the northernmost stream within Blue Retro went subsurface for greater than 50 feet after crossing under the footbridge. The stream, flowing less than 5 gallons per minute, was being filtered through sediment deposited behind tree branches and boles. Three of the seven stream crossings in the North Soup Creek Study Area did not have surface flow in January 2008, and investigators studying aquatic-dependent invertebrates and habitats in headwater forests classified five stream reaches within the North Soup Creek Study Area as spatially intermittent (Ellenburg 2008).

Peak Flow

Peak flow or peak discharge is the instantaneous maximum discharge generated by an individual storm. Historical records indicate that peak flows are highly variable on larger rivers from water year to water year[8]. For water years

[7] First order headwater streams have no tributaries. When two first order channels join they form a second order stream. When two second order channels come together they form a third order stream, and so on. If two streams with different orders join then the higher order is retained. The main stem always has the highest order (Strahler 1957).

[8] In hydrological studies it is preferable to compute annual statistics based on the water year. The water year, October 1st to September 30th, is defined such that the flood season is not split between consecutive years. Water year 1981, for example, ended on September 30th, 1981.

1964 through 1981, peak flow ranged from 1,320 to 7,760 cubic feet per second on the North Fork Coquille downstream from Blue Retro. Peak flows are also highly variable in smaller watersheds similar to the study areas. For water years 1971 to 1974 and 1976 to 1981, the annual peak flow from a thirty-two acre drainage within the Lower Camp Creek subwatershed, located just north of North Soup Creek, ranged from 1 to 47 cubic feet per second, with up to a 900% change in consecutive annual peak flow values.

Water Temperature

Neither study area contains or borders streams listed for exceeding Oregon's water quality standards.

The Oregon Department of Environmental Quality develops water quality standards that protect beneficial uses of rivers, streams, lakes, and estuaries. Section 303(d) of the federal Clean Water Act requires Oregon to develop a list of water bodies that do not meet these water quality standards. This 303(d) list of water quality limited streams provides a way to set treatment priorities of water quality problems. According to the 2004/2006 Section 303(d) list, the nearest listed stream to the North Soup Creek Study Area is Soup Creek (approximately two miles downstream), and the nearest listed stream to Blue Retro is Woodward Creek (roughly one mile downstream). Soup Creek is listed from river mile 0 to 1.4 for exceeding the summer temperature standard designed to protect anadromous fish passage and salmonid fish rearing. Woodward Creek is also listed for summer temperature and the listing extends from the mouth upstream 7.6 miles.

Sedimentation

The Oregon Department of Environmental Quality has not listed any streams inside the analysis area for sedimentation. Sedimentation, which affects resident fish and aquatic life and salmonid fish spawning and rearing, has a narrative criterion instead of a numeric criterion (ODEQ 2006). The narrative criterion states that "the formation of appreciable bottom or sludge deposits or the formation of any organic or inorganic deposits deleterious to fish or other aquatic life or injurious to public health, recreation, or industry shall not be allowed."

Effects on Hydrology

No-Action Alternative

Stream Flow
Weather, natural disturbance, and plant succession would continue to influence annual yield, low flows, and peak flows with or without implementation of the proposed project.

Water Temperature
Water temperatures within the study areas would continue to meet the Oregon summer temperature standard because prior thinning has facilitated growth of understory trees and shrubs that provide redundant layers of shade and the spatially intermittent streams have limited exposure to direct solar radiation, the largest source of heat energy.

Sedimentation
There is a low risk that sediment may enter the stream network from the seven stream crossing fills that were not completely removed on the 23-9-16.6 and 16.7 Roads. Woody debris and vegetation in the channels downstream from the abandoned crossings would trap and hold sediment before it reaches main stem North Fork Soup Creek.

Trail maintenance at Blue Retro would continue with or without implementation of the proposed project.

Proposed Action: Harvest

Based on information provided in the hydrology sections of this EA, and the Beaman Soup DM EA: OR125-04-06 (on file Coos Bay District Office), thinning of conifers in hydrologically recovered stands may lead to relatively short-lived, site-scale flow increases in the North Soup DM Sale No. 07-03 unit north of North Fork Soup Creek, and in the North Soup Study Area south of North Fork Soup Creek. However, any cumulative increase is expected to be morphologically inconsequential. Thinning-related annual yield increases are much less than the increases associated with patch cutting and clear cutting (Harr *et al.* 1979, Reiter and Beschta 1995), and thinning has a low likelihood of increasing peak flows (Grant *et al.* In press). Timber harvest may increase smaller peak discharge events or those with less than a one or two year recurrence interval (Ziemer 1998; Collier 2005), but step pool tributaries to North Fork Soup Creek and the gradient-controlled main stem are morphologically stable at these flows. Staggered harvests, and relatively rapid vegetation recovery, would disperse any flow effects in space and time. Stands to the north of North Fork Soup Creek are currently being thinned to 65 to 100 trees per acre, and that timber sale has a termination date of August 2010. Cutting and yarding within the North Soup Creek Study Area would be completed between September 2010 and March 2012. Canopy expansion would be underway on portions of the North Soup DM Sale No. 07-03 unit before on-the-ground operations begin in the study area south of North Fork Soup Creek.

Cumulative sedimentation is not a concern because on-the-ground operations for each sale would not overlap and sediment delivery to streams would be minimized to the extent practicable. Roadwork, including culvert installation and removal, would produce small (cubic yards), short-term (hours), site-specific disturbance. Vegetation established during the first growing season following culvert work would stabilize bare soil areas adjacent to channels. Sediment delivery from haul would be minimized by using Best Management Practices, road maintenance during the sales, and dry season operations when possible. Full log suspension is required above flowing streams in the North Soup DM sale and field measurements indicate that full suspension would be achieved over all channels in the North Soup Creek Study Area.

North Fork Soup Creek is buffered out of both timber sales and it would not be crossed with the exception of tail holds and one new bridge. Trees that shade the main stem throughout the day would not be cut, and upslope thinning should not produce temperature increases in the tributaries that exceed the range of natural variability or the measurement error of temperature monitoring equipment.

Stream Flow

The distribution of vegetative age classes on BLM-administered land in the analysis area indicates hydrologic recovery after a period of active timber harvest, especially 40 to 70 years ago (Table III-6). Hydrologic recovery refers to the decreasing impact of forest practices through time as a result of vegetation growth. Reduced interception and reduced evapotranspiration lead to increased water yield after forest cutting (Harr 1983). Stream flow increases following logging generally decrease over time and eventually disappear in about 20 to 30 years in western Oregon as maturing stands begin to transpire as much water to the air as the original forest (Adams and Ringer 1994). The National Marine Fisheries Service Northwest Fisheries Science Center reviewed regional literature and concluded that peak flow effects seem to diminish over 10 to 20 years as stands grow (Collier 2005). In the analysis area, 87% of the BLM stands, including those in the study areas, are greater than or equal to 30 years old, and nearly 95% of the BLM stands are greater than or equal to 20 years old. The 10 to 20 year old stands have attained or would soon attain canopy closure making them effective at interception.

Table III-6: Forest Operations Inventory age classes, BLM-administered land

Subwatershed	Acres by Age Class									Totals
	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80+	
Woodward Creek-Hudson Creek	14	222	264	268	848	2,405	2,079	1,221	483	7,804
Lower Lake Creek-Loon Lake	59	567	935	1,229	1,636	898	510	118	2,458	8,410
Totals	73	789	1,199	1,497	2,484	3,303	2,589	1,339	2,941	16,214

Annual yield

Any thinning-related, site scale annual yield increases would be relatively small and they would decrease as the remaining trees in the treated stands increase their growth rate and uptake of water. Reiter and Beschta (1995) state that "where individual trees or small groups of trees are harvested, the remaining trees would generally use any

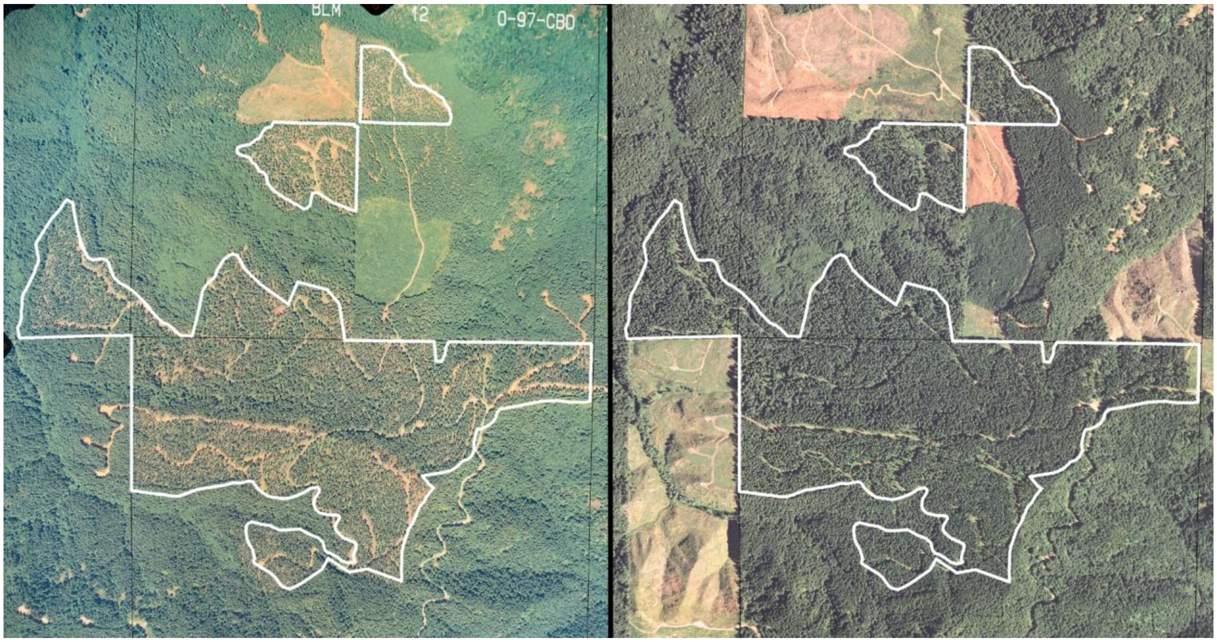


Figure III–11: Scare Ridge thinning T. 21 S., R. 9 W., Sections 11, 12 and 13. The aerial photo on the left, taken in 1997, shows 50-year-old stands that were thinned to 80 trees per acre in 1996. The 2005 photo, on the right, shows canopy development nine years post-harvest.

increased soil moisture that becomes available following harvest. Because of such 'edge effects,' partial cuts, light shelterwood cuts, and thinnings are expected to have little effect, if any, on annual water yields." Similarly, in a summary of water yield response to forest cutting outside the snow zone, Satterlund and Adams (1992, pg. 253) found that "lesser or nonsignificant responses occur… where partial cutting systems remove only a small portion of the cover at any one time."

Regional research shows patch cutting and harvest of individual trees produce considerably less increase in annual yield compared to clearcutting. Annual yield is defined as the total volume of surface flow computed for a water year expressed as a uniform depth of water over the contributing watershed. In western Oregon, patch-cutting 25% of a 250-acre drainage (H.J. Andrews Experimental Forest, western Oregon Cascades) produced an annual yield increase approximately one-half the size of that produced by clearcutting a 237-acre drainage (Harr 1976). Annual yield was increased 15 inches from predicted after 100% clearcutting, and increases averaged about 7.1 inches for the first five years following patch cutting. Patch-cutting 30% of a 169-acre drainage (Coyote Creek Experimental Watersheds, western Oregon Cascades) produced an annual yield increase approximately one-third the size of that produced by clearcutting a 123-acre drainage (Harr *et al.* 1979). Annual yield during the first five years after clearcutting averaged 11.4 inches, while annual yield following patch-cutting averaged only 3.5 inches. By comparison, harvest of individual trees making up about 50% of the total basal area in a 171-acre Coyote Creek watershed produced an average annual yield increase of only 2.4 inches. In the Alsea Watershed Study in coastal Oregon, three patch-cuts that had 50- to 100-foot buffers and accounted for 25% of a 750-acre drainage produced an average annual yield increase one-seventh the size, 2.8 inches versus 19.3 inches, of that produced by a severely burned, extensively clearcut 175 acre catchment without riparian buffers (Harr 1976).

Douglas-fir and western hemlock canopies respond quickly to thinning by stopping self-pruning of lower branches, expanding branch length, and growing longer and denser crowns (Chan *et al.* 2004). Chan and others (2004) note that canopy expansion and closure in BLM Density Management and Riparian Buffer Study units was evident five years after thinning in 40- to 70-year-old headwater forests. Figure III–11 shows canopy growth nine years after harvest units 13 air miles to the north of the North Soup Creek Study Area were thinned to 80 trees per acre. Canopy closure in Blue Retro and North Soup Creek is evident in the 2005 aerial photos in Figure III–12. Canopy closure in study area stands reduced to 20 to 60 live trees per acre is anticipated, especially given the growth of existing minor species.

Low flow
Small increases in site scale low flows following thinning may benefit aquatic species during the summer if wetted width and stream volume increase and stream temperatures are reduced. Harvest-related low flow increases are generally short-lived though, 5 to 10 years, and the additional quantities of stream flow represent a small component of annual yield (Harr 1976, Reiter and Beschta 1995).

Peak flow
Thinning-related site scale peak flow increases may occur due to reductions in interception and evapotranspiration, but the magnitude and timing of such events would likely be of little consequence to stream channel morphology.

Grant and coauthors (In press) reviewed the effects of forest practices on peak flows and the subsequent channel response in western Oregon and concluded that thinning has a low likelihood of increasing peak flows and the reported range of peak flow increases has little potential to affect primary channel structure in step pool streams. Step pool reaches in the study areas contain channel-spanning accumulations of wood that form a series of steps alternating with pools containing finer substrate. The large wood is stable and moves only during extreme flows or landslides. During more frequent bankfull flows, fine sediment and organic matter in pools is transported downstream over the stable, bed-forming steps.

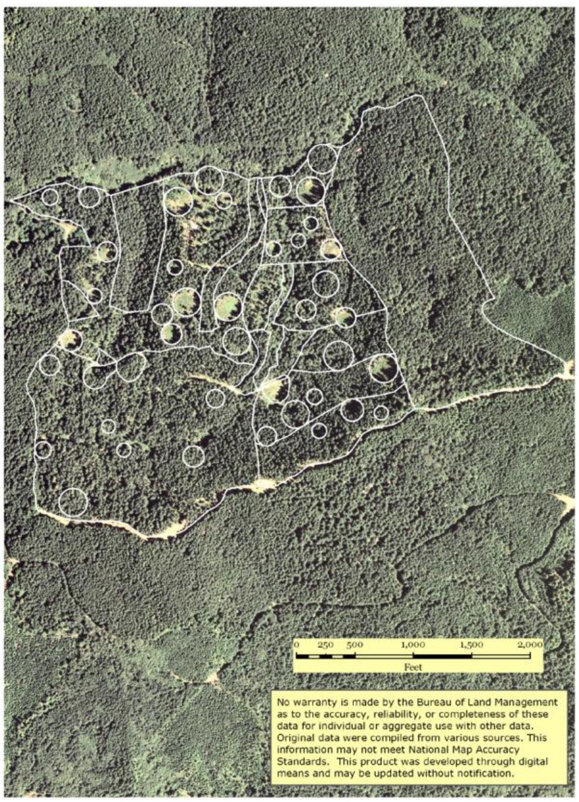


Figure III–12: 2005 Aerial Photo of the North Soup Density Management Study site taken 6 years after thinning.

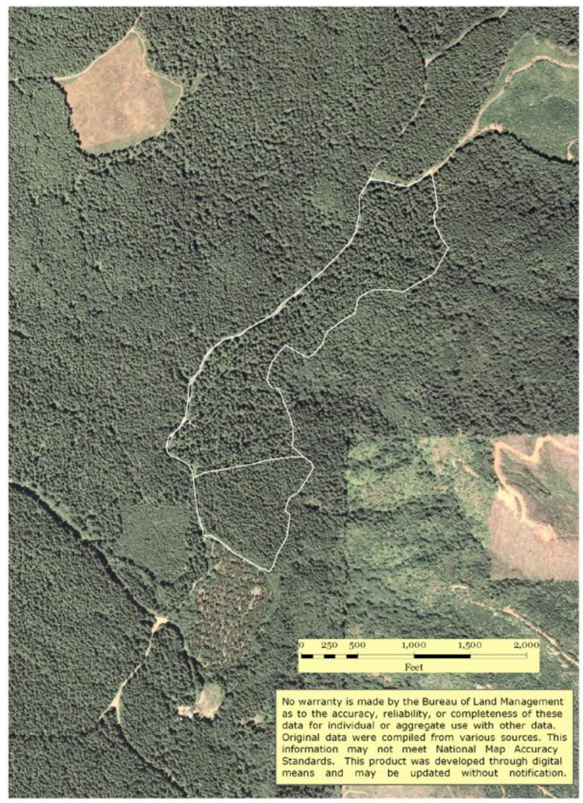


Figure III–12: 2005 Aerial Photo of the Blue Retro Density Management Study site taken 6 years after the most recent thinning.

In much of the western Cascades, and elsewhere in western Oregon and northern California, the largest post-harvest water yield increases occur during the fall months when maximum differences in soil water content exist between cut and uncut areas. In the fall, a smaller proportion of rain is required for soil moisture recharge in cut areas, so a larger proportion can go to stream flow (Harr 1976). Stream flows from the first fall rains are usually small and geomorphically inconsequential in the Pacific Northwest (Ziemer 1998). During the winter, when soils are saturated, rainstorm peak flows mask the effects that vegetation cover would have on runoff. In the spring, reduced transpiration in harvested areas contributes to peak-flow increases.

Any site scale thinning-related peak flow increases would not be measurable at the drainage, subwatershed, and watershed scales for a number of reasons. First, thinning would produce a relatively small stream flow response, and the ability of individual small watersheds to affect downstream discharge decreases as small streams form increasingly larger drainage networks (Garbrecht 1991). Second, the temporal and spatial variability of precipitation and the variable timing of peak flows from individual small basins across the analysis area would complicate change detection. Third, staggered harvests within the analysis area and relatively rapid vegetation recovery would disperse flow effects in time and space. Finally, interannual flow variability would be greater than the magnitude of any peak flow increase, and the size of any increase would likely fall within the 5 to 10 percent error associated with stream flow measurements (USGS 1992).

Water Temperature
The proposed stand treatments are not expected to increase stream temperatures measurably because the study area streams are intermittent and would have discontinuous surface flow or no surface flow during the summer when water temperature is a concern. The one site-potential tree height buffers or variable width buffers of at least 50 feet wide would protect existing shade. Topography, large wood in and over channels, and understory trees and shrubs would provide redundant layers of shade, especially important in the streamside retention buffer areas.

A few yarding corridors may be necessary to facilitate harvest operations. These yarding corridors are somewhat analogous to gaps created naturally in riparian buffers. In a recent study of riparian and aquatic habitats of the Pacific Northwest, Everest and Reeves (2007) state that although little research has been done on gap dynamics in riparian buffer strips, gaps created by both stem snap of weakened trees and uprooting of healthy trees probably have minimal effects on summer and winter water temperatures.

Sedimentation
Harvest-related bank instability and sediment delivery to streams would be negligible.

The no harvest buffers, including the streamside retention areas that maintain stream-adjacent trees with crowns that overhang the channel, would maintain bank stability. Abernethy and Rutherfurd (1999) state that “most riparian species typically develop a central rootball or rootplate of dense roots that can usually be considered as half a sphere below the surface that has a diameter of about five times the diameter of the trunk. Root density declines rapidly beyond the rootball, with both lateral distance and with depth. For reinforcement purposes, there are usually few roots beyond the canopy dripline or below about 2 meters under the bank surface.”

In a recent two-year study of surface erosion and sediment routing following clear cut logging in western Washington, Rashin and others (2006) found stream buffers were most effective at preventing sediment delivery when timber falling and yarding activities were kept at least 10 meters (32 feet) from streams and outside of steep inner gorge areas. Streamside retention buffer delineation has resulted in retention of one to two standing trees away from the channel or at a minimum those trees within approximately 20 feet of the channel, and streamside retention buffers include unstable slopes. Although the narrowest study buffers are less than 10 meters wide, sediment delivery is unlikely because felling and yarding select trees away from channels would leave undisturbed ground next to streams, and overland flow rarely occurs where forest soils in western Oregon are undisturbed (Harr 1976).

Negligible sedimentation from yarding is anticipated given the limited number of stream crossings in Blue Retro and full log suspension at North Soup Creek. Bare mineral soil exposed by skidding logs would be covered with slash within 50 feet of any channel to trap sediment and prevent erosion.

Proposed Action: Road renovation & improvement

Table III-7: Miles of Renovation by Surface Type

Study Area	Road Work	Surface Type			Totals
		Paved	Gravel	Dirt	
Blue Retro	Renovation	2.5	2.0	0	4.5
North Soup Creek	Renovation	3.2	2.3	1.3	6.8
Totals		5.7	4.3	1.3	11.3

The Proposed Action includes no new road construction. Instead, slightly more than eleven miles of existing open road would be renovated (Table III-7). There is little risk that renovation, which would consist mainly of roadside brushing and grading, and subsequent haul would cause sedimentation of waterways. Paved roads requiring little work account for half of the renovation mileage and established gravel roads flanked by vegetation capable of filtering runoff account for 40% of the renovation mileage. The dirt roads, useable only during the dry season, are located on ridges and they are isolated from the drainage network.

The Proposed Action also includes improving one mile of vehicle impassable road on the bench that bisects the North Soup Creek Study Area. Road improvement would include installation of seven culverts, brushing, and surfacing with rock if cable logging and hauling would occur during the winter. Installation of the culverts during the dry season may cause turbidity at the construction sites lasting several hours if flow is present, but sediment would not travel far downstream due to discontinuous surface flow and/or deposition behind channel-spanning woody debris accumulations. Vegetation established during the first growing season following construction would stabilize the fills. Improvements to minimize or eliminate sedimentation during haul include, but are not limited to, installation of cross drains to divert ditch flow away from streams, placement of silt fencing and/or straw bale barriers in ditches with removal of trapped sediment to stable upland areas, and installation of gravel lifts at stream crossings, stream crossing approaches, and soft spots in the road surface.

GEOLOGY

Affected Environment

The project areas are located within the Coastal Provence. The Blue Retro site is located in mapped Roseburg Volcanics (Tev), a stratigraphy of pillow basalts, breccias, and massive subarial flows, interbedded with minor conglomerate and basaltic sandstones. This formation can have impervious surfaces, with thin soils at steep angles, creating potentials for debris flow mass movements. However, the project is located on gentle to level slopes. Therefore, the potential for management activities to initiate debris flows is minimal to non-existent (Niem and Niem 1990).

The North Soup Creek site is located in mapped Elkton Formation (Tee), a stratigraphy of siltstone with thin to thick sandstone lenses and rhythmically interbedded thin graded sandstone and siltstone. This formation can be susceptible to erosion and mass movement. Mass movement includes all forms of movement, with slumps and deep-seated rotational failures being prevalent. However, the project area is located on gentle to level slopes (Niem and Niem 1990).

Likewise, stratigraphy dip angles are gentle (maximum of 9º mapped in the area). Therefore, the potential for management activities to initiate catastrophic or chronic mass movement is minimal to non-existent.

No faults were identified within the project areas.

Effects on Geology

Both alternatives would have minimal to non-existent direct, indirect, and/or cumulative impacts on existing geologic conditions. Continued development of the natural system would not affect the underlying stratigraphy except in the aspects of geologic time. Large-scale landslides or localized mass wasting would not be affected by this alternative. Localized rotational slides, translational slides, soil and rock creep, and debris flows would continue to be affected by existing natural and human features. Mass movement is part of the natural system, and would continue at the present rate.

SOILS

Affected Environment

The soils within the Blue Retro project are derived from the Roseburg Volcanics. They include Blachly Silt Loam and Preacher-Bohannon Loams (Haagen 1989).

The soils within the North Soup Creek project are derived from the Elkton Formation. They include Absaquil-Blachly-McDuff Complex, Digger-Bohannon-Umpcoos Complex, McDuff-Absaquil-Blachly Complex, and Preacher-Bohannon-Blachly Complex (Johnson *et al* 2003).

Existing compaction within the Blue Retro project is estimated to be approximately 2.2% of the project area. Existing compaction within the North Soup Creek project is estimated to be approximately 1% of the project area. These amounts are below the maximum area of allowable compaction of 12 percent for ground-based harvest (USDI-BLM, 1995).

Effects on Soils

No-Action Alternative
This alternative would have minimal to non-existent direct, indirect, and/or cumulative impacts on existing soil conditions. No additional disturbance would occur to soils not compromised by historic activity. The regeneration of a forest soil O-Horizon would continue. Slow decompaction of historically impacted soils would also continue with natural process (root growth, animal burrowing, accumulation, and development of an O-Horizon, etc.). Through extended time, these processes may return the soils to a pre-European condition.

Proposed Action
This alternative would have minimal to non-existent direct, indirect, and/or cumulative impacts on existing soil conditions. Cable logging would create temporary surficial ground disturbance by movement of soil. However, the effect would be temporary, with vegetation, especially in a thinned open canopy system, reclaiming the impacts within one to a few growing seasons. The regeneration of a forest soil O-Horizon would continue. Project design features to protect bare soils by applying seed, mulch, and /or cover with slash would minimize potential erosion.

As there are no ground based operations proposed, what little compaction that may result from cable harvesting operations would retain the sites below the 12 percent compaction threshold.

No road construction is anticipated. Therefore, there are no road construction related impacts.

Off highway vehicle operations outside of established trails would be discouraged by the restoration of the trail system and establishment of slash or other barriers within the yarding corridors, as detailed in Chapter 2.

WILDLIFE INCLUDING T&E SPECIES

Affected Environment

Threatened and Endangered Wildlife Species Occurrence and Habitat

The North Soup Study Area is in LSR number 263, and Critical Habitat Unit Number OR-58 for northern spotted owl and Critical Habitat Unit Number OR-04-e for marbled murrelet. The Blue Retro site is on TMA land.

BLM administers about 29% (24,523 acres) of the Mill Creek/Umpqua River Watershed and 37% (36,863 acres) in the North Fork Coquille River Watershed. Nearly 100% of these BLM acres are either now or capable of becoming suitable habitat for spotted owls and marbled murrelets. Approximately 89% (21,889 acres) of Mill Creek/Umpqua River Watershed and 74% (27,180 acres) of the North Fork Coquille River Watershed, BLM administered, habitat-capable acres within the watersheds are currently protected within LSMAs, administrative withdrawals (primarily sensitive soils), RMAs, research natural areas, or Congressional withdrawals.

BLM lands, in the Mill Creek/Umpqua River Watershed, currently supports 12 known spotted owl sites, and 9 known sites in the North Fork Coquille River Watershed. Neither of the proposed units is adjacent to suitable habitat or known spotted owl sites. The nearest spotted owl site is within about one-half mile of the North Soup study area, and the nearest suitable habitat is greater than one-quarter mile from the harvest area. No known owl sites or suitable habitat are within approximately two miles of the Blue Retro Study Area. No additional owl locations were projected by the northern spotted owl occupancy map near the proposed projects (USDI-FWS, USDI-BLM, *et al.* 2007).

No known marbled murrelet occupied sites are within one mile of the proposed unit. The nearest unsurveyed suitable habitat is greater than one-quarter mile away from the North Soup harvest area, and greater than two miles away from the Blue Retro area.

Other Special Status Wildlife Species and Habitat

Actions authorized by the BLM shall further the conservation and/or recovery of federally listed species and conservation of Bureau sensitive species (USDI-BLM 2008c). Special status species include threatened and endangered, proposed, candidate, and delisted species in the 5 years following delisting.

The final ruling to remove the bald eagle from the Federal List of Endangered and Threatened Wildlife was effective August 8, 2007. Protections remain in place under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. There are no known bald eagle nest sites within three miles of the proposed project areas. No restrictions on activity are required because no bald eagles are expected to be affected by the proposed actions.

There are no known special status species that occur in the project area. Table III-8 lists potential species presence and possible effects.

Table III-8: Special Status Wildlife Species on the Coos Bay District, excluding aquatic, marine, or species in the Strategic Category.

Common Name	Scientific Name	Key Habitat	Project Specific Impacts or Effects
Birds			
Marbled Murrelet	*Brachyramphus marmoratus*	Late-seral forest, potential occupied sites near proposed units	None, no suitable habitat removal or disturbance impacts
Aleutian Canada Goose (wintering)	*Branta hutchinsii leucopareia*	Coastal grass lands	None, not present
American Peregrine Falcon	*Falco peregrinus anatum*	Cliffs, no potential nest sites in analysis area	None, habitat not present
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	Generalist; Cliffs (in breeding range)	None, only an occasional winter migrant on District

Common Name	Scientific Name	Key Habitat	Project Specific Impacts or Effects
Bald Eagle	*Haliaeetus leucocephalus*	Late-seral forest, nests usually within one mile of major body of water	None, no suitable habitat removal or disturbance impacts
Black Swift	*Cypseloides niger*	Nests behind waterfalls.	Habitat not present.
Dusky Canada Goose	*Branta canadensis occidentalis*	Open grasslands, wet meadows	None, not present
Northern Spotted Owl	*Strix occidentalis caurina*	Late-seral forest, known occupied sites near proposed units	None, no suitable habitat removal or disturbance impacts
Bobolink	*Dolichonyx oryzivorus*	Grassland	None, habitat not present
Lewis' Woodpecker	*Melanerpes lewis*	Recently burned forest, oak/pine habitats	None, habitat not present
White-tailed Kite	*Elanus leucurus*	Pastures, open grasslands, typically low elevations	None, habitat not present
Oregon Vesper Sparrow (CR, KM)	*Pooecetes gramineus affinis*	Grassland	None, habitat not present
Purple Martin (CR, KM)	*Progne subis*	Snags in early-seral habitats	None, habitat not affected
Streaked Horned Lark (CR, KM)	*Eremophila alpestris strigata*	Open beach; open ground with short grass or scattered bushes	None, not present
Harlequin Duck	*Histrionicus histrionicus*	Predominately nest in western Cascades along low to moderate gradient, 3rd to 5th-order streams	None, presence highly unlikely
Trumpeter Swan	*Cygnus buccinator*	Marsh, wet meadows, bogs, ponds	None, not present
Tule Goose	*Anser albifrons elgasi*	Marsh, open grasslands, coastal lowlands. Rare migrant.	None, habitat not present
Upland Sandpiper	*Bartramia longicauda*	Open coastal grasslands. Very rare spring migrant	None, habitat not present
Western Snowy Plover	*Charadrius alexandrinus*	Coastal sand	None, habitat not present
Mammals			
Fisher	*Martes pennanti*	Forest w/shrub layer & riparian: nests/snags, dead parts of live trees, large live branches	None, presence highly unlikely due to lack of dead wood and decadent live trees
Townsend's Big-Eared Bat	*Corynorhinus townsendii*	Breed in caves/mines; bridges for night roosts	None, presence unlikely due to lack of caves, mines, bridges
Fringed Myotis	*Myotis thysanodes*	Roosts in large snags, caves, buildings, mines	None, presence unlikely due to lack of habitat features
Amphibians			
California Slender Salamander	*Batrachoseps attenuatus*	Late-seral forests, large down logs (especially class 3-4)	None, presence very unlikely
Foothill Yellow-legged Frog	*Rana boylii*	Perennial streams with rock or sand substrate.	None, habitat not affected
Reptiles			
Northwestern Pond Turtle	*Clemmys marmorata marmorata*	Lentic water (ponds, slow sections of rivers). Nests in open areas adjacent to water, can overwinter in forest	None, habitat not affected
Invertebrates			
Hoary Elfin Butterfly	*Incisalia polia maritima*	Maritime	None, not present
Insular Blue Butterfly	*Plebejus saepiolus littoralis*	Open areas, clover	None, habitat not present
Mardon Skipper	*Polites mardon*	Grass openings with Idaho Fescue and serpentine	None, habitat not present
Green sideband	*Monadenia fidelis beryllica*	Deciduous trees & brush in wet, undisturbed forest at low elevations.	Unknown
Salamander Slug	*Gliabates oregonius*	Mature conifer forest w/leaf litter	Unknown
Oregon Shoulderband	*Helminthoglypta hertleini*	Rocky & talus substrates	None, habitat not affected
Spotted Tail-dropper	*Prophysaon vanattae pardalis*	Moist, mature forests w/deciduous/shrub layer. Coastal fog zone.	None, presence unlikely, habitat remains suitable
Tillamook Westernslug	*Hesperarion mariae*	Habitats unknown, Douglas, Lane,& Tillamook Counties	Unknown

Other Species

In general, with the possible exception of the lowest density areas, the stands are even-aged second growth with a high canopy closure. These stands have canopy closure exceeding 60% and may reach 100%, which restricts ground vegetation. Stands of this type are used by approximately 36 species of wildlife for the primary purposes of feeding and/or breeding. An additional 92 species of wildlife are known to use stands of this type secondarily for feeding and/or breeding (Brown 1985). The expected species composition for this habitat type includes large mammals such as black bears, deer, elk, coyotes, bobcats, and mountain lions. Smaller mammal species include bats, shrews, moles, weasels, squirrels, chipmunks, ground squirrels, porcupines, and mountain beaver. Bird species found in habitats such as these include Cooper's and sharp-shinned hawks, grouse, owls, and many species of neo-tropical birds. Several species of salamanders, frogs, and snakes also use stands such as the proposed harvest area.

Effects on Wildlife

No-Action Alternative

Threatened and Endangered Species

Under the No-Treatment Alternative, stands in the project areas would continue to provide spotted owl dispersal habitat. Past treatments in these stands would provide late-successional conditions sooner than if they had been left unthinned. However, forgoing the additional stand treatments would delay attainment of suitable nesting habitat for spotted owls in the LSMA and RMA, compared with the proposed action.

The project areas are not currently providing suitable habitat for marbled murrelets. Development of large trees with potential nesting structure in the LSMA and RMA would be delayed under the no-action alternative.

Other Species

Impacts to wildlife or wildlife habitats associated with the no-treatment alternative would be negligible on the population scale. The smaller, less mobile species such as mollusks, amphibians, and small mammals, and their current habitat would be less negatively impacted on a local level. However, impacts at the population scale for all wildlife species would not be measurably different from the action alternative.

Some species associated with mid-seral stands would continue to utilize the project area, and would benefit from the delay of late-successional conditions. Hayes (2001) found that unthinned stands of similar age and structure maintained species such as the Pacific-slope flycatcher (*Empidonax difficilis*) and golden-crowned kinglet (*Regulus satrapa*). Though some species are more common in dense, unthinned stands, no species are known to depend on this development stage (Hayes *et al.* 1997).

The no-action alternative would not pose a direct disturbance to individual birds and their nests. Though some species are more common in dense, un-thinned stands, no species are known to depend exclusively on this development stage (Hayes *et al.* 1997).

Moderate hiding and thermal cover for big-game species would remain in the proposed project area. Gaps created on the North Soup site, during the previous entry, would continue to provide foraging habitat. Otherwise, forage would remain low in the project areas. No disturbance from harvest or roadwork would occur. Road densities in the watershed would not be affected.

The current trajectory of snag and coarse wood development would continue. Snags and coarse wood recruited would primarily come from smaller diameter trees that die as the result of competition mortality. As suppression mortality continued, there would be an increase in species associated with this habitat as pulses of snags and coarse wood become available. Species utilization depends on the size of the material, stage of decay, as well as amount on the landscape. Primary cavity excavators such as the pileated woodpecker (*Dryocopus pileatus*) use a variety of size snags for foraging, but use only larger snags for nesting. Due to the available range of tree sizes, most of the snags and coarse wood in the project area, would provide foraging substrate, but would not provide nesting habitat except for the smallest of cavity nesting species. Longevity of these snags and down wood would be short due to the overall size of the material and swiftness of decay. Development of large snags and large pieces of coarse wood would be delayed in comparison with the proposed action alternative. The Vegetation and Stand Structure section of this chapter describes additional effects of the no-treatment alternative on habitat associated stand structures.

Proposed Action

Threatened and Endangered Species

As previously stated, neither study area is near or adjacent to occupied northern spotted owl or marbled murrelet habitat. Neither proposed site is within 100 yards of suitable murrelet habitat or within 65 yards of spotted owl habitats, therefore, no effects from noise disturbing activities is expected to either species. Seasonal or daily timing restrictions would not be required.

The North Soup study area is within Critical Habitat Unit Number OR-58 for northern spotted owl and Critical Habitat Unit Number OR-04-e for marbled murrelet. The overall long-term effects would be beneficial to both species. Accelerating tree growth and providing future nesting habitat are primary constitute elements important to the CHU and recovery of the murrelet. In addition, thinning of these stands would accelerate the development of suitable nesting, roosting, and foraging habitat for the spotted owl within this project area. Recruitment of large snags and down logs would also be accelerated, which is especially beneficial to the spotted owl and their prey species. Some snags would be intentionally created and as the result of mortality through the thinning process. Some loss or degradation of existing snags and down wood from harvest activities is anticipated, but all wood would be left on-site to continue to provide habitat for owl prey-based species.

The Blue Retro study area is considered spotted owl dispersal habitat. Up to 48 acres of spotted owl dispersal-only habitat would receive commercial or density management thinning, but would continue to function as dispersal habitat after treatment.

The methodology for determining NSO incidental take (USDI and USDA 2008) states that it is likely that the removal of NRF or dispersal-only habitat within a 300-meter radius of a nest patch would cause adverse effects and could, depending upon the extent of the removal, likely constitute a "take" of spotted owls in the form of harm. None of the proposed units are within the 300-meter nest patch of any known or predicted spotted owl site.

In time, these stand treatments would cause an indirect beneficial effect by accelerating of the development of late-successional characteristics used by spotted owls, such as large diameter trees, multiple canopy layers, and hunting perches. Creating snags and down wood in applicable units would create a short-term input of these habitat structures for spotted owl prey species that utilize these features. Thinning the stands would also promote large trees more quickly for future large snag recruitment.

Migratory Birds

Migratory birds, as a group, are not Bureau sensitive species. Executive Order 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds* (66 FR 3853), of January 17, 2001, directs federal agencies to conserve migratory birds to meet obligations under the migratory bird conventions and the Migratory Bird Treaty Act. Interim management guidance is provided by BLM Instruction Memorandum No. 2008-050, dated December 18, 2007. This guidance establishes a consistent approach to project level analysis until a Memorandum of Understanding is established with the U.S. Fish and Wildlife Service. Western birds on the U.S. Fish and Wildlife Services' *Bird Species of Conservation Concern* and *Game Birds below Desired Condition* are to be addressed when actions could potentially affect those species. These lists are based primarily on declining trends in North American breeding bird survey data which can be accessed at http://www.mbr-pwrc.usgs.gov/bbs/ (Sauer *et al.* 2007).

The Partners in Flight conservation strategy for land birds in Western Oregon coniferous forests gives a detailed accounting of threats to migrant birds, including Meslow and Wight's identification of four areas of concern for forest birds associated with traditional managed forests: 1) shortening of the grass-forb-shrub stage, 2) effect of an even-aged Douglas-fir monoculture, 3) elimination of snags, and 4) elimination of old-growth forest (Altman 1999).

Mourning dove and band-tailed pigeon, northern goshawk, olive-sided flycatcher, and rufous hummingbird are migratory or game bird species that potentially could be affected by this project. Both the mourning dove and band-tailed pigeon are currently hunted in all of Oregon (see: Oregon Game Bird Regulations). Both species are common in western Oregon despite population declines overall. Mourning doves are thought to be currently more numerous than prior to European settlement because of agricultural practices and forest clearing (Marshall *et al.* 2003, 2006). They are nest generalists, and nest on the ground when trees are not available.

Northern goshawks are associated with late-seral stands and have not been documented in the project area. Because thinned stands are expected to achieve old-growth structure sooner than un-thinned stands (Bailey *et al.* 1998, Bailey and Tappeiner 1998), thinning is likely to benefit this species over the long-term.

The olive-sided flycatcher is associated with conifer forest, especially where burns have left scattered large snags and live trees. It is unclear why this species is declining in an era of increasingly fragmented forests when it prefers edge habitat, but some types of harvested forests could be acting as "ecological traps" where nesting success is poor (Marshall *et al.* 2003, 2006). However, in one study, this species responded positively to thinning, possibly because thinning creates the uneven canopy needed for foraging forays (Hagar and Howlin 2001).

The reasons for population declines in the rufous hummingbird are unclear. This species was one of a group of neotropical birds that did not respond to thinning (Hagar and Howlin 2001). Because rufous hummingbirds seem to prefer a high canopy and well-developed understory for breeding (distinct layers) (Marshall *et al.* 2003, 2006), they would likely benefit from thinning over the long-term, as thinning would improve available light resulting in improved understory development and flowering, resulting in increased nectar availability.

The proposed action represents a net benefit to land birds, at least in the short-term (10 years). Effects would be minimal to any particular species because canopy cover would remain above 60% on average, the harvest season is varied, some adjacent areas would not be thinned, hardwoods would generally be retained, and similarly aged forests exist throughout the analysis area. Canopy closure in the treated stands is expected to return to pre-project levels within 10-15 years. The variable structure and longer rotations of thinned stands ultimately benefits many migratory species, with abundance of birds generally found to be greater in thinned stands (Muir *et al.* 2002).

Habitat Components

The units currently contain few large snags. The proposed action includes retaining five of the larger trees per acre to be converted to snags if natural recruitment does not result in five snags per acre 10 years after thinning. Another project goal that would have a positive effect on many wildlife species is to increase the diversity of stand structural and compositional conditions. To achieve this goal, marking prescriptions would include retaining a range of diameter classes and tree structures, including diverse crown sizes and damaged or deformed trees. This would have a positive effect on a variety of wildlife species by providing potential nesting structures for birds and mammals.

The density management thinning would reduce crown cover, which would allow development of additional ground vegetation. Many of the wildlife species associated with young even-aged stands would continue to use these stands. Density management thinning would reduce the recruitment of small snags and down wood via suppression mortality. However, falling two trees per acre for coarse woody debris, and providing for five large snags per acre ten years after treatment, all which are larger than the average stand DBH, would result in a net benefit to wildlife.

Yarding of logs across large down logs in advanced stages of decay would cause damage to an important habitat feature, which would not be replaced in the short-term. Some existing snags may also be damaged as a result of the proposed action. Partial and complete suspension of logs during yarding could reduce impacts to existing snags and down logs in advanced decay classes when possible.

Directional falling away from marshy areas would protect these areas and by that benefit of amphibians and aquatic insects.

Activities involved with the proposed action would cause disturbance to a variety of wildlife species and could affect normal activities and expose individuals to additional risk. The smaller, less mobile species such as mollusks, amphibians, and small mammals, would be particularly vulnerable on a local level, but should not be seriously affected on a population scale.

Reports from a large study on the effects of commercially thinned and unthinned 40 to 55 year old Douglas fir stands in the Oregon Coast Range indicate that bird detections and bird species richness have increased in thinned stands (Hagar et. al., 1996). Weikel (1997) found that thinning for old-forest characteristics would likely have a positive impact on populations of cavity nesting birds in both the short and long-term.

Timber harvest in the proposed areas would decrease the amount of thermal cover and hiding cover for big game species. Thermal cover rejuvenates in approximately five to seven years in a commercially thinned area. Increased understory growth following the proposed action may benefit elk and deer populations. Elk populations are currently at a low to moderate level with good growth potential. Limiting factors may be forage availability because of reduced clearcut harvest in the area over the past several years. Deer populations are lower than in the 1970s and 1980s and are stable or slightly decreasing (J. Toman, pers. comm.).

Implementation of the proposed action would not have any appreciable negative impacts to any wildlife species including those listed as threatened or endangered. While the proposed action would reduce existing canopy density, it would accelerate progression to achievement of late-successional stand characteristics within the LSMA and RMA, including more complex forest structure in the future including larger trees with larger crowns. The resultant stand would be more similar to late-successional forest due to variation in density and distribution of overstory and understory vegetation. The growth of leave trees at lower densities would decrease the time needed for the creation of large diameter trees, snags, and large woody material.

AQUATIC SPECIES INCLUDING T&E SPECIES

Affected Environment

See the Hydrology Affected Environment section for a description of the hydrologic and topographic aspects of the aquatic habitats in and adjacent to the Blue Retro and North Soups study sites.

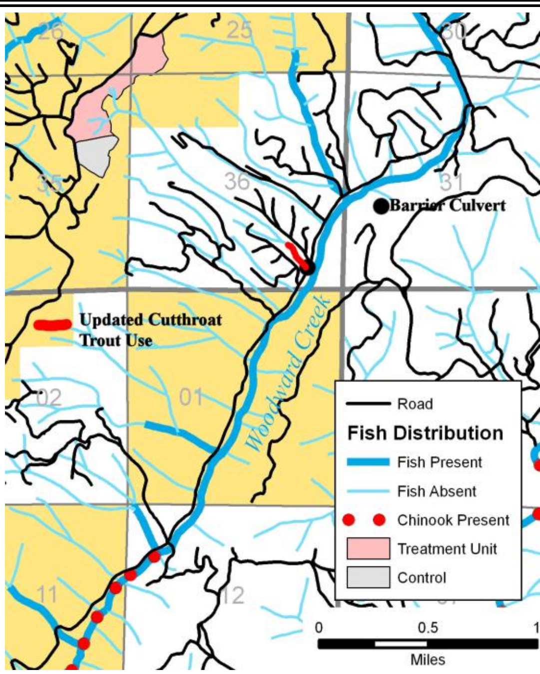


Figure III–13: Fish presence downstream from the Blue Retro site.

Blue Retro Fish Presence and Distribution

There are no fish present in the stream reaches within the Blue Retro study site. The streams originating in the Blue Retro site are the headwaters for a third order tributary to Woodward Creek. In 2006, Oregon Department of Fish and Wildlife conducted a fish presence survey, on the tributary stream prior to timber harvest on private land. They documented resident cutthroat trout at the very lower end of that tributary. These trout are resident due to a culvert located on private lands adjacent to Woodward Creek that prevents upstream migration of other salmonid species. As shown in Figure III–133, the upper extent of trout occupied reach is 1.04 miles below the Blue Retro unit. . Above the private harvest units, the tributary gradient steepens to over 16% and thus is a barrier to upstream fish migration.

Woodward Creek, which is 1.26 miles below the Blue Retro unit, contains Coho salmon. Coho are also found below a natural barrier 2.5 miles below the haul route crossing of Steinnon Creek. Oregon Coast Coho salmon is federally listed as “Threatened.” Table III-9 lists the special status aquatic species known or suspected to occur on the Coos Bay District. None of these species are found within the Blue Retro sale area or within the sale unit.

Fall Chinook salmon use the lower reaches of Woodward Creek. Other fish present in Woodward Creek include resident and sea run cutthroat trout, winter steelhead trout, and likely though not confirmed, brook lamprey and Pacific lamprey. Native non-game fish may also inhabit Woodward Creek.

North Soup Fish Presence and Distribution

The landslide that formed Loon Lake also created an upstream migration barrier, which prevents all species of anadromous fish from accessing the watershed above Loon Lake. Fish species thought to occur in the watershed above
 Loon Lake include coastal cutthroat trout, Umpqua pike-minnow, Brook lamprey, largescale sucker, and prickly sculpin. Non-native fish are also found in this part of the watershed, and most were planted, whether legally or illegally, to provide a recreational fishery in Loon Lake. These include hatchery rainbow trout, largemouth bass, white crappie, bluegill, and bullhead.

A portion of the coastal cutthroat trout population, above Loon Lake, migrates from the lake environment to stream habitat to spawn (adfluvial). Another portion of the population resides in streams where they hatch, rear, and spawn in the same stream system (resident).

A downstream barrier culvert prevents adfluvial fish from getting to the reach of the North Fork Soup Creek adjacent to the study area. Resident cutthroat trout populate the North Fork Soup Creek. As shown in Figure III–14, cutthroat trout in the fry stage (25mm to 30 mm long) were observed in small intermittent/ephemeral stream channels in and near the North Soup site, during the wet season.

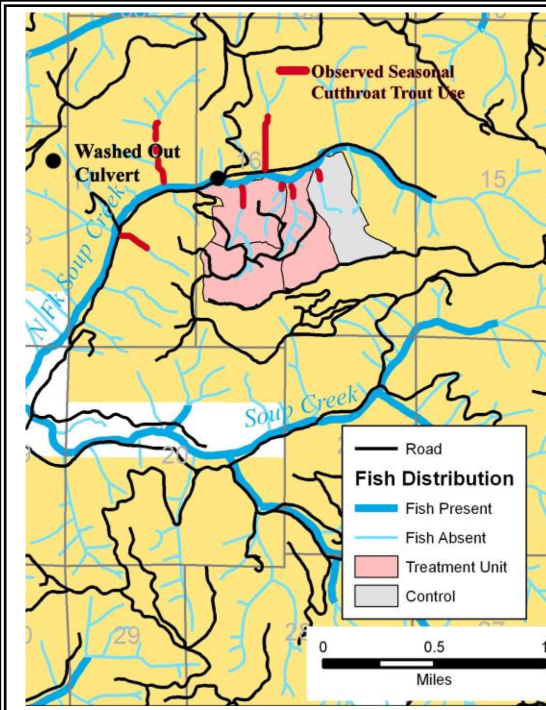


Figure III–14: Fish presence in and near the North Soup site.

Cutthroat trout fry, found in early March in these tributary streams, likely were spawned in these streams. Cutthroat fry were observed in North Fork Soup Creek tributaries during late winter to early spring. This suggests the reproductive strategy of North Soup resident cutthroat trout is to take advantage of the high stream flows of winter in order to access tributary streams to spawn. Spawning could occur possibly as early as January.

Fish distribution in the tributary streams can be highly variable depending on the frequency and timing of winter and spring rainfall events. As stream flows start to diminish in summer, trout fry likely back down these tributaries and enter the mainstem North Fork Soup Creek.

Table III-11 lists the special status aquatic species known or suspected to occur on the Coos Bay District. None of these species are found within the North Soup sale area or within sale units.

Effects on Aquatic Species

No-Action Alternative

There would be no direct impacts to aquatic species since no management activities would occur. Thinning harvest actions, such as road building, tree cutting, log yarding, and log haul, would not occur. Therefore, there would be no potential for active management effects on aquatic habitats components such as shade, large woody material recruitment, nutrients/organic litter input, bank stability or sediment delivery.

Riparian canopy and understory vegetation development trajectory, set by the last thinning entry in the unit, would continue until redirected by hillslope processes, fire, or other disturbance. Chronic disturbances would result in ongoing, naturally occurring inputs to the streams of wood debris, and fine and coarse sediments. On going trail maintenance and trail improvements such as bridges and gravel-armored turnpikes would continue to limit fine sediment delivery to streams at the Blue Retro site.

Proposed Action

Blue Retro

There are no fish present in the unnamed headwater stream habitat in the Blue-Retro study unit. The distance of this project away from fish occupied stream reaches means the project elements, such as roads, timber harvest, log yarding and log haul are unlikely to affect fish species.

Roads – No new roads would be constructed. The 26-12-35.4 road on the west edge of the unit would be renovated for its length between the unit and the 26-12-4.2 road, which is paved. The road does not cross any streams that drain into Woodward Creek. The road does cross two streams inside the Steinnon Creek drainage. One crossing is on an intermittent tributary to Steinnon Creek and the other is over the fire pond dam on Steinnon Creek. Steinnon Creek at this crossing contains resident cutthroat trout. Oregon Coast Coho salmon are found in Steinnon Creek up to a natural migration barrier approximately 2.5 miles below this crossing.

The renovation of this road over these crossings would slightly disturb the road surface but the placement of new gravel would act to stabilize surface material and would delay the breakdown of sandstone gravel at these crossings from road traffic and by that prevent road-generated sediment from entering these streams. No trees would be cut at these crossings. Thus, there would be no loss of overhead shade, or of trees that could be recruited for large woody material.

Harvest - A 20-foot wide no harvest streamside retention strip would be applied throughout the unit. This would maintain the existing streambank vegetative cover and the streambank stability along all stream channels. Canopy shade over stream channels would be slightly reduced. However, a dense understory brush, shrub, and tree cover would continue to provide nearly 100% channel shade resulting in no impact to water temperature as these streams are intermittent and do not flow water in summer months when temperature is a concern.
The Blue Retro study site would not have an effect to wood delivery to fish bearing streams. These moderate gradient channels are not prone to landslides and the nearest fish presence is over a mile downstream through mostly private lands that have been recently harvested.

Organic litter recruitment to channels would remain about the same from the overstory canopy and may increase from the greater density of understory and streamside brush, shrub, and tree cover.

Log Yarding - Logs would be yarded through existing corridors to landings along the west side road. Only two yarding corridors cross a stream. Applying project design features for log suspension, and the armoring of the outer gorge at each crossing with treetops and branches would protect the streams. The stream channels at these crossings are narrow and slightly incised. This would allow suspending yarded logs over the channel without dropping to the streambank. The inner gorge streambanks were not impacted with one end log suspension during the initial harvest. The outer gorge showed slight impact dents but little exposed soil. Vegetation on the outer gorge was compacted down but the root systems were not damaged. No soil reached the stream from the previous yarding. The same results are expected during the next thinning.

Log Haul - Logs would be hauled approximately 2.50 miles over the 26-12-35.4 road to the 26-12-4.2 road, which is a paved road. Two streams are crossed by this road. One stream is an intermittent non-fish bearing channel and the other is Steinnon Creek at the fire pond dam. Steinnon Creek contains resident cutthroat trout at the crossing and Oregon Coast Coho salmon are found below a natural barrier approximately 2.50 miles below this crossing. Both crossings would be upgraded with a lift of rock and it is unlikely that fine sediment would reach these streams as a result of log haul.

Trail – Stream crossings are well-established bridges and wet areas are crossed with gravel-filled cribs. Project design features require repair of any damage to the trail or crossing structures so to control fine sediment delivery to the streams.

Table III-9: Blue-Retro Project Effects Determination for Aquatic Special Status Species

Common Name	Scientific Name	Status	Species Information	Step #1 Species Present on District lands?	Step #2 Habitat Present?/ Accessible in Action Area?	Step #3 Species Present in Action Area?	Step #4 Would the proposed Action Affect this Species?	Step #5 What would the Effects be in Scope and Intensity?
Fish								
Coho salmon (OC)	*Onchorhynchus kisutch*	FT	anadromous, spawn and rear (1.5 yr) in smaller freshwater streams before migrating to ocean	Yes	Yes/No	No	No	N/A
Coho salmon (SO/NC)	*Onchorhynchus kisutch*	FT	anadromous, spawn and rear (1.5 yr) in smaller freshwater streams before migrating to ocean	Yes	Yes/No	No	No	N/A
Millicoma dace	*Rhinichthys cataractae ssp.*	OR-SEN	Coos River Basin, rubble areas in swifter waters	Yes	No/No	No	No	N/A
Invertebrates								
Rotund Lanx (snail)	*Lanx subrotundata*	OR-SEN	Freshwater snails found in large, turbulent water of large rivers. Confined to mainstem Rogue and Umpqua Rivers	Suspected	No/No	No	No	N/A
Robust walker (snail)	*Pomatiopsis binneyi*	OR-SEN	Perennial seeps, shallow mud banks and marsh seeps leading into shallow streams. Documented only in Chetco River drainage.	Suspected	No/No	No	No	N/A
Pacific walker (snail)	*Pomatiopsis californica*	OR-SEN	Wet leaf litter and vegetation near flowing or standing water in shaded areas, high humidity. Documented in the Lower Millicoma River sub-basin.	Suspected	No/No	No	No	N/A
A caddisfly (insect)	*Rhyacophila chandleri*	OR-SEN	Western Cascades habitat association, Douglas, Lane, Deschutes counties. Found in freshwater habitats.	Suspected	Yes/Yes	No	No	N/A

North Soup

There are 3.8 miles of intermittent stream channel in the North Soup study area. A small percent of these stream reaches have infrequent seasonal use by resident cutthroat trout. Cutthroat trout use the suitable low gradient reaches of these streams for spawning and rearing. They drop out of these streams and enter the North Fork Soup Creek as stream flows disappear. The project elements of this alternative, such as roads, timber harvest, log yarding, and log haul are unlikely to impact habitat features and aquatic life including fish species.

Roads – No new roads would be constructed. Two graveled road segments and one natural surface road would be renovated with only one of these segments crossing a seasonally used fish-bearing stream. The fish bearing stream crossing culvert at this site would be replaced under the North Fork Soup DM Sale No. 07-03. Additional renovation would occur on two roads that have paved surfaces.

The 23-9-16.6 and -16.7 roads, which access in the interior portion of the North Soup site would be improved. New culverts would be installed where these two roads cross streams. All crossings are on intermittent streams and are several hundred feet above fish bearing reaches. Culvert replacement activities would expose soil. All exposed soil resulting from culvert replacement would be stabilized before the onset of the next wet season. This would prevent road and culvert replacement sediment from reaching downstream fish bearing reaches.

The improvement of this road system would include measures to eliminate sediment from entering stream channels. Armoring and seeding ditch lines, and rocking road approaches to stream crossings would act to filter fine sediment, stabilize surface material, and would delay the breakdown of old sandstone gravel at these crossings from road traffic. This would prevent road use related sediment from entering these streams.

A few trees may need to be cut at these stream crossings during culvert installation. These trees are likely to be red alders. The result would be a slight loss of canopy shade in the short-term at the channel crossings.

Harvest – Various harvest treatments would be applied in the North Soup study area. Associated with these harvest treatments are three stream retention buffer widths. All stream channels would receive some form of streamside protection. Those buffer/streamside retention area descriptions are found on page 17 and illustrated in Figure II–5. They are the 20-foot wide no harvest streamside retention strip, the 50-foot minimum variable width buffer, and the 200-foot one tree height width. Indirectly, up to nine leave islands, which receive no thinning treatments, are positioned along stream channels in harvest treatment areas as shown in Figure II–1. These leave islands would act as unthinned retention buffers of varying widths along stream channels. Seventeen existing patch openings are scattered around the units. They vary from 100 to 250 feet in diameter. They are separated from streams by a minimum of 50 feet.

Stream Temperature
Water temperature is usually not an issue during the winter and spring seasons when cutthroat trout use the lower portions of tributary streams for spawning and rearing. During the summer months, when temperature is a concern, the streams inside the unit are intermittent. The existing buffer adjacent to North Fork Soup Creek would remain intact providing shade to this section of stream.

Log Yarding - Logs would be yarded to landings sites along the road system. All log yarding would use existing corridors from the previous thinning to the extent practical. Yarded logs would require one end suspension over streams. Due to the overall steep slopes and incised streams, full suspension over channels would be likely. In more gentle terrain, at mid slope locations, one end suspension of yarded logs may be necessary but the number of logs yarded across streams in those locations would likely be small. Where this occurs, the outer gorge banks of each crossing would be armored with treetops and branches. Stream channels at these crossings are narrow and slightly incised causing yarded logs to ride on the material placed on the outer gorge and logs would be suspend over the channel without dropping on to the inner gorge streambanks. The inner gorge streambanks would not be damaged from log yarding and no soil loss would occur. No soil is expected to enter any stream reach and no impacts to fish or fish habitat would occur.

Log Haul – Logs harvested from the lower portion of the units would be yarded uphill to the 23-9-16.6, the 23-9-16.7, or the 23-9-16.0 road. These logs would then likely be hauled via the North Fork Soup Creek Road #23-9-19.1. A segment of this road is gravel and a segment is paved. Log haul out this route would cross six ephemeral stream channels on the gravel segment. Renovations/improvements would occur at each of these crossings and these crossings would be upgraded with a lift of rock if approaches are steep and have drain issues. It is extremely unlikely that log haul would cause fine sediment to reach these streams. Logs harvested from the upper parts of the units would be yarded uphill to the 23-9-15.3 road, which is located on the crest of the ridge. This is a natural surface road that does not cross any streams. Trucks coming off the 23-9-15.3 road would enter the paved Soup Creek Road #23-9-19.0. Consequently, no haul-related sediment would enter any stream.

Table III-10: Streamside Retention Buffer Effects on Stream Habitats

	200-foot (one-site potential tree) buffer	50-foot minimum variable width buffer	20-foot streamside buffer
Large Woody Material *	The recruitment of large woody material to stream channels would be maintained at current levels over the short-term. Large woody material is likely to reach stream channels as single pieces of up-rooted or blowdown trees from within approximately the first 100 feet of the riparian zone. Hillslope processes that contribute large quantities of large woody material to channels are unlikely to occur because of the moderate average unit slope of 34% and the average stream gradient of 13%.	The variable 50-foot retention buffers that are adjacent to thinning treatments of 20-30 live trees per acre could result in the trees in the buffer being less wind firm. Winter storms with high winds could result in an increase in the amount of large woody material reaching streams over short-term. As thinned trees and edge trees receive more light and experience faster growth, a larger sized piece would reach streams from the outer half of this buffer width over the long-term.	The 20-foot retention buffers that are adjacent to thinning treatments of 20-30 live trees per acre could result in the trees in the buffer being less wind firm. Winter storms with high winds could result in an increase in the amount of large woody material reaching streams over the short-term. As thinned trees receive more light and experience faster growth, a larger sized piece would reach streams over the long-term.
**Bank Stabilization ** **	No change from current bank stability. No trees would be harvested from the banks of streams or lowland wet areas.	No change from current bank stability. No trees would be harvested from the banks of streams or lowland wet areas.	No trees would be harvested from the banks of streams or lowland wet areas resulting in no change from current condition in the high and moderate retention areas. The 20-foot retention buffers inside the 20 live trees per acre treatments may be at higher risk of blowdown until they gain root mass in response to increased growing space. Winter storms with high winds could result in streambank trees being uprooted and reducing streambank stability over short reaches of streams.
Sediment Control ***	Streamside and riparian vegetation would be retained and no increase in sediment delivery above normal background levels is expected.	Streamside and riparian vegetation would be retained and no increase in sediment delivery above normal background levels is expected. Fine debris, tops and branches is expected to trap any sediment movement.	Streamside and riparian vegetation would be retained and no increase in sediment delivery above normal background levels is expected. Fine debris, tops and branches are expected to retain or trap any sediment movement.
Organic Litter & Nutrients *****	No change in the input of organic matter and nutrients to streams is expected. Deciduous tree leaf input could be reduced over the long-term as conifer canopy expansion reduces light reaching red alder trees.	A slight reduction in organic litter could occur in the short-term as the result of removing a portion of the stand adjacent to the buffer. Organic litter amount and diversity would increase in the long-term as understory vegetation and overstory tree canopies respond to increased growing space.	A reduction in organic litter could occur in the short-term as the result of removing a portion of the stand adjacent to the buffer. Organic litter amount and diversity would increase in the long-term as understory vegetation and overstory tree canopies respond to increased growing space.

* Edge trees adjacent to gaps would receive more light and experience faster growth but would benefit stream channels only if they can reach channels when they fall.
** A few trees may have to be cut at the road crossings scheduled for improvements where culverts would be placed. If streambank trees are removed, other streambank stabilization methods would be deployed.
*** Little soil would be exposed as a result of harvest. Channelized gully flow is not likely to result from this thinning. Large amounts of limbs and tops would remain on the ground intercepting sediment and surface runoff.
**** Fine organic matter enters stream channels from vegetation within 30 meters from the stream. Most of this occurs as leaf matter and twigs and branches drop from the canopy cover.

Table III-11: North Soup Project Effects Determination for Aquatic Special Status

Common Name	Scientific Name	Status	Species Information	Step #1 *Species Present on District lands?*	Step #2 *Habitat Present/ Accessible in Action Area*	Step #3 *Species Present in Action Area?*	Step #4 *Would the proposed Action Affect this Species?*	Step #5 *What would the Effects be in Scope and Intensity?*
Fish								
Coho salmon (OC)	***Onchorhynchus kisutch***	FT	Anadromous, spawn and rear (1.5 yr) in smaller freshwater streams before migrating to ocean	Yes	Yes/No	No	No	N/A
Coho salmon (SO/NC)	***Onchorhynchus kisutch***	FT	Anadromous, spawn and rear (1.5 yr) in smaller freshwater streams before migrating to ocean	Yes	Yes/No	No	No	N/A
Millicoma dace	***Rhinichthys cataractae ssp.***	OR-SEN	Coos River Basin, rubble areas in swifter waters	Yes	No/No	No	No	N/A
Invertebrates								
Rotund Lanx (snail)	***Lanx subrotundata***	OR-SEN	Freshwater snails found in large, turbulent water of large rivers. Confined to mainstem Rogue and Umpqua Rivers	Suspected	No/No	No	No	N/A
Robust walker (snail)	***Pomatiopsis binneyi***	OR-SEN	Perennial seeps, shallow mud banks and marsh seeps leading into shallow streams. Documented only in Chetco River drainage.	Suspected	No/No	No	No	N/A
Pacific walker (snail)	***Pomatiopsis californica***	OR-SEN	Wet leaf litter and vegetation near flowing or standing water in shaded areas, high humidity. Documented in the Lower Millicoma River sub-basin.	Suspected	No/No	No	No	N/A
A caddisfly (insect)	***Rhyacophila chandleri***	OR-SEN	Western Cascades habitat association, Douglas, Lane, Deschutes counties. Found in freshwater habitats.	Suspected	Yes/Yes	No	No	N/A

Essential Fish Habitat Assessment
Because stream channels or habitat is not being effected, the proposed action would not adversely affect Essential Fish Habitat (EFH). This assessment fulfills the consultation requirements as described in the Magnuson-Stevens Fishery Conservation Management Act (16 U.S.C 1855((b)). Consultation with NMFS for EFH is not needed because there would be no adverse effects to EFH.

BOTANICAL SPECIES INCLUDING SPECIAL STATUS SPECIES

Affected Environment

The primary overstory trees on the Blue Retro site are Douglas-fir trees with western hemlock and western redcedar scattered through the stand. Understory brush species are predominantly rhododendron, Oregon grape, vine maple, salal, and sword fern. The stand supports numerous fungal mats, as evidenced by the high production of various sporocarps.

The primary overstory trees on the North Soup site are Douglas-fir and western hemlock with scattered grand fir, and a mix of hardwood species. Most prevalent is red alder, which is found in many of the riparian areas including streams and small ponds, and near recent disturbed sites. The understory is primarily swordfern. Vine maple often occurs in canopy gaps created by *Phellinus weirii* disease pockets and adjacent to small ponds created at the toe of some of the steeper slopes. Evergreen huckleberry, rhododendron, salal, and Oregon grape are found on ridge caps and slopes with a more westerly aspect. Riparian understory vegetation is composed of salmonberry and elderberry. Willow (*Salix* sp.) and slough sedge (*Carex obnupta*) are the main vegetation surrounding the marshy area.

Lichen diversity is often low in dense young stands due to limited light. However, the diversity and abundance increases with canopy gaps, ridgelines, areas where sunlight can penetrate the lower canopy, and riparian areas where there are hardwood components. Older mature hardwood shrubs such as ocean spray (*Holodiscus discolor*) and California hazelnut (*Corylus californica*) contain the greatest species richness for macrolichens and bryophytes (Muir *et al*. 2002).

Large class 3, 4 & 5 logs, and stumps provide excellent habitat for a diverse array of bryophyte and lichen species, particularly when they are not charred by fire.

Fungi quantity and species diversity is often fairly high in closed canopy stands. Even though special status fungi are not documented in the proposed project area, the potential habitat is present for many species.

Fungi require a wide range of habitats including: dead and down coarse woody debris, undisturbed soils, and suitable host species, which is usually prevalent within most timber stands. Fungi also perform many ecosystem roles. These include decomposing coarse woody debris, making nutrients available for many other species that depend on woody debris as a substrate, and helping to hold soil together, which aids soil porosity and stability.

There is limited data available on the effects of forest management as related to fungi richness and abundance. Many fungi form mycorrhizal connections with the surrounding vegetation. Up to eight species of fungi can attach to one tree or shrub. This symbiotic relationship benefits both organisms, through the exchange of nutrients, water, and protection. Soil inhabiting, decomposing fungi break down dead wood. Mycorrhizal fungi help to release nutrients to trees and shrubs (Butler et al 2002).

Special Status Species

Actions authorized by the BLM shall further the conservation and/or recovery of federally listed species and conservation of Bureau sensitive species (USDI-BLM 2008c). Special status species include threatened and endangered, proposed, candidate, and delisted species in the 5 years following delisting.

No botanical species listed on the Threatened or Endangered lists are known to occur on the project areas. Surveys in the project areas did not reveal any site occupied by special status species.

Eighteen Bureau sensitive fungi are suspected or documented to occur on Coos Bay BLM lands. Table III-12 displays specific information regarding connectivity, range (including presence or absence within the project area) for these 18 fungi.

Table III-12: Special Status Species Fungi Species Suspected within Project Area.

Species	Habitat	Range of Species ***
Arcangeliella camphorata	Associated with conifers, especially Douglas-fir and western hemlock, 200 to 950 m, March through November, under oaks. In the Oregon Coast Range (CR) and Klamath Mountains (KM) Ecoregions, and Washington. 13 sites known on Coos Bay BLM.	From the Siskiyou Mountains of southern Oregon, north through the Coast Range to the Olympic Peninsula and in B.C.
Boletus pulcherrimus	Westside Cascades (WC) in Lane County, sporocarps usually solitary in association with mixed conifer (grand fir, Douglas-fir) and hardwoods (tanoak) in coastal forests.	Endemic to the Pacific Northwest from Washington south to California.
Cortinarius barlowensis	Coastal to montane mixed coniferous forests up to 4,000 feet elevation with western hemlock, Pacific silver fir, Sitka spruce, and Douglas-fir. Known from Takenitch Lake in Douglas Co.	Widely distributed in western Washington and Oregon.
Cudonia monticola	Grows on spruce needles and coniferous debris, several district sites in the Burnt Ridge area. Fruits in late summer and autumn.	Endemic to the Pacific Northwest from Washington

Species	Habitat	Range of Species ***
Gomphous kauffmanii	Closely gregarious to caespitose, partially hidden in deep humus under *Pinus* and *Abies* spp.	Endemic to the Pacific Northwest from Washington south to California.
Leucogaster citrinus	Sub-surface soil. Roots of white fir, sub-alpine fir, shore pine, western white pine, Douglas-fir, and western hemlock. Known from Wild Rogue Wilderness (Siskiyou NF) and North Fork Rock Creek (Siuslaw NF), CR, KM, & WC Ecoregions. Fruits from August through November, one site located adjacent to Coos Bay District but not on BLM lands: T33S, R10W, Sec. 17 NESE (collector unknown in 10/11/85).	Widely distributed in western Washington and Oregon.
Otidea smithii	Exposed soil, duff, or moss under black cottonwood, Douglas-fir, and western hemlock. Solitary to gregarious, known from Roseburg and Salem BLM Districts, and near Crescent City, California.	Known from four sites within the range of the northern spotted owl.
Phaeocollybia californica	40 year old plantations to >400 year old-growth forests, associated with the roots of Pacific silver fir, Douglas-fir, and western hemlock; seven sites on Coos Bay District, fruits October-December.	Endemic to the Pacific Northwest from Washington south to California
Phaeocollybia dissiliens	40 year old plantations to >400 year old-growth forests, associated with the roots of Pacific silver fir, Douglas-fir, and western hemlock; seven sites on Coos Bay District, fruits October-December.	Endemic to the Pacific Northwest from Washington south to California
Phaeocollybia olivacea	40 year old plantations to >400 year old-growth forests, associated with the roots of Pacific silver fir, Douglas-fir, and western hemlock; 24 sites on Coos Bay District, fruits October-December	Endemic to the Pacific Northwest from Washington south to California
Phaeocollybia oregonensis	Associated with the roots of Pacific silver fir, Douglas-fir, and western hemlock. One site on district in a >200 year old Douglas-fir stand.	Endemic to the Pacific Northwest from Washington south to California
Phaeocollybia pseudofestiva	40 year old plantations to >400 year old-growth forests, associated with the roots of Pacific silver fir, Douglas-fir, and western hemlock. 19 sites on Coos Bay District, fruits October-December.	Endemic to the Pacific Northwest from Washington south to California
Phaeocollybia scatesiae	Mature and old-growth Douglas-fir forests, associated with the roots of spruce, Sitka spruce, and *Vaccinium* species, 0 to 1,250 m; several sites on district; fruits in spring and fall.	Endemic to the Pacific Northwest from Washington south to California
Phaeocollybia sipei	40 year old plantations to >400 year old-growth forests, associated with the roots of Pacific silver fir, Douglas-fir, and western hemlock. 29 sites on Coos Bay District, fruits October-December.	Endemic to the Pacific Northwest from Washington south to California
Phaeocollybia spadicea	40 year old plantations to >200 year old old-growth Douglas-fir forests and in mature Sitka spruce stands in coastal lowlands regions; solitary to scattered to closely gregarious, 34 sites on Coos Bay District, fruits October-December	Endemic to the Pacific Northwest from Washington south to California
Ramaria largentii	Associated with spruce, western white pine, Douglas-fir, and western hemlock, one site on district in a mature (>120 yr. old) Douglas-fir stand. Fruits in October.	Endemic to the Pacific Northwest from Washington south to California
Rhizopogon exiguus	Coastal, known site at Mapleton, hypogeous fungi in coniferous forest; CR & KM Ecoregion. Fruits in March, August, September, and November.	W. Oregon and the Washington Cascades.
Sowerbyella rhenana	Groups in duff of moist, undisturbed mature conifer forests, one collection from a tan oak stand in Curry County on Coos Bay District BLM; CR & WC Ecoregions. Fruits October through December. One known site on Coos Bay District likely destroyed during hardwood conversion and subsequent burning operations.	To be expected across the cool North Temperate zone in Europe and Asia as well as N. America

*** This data is from the Rare, Threatened and Endangered Species of Oregon (Oregon Natural Heritage Information Center (ORNHIC) 2007)

Effects on Botanical Species

No-Action Alternative

Vascular Plants

There would be no immediate negative impacts to special status species. Under this alternative, the proposed project area would not receive the density management treatments and the stand would continue on its present growth trajectory.

Over time, increasing competition for light, moisture, and nutrients would result in smaller average tree size compared with the effects of the proposed action. Crown size would be smaller and overall tree vigor would be lower. The crown competition factor would continue to increase to the point of imminent mortality in the smaller size classes. The canopies would continue to close reducing light levels under the canopy. Canopy openings would become limited to gaps created by root rot pockets, wind throw, and other disturbance factors. The relative density would increase contributing to slowly diminishing the volume of the understory shrub and herb cover. Without thinning and the formation of root gaps there would be a lower availability of water and mineral nutrients for plant growth.

Nonvascular Plants
No additional gaps would be created in the stands and macrolichen diversity would be greatest in areas with hardwoods, wolf trees, and remnant old-growth trees. Hotspots for macrolichen in young conifer stands diversity include gaps, hardwoods, wolf trees, and old-growth remnant trees (Neitlich & McCune 1997). Since lichens grow slowly and disperse slowly (Bailey 1976), the larger seed trees left behind should conceivably contain a valuable source of propagules for future inoculation of conifers and hardwoods. Bryophyte abundance would remain low except in areas where coarse woody debris, forest gaps, and hardwoods exist.

Mycorrhizal fungi are most active in the upper soil and humus layers. They are sensitive to increases in soil temperature, soil compaction, and erosion that can accompany forest harvest (Molina *et al.* 1993). Since plant-species composition would not be altered from its present existing state, there would be no near-term changes in the mycorrhizal communities. However, as plant species composition changes in response to forest succession, the fungus communities also undergo change (Molina *et al.* 1993).

Lichen and bryophyte diversity would change in correspondence to changing light levels and plant species composition. Canopy gaps, remnant old-growth trees, “wolf” trees, and hardwoods would continue to be the primary areas of macrolichen diversity (Neitlich & McCune 1995). Areas with coarse woody debris, forest gaps, and hardwoods would continue to host the greatest diversity of bryophytes (Rambo & Muir 1998).

Proposed Action

Vascular Plants
Species richness, frequency, and cover of some herbaceous species and exotics species are greater in thinned stands than in unthinned stands (Bailey & *et al.* 1998). Thinning is a management tool used to produce late-successional characteristic in a stand and increases the development of multistory stands of both conifers and hardwoods. Conifer regeneration is recruited, while small overstory trees survive, and the understory growth increases (Bailey & Tappeiner 1998). Thinning would promote the continued development of fuller crowns, larger branches and furrowed bark on overstory trees, which increases the surface area available for establishment of additional epiphytic plants. Thinning the stand would also increase the vulnerability to infestations by exotics, which may thrive in the resulting disturbed soils and brighter light conditions. Over time, any exotic weeds and early seral associated herbaceous plants that may have established would be negated by competition and suppression from taller well-established native brush species and understory tree regeneration.

In the short-term, the proposed project would change the structure of the vegetation within the study area, but no loss of special status species is anticipated. The removal of standing timber would allow more heat and light to reach the forest floor and stimulate the growth of the brush and herb layers. Some short-term impacts are expected as the result of logging activity, but these should be ameliorated within a few years.

Similarities in understory vegetation between young, unthinned, stands and old-growth stands suggest that native vascular plants in the Coast Range are quite resilient to environmental change (Bailey *et al.* 1998). Native plant species richness, composition, total cover, and individual species frequency and cover have been shown to be indistinguishable after severe disturbances such as logging and burning in the Coast Range in after more than 50 years (Oliver 1981).

Non-Vascular Plants – Lichens and Bryophytes
Thinning may help accelerate the development of old-growth characteristics in dense young-growth stands (Muir *et al.* 2002). Old-growth forests have a higher diversity and abundance of epiphytes (lichens and bryophytes) than do stands less than 150 years old (Muir *et al.* 2002). The proposed thinning would likely shorten the time these stands would need to attain old-growth characteristics associated with greater epiphyte diversity and abundance. Lichens (both cyanolichens and alectorioid lichens) grow and disperse slowly (Bailey 1976). In some of the thinning areas

where lichen colonies have lost suitable substance to grow on, remnant and larger trees left can contain a valuable source of propagules to slowly recolonize green algal-foliose pioneer lichen species on young conifers and hardwoods. Gaps, hardwoods, wolf trees, old-growth remnant trees, and variable density thinning also promote the majority of epiphytic macrolichens in young conifer stands (Neitlich & McCune 1997, Muir *et al.* 2002).

Thinning and opening young, dense, managed stands should favor bryophyte abundance (Rambo & Muir 1998). Retention of hardwoods species during thinning would contribute to diverse and abundant bryophyte community abundance (Rambo & Muir 1998). The retention of remnant old-growth trees would ensure a continuing supply of coarse woody debris to the forest floor (Rambo & Muir 1998). Retaining hardwood trees, such as red alder, would maintain the bryophyte diversity associated with hardwood substrates. Bryophyte cover appeared to be the greatest on older shrub stems, and damage to shrubs during thinning may lower bryophyte abundance (Muir *et al.* 2002).

The canopies of the stands, thinned to a relative density of about 35 or higher, would fill in rapidly. By the eighth year, it would have conditions approximating those in the unthinned stands (Chan & Cole 2002). This would potentially provide a window in which new shrubs can establish that would then provide new substrates for the lichens and bryophytes.

The North Soup site supports remnant older trees originally left on the site as seed trees. The retention of these older trees, in accordance with the thinning prescription, would protect the trees most likely to support old-growth associated epiphytic lichens. These, in turn, would be propagule sources for spreading epiphytic lichens to the younger trees in the stands (Sillett *et al.* 2000).

Macrolichen communities in thinned stands differed from those in old-growth stands and landscape-level hotspots, yet were comparatively similar to unthinned young-growth stands. Areas with coarse woody debris, forest gaps, and hardwoods would continue to host the greatest diversity of bryophytes (Rambo and Muir 1998). Bryophyte cover appeared to be the greatest on older shrub stems and damage to shrubs during thinning may lower bryophyte abundance (Muir *et al.* 2002).

Non-Vascular Plants – Fungi
There is limited data available on the effects of forest management as related to fungi richness and abundance. Chantrelle (*Cantharellus cibarius*), a common species of ectomycorrhizal fungi, was found to fruit in significantly lower numbers following thinning (Pilz *et al.* 2002). Declines were greatest in the most heavily thinned stands. It is likely that as the trees resume vigorous growth and the forest canopy closes, than chantrelles would fruit at the same levels prior to the thinning. Further studies are needed to verify this hypothesis (Pilz *et al.* 2002).

As plant species composition changes during forest succession, the fungi community undergoes change. Fungi succession is in response to changes in tree composition, tree age, and soil qualities, such as accumulation of organic matter (Molina *et al.* 1993). Commercial harvests have various degrees of adverse impacts depending on the method of tree removal and ground disturbance including reduction of canopy cover, although the potential for future snags and coarse woody debris creation is greater in thinned stands than un-thinned stands (Bailey and Tappeiner, 1998). Removal of organic matter of course woody debris could potentially pose a threat to fungal individual or alter habitat conditions beyond a given threshold of tolerance.

Predicting the likelihood of occurrence is difficult at best as habitat requirements for many of the suspected species is broad or poorly understood. At best only qualitative measures can be used to predict the occurrence. In Table III-13, the percent of fungal Bureau sensitive species located in Coos Bay is compared to all other known sites in the Northwest Plan Forest Area. Much of this data is based on various random surveys where all fungi specimens are collected and sent in to a few experts. Most fungal Bureau sensitive species have complex morphological habits and unknown environmental factors that make locating and identifying them extremely difficult. The 2004 FSEIS to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines addresses this incomplete and unavailable information. For these 18 fungal species, specific information on connectivity and habitat requirements, range (including occurrences within the project area), and disturbance effect is lacking (USDA-FS; USDI-BLM 2004 p. 108).

Table III-13: Percent of sites of fungal special status species in Coos Bay District

Scientific Name	Known sites in OR,CA, WA *	Additional sites on Coos Bay Dist. since FSEIS 2007 publication	Known sites on the Coos Bay District**	% of Coos Bay District sites
Habitat not sufficient within NWFP				
Arcangeliella camphorata	13	0	13	72.2
Boletus pulcherrimus	26	0	1	23.9
Cortinarius barlowensis	26	0	0	0
Cudonia monticola	32	0	3	9.3
Gomphous kauffmanii	72	1	1	1.4
Otidea smithii	13	0	0	0
Phaeocollybia californica	53	3	10	18.9
Phaeocollybia dissiliens	22	7	13	59
Phaeocollybia oregonensis	42	0	3	7.1
Phaeocollybia pseudofestiva	45	9	20	44.4
Phaecollybia scatesiae	19	0	5	26.3
Phaeocollybia sipei	54	20	46	85.2
Phaeocollybia spadicea	83	12	40	48.2
Ramaria largentii	17	0	0	
Rhizopogon exiguus	3	0	0	0
Sowerbyella rhenana	73	0	1	1.5
Insufficient habitat in portions of NWFP				
Phaeocollybia olivacea	47	10	29	22.8
Sufficient habitat in NWFP				
Leucogaster citrinus	57	0	7	12.3

* This data is taken from Table 2-13 in the 2007 Final Supplement to the 2004 SEIS to *Remove or Modify Survey and Manage Mitigation Measure Standards and Guidelines* (USDA-FS and USDI-BLM 2007)
** Query by district GIS data steward of the ORNHIC and GeoBob data as of 1/22/08.

The 18 species of fungi are all mycorrhizal, forming associations with their hosts, mostly conifer. Under the proposed project, an estimated 60.8% of the forest stand would be treated. The thinning activity could have varying degrees of adverse impacts depending on the level of tree removal and ground disturbance. Most occurrences of the special status fungi are known to be associated with forested stands that have late successional characteristics including moderate to high canopy cover, high incidence of large trees, snags, and accumulation of coarse woody debris (including logs) (USDA-FS and USDI-BLM 2004).

Adverse effects to fungi take account of changes in microsite conditions from reduction of canopy cover, edge effects, changes in soil moisture regimes, potential fragmentation of the mycelial network, reduction in availability of host trees, decrease in organic soil layer, and a decrease in the amount of coarse woody debris that may serve as a source of moisture in the dry months. These effects may reduce or eliminate sporocarp reproduction, change fugal species composition and species diversity, and decrease fungal biomass.

Although the thinning action of the proposed project should not necessary reduce the canopy coverage to less than 40%, the removal of host tree and shrub species, actions that produced forest gaps and removal and/or the consummation of forest floor litter and woody substratum all of which are associated with "posing a threat to fungal individuals or alter habitat conditions beyond a given threshold of tolerance" promoting conservational assessment for several sensitive fungal species (Cushman and Huff 2007).

Summary

The North Soup and Blue Retro density management project area reduction of canopy cover and removal of host trees proposed overall would not likely affect any Bureau special status vascular plant, lichen, bryophyte or fungal species since there are no known sites within the project area or adjacent to the project.

Currently there are no known sites for any Bureau special status fungal species within the project area. There are , however, 14 species are fungi in which pre-disturbance surveys are not practical or not necessary (USDA and USDI 2001). Bureau sensitive species (fungal populations) could be potentially impacted through localized disturbances such as new roads or slash piles thereby reducing population viability.

NOXIOUS WEEDS

Affected Environment

Scotch broom (*Cytisus scoparius*), French broom (*Genista monospessulana*), and Himalayan blackberry (*Rubus discolor*) are common weed species within the watersheds. Gorse (*Ulex europaeus*) occurs on district, and has been found on sites similar to those in the proposed project. Noxious weeds have the ability to out compete and in some cases eliminate native vegetation by competing for water, sunlight, nutrients, and physical space. Gorse and the broom species are also able to fix nitrogen and establish on nutrient-poor sites. This adaptation gives these species an advantage over many native species. Known locations of plants are generally scattered and are relatively small in size, consisting of less than 20 individuals in isolated locales. However, there are a few locations of Scotch broom with well over thousands of individuals along roads and within recent regeneration harvest units. On private industrial forestland, noxious weeds are often effectively controlled through the application of herbicides. On public land, herbicide use is presently restricted to areas immediately adjacent to existing roads. Within existing BLM plantations, the broom species can be controlled by pulling or cutting until the seedlings outgrow the competitive height of the broom.

Other less competitive noxious weeds, such as Canada thistle, Klamath weed, tansy ragwort and bull thistle also are present. They do not occur in sufficient numbers to be of management concern, are managed through biological control efforts, and are not expected to increase to a level that would jeopardize management objectives of landowners.

Noxious weeds are commonly found along roads or in disturbed areas adjacent to roads. The majority of the road systems have been inventoried for weeds since 1997, and most inventoried BLM locations of brooms and gorse have been treated in 2002, 2003, 2005, 2006, and 2007. On-going inventories are performed and treatment occurs in the spring when plants are in bloom. Human activities can spread noxious weeds, for example, by moving contaminated vehicles and equipment into uninfected areas. Wind, water, and animals can also transport weed seeds. The BLM controls the spread of noxious weeds by requiring vehicle washing, conducting annual weed surveys, and treating all weed infestations along BLM controlled roads.

Effects on Noxious Weeds

No-Action Alternative

Commercial log hauling, administrative traffic, and recreational driving would continue on existing open roads. BLM would continue to monitor and treat existing and new noxious weed populations using manual and chemical applications on BLM managed lands and along BLM controlled roads. The analysis areas have been intensively inventoried, treated, and monitored for weeds in the past. Regular treatment of known weed sites would continue as funding remains available. Control of noxious weeds on private industrial forestlands is expected to continue where needed to ensure survival and growth of plantations.

Proposed Action

New road construction and renovation routinely exposes bare soil areas, which may allow for the introduction of pioneer species, some of which could be noxious weeds. Under the special provisions of the timber sale contract, the contractor is required to apply a mixture of grass seed and mulch on all disturbed areas establishing a ground cover that is reasonably effective in suppressing noxious weeds. Application of rock to the road surface may introduce weed seed from the quarry site of origin. However, this rarely occurs unless the gravel is stockpiled for at least one generation of a weed species. Processing of the rocked roads and hauling of logs is not conducive to establishment of noxious weed seedlings. Follow-up monitoring and treatment is an effective control method on BLM roads in the project area. All logging, road construction, and site preparation equipment that operate off of the gravel and natural surfaced roads would be required to be washed prior to entering BLM lands. BLM controlled haul routes and potential landing locations would be inventoried for noxious weeds and treated, either mechanically or chemically, prior to hauling from the harvest units. Roads and landings would be monitored on an annual basis to identify new invaders and treat them using an integrated pest management approach.

No new noxious weed populations are likely to occur within harvest units after yarding with a skyline system. New road construction and renovation could increase the chances of some scattered noxious weed populations occurring along road systems, depending on the rock source, effectiveness of washing equipment, pre-harvest weed treatment of the haul road system, and post-harvest inventory and treatment. The design features outlined in the action alternative, i.e., pre-harvest inventory and treatment, washing of equipment prior to entry, mulching and seeding, post-harvest inventory and treatment, and continued monitoring and treatment, would help reduce the risk of noxious weed spread. Other District projects such as manual maintenance, precommercial thinning, and site preparation activities specifically address prevention and removal of noxious weeds through mechanical methods. Annual inventory of the road system would continue to identify any new populations and treat those weeds with mechanical or chemical methods to control the spread. Any new species of noxious weeds that were identified in the project areas would be managed using integrated pest management techniques.

Due to the active management of noxious weeds by landowners in the areas, there should be no cumulative increase in noxious weed infestations within the North Soup/Blue Retro study areas. Most of the existing noxious weeds only thrive in an open canopy environment, particularly in regeneration harvest areas and roadside openings. As the canopy levels increase on all ownerships, existing noxious weed sites would become completely shaded out. The annual monitoring and treatment of roadside infestations would reduce the level of infestations, particularly along BLM controlled roads as well as private controlled roads on BLM lands.

FUELS

Affected Environment

LANDFIRE National Map Data suggests that both study areas are predominantly in a Fire Regime Group V[9] with a mean fire return interval greater than 200 years. Some areas near the ridge tops are classified as Fire Regime groups III and IV with more frequent fire return intervals of 35 -200 years. Fire severity in Group V can be of any class (low to replacement) and in III as low to mixed and in IV as replacement type. The Fire Regime Condition Class[10] for the project areas is II indicating a moderate departure from historical reference conditions. The dominate fuel model in the project areas is fire behavior Fuel Model 8 characterized by closed canopy stands with little under growth and a litter layer composed primarily of duff, needles, twigs and wood less than 3 inches in diameter (Anderson 1982). Under normal conditions, fire behavior in these timber stands would be slow burning ground fires with low flame lengths. Also located within the project areas are scattered pockets of timber that would be classified as Fuel Model 10. The control areas within the study appear to have a greater level of this fuel model present probably due to lack of management. These areas, which are characterized by a heavier load of down dead wood greater than 3 inches diameter, result from natural mortality, stem exclusion and other natural events like snow break and wind throw. Landscapes dominated by Fuel Model 10 are prone to more extreme fire behavior including torching; spotting and short crown fire runs (Anderson 1982). Other factors including weather, topography, and aspect may contribute to more extreme fire behavior (crown fire potential) regardless of the fuel model present.

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9 There are five natural fire regime groups. A natural fire regime is a general classification of the role fire would play across a landscape in the absence of modern human intervention but included the influence of aboriginal burning (Agee 1993; Brown 1995)

10 Fire Regime Condition Classes are a qualitative measure describing the degree of departure from historical fire regimes, possible resulting in alterations of key ecosystem components such as species composition, structural stage, stand age, canopy closure and fuel loadings. One or more of the following activities may have caused this departure: fire suppression, timber harvesting, livestock grazing, introduction and establishment of exotic plant species, introduced insects or disease and other past management activities (Schmidt et al. 2000)

Both project areas are in areas considered as wildland urban interface[11]. The Blue Retro project is within ¼ mile of critical communication infrastructure for multiple government agencies and private companies in Coos County. Portions of the North Soup project area are adjacent to non-industrial ownership in the community of Ash Valley, Oregon. Ash Valley is listed in the August 17, 2001 Federal Register as an urban wildland urban interface community within the vicinity of Federal lands that is at high risk from wildfire. The project areas also have a history of intensive use by the public for both harvest of special forest products such as firewood cutting, mushroom and brush picking and recreational activities including camping, hiking, biking (motorized and non-motorized) and hunting. These activities can, and often do, occur during periods of high fire danger. Therefore, post-harvest fuel loadings would require some form of treatment for hazard reduction by reducing the volume of logging slash primarily along roads not planned for closure or decommissioning after harvest operations. Dependent upon the final project layout, post-harvest fuel loading and the actual disposition of fuels throughout each project area, burn methods and burning conditions may be necessary that may not fully meet all desired objectives, primarily those with regards to silviculture.

Effects on Fuels

No-Action Alternative

The no-action would allow development of increasingly crowded stand conditions that would contribute to increased mortality within the overtopped and suppressed trees. Increased mortality would result in the long-term build up and accumulation of dead or dying fuels on the ground and within the canopy. These conditions could make the stands more vulnerable to damaging wildfire and may hamper fire control efforts during a fire event.

Under the no-action alternative, the BLM managed lands would remain at a moderate to high risk of loss to wildfire. Stand densities, characteristics, and composition that may help to improve the stand and landscape level fire regime-condition class would not be achieved.

Proposed Action

Under the proposed action, there would be short-term but manageable increases in activity related surface fuel loadings and short-term increased risk of damaging wildfire in the affected areas. Harvest and other management activities associated with the proposed action would result in short-term and sporadic increases in human activity, which in turn may increase the possibility of human-caused or operational wildfire. These types of fire events occur with low frequency within the District. All operations, using power-driven equipment, are required to operate in accordance with State fire regulations and restrictions. These include having fire-fighting equipment on site during the fire season, and posting of a watchperson for specific periods after mechanical operations cease.

Thinning dense stands may reduce the long-term vulnerability of the stand to a damaging wildfire by removing or reducing accumulated fuel loadings that contribute to extreme fire behavior such as a crown fire. The proposed treatments could facilitate fire suppression activities by providing safer and better access and egress for firefighters as well as for counter-firing opportunities in the event of an extreme fire occurrence (Omi & Martinson, 2002).

The stand gaps created during the first phase of the research project may subtly mimic those gaps caused by natural disturbances like fire. The research prescription to maintain or increase minor species would result in the retention of fire intolerant species across the units without consideration of the effects of topography and aspect on fire intensity. The prescription would contribute to stand level species diversity. However, it does not consider

[11] Wildland Urban Interface has two accepted definitions:
- "the urban wildland interface community exists where humans and their development meet or intermix with wildland fuel." (Federal Register. Vol. 66, No. 3. Thursday, January 4, 2001/Notices. On line: http://www.co.douglas.or.us/planning/wildfire_plans/default.asp)
- "the line, area or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuel." (NWCG Glossary and the 10-Year Comprehensive Strategy Implementation Plan).

landscape scale species distribution created by disturbance patterns, which are influenced by topography and aspect driven microclimates, and expressed in unmanaged landscapes.

The Southwest Oregon Fire Management Plan (USDA et al. 2004) addresses Wildland Urban Interface (WUI) criteria. Proposed harvest units are within the Wildland Urban Interface area, and have been evaluated to determine appropriate mitigating measures to protect adjacent public and private property and provide for public health and safety. Hazardous fuels reduction treatments would follow the management direction provided in the RMP (USDI-BLM 2008a, p. 43). Examples of treatments could include hand and/or machine piling, pullback and/or removal of ladder and surface-fuels adjacent to private ownership boundaries and roadside hazardous fuel reduction.

The density management study projects, excluding the control areas, would have a beneficial cumulative effect at the watershed scale by reducing the continuity of standing fuels and consequently lowering risk of damage to fire, increasing stand resiliency to fire, and moderating fire behavior potential. The affects from smoke released from slash disposal would be minor because of the small acreage being burned. Any prescribed burning that takes place would occur spatially over time.

RECREATION

Affected Environment

North Soup
There are no developed recreation sites in the project area and none are planned. The closest developed site, East Shore, is at least two miles away and would not be affected by the project.

There is dispersed use in the area including hunting. Cross-country ATV use has not been an issue in the area. Vehicles are permitted on the roads.

Blue Retro
There were about twelve miles of trail constructed in the project area in the late 1990's, called The Blue Ridge Trail System. The trails are open to foot traffic, horseback riders, and motorcycles, but ATV's are prohibited. There has been occasional unauthorized motorized access on Blue Ridge. Monitoring occurs throughout the year and any problem areas are addressed as needed. When unauthorized motor vehicle access routes are discovered, they are blocked with boulders. Drainage and erosion problems are addressed by various techniques including regular maintenance, drainage structures and armoring the trail surface. The recreation staff tries to keep abreast of the latest materials and methods for trail work.

The EA-OR-125-98-18, which was prepared when the trail system was proposed, acknowledged there would be timber sales in the area of the trails. Page 7 states, "Trail system would be designed to coexist and not impair other management programs including timber. Trails which have active timber harvesting activities would be signed closed for the duration of the harvest."

Effects on Recreation

No-Action Alternative

There would be no effects on dispersed camping, hunting, or recreational driving at either site. Trail maintenance and monitoring for unauthorized activities at the Blue Retro site would continue.

Proposed Action

North Soup

Temporary road closures to protect the public from the hazards associated with logging may affect recreational driving. Falling and yarding activities may cause a localized drop in game animal use, and by that, temporarily depress hunting opportunities in the immediate area around the study site. Both effects are temporary. No other impacts are foreseen for recreation.

Blue Retro

Paint on trees designating trees to be removed, and trees to be dropped for down wood debris would be visible from the trail before, and during the project. Paint applied during the previous entry to designate trees to be retained is also visible. The cutting and removing of trees would change the views from the trail by increasing the sight distances into the stand. In time, growth of understory vegetation and the densification of overstory tree crowns would reduce sight distances. Approximately one mile of the trail inside the thinning unit would be unavailable for use while the thinning operations are active. Alternate routes are available for trail users. The trail inside the thinning area would likely sustain some damage. Design features would provide for trail repair and erosion prevention. Road renovation for timber haul would also improve the condition of the road for recreationist driving to trail heads in low ground clearance vehicles.

CULTURAL RESOURCES

Affected Environment and Effects at the Soup Creek Site

Cultural resources are not known in the vicinity of the North Soup unit. Its position adjacent to Soup Creek and east of Ash Valley indicates the area may have been used by Native Americans living in the Ash Valley / Loon Lake area, but archaeological evidence has not been located to support that conjecture. Known historic land use of the area has been documented in Table III-1. Those activities are not expected to leave significant archaeological traces within the North Soup unit. Thus, there should be no difference between the proposed alternative and the no action alternative in cultural resource management for the Soup Creek unit.

Affected Environment at the Blue Retro Site

Blue Ridge is a very prominent landform in the vicinity of Coos Bay. It is the first evidence of land that ocean travelers see when heading shoreward to the Coos Bay area. Native American stories exist concerning Blue Ridge, both as a sanctuary for people from floods and a home of supernatural forces. Undoubtedly, Blue Ridge has played an important part of local geography for as long as people have lived here. If evidence of Native American use did exist on the ridge top, subsequent historic land use has obliterated remaining evidence.

Early settlers realized the wealth in timber around Coos Bay and with the help of steam engines, by the late nineteenth century logging operations had extended up Daniels Creek. In 1900, the Myrtle Point Enterprise (newspaper) reported, “The trainload of logs was brought down the Blue Ridge railroad at Daniels' Creek Wednesday morning. They were from Noble King & Bradbury camp.”

Figure III–15: Koos King steam donkey on Blue Ridge

Curt Beckham (1987) describes one of William "Bill" Vaughn's best remembered accomplishments in early logging – logging Blue Ridge by way of Daniels Creek.

> *A railroad had already been built up Daniels Creek and along Coos River. Blue Ridge had some of the finest fir on the coast, and as Bill Goodman related when he worked for Vaughn the ground was flat once on top. Vaughn strung a railroad to the bottom of the ridge, laid railroad iron up its steep sides, than another track along the ridge. Logs came out along the ridge pulled by a locomotive to a sturdy lowering machine, which was a huge donkey with a special brake. The loaded cars were lowered a full mile at the end of thick cable down a grade of 30 to 38 percent. Another locomotive took over at the base, hauling the logs to Coos River where they were rafted and towed to the sawmill in North Bend. The lowering machine had a very large drum in order to hold that mile long cable. The "Koos King" lowering machine was designed and built by the Willamette Iron and Steel Co. There were a few other inclines on the coast but none could match the length of this Blue Ridge lowering machine.*

Figure III–15 shows the Koos King steam donkey. The logging of the top of Blue Ridge was complete by 1936, when the photograph in Figure III–2 was taken from the Blue Ridge Lookout. Shortly after, the Fairview fire burned the top of Blue Ridge. Figure III–1 shows a 1950 aerial view of the Blue Retro Density Management Study Area and its relationship to a portion of the Blue Ridge logging railroad, remnants of which still were visible at that time. Blue Ridge lookout is to the bottom of this map. One branch of the railroad extends into the unit, where it terminates in an open area with yarding roads radiating out in several directions (area labeled "Trestle remains" on Figure III–1).

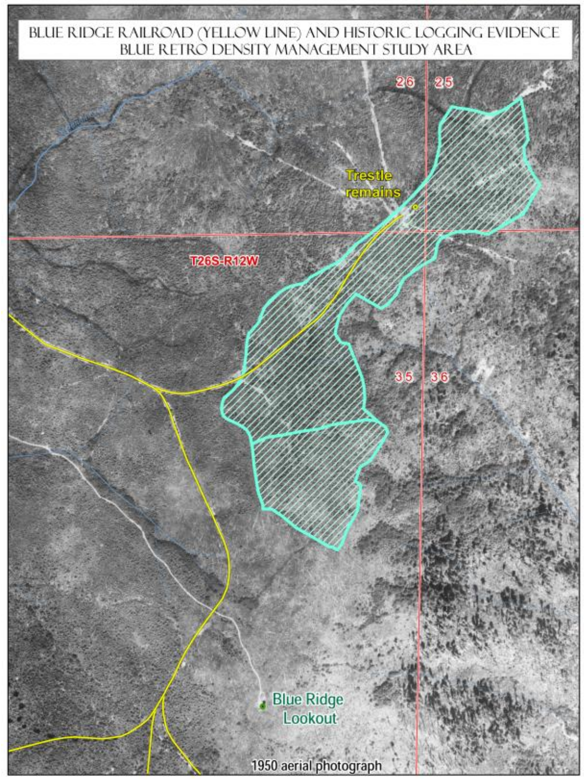

Figure III–16: Relationship between Blue Ridge Railroad and Density Management Unit.

Effects at the Blue Retro Site

Today, the only evidence of the railroad construction are several rotting trestle upright posts. The railroad line was salvaged, and most evidence of this railroad that was visible 25 years ago is now deteriorated beyond identification. Therefore, there would be no difference for cultural resource management whether the preferred alternative or the no action alternative is chosen for this project.

Solid and Hazardous Waste

Affected Environment

A hazardous material Level I survey was conducted on the project area. No hazardous material sites were found. There are no known past uses that would indicate a potential solid or hazardous waste problem.

Effects on Solid and Hazardous Waste

No-Action Alternative

No project-related effects from solid or hazardous wastes would occur.

Proposed Action

The proposed action is subject to applicable provisions for Petroleum Product Precautions under the Oregon Forest Practices Act (reference: OAR 629-57-3600), and Spill Prevention, Control and Countermeasures under Oregon Department of Environmental Quality provisions (reference: OAR 340-108). This specifies the reporting requirements, cleanup standards, and liability that attaches to a spill or release or threatened spill or release involving oil or hazardous substances. Site monitoring for solid and hazardous waste would be performed in conjunction with normal contract administration. In addition, the Coos Bay District Hazardous Materials Contingency Plan and Spill Plan for Riparian Operations would apply when applicable to operations where a release threatens to reach surface waters or is in excess of reportable quantities.

No effects from solid or hazardous wastes are anticipated from the proposed action, unless an accidental release of hazardous materials occurs because of operations. Depending upon the substance, amount, and environmental conditions in the area affected by a release, the impacts could range from short-term to more extensive and longer lasting. Minor amounts, less than 2 gallons, of diesel fuel, gasoline, or hydraulic fluid leaking from heavy equipment onto a road surface, with little or no chance of migrating to surface or ground water before absorption or evaporation would be an example of minimal impact.

If a petroleum substance is released at or above the State of Oregon reportable quantity of 42 gallons, or has the likelihood of reaching ground or surface water regardless of the amount, it could cause more serious impacts to the environment. This impact could range from localized contamination of soil and vegetation, to entry into surface water and toxic effects upon fisheries and aquatic life habitat. The greater the quantity of material released, the more likely that adverse effects would occur. These effects would depend on variable pathway conditions such as seasonal water levels, flow velocity, and rainfall.

Road decommissioning and closing off skid trails would reduce the available area of potential illegal dumping of solid and hazardous waste along roadsides. Based on years of on-site monitoring of timber harvest on other similar projects within the District, there would be no short or long-term cumulative impacts due to the release of solid or hazardous waste materials resulting from this project. In the last decade, the BLM has only recorded one hazardous waste spill associated with timber harvest that resulted from a log truck going off the road and leaking a small quantity of diesel fuel adjacent to Moon Creek. These types of events are extraordinary and are not considered to be reasonably foreseeable.

RESOURCES NOT ANALYZED IN DETAIL

Due to the lack of concern expressed by the Scoping respondents, adequacy of existing best-management practices and policy, and the limited intensity or scope of the effects on the affected resource, the items below are excluded from detailed comparative analysis as directed by CEQ regulation §1500.1(b), 1500.2(b) and other sections.

Air Quality

Landing pile burning (if burning is necessary to reduce potential wild land fire intensity) would adhere to the Oregon Smoke Management Plan for limiting effects of particulate emissions. A post harvest assessment of the treatment areas would occur to determine whether landing piles would be burned.

Port-Orford-cedar

The North Soup site is outside the natural range of Port-Orford-Cedar. The Blue Retro site is inside the range of Port-Orford-Cedar. However, no Port-Orford-Cedars are growing on the site. Based on the risk rating table on page 2-18 of the *Management of Port-Orford-cedar in Southwest Oregon Final Supplemental Environmental Impact Statement* (USDA-FS/USDI-BLM 2004a), the Blue Retro portion of the proposed project is considered “low risk” and no Port-Orford-Cedar management practices are required.

Environmental Justice

The proposed areas of activity in connection with the project are not known to be used by, or disproportionately used by minority or low-income populations for specific cultural activities at greater rates than the general population. This includes their relative geographic location and cultural, religious, employment, subsistence, or recreational activities that may bring them to the proposed areas. Thus, BLM concludes that no disproportionately high or adverse human health or environmental effects will occur to Native Americans, and minority or low-income populations as a result of the proposed actions.

UNAFFECTED RESOURCES

None of the following critical elements of the human environment are located within the project area or within a distance to be affected by implementation of either alternative:

- Areas of Critical Environmental Concern
- Farmlands, Prime or Unique
- Flood Plains (as described in Executive Order 11988)
- Wild and Scenic Rivers
- Wilderness values

CHAPTER IV.: List of Agencies and Individuals Contacted

The public was notified of the planned EA through the publication of Coos Bay District's semi-annual Planning Update.

Public agencies and interested parties were notified with e-mail scoping letters as part of the Coos Bay District office’s Web Update process.

The following public agencies and interested parties were notified with hard copy scoping letters:

American Forest Resource Council
Association of O&C Counties
Cascadia Wildlands Project
Confederated Tribes of the Grande Ronde
Coos County Board of Commissioners
Coquille Indian Tribe
Douglas County Board of Commissioners
Douglas Timber Operators
Hugh Kern
Klamath-Siskiyou Wildland Center
NOAA National Marine Fisheries Service
Oregon Department of Fish and Wildlife
Oregon Department of Forestry
Oregon Department of Forestry – Sudden Oak Death
Oregon Division of State Lands
Oregon Wild
Rogue Forest Protective Association
Umpqua Watersheds Inc.

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APPENDIX FOR
NORTH SOUP AND BLUE RETRO DENSITY MANAGEMENT STUDY
ENVIRONMENTAL ASSESSMENT
EA: OR125-08-01

APPENDIX A.: INSTRUCTIONS, MEMORANDUMS, AND CORRESPONDENCE

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
Oregon State Office
P.O. Box 2965 (1300 N.E. 44th Ave.)
Portland, Oregon 97208

In Reply Refer to:
5700 (931.6)

June 25, 1993

Instruction Memorandum No. OR—93—145
Expires 9/30/94

To: DMs: Coos Bay, Eugene, Lakeview, Medford, Roseburg, and Salem

From: State Director

Subject: Silviculture System Experiments - Co-op Unit Project

The Bureau of Land Management is implementing studies of silvicultural systems that will produce old-growth characteristics on selected land uses as quickly as possible. These plans are part of the adaptive management found in the Resource Management Plans. As part of the studies, each District will potentially provide one or more areas in which to carry out these experiments.

Initial installations are to serve as demonstrations and trials for BLM resource specialists and for our publics in order to learn and demonstrate our ability to implement this type of stand management, and to verify that they are an adequate means of attaining the desired objectives of ecosystem-based management.

Attached is a study plan for an experiment in density management of forest stands. This will be a cooperative effort coordinated jointly by the Oregon State Office and the Co-op Unit. Projects will be initiated on a province basis (Cascade, Coastal, and Klamath) with cross-District planning/ implementation teams. We are asking each District to select representatives for determining potential locations and for the coordination of these studies.

The first study area is projected for the Cascade Province, and we plan to coordinate with the U.S. Forest Service to sample stands across the province. Implementation of study projects is expected to occur in the fall of 1993. Similar studies are planned for "adaptive areas" in the Coastal and Klamath

Provinces later in FY 1994.

We realize there are many issues involved in the location of the study sites in the Cascade Province and hope to begin planning the process now, so that units can be located and implemented in early FY 1994.

The Salem, Eugene, Roseburg, and Medford Districts should each designate a wildlife biologist and a silviculturist to attend a meeting to discuss the Cascade Province project. The meeting is scheduled for July 21, 1993, at 9:00 a.m. in the Willamette Room of the Eugene District Office. Please give the names of your district's representatives to Larry Larsen (OR-931.6) at (503) 280-7080.

A research ecologist from the Co-op Unit will be available to help plan the integration of studies and to locate study sites.

/s/ Elaine Y. Zielinski

Elaine Y. Zielinski
Deputy State Director for
Lands and Renewable Resources

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
Oregon State Office
P.O. Box 2965 (1300 N.E. 44th Ave.)
Portland, Oregon 97208

March 29, 1994

In Reply Refer to:
5600 (936)(931.6)

Information Bulletin No. OR-94- 317

To: District Managers: Coos Bay, Eugene, Lakeview, Medford, Roseburg, and Salem

From: State Director

Subject: Density Management Study - National Biological Survey/BLM Project

As of November 14, 1993, our Cooperative Research Unit based at Oregon State University in Corvallis was absorbed into the National Biological Survey (NBS). Most of the personnel who formerly worked for OR-936 now work for the NBS. This change will not affect the status of existing cooperative agreements, including the Density Management Study now in progress.

The Density Management Study was formerly known as the "Silvicultural Systems Experiment." This study provides us with the opportunity to test the use of alternative silvicultural systems to accelerate the development of old-growth characteristics in young forest stands. Procedures for monitoring the response of botanical, wildlife, and riparian resources to the various silvicultural treatments will be tested; thereby providing a basis for adaptive management. Similar studies have been started in other parts of the Pacific Northwest.

The study is being initiated in the Cascades Province because its forest management picture is less complex than that of either the Coast Range or Klamath Province. Site selection for the first blocks of treatment replications in even-aged, 50-year-old stands is nearly complete. Two 200-acre study blocks will be the primary focus for FY 1994 - one each in the Salem and Eugene Districts.

We will also begin the process of expanding the study to the rest of the westside Districts. NBS personnel will look along the Coos Bay/Roseburg District boundary for a suitable group of study sites. Both Districts will have a study block identified, and these two sites will be the initial focus for the study in the Coast Range Province. A list of site selection criteria for the Coast Range Province is attached.

OSO and NBS personnel would like to screen each District's timber sale plan for possible study sites. They will work with the District Silviculturist to get the necessary information. Potential study sites may be at a point in the timber sale planning process where it is not too late to select them for the study. This would not necessarily delay implementation of a given sale.

Study blocks will be replicated across the landscape in groups of three or more, providing as much overlap and replication among Districts or Resource Areas (RAs) as possible. The study design for the first group of Cascades Province installations is being developed, and the same design is projected for use in the Coast Range Province. The design will be modified as needed as the study is expanded to include older stands, other plant associations or habitat types, and as we move into other Land Use Allocations such as Late Successional Reserves or Adaptive Management Areas.

Both the study design and the timeline for implementation will need to be different for the Klamath Province, and Medford District is preparing a study proposal.

Each RA containing a project area selected for the study will need to identify a silviculture forester to work with NBS personnel as needed. These people do not need to be formally designated until that time.

Before these sales are harvested, permanent understory vegetation monitoring plots will be installed by NBS personnel. These plots will be remeasured by RA personnel in each of the first five years following treatment, and every five years thereafter. Our regular stand exam will be used to track the development of the overstory vegetation, and the RAs will do this in years 1 and 5 following treatment, and every five years thereafter. The planting of seedlings to create another canopy layer will be a standard practice, and this will also be the responsibility of the RAs. Each RA with a project area will require about 4 workmonths of work in years 1 and 5 following treatment, with 2 workmonths being needed in years 2-4.

NBS personnel will soon begin working with the appropriate people to identify potential study blocks along the Coos Bay/Roseburg boundary. At the same time, layout of the Salem and Eugene blocks is beginning; with marking of these two blocks planned for this summer. NBS personnel will assist in the actual marking of these sales.

The OSO will coordinate the rate of development of this study so that a positive momentum is maintained. NBS personnel intend to accommodate as many RAs with prospective density management sales-as time and logistics allow, but they can only handle a few project areas in this early phase of implementation. Limiting the number of project areas will help assure a credible and high-quality product.

Management recognizes that research projects such as this study represent an important opportunity to demonstrate to managers, resource specialists, and our various interested publics that we can implement ecosystem-based stand management objectives as described in our various draft District RMPs and the Forest Plan. Your continued cooperation is appreciated.

Please direct any questions/comments/feedback to Charley Thompson at 280-7076 in Portland or John Tappeiner at 750-7359 in Corvallis.

/s/ Terry Nichols
Acting Associate Director

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Oregon State Office
P.O. Box 2965
Portland, Oregon 97208

TAKE PRIDE IN AMERICA

In Reply Refer to:
5610 (OR-933) P

August 12, 2005

EMS TRANSMISSION 8/16/2005
Instruction Memorandum No. OR-2005-083
Expires: 9/30/2006

To: District Managers: Coos Bay, Eugene, Roseburg, Salem
From: State Director, Oregon/Washington
Subject: Density Management Studies

Purpose: This Instruction Memorandum provides direction for the next phase of the Density Management and Riparian Buffer Study (DMS).

Policy/Action: To begin out-year planning to implement the next phase of the DMS according to the revised DMS Study Plan. The DMS Site Coordinator for each site should work with the local field manager and employees responsible for the necessary contract work to ensure that this schedule can be met and to resolve difficulties. The DMS Study Coordinator should be kept informed and involved as necessary to help keep necessary actions on schedule.

Timeframe: The schedule for on-the-ground treatment implementation is as follows:

Site Name	District	Implementation Year	Site Coordinator
Bottomline	Eugene	2009	Peter O'Toole/Shami Premdas
OM Hubbard	Roseburg	2009	Craig Kintop
Keel Mountain	Salem	2009	Charley Thompson
Sand Creek	Salem	2009	Hugh Snook
Callahan Creek	Salem	2009	Hugh Snook
North Soup	Coos Bay	2010	Frank Price
Little Wolf	Roseburg	2010	Craig Kintop
Blue Retro	Coos Bay	2010	Frank Price
Green Peak	Salem	2011	Hugh Snook
Ten High	Eugene	2011	Peter O'Toole/Shami Premdas
Delph Creek	Salem	2011	Charley Thompson
Perkins Creek	Eugene	2011	Peter O'Toole/Shami Premdas

NOTE: Implementation year means the year that the activity happens on the ground. Every effort should be made to ensure the DMS units are treated in the one-year window assigned above.

Budget Impact: Funding to support contract development and implementation for the next round of treatments will come out of normal operating budgets, and achievements will contribute to normal accomplishment reporting. The Study Coordinator and other individuals in the State Office are evaluating the feasibility of funding post-treatment monitoring through contract receipts, either through stewardship contracting and/or use of the 5900 forest health funds. Additional funding of post-treatment monitoring may be needed and will be funded out of 6320, 6334, and/or 6310 subactivities, as has been the case for the last 10 years. Total funding needs for post-treatment monitoring will range from $100,000 to $300,000 annually depending on scheduling and partner funding contributions. Partner contributions have exceeded Bureau of Land Management (BLM) study funding to date.

Background: Initial direction to implement the DMS was provided through two State Office directives (Instruction Memorandum OR-93-145, Information Bulletin OR-94-317) over ten years ago. Since then, treatments implementing the study have been completed, over a thousand plots have been established, measurements for a wide variety of responses have been conducted, initial results have been reported, and a wide range of outreach and education activities have been conducted on DMS sites or with DMS information. Several manuscripts officially reporting five-year post-treatment results are scheduled for publication within the year. A strong partnership among Pacific Northwest Research Station, Oregon State University, US Geological Survey, and the BLM has supported these accomplishments.

An extensive effort was made over the past year to develop a revised DMS Study Plan (Cissel et al. in review) to address key information needs of the BLM. Proposal development steps included:

- DMS scientists and site coordinators developed initial ideas for the revised study plan and reviewed proposals in the field
- Revised study plan was reviewed and discussed with a wide range of field practitioners and managers at the DMS Workshop and Field Trips in June, 2004
- The DMS Study Coordinator reviewed the proposal with affected field managers
- Revised study plan proposal was distributed to westside field units for review
- Revised proposal was reviewed and approved by the interagency DMS Steering Committee (includes BLM district manager and branch chief)

The BLM State Office leadership and Pacific Northwest Research Station Leadership Team were briefed and concurred on study plans and direction.

Manual/Handbook Sections Affected: None

Coordination: Development of these instructions was coordinated with District Management, DMS Coordinators, and OR-930 Management and staff.

Contact: Contact the DMS Study Coordinator John Cissel, at (541) 683-6410 with questions, or for a copy of the revised study plan.

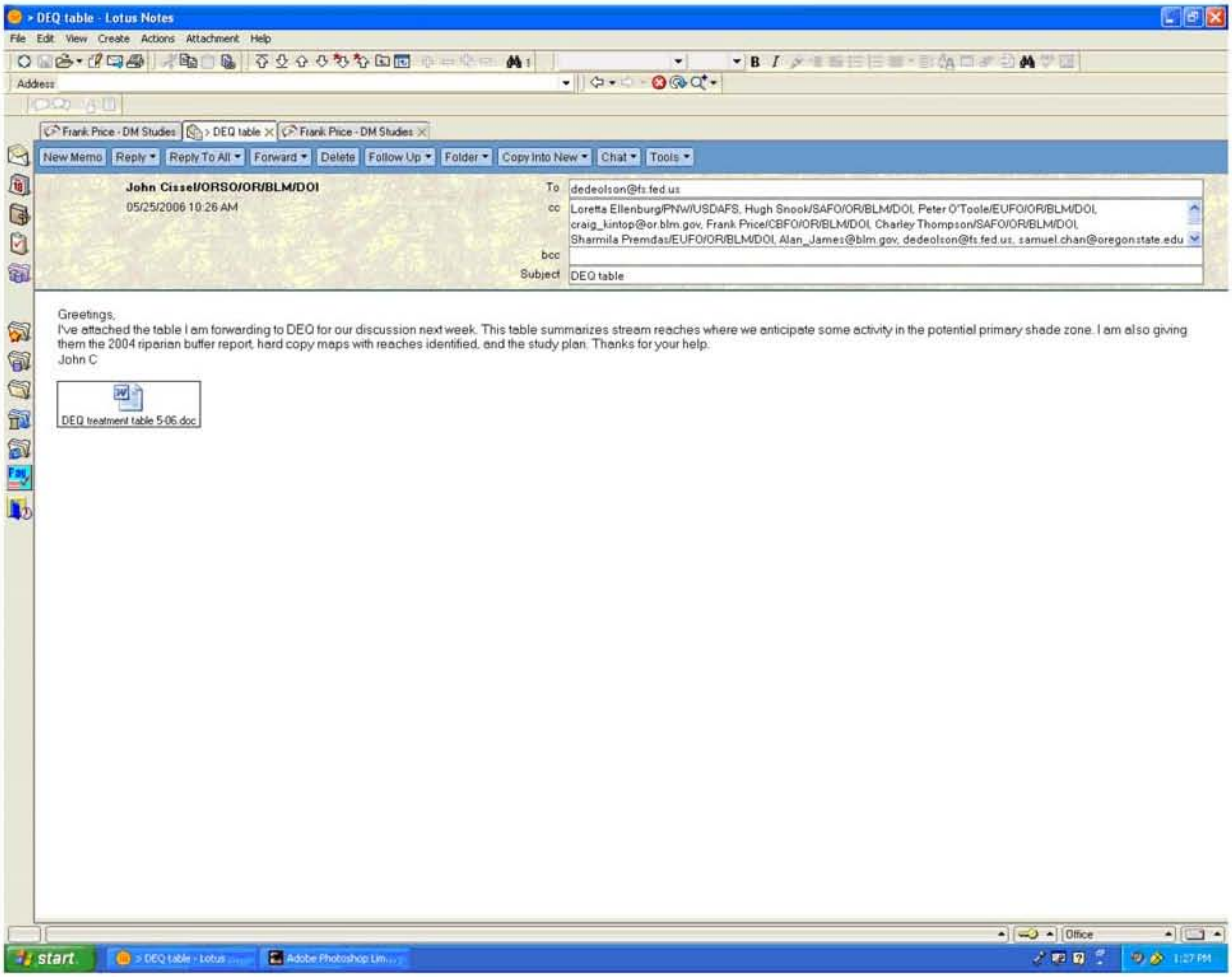
Districts with Unions are reminded to notify their unions of this Instruction Memorandum and satisfy any bargaining obligations before implementation. Your servicing Human Resources Office or Labor Relations Specialist can provide you assistance in this matter.

Signed by

Kathy Eaton
Acting Associate Director

Authenticated by

Mary O'Leary
Management Assistant



John Cissel/ORSO/OR/BLM/DOI
05/25/2006 10:26 AM

To: dedeolson@fs.fed.us
cc: Loretta Ellenburg/PNW/USDAFS, Hugh Snook/SAFO/OR/BLM/DOI, Peter O'Toole/EUFO/OR/BLM/DOI, craig_kintop@or.blm.gov, Frank Price/CBFO/OR/BLM/DOI, Charley Thompson/SAFO/OR/BLM/DOI, Sharmila Premdas/EUFO/OR/BLM/DOI, Alan_James@blm.gov, dedeolson@fs.fed.us, samuel.chan@oregonstate.edu
bcc:
Subject: DEQ table

Greetings,
I've attached the table I am forwarding to DEQ for our discussion next week. This table summarizes stream reaches where we anticipate some activity in the potential primary shade zone. I am also giving them the 2004 riparian buffer report, hard copy maps with reaches identified, and the study plan. Thanks for your help.
John C

DEQ treatment table 5-06.doc

E-Mail & Attachment planned treatments within the potential primary shade zone 05/25/2006 page 1 of 3

E-mail message and attachment listing stream reaches where we anticipate some activity in the primary shade zone when implementing the second phase of the Density Management Study. The document "Olson 2004, attached" referred to below was not attached to the 05/25/2006 10:26 AM message from John Cissel.

John Cissel/ORSO/OR/BLM/DOI

05/25/2006 10:26 AM

To
dedeolson@fs.fed.us
cc
Loretta Ellenburg/PNW/USDAFS, Hugh Snook/SAFO/OR/BLM/DOI, Peter O'Toole/EUFO/OR/BLM/DOI, craig_kintop@or.blm.gov, Frank Price/CBFO/OR/BLM/DOI, Charley Thompson/SAFO/OR/BLM/DOI, Sharmila Premdas/EUFO/OR/BLM/DOI, Alan_James@blm.gov, dedeolson@fs.fed.us, samuel.chan@oregonstate.edu, Klaus.Puettmann@oregonstate.edu, moldenka@bcc.orst.edu, pdanderson@fs.fed.us, Robert A Progar/PNW/USDAFS, shanti.berryman@oregonstate.edu, sperakis@usgs.gov
bcc

Subject
DEQ table

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Thanks for your help.
John C

DEQ treatment table 5-06.doc

BLM Density Management and Riparian Buffer Study

Summary of planned treatments within the potential primary shade zone

May 25, 2006

The following table lists the approximate reach length and other characteristics of streams where BLM Density Management and Riparian Buffer Study (DMS) treatments are planned within the potential primary shade zone. These stream reaches occur within the Moderate Density and High Density treatments (see DMS Study Plan) on seven sites on BLM lands in western Oregon (see attached study site locator map). Three different riparian buffer/treatment combinations occur as follows:

1) Streamside retention, where thinning from 80 TPA to 35 TPA is planned upslope of an ~20 ft stream buffer
2) Thin-through variable-width buffer, where thinning from ~250 TPA to 65 TPA is planned within existing variable-width buffers (minimum 50 ft width, may be larger)
3) Thin-through two site-potential tree heights buffer, where thinning from ~250 TPA to 65 TPA is planned within existing two-tree buffers

Reach numbers are given on attached hard-copy maps and are the same as those listed in the DMS Riparian Buffer Study report to site coordinators (Olson 2004, attached). Reach length and fish presence were determined from field surveys, except for those reaches identified with a letter. Values were estimated for these reaches.

Site	Upslope Treatment	Buffer Treatment	Reach #	Reach Length (ft)	Fish Presence
Callahan Creek	Moderate	3	61	1122	y
	Moderate	1	64	1412	n
	Moderate	1	65	980	y
	Moderate	1	69	450	n
Delph Creek	Moderate	1	94	1780	n
	Moderate	1	a	1800	n
Green Peak	Moderate	1	144	1348	n
Keel Mountain	Moderate	1	58	1360	n
	Moderate	3	48	1034	y
	High	2	40	1278	y
	High	2	53	517	n
	High	2	54	436	n
	High	2	c	1200	n
	High	1	d	1300	?y
North Soup	Moderate	1	87	821	y
Perkins Creek	Moderate	1	100	2612	n
	Moderate	1	102	1266	n
Ten High	Moderate	1	125	997	n
	Moderate	1	127	971	n

5600/7240 (OR-932/933)

September 8, 2006

Stephanie Hallock, Director
Oregon Department of Environmental Quality
811 S.W. Sixth Avenue
Portland, OR 97204

Dear Ms. Hallock:

Subject: Bureau of Land Management Density Management and Riparian Buffer Study Effectiveness Monitoring

The purpose of this letter is to recognize the contribution of the Bureau of Land Management's (BLM) Density Management Study towards increasing our understanding of the effects of an active management role in the attainment of Riparian Reserve restoration objectives, and to emphasize BLM's commitment to continue working with the State of Oregon Department of Environmental Quality (DEQ) regarding the assumptions and technical basis for Temperature Total Maximum Daily Load (TMDL) implementation strategies.

Since 2000, there have been a number of regulatory changes relating to water quality compliance and implementation of the Clean Water Act. The DEQ has been evaluating stream temperature and validating models being used to develop and implement TMDLs throughout Oregon. The BLM, DEQ, and the Forest Service have developed in partnership the Northwest Forest Plan Temperature TMDL Implementation Strategy (September 2005) which provides tools and a strategy for addressing waters listed specifically for temperature impairment. This DEQ conditionally approved strategy addresses the concepts of managing Riparian Reserves, as defined in the Northwest Forest Plan, for the long-term protection and restoration of water quality. While recognizing the benefit of passive restoration, the strategy also recognizes that active management of Riparian Reserves can contribute to attainment of restoration objectives. The DEQ's conditional approval facilitated testing a number of the assumptions upon which the strategy is based. The Rogue River-Siskiyou National Forest has been analyzing several assumptions of the "Shadow" model that DEQ has used to develop Temperature TMDLs and the model upon which the BLM and Forest Service strategy is based. The Density Management Study affords an additional opportunity to evaluate assumptions and provisions of the Temperature TMDL Implementation Strategy.

The first round of Density Management Study treatments was implemented on 12 BLM sites in western Oregon between 1997 and 2000, and a second round of treatments is planned for implementation beginning in 2009. Phase one of the study shed light on the effects of thinning adjacent to riparian buffers of varying width on vegetation and microclimate, and on aquatic habitat, vertebrates, and invertebrates. Phase two will provide another opportunity to analyze the interaction among vegetation, shade, and stream temperature in riparian buffers of varying widths encompassing both the primary and secondary shade zones. The riparian buffer component of the study will evaluate the effects of four alternative buffer widths (e.g., one site-potential tree height buffer averaging 200 ft.; a variable width buffer averaging 75 ft.; a streamside buffer averaging 25 ft.; and a no buffer treatment) adjacent to young stands (50-90 years of age) thinned to varying stocking densities. Response variables being monitored include air temperature, soil and substrate temperature, stream temperature, relative humidity, overstory density (e.g., canopy cover, skylight/shade, and angular canopy density), basal area, and understory and midstory canopy cover.

Important elements of the study design are the range of riparian buffers being monitored (e.g., from one-tree height buffer [200 ft.] to no buffer [0 ft.]) and the diversity of treatments (e.g., thinning) within the primary and secondary shade zones of young stands. Phase one of the Density Management Study reduced tree density adjacent to riparian buffers to 80 trees per acre. Phase two will further reduce densities to 65 trees and 35 trees per acre, depending on the site and treatment, and includes a no-thin control treatment. These treatments provide a range in which to bracket treatment response, and provide important context for conducting sound statistical analysis and interpreting results.

Although the Density Management Study treatments will be applied as actions included in timber sales, the study is focused on the effects of management to develop late-successional habitat on aquatic and riparian ecosystems. Study results will be evaluated from the standpoint of adaptive management and the development of strategies for appropriate treatment of riparian areas given site-specific conditions of vegetation, microclimate, canopy cover, and shade among other parameters.

We understand that DEQ cannot "approve" or "authorize" the actions planned in the Density Management Study, but that DEQ is interested in remaining involved and providing feedback regarding this monitoring and adaptive management process. Thus, we will continue to invite DEQ's participation and review of results from the 2006 and future field seasons, and will solicit DEQ input regarding changes to the monitoring design. In addition, we will continue to work with DEQ to ensure that data produced by the study is used to further refine and improve methods for analyzing stream temperature and the impacts of forest treatment on parameters that affect stream temperature. To facilitate this collaboration, we are requesting that you respond with the name of a technical contact in your agency who can review Density Management Study monitoring results and coordinate with others in DEQ interested in the application of this information.

Please direct technical questions related to study design and implementation and questions concerning DEQ's continued involvement in the monitoring process to John Cissel, Science Coordinator–Westside (541-683-6410). Questions or concerns regarding the relationship of the study to the Temperature TMDL Implementation Strategy should be directed to Rosy Mazaika, State Water Program Lead (503-808-6076).

Sincerely,

James G. Kenna (for)

Elaine M. Brong
State Director

cc:
Rosy Mazaika (OR-932)
John Cissel (OR-933)

Regional Ecosystem Office

333 SW 1st P.O. Box 3623
Portland, Oregon 97208-3623
Website: www.reo.gov E-Mail: REOmail@or.blm.gov
Phone: 503-808-2165 FAX: 503-808-2163

Memorandum

Date: **May 12, 2003**

To: Regional Interagency Executive Committee (See Attached Distribution List)

From: Anne Badgley, Executive Director /s/Anne Badgley

Subject: Assessment and Review of Proposed Research under the Northwest Forest Plan

Purpose: The purpose of this memorandum is to clarify implementation of certain Northwest Forest Plan (NWFP) provisions regarding research assessments and reviews.

Background: In 2001, the Regional Ecosystem Office (REO) received questions from field offices asking whether REO review of new proposed research is required. The REO prepared findings to clarify two aspects of the research questions:

1. Reviews. When is REO review of research required?
2. Assessments. Who assesses new research proposals and what factors should be considered?

This memorandum is based on interagency discussions (which included participation by research agency representatives) and review of NWFP provisions. Key NWFP provisions are attached and referenced below.

Findings: Reviews. The NWFP Standards and Guidelines (S&Gs) distinguish between ongoing and proposed research (S&Gs, pp. C-4, 18, 19 & 38). Project summaries of ongoing research, i.e., current, funded, agency approved research, were to be submitted to REO for review within 180 days after the date the NWFP Record of Decision (ROD) was signed (April 13, 1994). New research, i.e., research proposed after the NWFP was signed, does not require REO, Research and Monitoring Group (RMG), or Regional Interagency Executive Committee (RIEC) review. However, agencies may request REO or RMG assistance in conducting science reviews of new proposed research, particularly where independent, regional-scale, or interagency analysis is indicated. Requests should be submitted through the agency's RIEC executive to the REO Executive Director.

Assessments. The S&Gs (pp. C-4, 18 & 38) require that research be assessed to determine if it is consistent with the objectives of the standards and guidelines. The appropriate land manager is responsible for assessing proposed research and has discretion regarding how to conduct the assessment and documentation process. For example, the assessment and documentation may be completed in conjunction with the NEPA process.

The ROD states that, where appropriate, some research activities may be exempted from the standards and guidelines (ROD, p.15). The S&Gs further provide for this by indicating that some activities not otherwise consistent with the objectives of the standards and guidelines may be appropriate (S&Gs, pp. C-4, 18 & 38), particularly if the activities:

- Will test critical assumptions of these standards and guidelines;
- Will produce results important for habitat development; or
- If the activities represent continuation of long-term research.

The land manager is responsible for identifying any proposed research activities that are inconsistent with the objectives of the standards and guidelines, for assessing whether the activities are appropriate, and for ensuring that appropriate efforts have been made to locate non-conforming activities in land allocations where they will have the least effect upon the objectives of the standards and guidelines. The land manager may then exempt research activities from the standards and guidelines where appropriate. All research activities must meet the requirements of applicable federal laws (ROD, p.15), including the Endangered Species Act, NEPA, etc.

Related Considerations: The REO identified other factors that may be helpful to ensure scientific credibility of proposed research (a basic principle of the NWFP). These factors are not specified in the NWFP, however, land managers may consider them if appropriate during design and assessment of new research proposals, particularly proposals which include activities inconsistent with the objectives of the standards and guidelines. Optional factors that may be appropriate to consider include:

1. The extent to which the proposed research represents credible science. The following questions may be helpful in evaluating whether the proposed research represents credible science:

    - What hypotheses will be tested by the proposed research, and how are they linked to assumptions or uncertainties in the S&Gs?
    - Is the proposed study design adequate to test the stated hypotheses?
    - What are the temporal and spatial zones of inference for the proposed research?
    - Has the proposal been the subject of an independent science review? If so, what are the results?

2. The potential of the research to contribute to scientific knowledge of importance beyond the local area.

3. The potential to modify the research proposal to make it more consistent with the objectives of the standards and guidelines.

4. The extent to which the desired results could be obtained if the research was modified to conform to the standards and guidelines.

This memorandum is intended for use as the basis for responding to future inquiries regarding research assessments and reviews. All RIEC executives are encouraged to distribute this memorandum to appropriate individuals in their agency. If you have comments or need additional information, please contact me at 503-808-2165, or your REO representative.

cc: REO/RMG reps
Ken Denton (FS)
John Cissel (BLM)

1819final.doc/kc

Attachment: NWFP Excerpts Related to Research Assessments and Reviews (2 pp.)

Distribution List for RIEC

Dave Allen, US Fish & Wildlife Service
Dave Wesley, US Fish & Wildlife Service (Alt)
Elaine M. Brong, Bureau of Land Management
Judy Nelson, Bureau of Land Management (Alt)
Jon Jarvis, National Park Service
Jim Shevock, National Park Service (Alt)
Linda Goodman, Forest Service
Lisa Freedman, Forest Service (Alt)
Bob Graham, Natural Resources Conservation Service
Dianne Guidry, Natural Resources Conservation Service (Alt)
Col. Richard W. Hobernicht, U.S. Army Corps of Engineers
Curt Loop, U.S. Army Corps of Engineers (Alt)
Anne Kinsinger, USGS Western Region
Dave Busch, USGS/REO (Alt)
Robert Lohn, National Marine Fisheries Service
Mike Crouse, National Marine Fisheries Service (Alt)
Jennifer Orme-Zavaleta, Western Ecology Division, EPA
Dan McKenzie, Western Ecology Division, EPA (Alt)
Dave Powers, Environmental Protection Agency
Dan Opalski, Environmental Protection Agency (Alt)
Stan M. Speaks, Bureau of Indian Affairs
Alex Whistler, Bureau of Indian Affairs (Alt)
Tom Quigley, Pacific Northwest Station, Forest Service
Cindi West, Pacific Northwest Station, Forest Service (Alt)

California Federal Executives

Kent Connaughton, Forest Service
Kathy Anderson, Forest Service (Alt)
Steve Thompson, U.S. Fish and Wildlife Service
John Engbring, U.S. Fish and Wildlife Service (Alt)
Phil Detrich, U.S. Fish and Wildlife Service (Alt)
Michael Pool, Bureau of Land Management
Paul Roush, Bureau of Land Management (Alt)

NWFP Excerpts Related to Research Assessments and Reviews

This enclosure provides excerpts from the Northwest Forest Plan Record of Decision (ROD) and Standards and Guidelines (S&Gs) which are referenced in the accompanying memorandum on research assessments and reviews.

ROD, p. 15:

"An important component of this decision is the facilitation of research activities to gather information and test hypotheses in a range of environmental conditions. Although research activities are among the primary purposes of adaptive management areas and experimental forests, this decision does not intend to limit research activities to these land allocations. Where appropriate, some research activities may be exempted from the standards and guidelines of this decision. However, every effort should be made to locate non-conforming activities in land allocations where they will have the least adverse effect upon the objectives of the applicable standards and guidelines. All research activities must meet the requirements of applicable federal laws, including the Endangered Species Act."

S&Gs, p. C-4:

"A variety of wildlife and other research activities may be ongoing and proposed in all land allocations. These activities must be assessed to determine if they are consistent with the objectives of these standards and guidelines. Some activities (including those within experimental forests) not otherwise consistent with the objectives may be appropriate, particularly if the activities will test critical assumptions of these standards and guidelines, will produce results important for habitat development, or if the activities represent continuation of long-term research. Every effort should be made to locate non-conforming activities in land allocations where they will have the least adverse effect upon the objectives of these standards and guidelines.

Current, funded, agency-approved research that meets the above criteria, is assumed to continue if analysis ensures that a significant risk to Aquatic Conservation Strategy objectives does not exist. Research Stations and other Forest Service and BLM units will, within 180 days of the signing of the Record of Decision, submit a brief project summary to the Regional Ecosystem Office of ongoing research projects that are potentially inconsistent with other standards and guidelines in this document but are expected to continue under the above research exception. The Regional Ecosystem Office may choose to more formally review specific projects, and may recommend to the Regional Interagency Executive Committee modification, up to and including cancellation, of those projects that have an unacceptable risk [to] the objectives of these standards and guidelines."

S&Gs, pp. C-18,19:

"A variety of wildlife and other research activities may be ongoing and proposed in late-successional habitat. These activities must be assessed to determine if they are consistent with Late-Successional Reserve objectives. Some activities (including those within experimental forests) not otherwise consistent with the objectives may be appropriate, particularly if the activities will test critical assumptions of these standards and guidelines, will produce results important for habitat development, or if the activities represent continuation of long-term research. These activities should only be considered if there are no equivalent opportunities outside Late-Successional Reserves.

Attachment pg. 1 of 2

Current, funded, agency-approved research that meets the above criteria is assumed to continue if analysis ensures that a significant risk to Aquatic Conservation Strategy objectives does not exist. Research Stations and other Forest Service and BLM units will, within 180 days of the signing of the Record of Decision for these standards and guidelines, submit a brief project summary to the Regional Ecosystem Office of ongoing research projects that are potentially inconsistent with other standards and guidelines of this document, but are expected to continue under the above research exception. The Regional Ecosystem Office may choose to more formally review specific projects, and may recommend to the Regional Interagency Executive Committee modification, up to and including cancellation, of those projects having an unacceptable risk to Late-Successional Reserve objectives."

S&Gs, p. C-38:

"**RS-1.** A variety of research activities may be ongoing and proposed in Key Watersheds and Riparian Reserves. These activities must be analyzed to ensure that significant risk to the watershed values does not exist. If significant risk is present and cannot be mitigated, study sites must be relocated. Some activities not otherwise consistent with the objectives may be appropriate, particularly if the activities will test critical assumptions of these standards and guidelines; will produce results important for establishing or accelerating vegetation and structural characteristics for maintaining or restoring aquatic and riparian ecosystems; or the activities represent continuation of long-term research. These activities should be considered only if there are no equivalent opportunities outside of Key Watersheds and Riparian Reserves.

RS-2. Current, funded, agency-approved research, which meets the above criteria, is assumed to continue if analysis ensures that a significant risk to Aquatic Conservation Strategy objectives does not exist. Research Stations and other Forest Service and BLM units will, within 180 days of the signing of the Record of Decision adopting these standards and guidelines, submit a brief project summary to the Regional Ecosystem Office of ongoing research projects that are potentially inconsistent with other standards and guidelines but are expected to continue under the above research exception. The Regional Ecosystem Office may choose to more formally review specific projects, and may recommend to the Regional Interagency Executive Committee modification, up to and including cancellation, of those projects having an unacceptable risk to Key Watersheds and Riparian Reserves. Risk will be considered within the context of the Aquatic Conservation Strategy objectives."

S&Gs, pp. D-7, 8:

"Monitoring and research, with careful experimental design, will be conducted in Adaptive Management Areas. Research in forest ecology and management as well as social, biological, and earth sciences may be conducted. Each Adaptive Management Area will have an interdisciplinary technical advisory panel that will provide advice to managers and the local communities involved with this effort. The technical advisory panels will provide advice and information on the appropriateness of the project.

Direction and review are provided by the Regional Interagency Executive Committee, through the Regional Ecosystem Office. This review will help assure that plans and projects developed for the various Adaptive Management Areas will be both scientifically and ecologically credible. It will assure that new, innovative approaches are used, that the laws and the goals of the plan are met, and that validation monitoring is incorporated."

S&Gs pp. E-17, 18:

"The Research and Monitoring Committee will review and evaluate ongoing research; develop a research plan to address critical natural resource issues; address biological, social, economic, and adaptive management research topics; and develop and review scientifically credible, cost efficient monitoring plans; and facilitate scientific review of proposed changes to the standards and guidelines."

Attachment pg. 2 of 2

APPENDIX B.: PROJECT MARKING GUIDELINES PREPARED BY DR. KLAUS PUETTMANN OSU DEPARTMENT OF FOREST SCIENCE / PRINCIPAL INVESTIGATOR-VEGETATION RESPONSE

FINAL DRAFT
DMS Next Entry Marking Guidelines

July 25, 2006

Intent

These marking guidelines are intended for use by the site coordinators. Site coordinators may need to edit this document for use by markers. These guidelines are intended to provide a clear vision of the desired outcome rather than an absolutely rigid set of rules. Specific methods of implementation will likely vary across sites (e.g., marking color or technique, definition of minor species, degree of existing down wood). Site coordinators are expected to be directly involved in the marking on a daily basis to provide guidance and to translate this vision into marked stands.

Goals

Maintain or increase the diversity of stand structural and compositional conditions through the thinning operation. Specific goals include to:

1. maintain the full range of diameter distribution
2. allow for a range of tree structures, including diverse crown sizes, and damaged or deformed trees
3. increase the proportion of minor species by focus the harvesting activities on the dominant species.

Hierarchy

To meet these goals the following general priorities are to be applied when making marking decisions:

4. Residual trees per acre and down wood target
5. Maintenance of minor species
6. Proportional across diameters to ensure representation of all size classes
7. Maintenance of unique trees - e.g., wolf trees, broken-top trees, forked trees, deep crowns
8. Residual tree spacing

Trees per acre targets

Trees per acre (TPA) targets are determined by adding the requirements from two sources:

1. Desired residual green tree density
   60 TPA - High-density treatment and high-density subtreatment within the variable-density treatment
   30 TPA - Moderate-density treatment and moderate-density subtreatment within the variable-density treatment
   20 TPA - Low-density subtreatment within the variable-density treatment

2. Future snag recruitment
   5 TPA to be left on all treatments

NOTE: Reserved hardwoods do not count towards the TPA targets

Down wood requirement

2 TPA of diameter larger than mean DBH should be marked for felling as part of the timber sale contract

NOTE: Existing Class I and II logs of diameter larger than mean DBH can be counted towards this requirement if there is sufficient material to warrant the effort. Clumps of existing Class I and II logs can contribute to down wood requirements for a larger area not to exceed five acres.

Minor species

- In general, all hardwoods are to be retained. However, dense hardwood patches may be marked for thinning to improve the vigor and longevity of the hardwoods.
- Coniferous species of very low occurrence on a site will be reserved. In addition, coniferous species of low occurrence may be identified for each site to be favored in the marking. The vegetation PI (Klaus Puettmann, OSU) will provide a list of species that occur at very low and low levels for each site prior to marking. Dense patches of minor conifer species may also be marked for thinning to improve their vigor and longevity.
- Leave extra growing space around retained minor species to improve their vigor and longevity.

Proportional marking

Rethinnings

- Marking should be proportional across diameters to foster development of a vertically-complex canopy structure and to ensure a rough representation of each diameter class. Concentrate on removing trees that are in the intermediate and co-dominant crown classes. Take dominants only as necessary to achieve the desired density or to release a desired minor species tree. This should result in a d/D approaching one.
- Reserve all trees less than 9 inches DBH

Initial thinnings

- Areas marked for thinning for the first time (i.e., in portions of designated uncut riparian buffers) should be marked with greater concern for tree stability to avoid the Puettmann effect. Mark 10 TPA for retention in the 9”-15” diameter class; otherwise, mark for a thin-from-below to ensure the largest, most stable trees are retained.

NOTE: The vegetation PI (Klaus Puettmann, OSU) will provide tables and graphs detailing the diameter distribution by species for each site prior to marking.

Unique trees

- Retain sufficient trees of unique structural characteristics (wolf trees, broken-top trees, forked trees, trees with deep crowns) to ensure their representation in the stand.
- Reserve large remnant trees from the previous stand.
- Retain snags where operationally feasible. If it is a large, high-value snag mark nearby trees for retention to protect the snag from logging operations.
- Western hemlock infected with dwarf mistletoe should be marked to cut where there is a choice of another species or a less infected tree.

Residual tree spacing

Spacing distances are provided below as a general reference and are not meant as a strict criterion for marking.

High density treatment

- Current density: 120 TPA (19 ft spacing)
- Desired density after thinning 65 TPA (26 ft spacing)

Moderate density treatment

- Current density: 80 TPA (23 ft spacing)
- Desired density after thinning 35 TPA (35 ft spacing)

Variable density treatment

- High density subtreatment:
  - Current density: 120 TPA (19 ft spacing)
  - Desired density after thinning 65 TPA (26 ft spacing)
- Moderate density subtreatment:
  - Current density: 80 TPA (23 ft spacing)
  - Desired density after thinning 35 TPA (35 ft spacing)
- Low density subtreatment:
  - Current density: 40 TPA (33 ft spacing)
  - Desired density after thinning: 25 TPA (42 ft spacing)

Other guidelines

- Areas around patch cuts (gaps) should be marked using the same criteria as the rest of the stand, i.e., as if the gaps were not there.
- Reserve tree improvement parent trees and bearing trees; they are marked with orange paint.
- Reserve the plot center trees for the thinning plots (also know as the BLM plots)

APPENDIX C.: DIAMETER DISTRIBUTION BY TREATMENT SUPPLIED BY DR. KLAUS PUETTMANN OSU DEPARTMENT OF FOREST SCIENCE / PRINCIPAL INVESTIGATOR-VEGETATION RESPONSE

Diameter distribution by treatment for North Soup

The following pages contain the diameter distributions within each treatment. Summaries are for all live trees with DBH>7 inches and reported using 2-inch diameter classes. Trees with DBH>40 have been lumped into a single bin. Diameter distributions are reported separately by sampling protocol: BLM or OSU. Each section starts with a table displaying trees per acre by diameter class for all treatments. Subsequent pages contain plots of the diameter distribution and a table of relative stem density by species for each treatment. Treatment codes are listed in Table 1.

Table 1: Treatment codes used in tables and charts.

Treatment Code	Definition
CON	Control
MD80	Moderate density 80 tpa
HD120	High density 120 tpa
VD40	Variable density 40 tpa
VD80	Variable density 80 tpa
VD120	Variable density 120 tpa
DEMO20	Demonstration site 20 tpa
DEMO40	Demonstration site 40 tpa
DEMO80	Demonstration site 80 tpa
DEMORIP	Demonstration site for a riparian area
RIPCON	Riparian control, unthinned riparian buffer in treatment areas other than the control
RIP120	Riparian thinned to 120 tpa, outside of the trt area
RT	Rethin, only for rethinning study

Table 2: Trees per acre by diameter class and treatment in North Soup BLM plots.

DBH	CON	HD120	MD80	VD120	VD80	VD40	RIPCON
8	12.0	4.5	1.0	5.1	6.3	3.5	15.0
10	20.4	6.0	3.5	10.3	4.6	1.0	21.0
12	17.2	16.0	4.5	8.6	9.7	0.5	19.0
14	18.0	20.0	10.0	15.4	6.3	2.0	24.0
16	20.4	14.5	11.0	16.6	18.9	7.5	28.0
18	17.2	17.5	13.0	16.6	13.1	11.0	25.0
20	12.4	17.0	14.5	10.8	13.1	6.5	17.0
22	9.6	10.5	11.0	8.6	5.7	8.0	8.0
24	6.8	5.0	6.5	9.1	5.1	2.5	2.0
26	4.4	3.5	3.0	2.9	1.7	0.5	1.0
28	2.8	0.5	0.5	0.0	1.1	1.5	1.0
30	1.2	0.0	0.0	0.6	0.6	0.5	0.0
32	0.8	0.0	0.5	0.0	0.0	0.0	0.0
34	0.4	0.0	0.0	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0	0.0	0.0	0.0
38	0.0	0.0	0.5	0.0	0.0	0.0	0.0
40+	0.4	0.0	0.0	0.0	0.0	0.0	0.0
Total	144.0	115.0	79.5	104.5	86.2	45.0	161.0

Figure 1: North Soup BLM CON plots. Total trees per acre = 144.

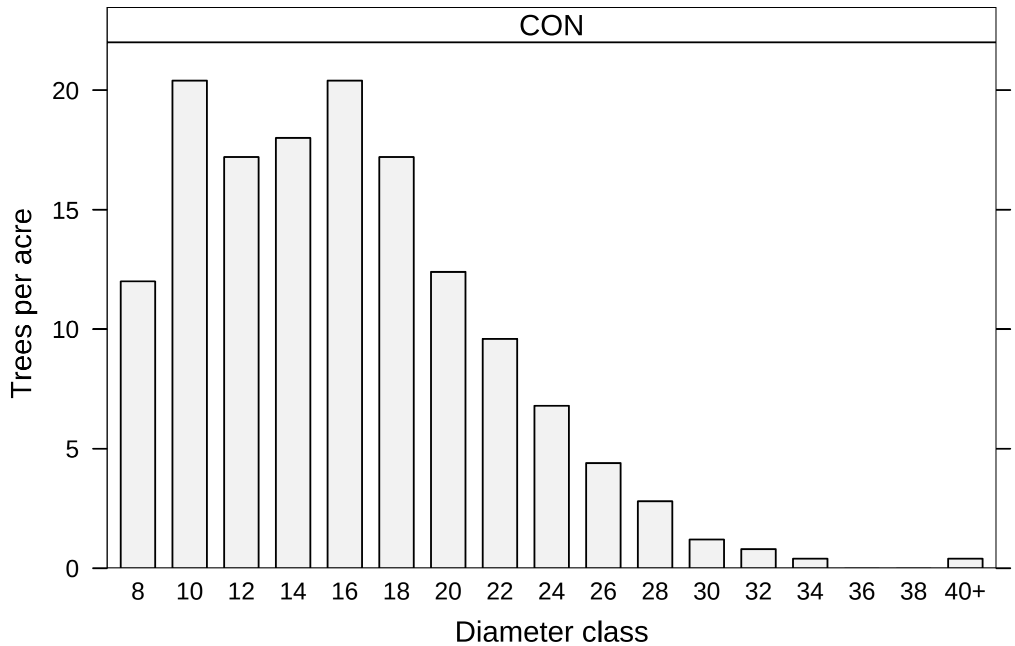

Table 3: Relative abundance of overstory trees in North Soup BLM CON plots.

Species	Percent
Douglas fir	60.1
western hemlock	31.7
red alder	6.2
bigleaf maple	2.0

Figure 2: North Soup BLM HD120 plots. Total trees per acre = 115.

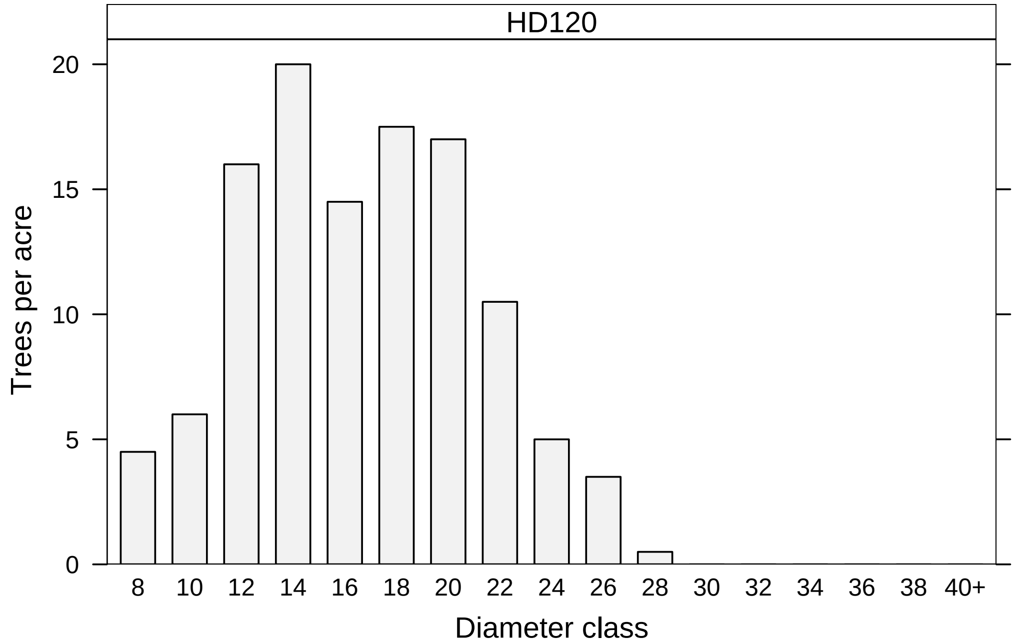

Table 4: Relative abundance of overstory trees in North Soup BLM HD120 plots.

Species	Percent
Douglas fir	82.1
western hemlock	17.4
western red cedar	0.5

Figure 3: North Soup BLM MD80 plots. Total trees per acre = 80.

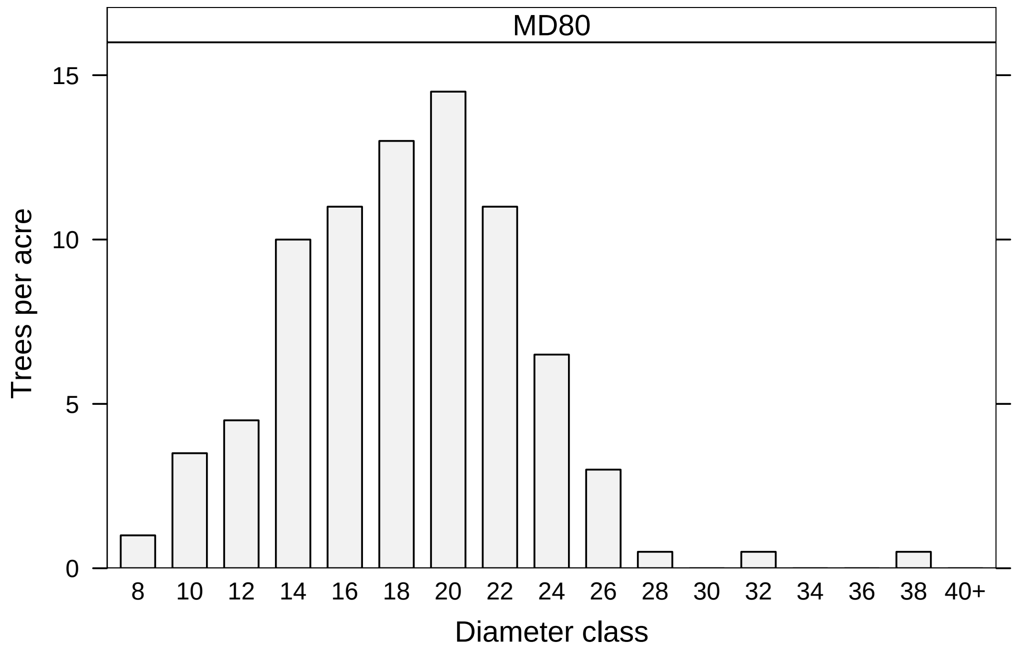

Table 5: Relative abundance of overstory trees in North Soup BLM MD80 plots.

Species	Percent
Douglas fir	83.9
western hemlock	12.9
bigleaf maple	2.6
grand fir	0.6

Figure 4: North Soup BLM VD120 plots. Total trees per acre = 105.

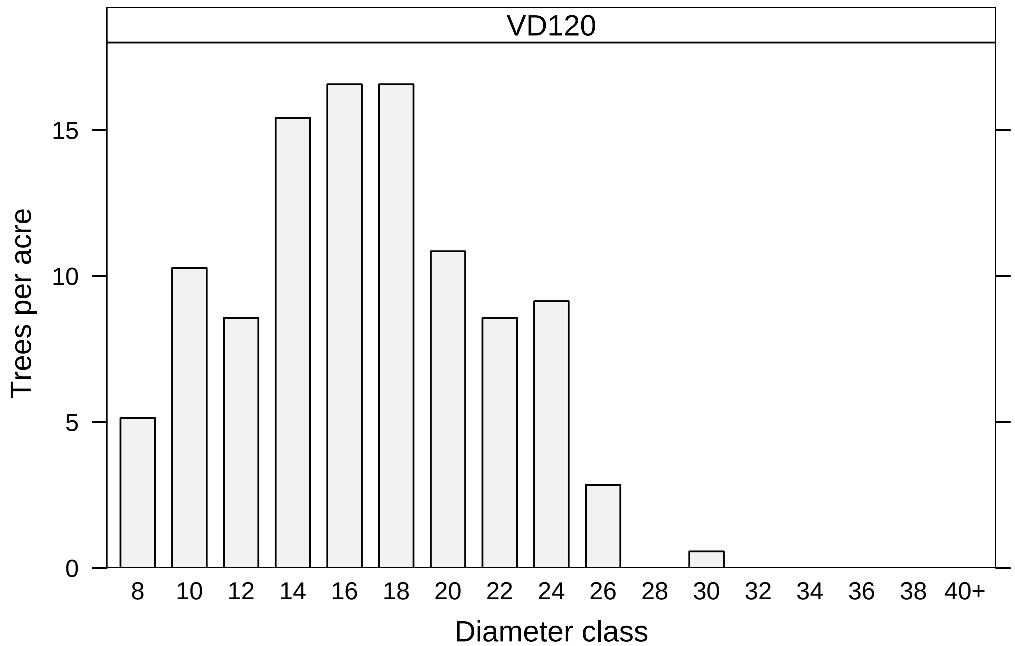

Table 6: Relative abundance of overstory trees in North Soup BLM VD120 plots.

Species	Percent
Douglas fir	87.1
western hemlock	7.7
red alder	2.9
bigleaf maple	2.3

Figure 5: North Soup BLM VD80 plots. Total trees per acre = 86.

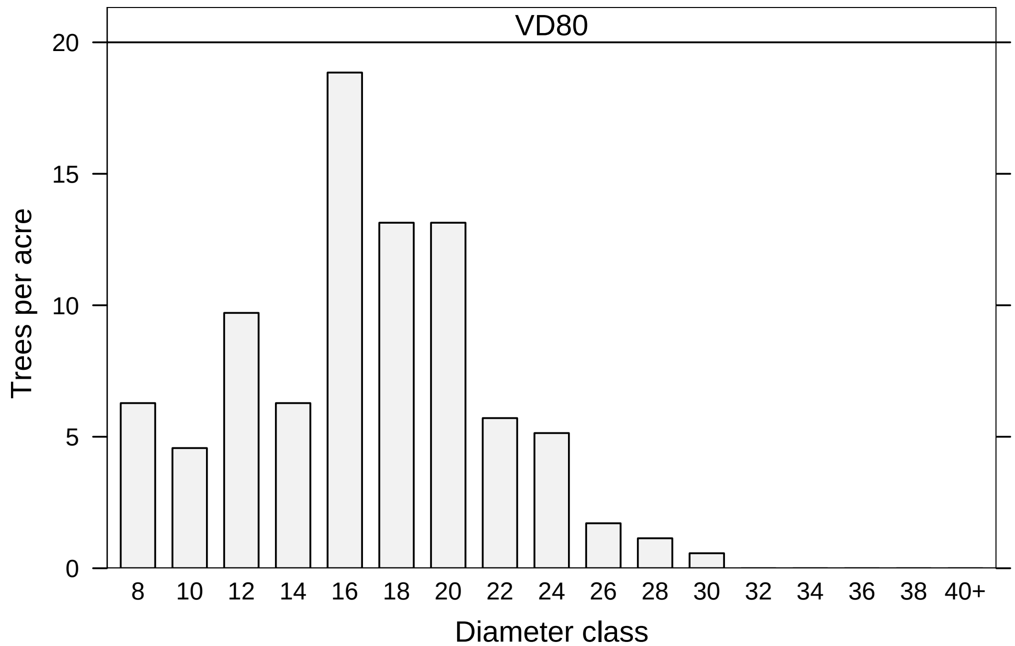

Table 7: Relative abundance of overstory trees in North Soup BLM VD80 plots.

Species	Percent
Douglas fir	87.5
western hemlock	5.7
bigleaf maple	5.0
red alder	1.9

Figure 6: North Soup BLM VD40 plots. Total trees per acre = 45.

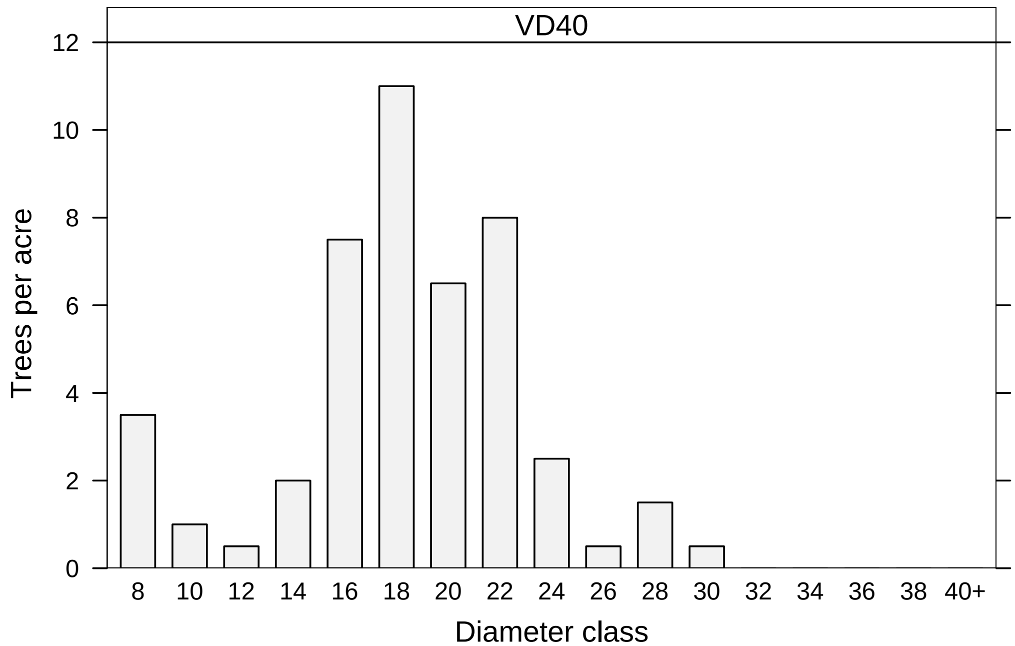

Table 8: Relative abundance of overstory trees in North Soup BLM VD40 plots.

Species	Percent
Douglas fir	88.1
bigleaf maple	7.9
western hemlock	3.9

Figure 7: North Soup BLM RIPCON plots. Total trees per acre = 161.

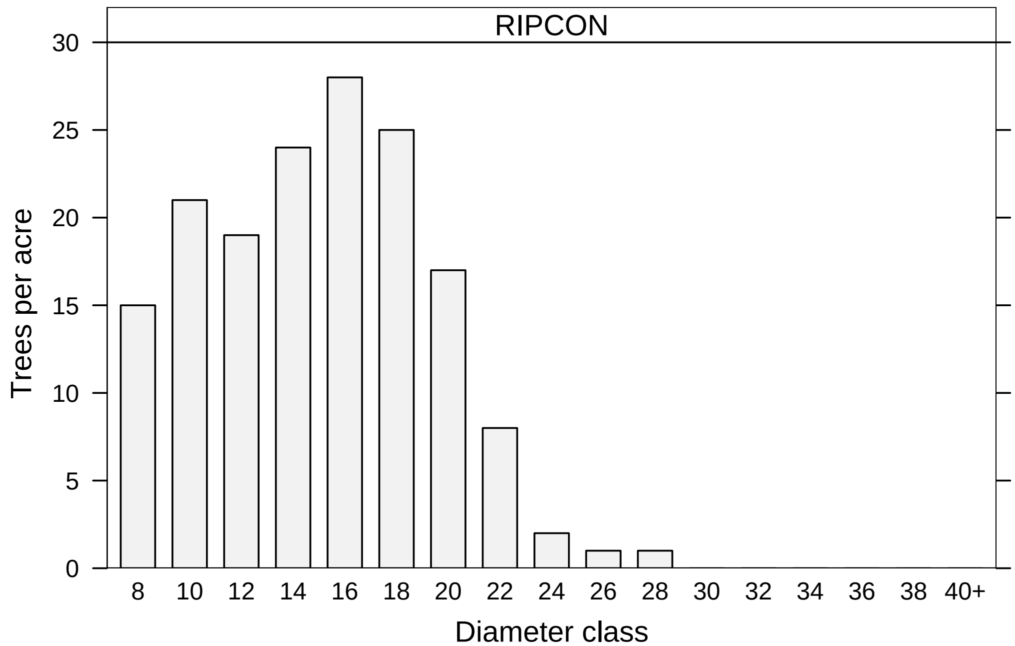

Table 9: Relative abundance of overstory trees in North Soup BLM RIPCON plots.

Species	Percent
Douglas fir	88.2
bigleaf maple	8.3
red alder	2.8
western hemlock	0.7

Table 10: Trees per acre by diameter class and treatment in North Soup OSU plots.

DBH	CON	HD120	MD80	VD120	VD80	VD40	VDGAP
8	12.8	9.5	13.1	12.7	6.5	4.0	8.0
10	18.0	8.8	11.2	10.9	8.5	2.0	0.0
12	17.1	11.2	10.3	13.4	3.5	0.0	2.0
14	16.6	14.8	10.7	14.5	8.0	2.0	6.0
16	20.6	13.3	11.6	9.8	6.5	8.0	0.0
18	14.8	13.9	12.2	14.2	9.0	18.0	2.0
20	12.3	10.8	8.9	10.2	7.0	10.0	2.0
22	8.0	8.4	7.4	7.6	4.5	8.0	0.0
24	6.8	5.3	3.8	4.7	3.0	2.0	0.0
26	4.8	2.9	1.9	1.1	1.0	0.0	0.0
28	1.7	2.1	1.1	0.4	0.0	0.0	0.0
30	1.1	0.2	0.6	0.7	0.0	0.0	0.0
32	1.4	0.4	0.0	0.0	0.0	0.0	0.0
34	0.6	0.0	0.0	0.0	0.0	0.0	0.0
36	0.6	0.2	0.0	0.0	0.0	0.0	0.0
38	0.6	0.6	0.0	0.0	0.0	0.0	0.0
40+	0.8	0.6	0.0	0.4	0.0	0.0	0.0
Total	138.8	103.0	92.9	100.7	57.5	54.0	20.0

Figure 8: North Soup OSU CON plots. Total trees per acre = 139.

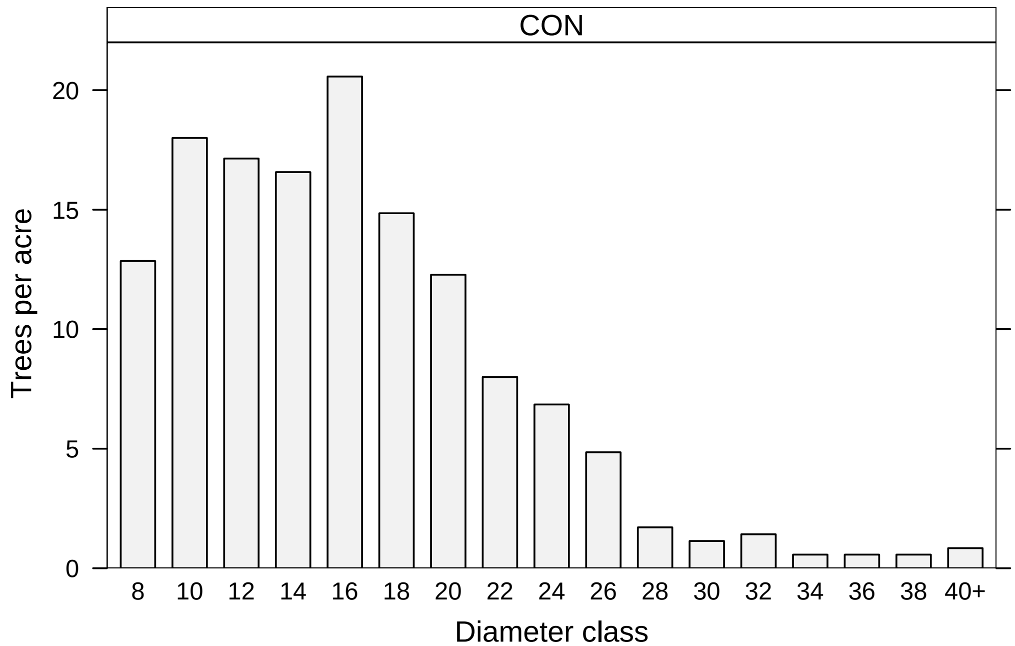

Table 11: Relative abundance of overstory trees in North Soup OSU CON plots.

Species	Percent
Douglas fir	61.2
western hemlock	23.6
red alder	8.3
bigleaf maple	6.3
giant chinquapin	0.3

Figure 9: North Soup OSU HD120 plots. Total trees per acre = 103.

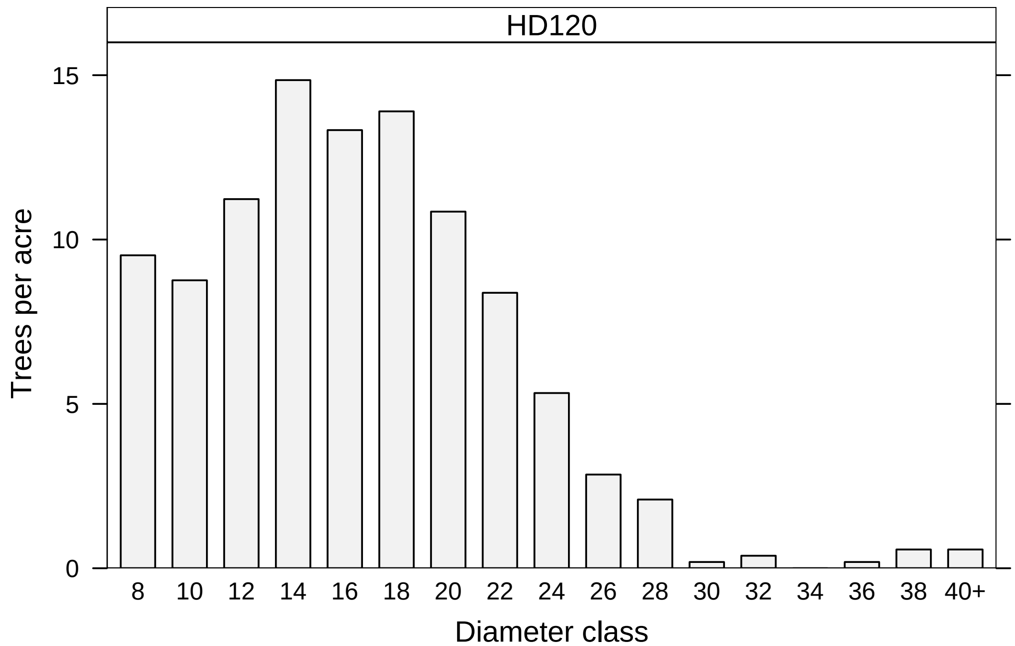

Table 12: Relative abundance of overstory trees in North Soup OSU HD120 plots.

Species	Percent
Douglas fir	69.6
western hemlock	20.8
red alder	5.0
bigleaf maple	3.5
bitter cherry	0.3
Pursh's buckthorn	0.3
western red cedar	0.3

Figure 10: North Soup OSU MD80 plots. Total trees per acre = 93.

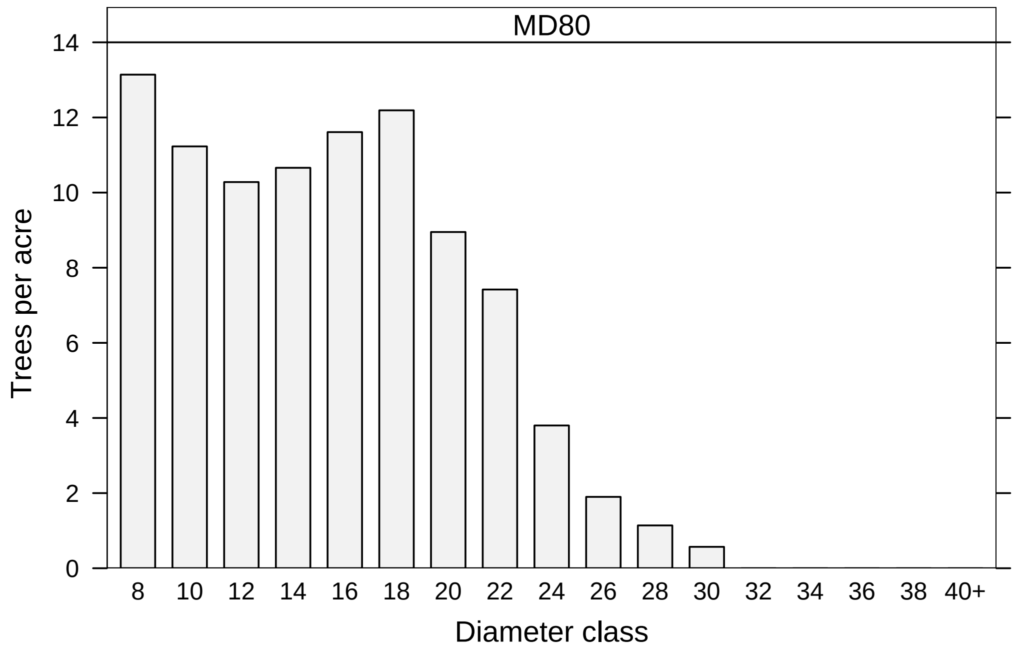

Table 13: Relative abundance of overstory trees in North Soup OSU MD80 plots.

Species	Percent
Douglas fir	73.5
red alder	8.8
western hemlock	7.6
bigleaf maple	4.3
western red cedar	0.6
bitter cherry	0.3
California laurel	0.2

Figure 11: North Soup OSU VD120 plots. Total trees per acre = 101.

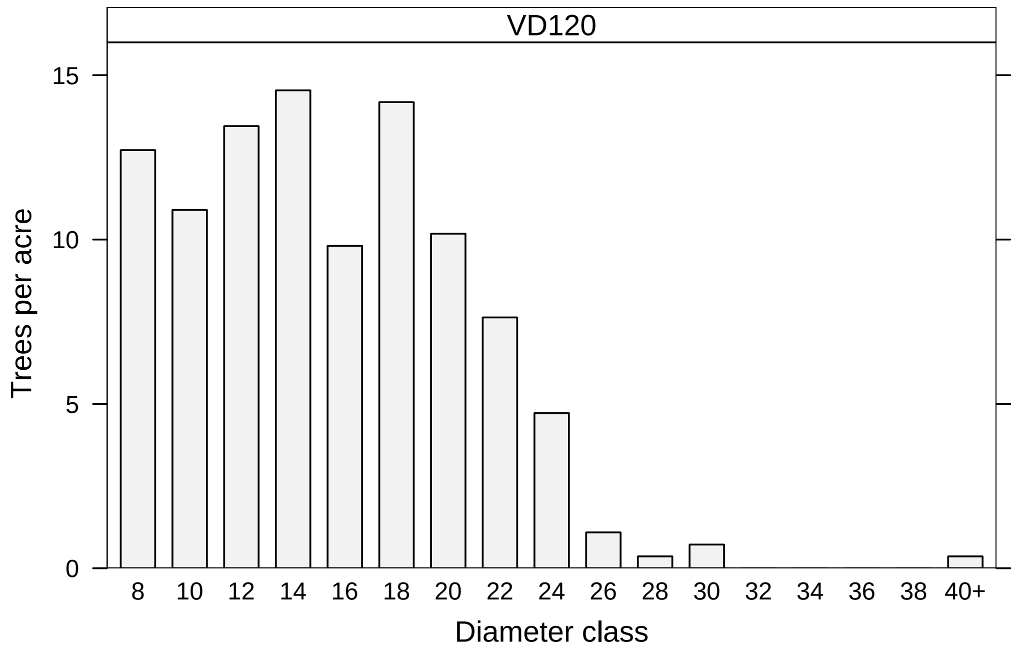

Table 14: Relative abundance of overstory trees in North Soup OSU VD120 plots.

Species	Percent
Douglas fir	80.4
bigleaf maple	11.5
western hemlock	4.8
red alder	2.3
California laurel	0.4
bitter cherry	0.2
giant chinquapin	0.2
Pacific dogwood	0.2

Figure 12: North Soup OSU VD80 plots. Total trees per acre = 58.

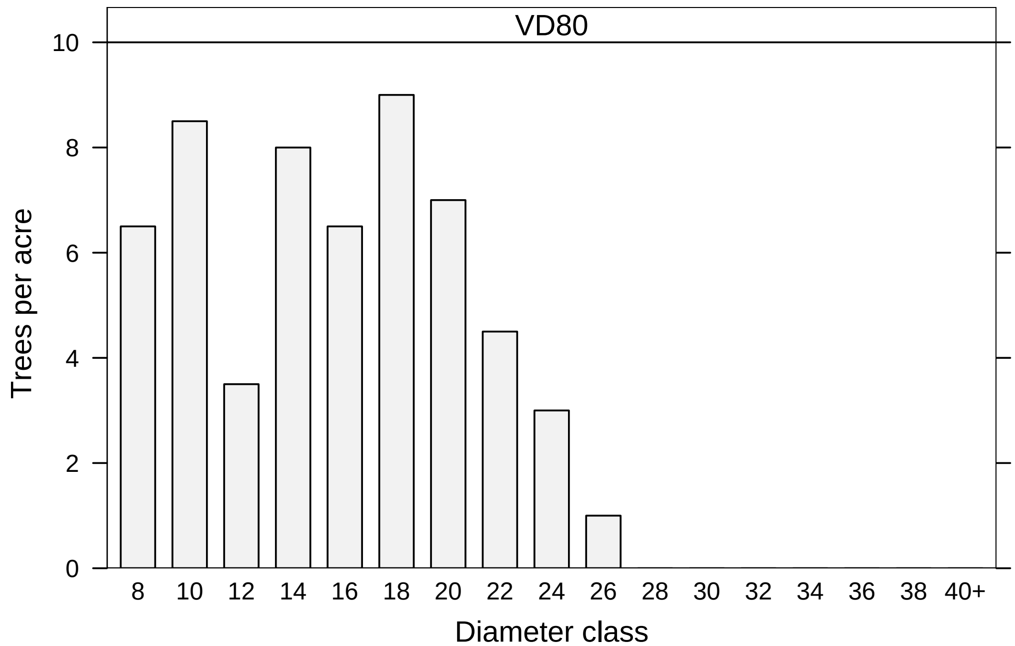

Table 15: Relative abundance of overstory trees in North Soup OSU VD80 plots.

Species	Percent
Douglas fir	62.5
bigleaf maple	6.0
giant chinquapin	3.8
red alder	1.1
California laurel	1.0
bitter cherry	0.5

Figure 13: North Soup OSU VD40 plots. Total trees per acre = 54.

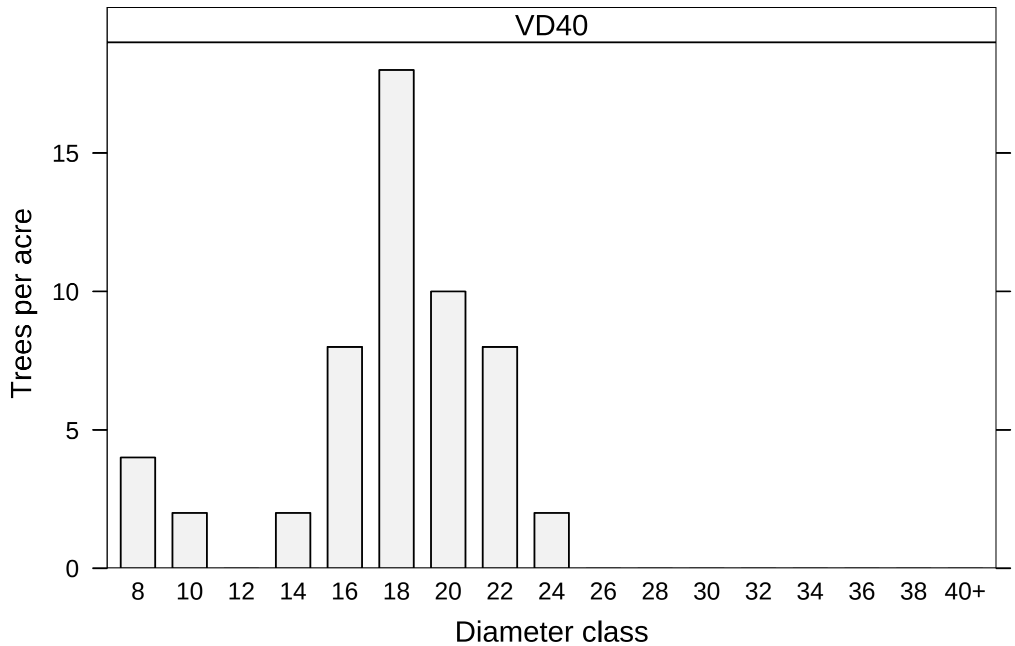

Table 16: Relative abundance of overstory trees in North Soup OSU VD40 plots.

Species	Percent
Douglas fir	91.2
western hemlock	8.8

Figure 14: North Soup OSU VDGAP plots. Total trees per acre = 20.

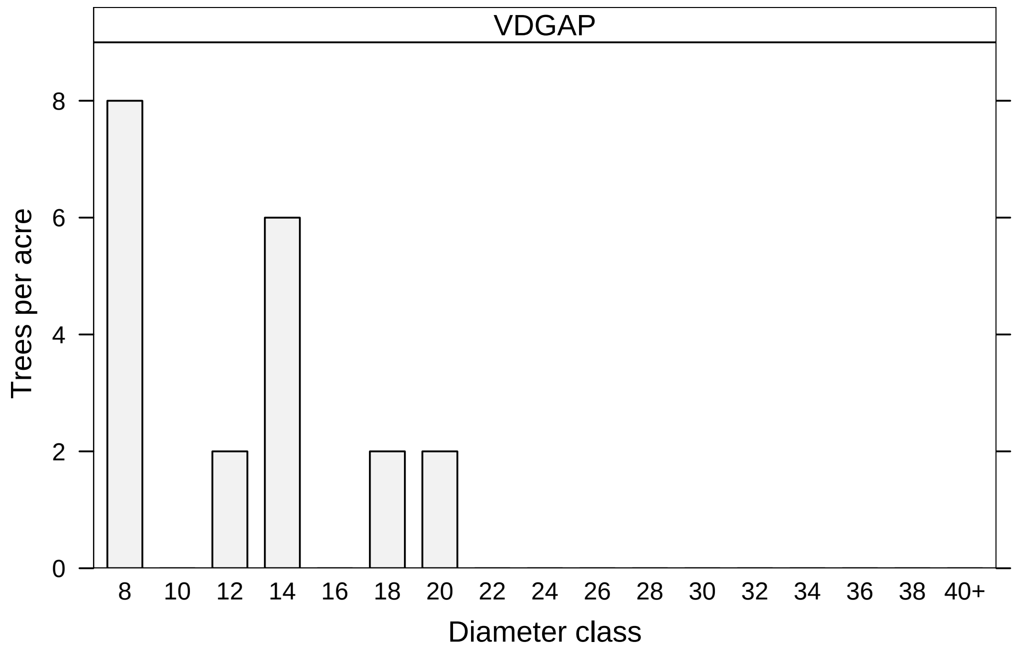

Table 17: Relative abundance of overstory trees in North Soup OSU VDGAP plots.

Species	Percent
Douglas fir	45.0
giant chinquapin	5.0

Diameter distribution by treatment for Blue Retro

The following pages contain the diameter distributions within each treatment. Summaries are for all live trees with DBH>7 inches and reported using 2-inch diameter classes. Trees with DBH>40 have been lumped into a single bin. Diameter distributions are reported separately by sampling protocol: BLM or OSU. Each section starts with a table displaying trees per acre by diameter class for all treatments. Subsequent pages contain plots of the diameter distribution and a table of relative stem density by species for each treatment. Treatment codes are listed in Table 1.

Table 1: Treatment codes used in tables and charts.

Treatment Code	Definition
CON	Control
MD80	Moderate density 80 tpa
HD120	High density 120 tpa
VD40	Variable density 40 tpa
VD80	Variable density 80 tpa
VD120	Variable density 120 tpa
DEMO20	Demonstration site 20 tpa
DEMO40	Demonstration site 40 tpa
DEMO80	Demonstration site 80 tpa
DEMORIP	Demonstration site for a riparian area
RIPCON	Riparian control, unthinned riparian buffer in treatment areas other than the control
RIP120	Riparian thinned to 120 tpa, outside of the trt area
RT	Rethin, only for rethinning study

Table 2: Trees per acre by diameter class and treatment in Blue Retro BLM plots.

DBH	CON	RT
8	4.7	10.3
10	8.7	11.3
12	11.3	3.0
14	14.0	3.0
16	16.7	3.0
18	11.3	3.0
20	12.0	5.0
22	11.3	8.0
24	10.7	7.3
26	7.3	6.0
28	4.7	6.3
30	4.0	3.0
32	1.3	1.7
34	1.3	1.0
36	0.0	0.0
38	0.0	0.3
40+	0.0	0.0
Total	119.3	72.3

Figure 1: Blue Retro BLM CON plots. Total trees per acre = 119.

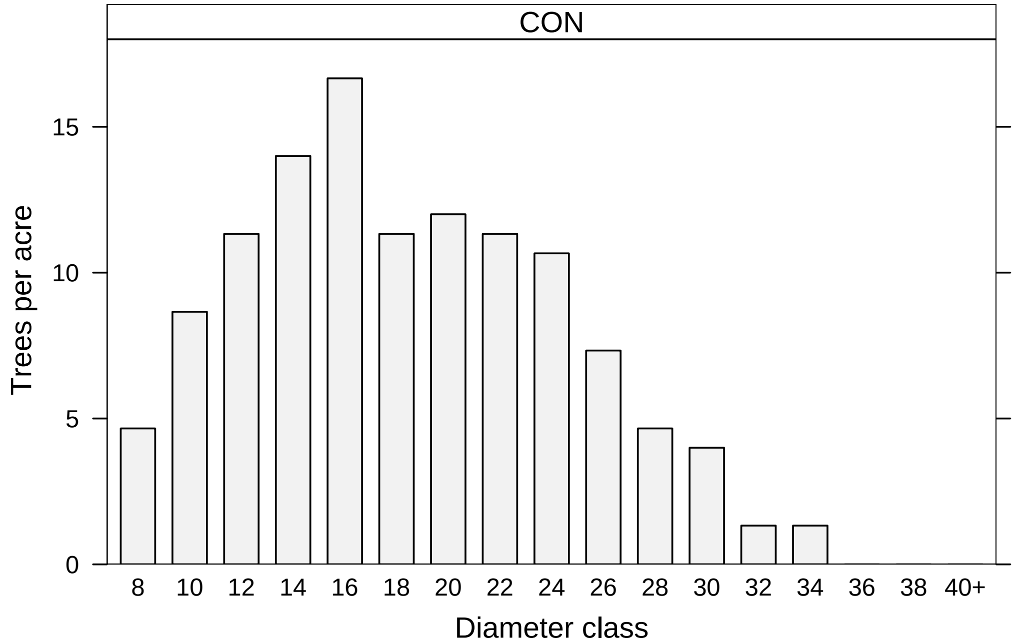

Table 3: Relative abundance of overstory trees in Blue Retro BLM CON plots.

Species	Percent
Douglas fir	91.6
western red cedar	4.3
western hemlock	3.5
red alder	0.6

Figure 2: Blue Retro BLM RT plots. Total trees per acre = 72.

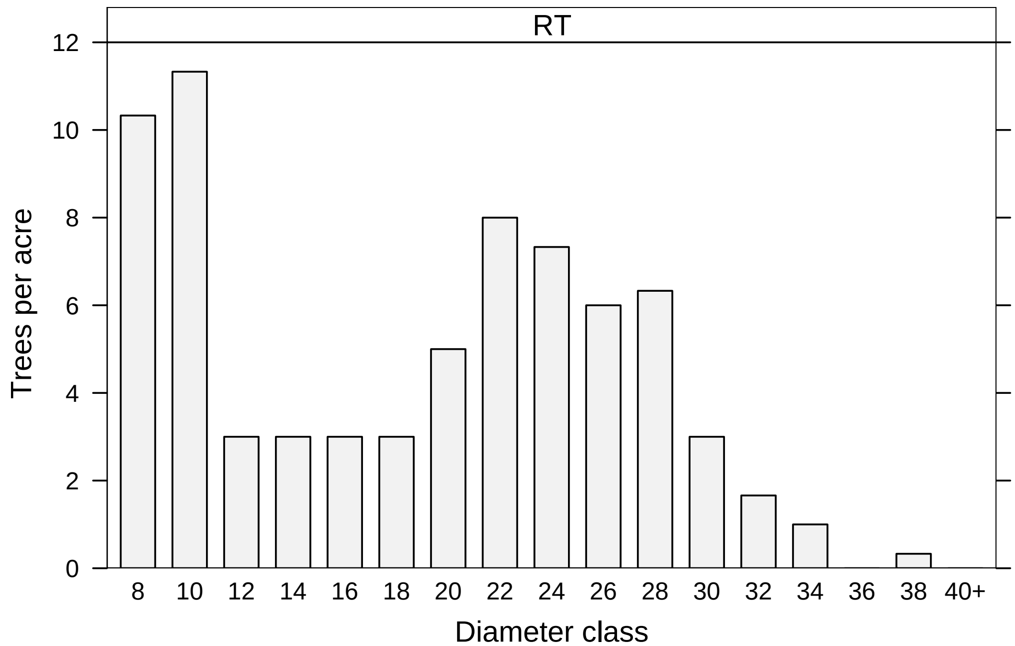

Table 4: Relative abundance of overstory trees in Blue Retro BLM RT plots.

Species	Percent
Douglas fir	59.9
western red cedar	21.2
western hemlock	18.9

APPENDIX D.: **1996 NORTH SOUP DENSITY MANAGEMENT STUDY DECISION DOCUMENTATION AND ENVIRONMENTAL ASSESSMENT (EA OR125-96-08)**

DECISION DOCUMENTATION

NORTH SOUP DENSITY MANAGEMENT STUDY
EA No. OR 125-96-08

Background:
An Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) for the North Soup Density Management Study were prepared by the Umpqua Resource Area, Coos Bay District Office, using input from District resource staff and public comment. The proposal is to install a Density Management Study in approximately 227 acres of 45 year old timber dominated by Douglas-fir and western hemlock in the North Fork Soup Creek area of the Umpqua Resource Area in fiscal year 1996. The proposed study site is located in the Late Successional Reserve (LSR) and Riparian Reserve land use allocations of the Soup Creek subwatershed of the Mill Creek Analytical Watershed. The range of alternatives for the density management sale could remove approximately 1.75 million board feet (MMBF) of timber from the LSR and Riparian Reserve. A Watershed Analysis was completed for the subwatershed in January 1995.

In accordance with the Aquatic Conservation Strategy objectives and the Mill Creek Watershed Analysis recommendations, portions of the LSR's and the Riparian Reserves would have density management in order to provide for a future supply of larger, more durable coarse woody debris, promote wind firmness of the stand, and increase species diversity within the Riparian Reserves. Trees adjacent to the streams would not be harvested. Douglas-fir and western hemlock would be thinned in portions of the riparian reserves; most all other conifer and all hardwood species would be retained within the riparian reserves.

Management objectives are to:

- Establish a Coos Bay replication of the Density Management Study to represent a local District site in the coastal environment;
- To provide a basis for learning how to monitor new stand and landscape management systems and allow for an adaptive management approach;
- To provide the basis for studying a variety of ecosystems and management variables such as site productivity, root disease effects, wildlife response, and economic feasibility;
- Alter stand development to increase the growth and vigor of the remaining dominant, co-dominant, and multiple understory layers through density management to achieve old-growth characteristics as quickly as possible;
- Protect and enhance the long term health of the forest ecosystem; and
- Restore and maintain the ecological health of watersheds and their aquatic ecosystems on public lands.

Decision:
My decision is to implement Alternative 3 (proposed action) as described in EA OR 125-96-08.

This sale is located in T. 23 S., R. 09 W., Sections 16, Willamette Meridian. An estimated 1.75 MMBF of timber will be removed by density management. The Design Features such as road construction, logging method, the Density Management Study Plan and Layout design, described in the EA are hereby adopted.

EA estimates are changed as follows:

	EA estimate	Field Verification
Study Area	approx. 220 acres	228 acres
Harvest Acreage	approx. 220 acres	145 acres
Harvest Volume	approx. 1.5 MMBF	1.75 MMBF

Other project design features will be implemented as described in the *Coos Bay District Resource Management Plan and its Record of Decision* (RMP) (BLM, May 1995) which conforms with the *Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl* (Northwest Forest Plan) and its Record of Decision (ROD) (Interagency, 1994).

This sale has been surveyed for sensitive, threatened or endangered botanical species. No populations of threatened or endangered botanical species, as defined by the Endangered Species Act of 1973, as amended, were found on the project area. The project is within a 1/4 mile of unsurveyed suitable Marbled Murrelet habitat. Consultation for this project will be done in the 1996-1997 Coos Bay District Programmatic Biological Assessment and is defined as a commercial thinning, Any mitigating measures required by the USFWS will be adopted and incorporated into the timber sale prior to award of the contract.

Rationale:

Alternative 3 (the proposed action), is the alternative that will allow us the best opportunity to implement the Density Management Study in a cost effective manner, minimize excessive soil compaction, and provide for better access in yarding the study area thereby lessening residual damage to the numerous reserve islands within the various stand densities. This decision also meets the *Mill Creek Watershed Analysis* recommendations to promote forest health.

The decision is consistent with the ROD for the Northwest Forest Plan and the *Coos Bay District Resource Management Plan/Final Environmental Impact Statement*.

Daryl L. Albiston
Umpqua Area Manager

Date

North Soup Density Management Study
Environmental Assessment

Umpqua Resource Area
Coos Bay District
Bureau of Land Management

EA - OR - 125 - 96 - 08
Prepared this 17th day of July 1996 by

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CHAPTER I.: Purpose and Need for Action

The Bureau of Land Management (BLM), Umpqua Resource Area selected this proposed study site based on a request by the BLM Oregon State Office to install a Coos Bay District replication of John Tappeiner's Density Management Study. A data search was completed for areas that had a minimum of four 50-acre blocks of homogeneous conifer stands, were relatively contiguous, 30 to 70 year age class, and with sufficient stand densities to merit a commercial thinning. Initial efforts went towards identifying acres in the Matrix lands, but no stands qualified under the specific selection criteria. As a result, the North Soup area, located within a Late Successional Reserve (LSR), was selected. Trees selectively removed from the Study Area would be sold in a timber sale to accomplish the project.

Goals for the Resource Area

- Establish a Coos Bay replication of the Density Management Study to represent a local District site in the coastal environment.

- Protect and enhance the long-term health of the forest ecosystem.

- Restore and maintain the ecological health of watersheds and their aquatic ecosystems on public lands.

Objectives for the Study Area

- To provide density management for this stand to achieve old- growth characteristics such as large trees and multiple understory layers as quickly as possible.

- To provide a basis for learning how to monitor new stand and landscape management systems and allow for an adaptive management approach.

- To provide the basis for studying a variety of ecosystems and management variables such as site productivity, root disease effects, wildlife response, and economic feasibility.

- To determine the following:
    - Overstory tree response to density management.
    - The response of wildlife to different levels of stand density of conifers and hardwoods, green tree retention, and numbers of snags and down logs.
    - The response of shrubs and herbs (and lichens, bryophytes, and fungi if possible) to overstory density and pattern, and also their response to treatments controlling competition to conifer seedlings.
    - The effects of environment, microsites, and regeneration in upland and riparian areas.

- Determine the feasibility of implementing these prescriptions on a local site.

The Mill Creek Watershed Analysis identifies management of younger stands in the LSR to accelerate development of late successional stand conditions. The Mill Creek Watershed Analysis is hereby incorporated by reference, and is part of the Mill Creek Analysis File.

This Environmental Assessment (EA) is tiered to the *Coos Bay District Resource Management Plan* and its *Record of Decision* (RNP, May 1995), and the *Record of Decision* (ROD) (Interagency, April 1994) for the *Final Supplemental Environmental Impact Statement of Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl.*

The Analysis File for this EA contains additional information such as scoping data, public input, vegetation maps, topographic maps, Interdisciplinary (ID) Team notes, Staff Input, LSR Assessment, and the Engineer's Summary used by the ID Team to analyze impacts and alternatives and is hereby incorporated by reference.

Proposal

The Umpqua Resource Area of the Coos Bay District BLM proposes to install the North Soup Density Management Study on approximately 220 acres in the North Fork Soup Creek drainage. The treatment areas will be divided into four similar size blocks. The study site will be monitored by scientists from the Pacific Northwest Experiment Station (PNW) in Corvallis, researchers from the National Biological Survey in Corvallis, and Coos Bay BLM District personnel.

The north boundary of the project is located on the south side of the North Fork of Soup Creek (see map No.1) and bounded to the south by the Homalac Seed Orchard. The legal description of the study is Section 16 of T. 23 S., R. 9 W., Willamette Meridian and is within the Soup Creek subwatershed of the Mill Creek Analytical Watershed.

Scoping

The scoping process afforded the opportunity for the public, and agency personnel, to identify their concerns relating to the proposed project, and define the issues and alternatives that are examined in detail in the EA. The general public was notified of the planned EA through publication of the District's semi-annual Planning Update and letters to interested individuals and organizations on the District's NEPA mailing list. Responses to these scoping efforts are contained in the Analysis File.

Identified Issues

Only these two issues, from the eight identified, were judged to be worthy of analysis:

- Soil compaction from ground based cutting and yarding systems.

- Road densities in the Mill Creek Watershed.

Issues Identified but Eliminated from Further Analysis

- The scoping process identified six additional issues, which were eliminated from analysis. The rationale for their elimination is as follows:

- New road construction: Roads would be located through early successional habitat and would be designed to minimize adverse impacts. Depending on the alternative selected, the roads could be located on the ridge top along the south boundary of the study area and/or on the mid-slope bench. All road locations would use existing old road locations whenever possible. All mid-slope roads would be ripped and seeded following logging activities.

- Thinning in the riparian reserves adjacent to the North Fork Soup Creek and intersecting intermittent streams: The north unit boundary would be located 50 foot from the edge of North Fork Soup Creek. Reserve leave islands would be located along the lower portions of the intermittent streams 2A and 3A. (see map No. 1)

- Seed Tree Retention: All seed trees would be marked for retention for future cone collection, except those seed trees located within the road right-of-way of the proposed new road construction.

- Attainment of Aquatic Conservation Strategy Objectives:

- Aquatic Conservation Strategy objectives would be met under all of the alternatives listed in this assessment. While some wood would be removed within the riparian reserves, densities of residual trees would be adequate to provide future downed woody debris, maintain shading, and provide for hydrologic function. It is unlikely that the sediment regime or water quality would be affected. Variable break and inner gorge no- cut zones would protect the current downed wood and instream habitats within the stream channels.

- Retention of large Woody Debris: The study design requires leaving all existing large down logs and snags.

- Hardwood Retention - All red alder, big leaf maple, myrtlewood, cherry, and tanoak would be retained within the study area.

CHAPTER II.: Description of Alternatives, Including the Proposed Action

Process used to formulate Alternatives

The implementation of this Density Management Study requires adopting the basic framework outlined in the Tappeiner plan. The treatments outlined in this study are replicates of, and comparable to, similar study sites implemented on other BLM Districts and U.S. Forest Service lands.

Various alternatives were discussed in the development of this Environmental Assessment. Discussions focused on various yarding alternatives in order to remove selected trees from the units using best management practices that would minimize soil compaction, maintain physical integrity of the study area (i.e. reserve islands, no-cut zones, etc.), and provide for economic efficiency.

Alternative 1 - No Action

Under this alternative, the proposed project area would not receive the density management treatments and the stand would continue on its present growth trajectory following either a natural course or a future management induced change.

If the study area is left unmanaged, average tree size will be less due to increased competition for light, moisture, and nutrients. Crown size would be smaller and overall tree vigor would be lower. The crown competition factor will continue to increase to the point of imminent mortality in the smaller size classes. Crown closure will remain high with openings limited to root rot pockets, windthrow, and other disturbance factors. The relative density would increase.

Since the establishment of a study area is being requested by the BLM Oregon State Office and others, another site would be proposed for the location of this study area.

Alternative 2 - Density Management Study in North Fork Soup Creek using cable system, cut-to-length processor, and helicopter yarding

Harvest Systems

This alternative would entail a combination of a cable system, cut-to- length processor, and a helicopter to selectively remove trees from the treatment areas.

Cable System

Cable logging is proposed on approximately 68 acres for Area A and C (see map No. 2). A small running skyline yarder equipped with a clamping carriage capable of yarding laterally and transporting logs with one-end suspension would be used. Area A would require that 18 acres be yarded to the existing 23-09-16.0 road. Area C would require that 50 acres be yarded to the newly constructed ridge road.

The 23-09-16.0, 23-09-19.1, and the 23-09-15.3 roads would require 3.8 miles of road renovation. Approximately 1.0 miles of new road construction would be required along the ridge south of the unit boundary extending the 15.3 road (See map No. 2).

Ground-based System

Under this alternative, a cut-to-length processor would be used on approximately 64 acres of mid-slope, flatter portions of Areas B & D, followed by helicopter yarding to landings along the 23-09-16.0 road. This is about 39% of the treatment area (see map No.2). The equipment would require a 10' wide path with 60' between paths. The cut-to-length processor would be used on slopes less than 30%. The activity would occur between July 1 and October 15 in order to minimize soil compaction and erosion.

A cut-to-length log processor would be used to fell, limb, and cut logs to length. The treetops and branches would be placed in front of the harvester to travel on as the trees are cut and decked. No ground-based forwarder would be used to transport logs. Use of a forwarder could exceed the 12% of the harvest area affected by compaction as outlined in the RMP.

Helicopter Yarding

A helicopter would be used to remove trees cut by chainsaw on 31 acres of Area E in the steep sections and 64 acres on Area B & D where the cut-to-length processor would be felling trees (see map No. 2). Logs would be flown to landings located along the 23-09- 16.0 road. This allows for minimizing new road construction and does not subject the area to increased compaction experienced with some processor/forwarder combination systems. Several helicopter landings would need to be constructed.

Alternative 3 - Proposed Action - Density Management Study in North Fork Soup Creek Using Cable system only

Harvest System

The action described under this alternative would entail yarding all the treatment areas by a cable system.

Cable System

Cable logging is proposed on approximately 163 acres for the entire treatment area. Area G would require that 50 acres be yarded to the newly constructed 23-09-15.3 ridge road (see map No. 3). Area F would require that 37 acres be yarded from the existing 23-09- 16.0 road, and 76 acres of Area H would be yarded to the new mid- slope roads 16.6 and 16.7.

The 23-09-16.0, 23-09-19.1, 23-09-15.3, and 23-09-16.3 roads would require 3.9 miles of road renovation. Approximately 1.0 mile of new road construction would be required along the ridge south of the unit boundary on the 23-09-15.3 road and 1.0 mile of new construction would be required to access the mid-slope bench on the 23-09-16.6 and 23-09-16.7 roads (see map No. 3). These roads would be constructed in order to cable yard the steeper sections in the north portions of the units (see map No. 3).

Alternative 4 - Density Management Study in North Fork Soup Creek using cable system and helicopter

Harvest System

The proposed action described under this alternative would entail yarding treatment areas with a cable system and a helicopter.

Cable System

Cable logging is proposed on Area I with the 37 acres yarded to the existing 23-09-16.0 road (see map No. 4). No new roads would be constructed under this alternative.

Helicopter Yarding

Helicopter yarding would take place under this alternative for Area J for a total of 126 acres. Logs would potentially be flown to two landings located along the 23-09-16.0 road (see map No. 4).

Cost/Benefit of Alternatives

	Alt. No. 1 No Action	Alt. No. 2	Alt. No. 3	Alt. No. 4
Est. revenue	0	$450,000	$450,000	$450,000
Cost of Ops.	0	$425,700	$304,820	$681,300
Cut-to-length processor acres	0	64 Ac.	0 Ac.	0 Ac.
Cable system yarded acres	0	68 Ac.	163 Ac.	37 Ac.
Helicopter yarded acres	0	95 Ac.	0 Ac.	126 Ac.
Potential Soil Compaction		3.7 Ac.	7.3 Ac.	2.0 Ac.
Miles of New Road	0	1.0 Mile	2.0 Miles	0 Miles

Design Features Common to Action Alternatives 2, 3, and 4

Design features and management requirements include timber sale design, contract stipulations, and prescribed activities to be accomplished by the BLM or timber sale purchaser. The objectives of these measures and requirements are to maintain or enhance the quality and productivity of the resources in the project area.

Density Management Study Design and Layout

The study design, layout, and implementation would remain the same throughout the three action alternatives.

Approximately 220 acres of 45-year-old Douglas-fir and western hemlock would be included in this density management study. Approximately 163 acres would be thinned to leave varying levels ranging from 40 to 120 dominant and co-dominant trees per acre, removing primarily suppressed, intermediate, and some co-dominant Douglas-fir and western hemlock trees. The remaining dominant and co-dominant trees would be allowed to grow and develop into a late successional forest.

The project is expected to remove approximately 1.5 million board feet (MMBF) from the treated acres. The amount removed from each acre would vary from 0 to 40 thousand board feet (MMBF) with an average of approximately 10 MBF per acre.

Under all of the action alternatives, Units 1, 2, and 3 would be thinned using various combinations of cable, and/or cut-to-length processor, and/or helicopter yarding; to implement a Density Management Study; provide a basis for learning how to monitor stands managed under the Northwest Forest Plan; and increase and accelerate residual tree growth in the riparian reserves and LSR’s to approach conditions similar to that of a late successional stand.

Selection of treatments by PNW staff: The researchers provided input on the placement of no-cut zones on streams 1A, 2A, 2B, and 3A (see map No. 5). They also selected sites for two patch cuts positioned in the moderate density treatment and two of the 40 tpa thinning areas. (See map No. 1)

Location of patch cuts: These would be positioned to benefit wildlife and assure successful regeneration of desirable tree seedlings. Patch cuts would be placed away from stream channels.

Location of reserve patches (leave islands): These would be located to help increase horizontal structural diversity, provide suitable microclimates for organisms, represent unique characteristics of the existing stand, and to protect the integrity of the leave patch from yarding as much as possible. Yarding corridors would be allowed through the patch if necessary.

Reserved hardwoods and understory conifer trees less than 5 inches dbh would not be removed within the various thinning densities resulting in some intermediate and suppressed trees remaining in the stand. The resulting dominant tree spacing is expected to range from 19 to 33 feet. The study area would be divided into four separate units, see attached map No. 1, receiving the following treatment:

Unit 1 Moderate Density- (55 acres)
- 60% to 65% of the stand would be thinned to leave 80 tpa
- 10% of the stand would have well dispersed circular patch cuts ranging from ¼ to 1.0 acre in size. They would include:
  - 3 – ¼ acre patch cuts
  - 3 – ½ acre patch cuts
  - 3 – 1 acre patch cuts

Unit 2 High Density- (55 acres)
- 70% to 75% of the stand would be thinned to leave 120 tpa

Unit 3 Variable Density- (55 acres)
- 10% of the stand would be thinned to leave 40 tpa
- 20% to 25% of the stand would be thinned to leave 80 tpa
- 20% to 25% of the stand would be thinned to leave 120 tpa.
- 10% of the stand would have well dispersed circular patch cuts ranging from ¼ to 1.0 acre in size. They would include:
  - 3 – ¼ acre patch cuts
  - 3 – ½ acre patch cuts
  - 3 – 1 acre patch cuts

Note: There would be 20 to 30% of the treatment units left untreated, with the riparian reserve acres contributing to this component. Units 1, 2, and 3 would all have the following reserve areas (leave islands) as a minimum:
  - 3 - ¼ acre areas
  - 3 - ½ acre areas
  - 3 - 1 acre areas

Unit 4 Control- (55 acres)
No treatment on entire unit.

(A copy of the Density Management Study Plan by John Tappeiner is in the Analysis File)

Riparian Reserves

Areas within the Riparian Reserves (RR) that are outside the no-cut zones would be subject to the various thinning densities of that treatment area.

The unit boundary would be located a minimum 50 foot slope distance away from the edge of North Fork Soup Creek. Additional no-cut zones (reserve leave islands) would be placed where the stream gradient of the tributary streams meets the floodplain of North Fork Soup Creek.

Along the tributaries, a minimum 15-foot slope distance no-cut zone from each side of the inner gorge would be maintained to protect bank stability.

Stream lA: A no-cut zone of 1 site tree (200’) would be left on either side of stream as designed by PNW researchers (see map No. 5)

Stream 2A: The RR would be a "thin through" for the length of the stream; however, there will be no cutting of trees where the crown intersects the plane of the stream channel (see map No. 5)

Stream 2B: A no-cut variable break zone of no less than 50 foot slope distance would be left on either side of stream throughout its entire length (see map No. 5).

All hardwoods would be retained within the RR.

There would be no yarding within the no-cut zones. One-end suspension of logs would occur within the RR in cable yard areas and full suspension in aerial yarded areas.

Protect marshy areas by leaving a minimum of one row of conifers around the perimeter of the area.

Directional felling of trees away from streams and no-cut areas within RR would be required. Logs would be yarded away from streams.

Snag and Down Log Management

Retain existing snags where safety allows.

All existing down logs and snags from trees originating from the previous stand would be retained.

Retain all understory conifers less than 5.0 inches in diameter except in small patch cuts.

Retain limby/wolf trees from all canopy levels.

Designate 3 to 5 trees/acre for potential snags after thinning at some point in the future.

Larger trees on the margins of root disease centers would be selected to thin around for future coarse woody debris recruitment.

Road Construction

New road construction would be:

- constructed on gentle ridgetops with gentle side slopes to minimize sidecast.
- constructed on stable mid-slope benches and ridge tops using existing old road locations whenever feasible.
- permitted only during dry weather conditions.
- designed and constructed using minimum road widths.
- dirt spur systems.

- water barred and blocked to traffic.

After logging operations are complete, all new temporary dirt spur roads would be closed . All roads would be ripped followed by seeding where soil substrate permitted.

Compacted soil areas would not exceed 12% of the total treated land area as recommended in Best Management Practices. This would include new roads.

Down logs would be moved and maintained outside of the right-of- way.

Harvest Operations

Prohibit felling and yarding operations between March 1 and June 30 to reduce residual stand damage during high sap flow.

A maximum log length of 40’ is required to protect residual stands and minimize the size of landings.

Trees would be felled in a pattern designed to minimize the number of yarding corridors and reduce damage to the residual stand.

Utilize one-end suspension of logs during in-haul with the cable system.

Maintain a minimum of 150’ between skyline corridors at the tail holds with a 15’ maximum corridor width.

Yarding roads would be placed to avoid streams.

Post Harvest

Seed new road construction after closure and before rainy season to control erosion with approved District seed mix.

Fuel concentrations located along newly constructed and existing roads would be piled using a hydraulic excavator. Piles would be covered and winter burned.

Under the study plan, all of the patch cuts and portions of all of the thinning treatments, would receive some underplanting with a mixture of conifer planting stock.

Stocking maintenance would be performed on 50% of each planted area to reduce competition from shrubs and possibly natural conifer regeneration.

Effectiveness of Design Features

Best Management Practices are designed to meet or exceed the Water Quality Standards for the State of Oregon. The design features meet the standards in the RMP.

Monitoring

Density Management Studies should provide a basis for monitoring and adaptive management. This study should provide a basis for learning how to monitor new stand and landscape management systems and eventually proceed with adaptive management. Monitoring should provide the basis for studying a variety of stand features and management variables, such as site productivity, root disease effects, wildlife response, and economic feasibility. Monitoring plots would be established and reestablished following harvest. Monitoring would continue as part of the study for several decades.

Preharvest Monitoring

Pre-harvest stand exams would be completed before layout of the study area.

Stream habitat would be inventoried by PNW before treatment.

Permanent monitoring plots for overstory trees, natural understory and tree regeneration, major shrubs, and herbs would be installed.

Permanent monitoring plots for common herbaceous and shrub species would be installed.

Permanent monitoring plots for rare or less common species would be installed.

Pre-harvest monitoring for environment, microsites, and regeneration in upland and riparian areas would occur.

Implementation Monitoring

Implementation monitoring will determine whether the Standards and Guidelines are being met.

Compliance with contract stipulations associated with the timber sale would be performed by the timber sale contract administrator and the road construction inspector. If adverse environmental impacts occur, the problem would be addressed by logging and resource specialists in the Resource Area.

Problems may be rectified by contract changes, additional mitigation measures and/or cessation of logging.

During logging, the proposed units would be periodically reviewed on-the-ground by resource area specialists.

Effectiveness Monitoring

Post-harvest monitoring verifies if the desired results (changes from baseline data gathered pre-harvest) were achieved. After harvest, all permanent monitoring plots would be reestablished, then post-harvest monitoring could occur in the following manners:

Amphibian monitoring would be conducted for instream and riparian species under various stocking levels and buffer widths.

Overstory tree response to density management would be monitored.

Monitor the response of wildlife to different levels of stand densities of conifers and hardwoods, riparian buffer widths, green tree retention, and the numbers of snags and down logs.

Monitor and compare results from the response of shrubs and herbs (and lichens, bryophytes, and fungi if possible) to overstory density and pattern, and to treatments controlling competition to conifer seedlings.

Monitor the effects of environment, microsites, and regeneration in upland and riparian areas.

Analyze monitoring results of stream habitat under differing density levels and riparian no-cut zones.

CHAPTER III.: Affected Environment

The project area is within the Mill Creek Watershed along the North Fork of Soup Creek, which is a tributary to Loon Lake. The watershed is 85,932 acres in size, 29% of which (24,835 acres) is managed by BLM in a checkerboard pattern. The Soup Creek drainage is 5,252 acres in size with approximately 85% managed by the BLM.

History

Logging has been the main disturbance factor within the watershed since the mid 1900's. Many of the current second growth stands in the Soup Creek area are 40 to 50 years old. The proposed area was logged and naturally seeded from the surrounding residual stand around 1950.

Currently 21% (18,148 acres) of the entire Mill Creek Watershed (85,932 acres) is designated as LSR. BLM manages a total of 24,835 acres in the Watershed of which 73% (18,148 acres) is considered to be LSR. A more complete history of this watershed can be found in the Mill Creek Watershed Analysis.

Landscape

The proposed project is located in Section 16, which consists of timber stands primarily within a 45-year age class. Neighboring sections are predominantly BLM ownership which comprise a rather large contiguous block of Federal forested lands with stands ranging in ages from 40 to 80 year old with some scattered older stands from 100 to 200 years old. Private ownerships are located to the south and west of the study area and are primarily farmland with some active forest management taking place above the flatter agricultural land.

Physical and Geographic Characteristics

The proposed project is located 15 miles east of Reedsport, Oregon, and is on the south side of the North Fork of Soup Creek in the south half of Section 16 of T. 23 S., R. 9 W., Will. Mer.

The 23-09-16.0 road currently accesses the west side of the unit and an abandoned road parallels the North Fork of Soup Creek and the north boundary. The abandoned road has been closed, had its culverts removed, and is starting to grow over with alder due to a lack of use.

The proposed study area has a variety of topographic features. The majority of the ridges run mostly north and south and are interrupted by a sizeable mid-slope bench. Many of the 1st and 2nd order streams start from the mid-slope benches and have formed predominant, incised draws that are tributaries to the North Fork of Soup Creek. Above the mid- slope bench there are a series of minor ridges and draws running north and south with slopes averaging 60%. The minor ridges originate on the main ridge on which the proposed new road construction will be located. This main ridge runs west to east and intersects a landing at the end of the 23-09-15.3 road on the southeast corner of the project area.

Soils

Soils in the density management study area are primarily Preacher (57), and Bohannon (63) with some Jason (64), and small inclusions of Rock outcrop (R). These map units are designated 57/W, Preacher soils on 10 to 35% slopes, 57-63/WX, Preacher - Bohannon soils on 10 to 35 and 35 to 60% slopes, and Preacher - Bohannon - Jason (57-63-64/XY). Rock outcrop occurs as an inclusion primarily in the 57-63-64/XY map unit.

Preacher soils are deep (>40”), well drained, fine-loamy soils that occur on gentle (10-35%) to steep slopes (60%+). Preacher soils are highly productive, typically with a site index of II for Douglas fir. Bohannon soils are moderately deep (20-40”), well drained, loamy and gravelly soils that occur on moderate to very steep slopes (35 to 60 and 60 to 80%). Site index of Bohannon soils is typically III. Jason (64) soils are shallow, (10-20”) , well drained gravelly barns that occur on extremely steep slopes and knife edge ridge tops. Site Index is typically IV. Rock outcrops (R) occur as small inclusions on extremely steep slopes and sharp ridgetops.

All of these soils are formed in the Tyee/Flournoy geologic formation. This formation has rhythmically bedded micaceous sandstones and siltstones. The sandstones can be hard, massive, erosion resistant, and ridge forming, as is the case here, on the main ridge.

Hydrology

The project area is typical of the Coast Range in both climatic and hydrologic features. The climate is characterized by moderate temperatures, wet winters, and cool, dry summers.

The temperatures rarely drop below freezing during the winter months and reach a high of 90F in the summer. Precipitation, in the form of rain, is the major factor influencing the hydrologic characteristics and controlling the hydrologic cycle. The varied topography of high relief has a strong effect on the precipitation pattern, causing very large differences within small areas. The study area normally receives approximately 80 inches annually. The intensity of precipitation is as variable as the amount but storms of extreme intensity are rare.

Virtually all precipitation comes in the form of rain from general storms associated with extratropical cyclones originating over the Pacific. Occasionally Arctic air meets an onshore flow, producing snow but snow lasting more than a few days and accumulating to a significant depth is extremely rare. Approximately 80% of the precipitation occurs between October and March with the months of June, July and August receiving only 4% of the annual total. The precipitation produces an average annual yield of 50 inches.

The distribution of the precipitation and runoff/stream flow is directly related and is evident as the high flows are observed during the winter months and low flows predominant in the summer. This direct relationship indicates the systems are dominated by direct or storm runoff as opposed to base flow. The limited base flow results in systems that are “flashy” or very responsive to precipitation events and have little ability to maintain flows during dry periods. The “flashiness” or high hydraulic response of the systems can be contributed to many related factors including: climate, topography, precipitation pattern and intensity, geology, vegetative ground cover and past management activities. However, the most dominate factors are soil properties and the lack of ground water storage due to the well-drained soils.

Channel Morphology

The study area is primarily drained from the south to the north by four perennial tributaries to the North Fork of Soup Creek. These drainages are somewhat atypical because the headwall areas are relatively flat and benchy as opposed to steep and dissected. In general, the headwalls tend to consist of low, seepy areas with some ponding but relatively undefined channels.

As the gradient increases downstream of the benchy area all of these tributaries become step/pool type channels due to the high gradient (energy), low sinuosity, high entrenchment, low width/depth ratio and lack of floodplain development. These tributaries have a great deal of stream energy that must be dissipated through the resistance to flow provided by streamside vegetation, channel roughness and large woody debris. If this energy is not dissipated, especially during high flow events, serious channel bed degradation and bank erosion will occur and the potential for recovery is extremely low once down cutting begins.

Vegetation, Including T&E Species

The current stand is approximately 45 years old. The stand is predominantly Douglas-fir with a fairly high component of western hemlock (Douglas fir = 165 tpa, avg. diameter breast height (dbh) = 13”; western Hemlock = 61 tpa, avg. dbh= 10.6”). Other conifer species present in the stand that did not appear within the stand exam are grand fir, western red cedar, and Pacific yew.

There is a mixture of hardwoods within the stand; the most prevalent is red alder, which is found in many of the riparian areas including streams and small ponds, and near recent disturbed sites. Wild cherry, bigleaf maple, and myrtlewood are also scattered throughout the stand.

Stand exam data reveals the following information: Average age = 45 years, trees per acre (>=7.0” dbh) = 230, average dbh = 12.6”, basal area = 200, relative density = 56. (Stand exam data is in the Analysis File)

The understory is primarily swordfern. Vine maple often occurs in canopy gaps created by *Phellinus weirii* disease pockets and adjacent to small ponds created at the toe of some of the steeper slopes. Evergreen huckleberry, rhododendron, salal, and Oregon grape can also be found on ridge caps and slopes with a more westerly aspect. Riparian understory vegetation is composed of salmonberry and elderberry.

The area has many unique habitats, including alder stands with a slough sedge (*Carex obnupta*) dominated understory near several small marshes and a seep dominated by golden saxifrage (*Chrysosplenium glechomaefolium*).

No botanical species listed on the Threatened or Endangered lists are known to occur on the project area.

Structure

The project area has a very small amount of residual old-growth scattered throughout the unit, with the majority located on the southeast ridge and southwest edge. The younger stand is the result of a fire that occurred before 1951 followed by natural seeding. Most of the older trees are fire scarred and many of the stumps are burned also indicating some fire activity after logging. Portions of the current stand have achieved closed canopy and exhibit very little or no forest floor vegetation while areas with openings in the canopy have multiple layers of vegetation.

Wildlife, Including T&E Species

This phase of forested condition is rather “in-between” for wildlife; and the wildlife that occur in this habitat are generalists compared to a more open or more closed canopy situation. Wildlife species that inhabit this area are identified in the District RMP and Watershed Analysis and are typical for the Umpqua Resource Area.

Because the habitat varies from larger trees to a more closed canopy, and due to topographic differences, wet areas and areas which have ground and shrub diversity, one would expect to find a broad diversity of birds on the study area. Any of these bird species could use the area at one time or another, either for feeding, resting, or nesting.

No wildlife species listed on the Threatened or Endangered lists are known to occur on the project area.

Aquatic Resources, fish species including T&E Species

In general, the first and second order draws are intermittent in nature (they do not flow year round) while the North Fork Soup Creek mainstem, a third order draw, is perennial. Streams within the proposed project area are highly confined by hillslopes, are steep in gradient and contain small floodplains only at their confluences with the mainstem. Substrates within them range from sand to cobble (12” average diameter). There is also a large component of wood.

Habitat types are dominated by steps and riffles with small pocket pools. These characteristics offer quality habitats for a variety of amphibian and invertebrate species. The riparian vegetation is either dominated by a conifer overstory with sword fern understory or a red alder dominated overstory with salmonberry understory, depending on the location.

Adjacent to the north boundary of the study area is a large pond (approximately acre) created by a road fill and improved by beaver activity. The pond provides a large still-water habitat, which is somewhat uncommon in the area. Also uncommon are small marshy areas that occur in the central portions of the project area where the topography flattens out (see topographic map). These flats are dominated by thick semi-aquatic vegetation (rushes, grasses) and are typically surrounded by red alder or salmonberry patches. They provide unique habitats for amphibians and aquatic insects in a watershed that is dominated by steep slopes and a highly dissected drainage pattern.

There are a large number of aquatic organisms that occur in and adjacent to the proposed study area. Fish species include the resident cutthroat trout and potentially four sculpin species (Coast Range, prickly, riffle, and reticulate). There are no anadromous fish in this drainage and no fish within the treatment units. Both the stream and pond systems provide habitat for the invertebrates that fish, amphibians, and other terrestrial species utilize as a food source.

No Threatened or Endangered or Proposed aquatic species are known to occur within the study area.

CHAPTER IV.: Environmental Consequences

This chapter summarizes the analysis of potential impacts of the alternatives.

Alternative 1 - No Action

Soil Compaction - (Issue No. 1)

Soils will not be directly affected by the No Action Alternative. Some soil erosion, naturally occurring slides, etc. would be expected to continue.

Road Densities in the Mill Creek Watershed - (Issue No. 2)

There would be no increase road densities for the Soup Creek drainage under the No Action Alternative. The current road density is 3.4 miles of road per square mile. Over time, some side roads, which do not receive maintenance, would be naturally reclaimed, and would contribute to a very slow decline in road densities in both the Soup Creek drainage and the Mill Creek Watershed as a whole.

Impacts to Other Resources on Site

Wildlife, Including T&E Species

As this stand progresses towards an older age class, the species who occupy it will become more specialized and dependent on these closed canopy conditions to the exclusion of species who do not survive in this type of habitat.

Cultural Resources

No direct, indirect, or cumulative effects are anticipated from the No Action Alternative.

Aquatic

No direct impacts to the current aquatic habitat or environment would occur. Over time, the stand would thin itself naturally allowing dead trees to eventually fall into the riparian and aquatic systems and thereby provide long-term woody debris to the stream system. This wood would benefit amphibians and aquatic invertebrates.

There would be no direct impacts to the riparian zone since no management activities would occur.

Solid and Hazardous Waste

No effects are anticipated from the No Action Alternative.

Noxious Weeds

Continued spread of weeds established on site.

Alternative 2 - Density Management Study in North Fork Soup Creek (combination cable, cut-to-length processor, helicopter yarding)

Soil Compaction - (Issue No. 1)

Cable yarding systems capable of one-end log suspension should keep soil compaction, displacement, and general disturbance to a practical minimum. The ground-based processor would be traveling on cut limbs to minimize soil compaction. The portion proposed for helicopter logging should have almost no soil disturbance associated with chainsaw felling and yarding operations.

New road construction and landings along the ridge would be subject to soil compaction. Approximately 3.7 acres would be affected under this alternative. This would amount to 2% of the area affected by compaction.

Wide no-cut zones near draws should keep sediment out of drainages. No measurable soil erosion or sedimentation would be expected to occur if the plans were implemented as proposed.

The main opportunity for soil/site impacts would come from road construction and renovation activities and is limited in scale. The existing road that accesses the lower and middle parts of the study area would be upgraded for hauling and some minor short-term surface erosion and subsequent sedimentation could be expected as a result of these activities especially during the first heavy rains of the first winter following construction activities.

Impacts to soils are not expected to be significant in the project area, but they will add to cumulative effects in the general area (The Soil Scientist's report is in the Analysis File).

Construction for helicopter landing sites would be located in previously compacted areas used for landings in the past.

Road Densities in the Mill Creek Watershed - (Issue No. 2)

Road densities would temporarily increase with the new road construction proposed. Approximately 1.0 mile of dirt road would be constructed under this alternative. This alternative would yield 1.0 mile less road than Alternative 3.

Soup Creek drainage road density levels would temporarily rise from 3.4 to 3.5 miles per square mile, a 3% change in density level. The Mill Creek Watershed road density levels would temporarily rise from 4.55 to 4.56, a 0.2% increase in density level. After the sale is complete, a road closure would return the road density level to the same as the No Action Alternative.

Impacts to Other Resources on Site

Soil -Water-Erosion

Road construction will entail conventional practices and the location is favorable. Most of this new road would actually be on the ridgetop, and surface soil erosion is expected to be minimal. In a couple of places, the road is just below the ridgetop and would be on 60-70% slopes for a couple of stations. This is not expected to create slope instability problems as excavated materials would be end-hauled to a stable site. An end-haul site approximately 1500’ from the end of the road has been identified. Approximately 10,000 cubic yards is proposed to be placed here. Landslide potential for this road location is considered to be slight. Helicopter yarding and use of the processor will lessen the amount of road building needed to access timber on the mid- slope bench area (The Soil Scientist’s report is in the Analysis File).

Wildlife, Including T&E Species

There will be increased (above ambient) , short duration noise from the use of the helicopter. While this is one of the worst impacts (since helicopter noise can usually be clearly heard by animals for miles) it will only occur while yarding the steeper areas of the units. The use of the processor as well as the yarding and loading equipment could have a negative impact on ground dependant organisms. These organisms include, but are not limited to: insects, burrowing mammals, amphibians, reptiles, and shrub/thicket nesting birds. They may be displaced, or they and their young may be destroyed.

This alternative, using cable, with helicopter yarding only on the steep areas, and using the processor on relatively flat ground, will minimize damage and noise impacts to the area.

Impacts to wildlife from any new road construction would be mitigated by the closure and seeding to reduce erosion and provide for short-term forage for wildlife.

Economic Feasibility

Recently two U.S. Forest Service commercial thinning sales on the Siuslaw National Forest went “No Bid.” These timber sales were similar to this proposed study site with regards to age class, approximate volume, density levels, and helicopter yarding. With the current depressed log market, helicopter thinnings have been unable to operate economically. The Myrtlewood Resource Area currently has a helicopter thinning that has had to stop operations until the log market improves. There is the potential for this proposed sale to go unsold if helicopter yarding is proposed.

Study Implementation
This alternative would allow for the treatment units to be yarded without causing excessive damage to the reserve island patches scattered throughout the study area.

Alternative 3 - Proposed Action - Density Management Study in North Fork Soup Creek (Cable yarding only)

Soil Compaction - (Issue No. 1)

The area would have the same 1.0 mile of new ridge road construction as Alternative 2 on the 23-09-15.3 road and 3.86 miles of renovation along the existing 23-09-16.0, 23-09-19.1, 2309-16.3, and 23-09-15.3 roads.

Additional new road construction would be required on the mid-slope bench and extend out on two ridges to access desirable landing locations for the steeper sections of the north end of the units amounting to 1.0 miles more new road, a total of 2.0 miles. Approximately 7.3 acres of road construction and additional landings would be subject to soil compaction. This would amount to 5% of the treatment area affected by compaction.

Many of these same areas have received compaction from ground based yarding from previous logging activities. Efforts would be made to use these existing skid trails when possible for new road layout and construction. Soil compaction, displacement, and general disturbance should be able to be kept to a practical minimum. No compaction is expected within the marshy areas or within the stream channels.

Road Densities in the Mill Creek Watershed - (Issue No. 2)

With the ridge road construction of 1.0 miles and 1.0 miles of mid- slope road on the bench, the total would be 2.0 miles.

Soup Creek drainage road density levels would temporarily rise from 3.4 miles per square mile to 3.65 miles per square mile, a 7% change in density level. The Mill Creek Watershed road density levels would temporarily rise from 4.55 to 4.56, a 0.2% increase in density level.

After the sale is complete, a road closure would return the road density level to the same as the No Action and Proposed Action Alternatives.

Impacts to Other Resources on Site

Soil -Water-Erosion
The new road construction proposed on the mid-slope benches is well located on deep well-drained soils, and construction should present no particular problems. In fact, much of this one mile of new construction would be located on old skid roads that were used in the original harvest of this area.

About 3.5 acres of land would be taken out of production to construct the road on the benches, and for the first winter or two, there is the possibility that a small amount of soil could erode and reach perennial drainages as sediment. However, soil erosion is expected to be slight as grades are gentle, and slope of the benches is gentle to moderate at most so cut banks will be low. Also, erosion controlling grasses should establish quickly and thickly on these deep, fine soils. This should provide good protection for erosion and sedimentation. Comments made with regards to the ridge road in Alternative 2 also apply to this alternative.

Wildlife, Including T&E Species
The cable logging would generate high and relatively constant noise and disrupt animals on site the same as described in Alternative 2, but it would be less noisy for animals away 200from the site as described with helicopter use in the Proposed Action.

The most significant negative effect of Alternative 3 is the new road and spur construction. Additional road construction to access the lower part of the unit will displace or kill some ground dependant organisms, in addition to the normal use of the logging equipment.

Impacts to wildlife from any new road construction would be mitigated by the closure and seeding to reduce erosion and provide for short-term forage for wildlife.

Economic Feasibility
Due to the lower cost associated with cable logging, this alternative would be more likely to result in selling this thinning.

Study Implementation
This study has numerous reserve patch (leave islands) and varying widths of no-cut zones adjacent to many of the streams. For the purposes of this study, it is desirable to protect these leave areas as much as possible through the entire logging process. With a cable yarding system, there could be some damage to the residual leave areas due to their placement throughout the stand. Extra time may need to be spent rigging intermediate supports and selection of yarding roads to minimize damage.

Alternative 4 - Density Management Study in North Fork Soup Creek (Cable system and helicopter yarding)

Soil Compaction - (Issue No. 1)

Soil compaction associated with the cable logging would be isolated to small areas of the yarding roads. Since the processor would not be used under this alternative, there would be a slight decrease in the amount of compaction that would be experienced with the processor under Alternative 2. Larger or additional helicopter landings may be necessary in order to handle the extra volume yarded, thus marginally increasing the potential compaction area on helicopter landings.

Road Densities in the Mill Creek Watershed - (Issue No. 2)

Road density, after the project is completed, would be the same as the Proposed Action; however, the density level would not increase in the short-term since no new construction would be needed.

Impacts to Other Resources on Site

Wildlife, Including T&E Species
This alternative does well in regard to reducing damage to surrounding trees and reducing soil compaction. Hence, fewer organisms which live on these sites, will be killed or displaced. These organisms include, but are not limited to: insects, burrowing mammals, amphibians, reptiles, and shrub/thicket nesting birds.

There will be an increased (above ambient) noise level for a short duration from the use of the helicopter. This is one of the worst impacts since helicopter noise can usually be clearly heard by birds and animals for miles.

Overall, Alternative 4, involving cable and helicopter yarding only, will minimize damage and noise to the area; however, the helicopter noise would continue for a longer period since more acres would be yarded by helicopter (compared to Alternative 2).

Economic Feasibility
As in Alternative 2, logging costs associated with helicopter yarding on this proposed study site could potentially force this sale to go unsold.

Study Implementation
This alternative would be the one most likely to do the least damage to the residual reserve islands and riparian no-cut zones. The residual stand could be subject to some crown damage, especially in the lower density level treatments from helicopter rotor wash. There is generally more damage to crowns of western hemlock with helicopter yarding.

Impacts Common to Alternatives 2, 3, and 4

Wildlife, Including T&E Species
Probably most, if not all, territorial animals, (elk, deer, bear, mountain lion, bobcat, etc.) and birds which reside in the study area could be displaced during the thinning operation, either to the fringes of the project or entirely out of the area. We assume that most of these individuals, or others like them, will come back directly afterwards and reclaim or re-colonize the area. Any forestry operation involving noise, removal of habitat (trees), destruction of other habitat (woody debris, shrubs, etc.) could produce a negative impact on many species of wildlife. In particular the “specialist” species that have small home ranges, low mobility, and are sensitive to microclimate changes, will be impacted the greatest over the short and possibly long-term.

Conversely, creating more edge effect and differing habitat types will also encourage colonizing wildlife species and those species, which prefer more open spaces. Species shifts in both density and diversity are often subtle over time and it is unclear whether a net loss or gain of species will occur. Certainly, the project design, with its variable cuts and other adaptive management strategies should encourage richer habitat opportunities which equate to greater species numbers and composition.

The general area has been surveyed for marbled murrelets and Northern Spotted Owl and found to be free of any nests or suitable habitat that will conflict with this study.

Botany, Including T&E Species

Impacts to late-successional species from any of the action alternatives should be minimal. Some short-term impacts are expected as the result of logging activity, but these should be ameliorated within a few years. The marshy areas will be buffered and some of the alder/carex dominated areas are included in the reserve leave islands decreasing the possibility of negative effects to these special habitat areas.

Cultural Resources

Any cultural object or site found within the proposed project area during pre-harvest monitoring, logging, post-harvest monitoring, reforestation activities, or any subsequent management activity would be grounds for immediate suspension of activities until the District Archaeologist examined and cleared the area for reentry. Examination of the sites and literature searches have not indicated any sites of importance.

Aquatic

Logging activities would yield the addition of small woody debris into the channel by falling limbs. Negative affects might be the slight increase in microclimate factors (such as light, temperature, and relative humidity) due to the thinning and the presence of yarding corridors. Microclimate changes may negatively impact amphibian species within the area, however the extent is not known. The loss of woody debris in the riparian area and instream would occur over the long-term due to the removal of trees within 200’ of the stream.

There are three marshy areas located in the study area. A buffer consisting of the first row of conifer trees will afford approximately 20’ of protection from harvest activities with additional reserve islands placed adjacent to each of these. Impacts to aquatic organisms, riparian vegetation and bank stability should be minimal to non-existent based on the small size of these marshes. Minor changes in microclimate may occur.

The majority of the riparian areas have a large component of hardwoods directly adjacent to the stream. None of the hardwoods would be cut under this study plan, thus offering continued thermal protection to the stream. The low-density harvest areas of 40 TPA will occur along the upper portions of this stream. No harvest zones of at least 15’ will be placed in order to buffer the stream against thermal changes. Impacts to microclimate will occur in these areas but should not affect the stream.

Once again, there will be some loss of potential riparian and instream wood over the long term due to thinning within the Riparian Reserve.

Solid and Hazardous Waste

The near proximity of North Fork Soup Creek and the wetlands to the road is a medium risk factor, depending upon the type of vehicle activity to be associated with this project.

Petroleum product management is a concern, given the slopes, vegetation and surface waters. Any contracts should require a Spill Prevention and Countermeasure Control Plan (SPCC), a State of Oregon DEQ requirement.

No effects are anticipated from any of the Action Alternatives, unless a release of hazardous materials occurs as a result of operations. Depending upon the substance, amount, and environmental conditions in the area affected by a release, the impacts could range from minimal to lasting and significant.

The proposed road closure would diminish the future potential for illegal dumping of solid and hazardous waste along roadsides and on landings. (The Hazardous Materials Report is located in the Analysis File)

Noxious Weeds

Would continue to experience slow spread of weeds already established on site. No introduction of new species are expected.

Critical Elements Evaluation of Each Alternative

The following matrix lists the critical elements of the human environment that are required to be addressed by Executive Order and whether they are affected by the alternatives.

Critical Elements	No Action Alternative	Alt. No. 2	Alt. No. 3	Alt. No. 4
Air Quality	no	no	no	no
Area of Critical Environmental Concern	no	no	no	no
Cultural Resources	no	no	no	no
Farmlands	no	no	no	no
Floodplains	no	no	no	no
Native American Religious Concerns	no	no	no	no
T & E Species	no	no	no	no
Wastes solids or hazardous	no	no	no	no
Water Quality	no	no	no	no
Wetlands/ Riparian Zones	no	Some thinning is scheduled for designated RR	Same as Alt. No. 2	Same as Alt. No. 2
Wild and Scenic Rivers	no	no	no	no
Wilderness	no	no	no	no
Noxious Weeds	Continued slow spread of weeds established on site	Same as No Action Alternative	Same as No Action Alternative	Same as No Action Alternative

Cumulative Impacts

The Bureau of Land Management manages approximately 85% of the Soup Creek compartment within the Mill Creek Watershed. There are 40.08 stream miles within the compartment. There are 28.04 road miles within the Soup Creek compartment. Through the Transportation Management Objectives, roads within the Mill Creek Watershed have been identified for future closures. This will result in 9.7 miles of road closures in the Soup Creek drainage alone.

Numerous old logging roads and skid trails are in the area. Utilizing these for current or future timber sales would prevent further soil compaction in the compartment when compared to new road construction.

The remaining 420 acres within Section 16 are potentially suitable for future density management under the District RMP.

Irreversible and Irretrievable Commitment of Resources

None identified.

CHAPTER V.: List of Agencies and Individuals Contacted

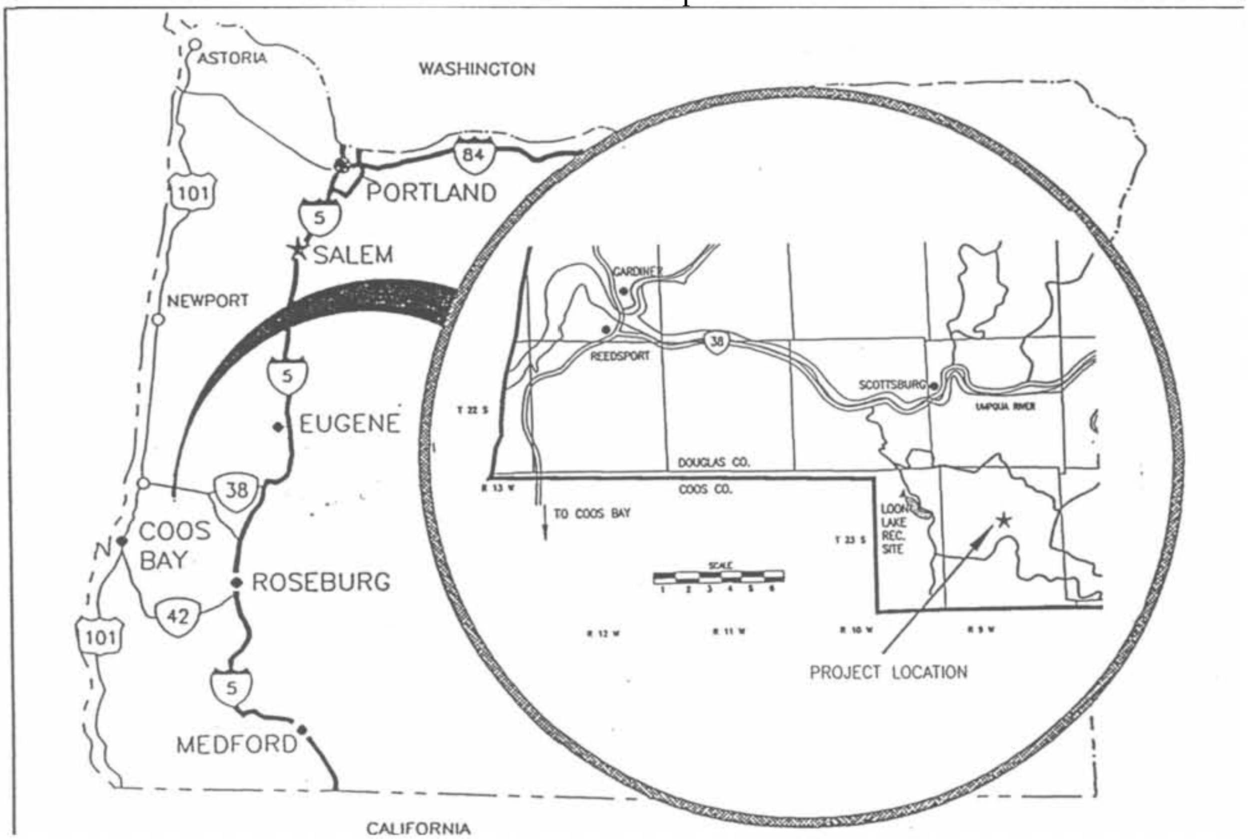
The general public was notified of the planned EA through the publication of Coos Bay District's semi-annual Planning Update. One adjacent landowner was contacted of the project and he had no input.

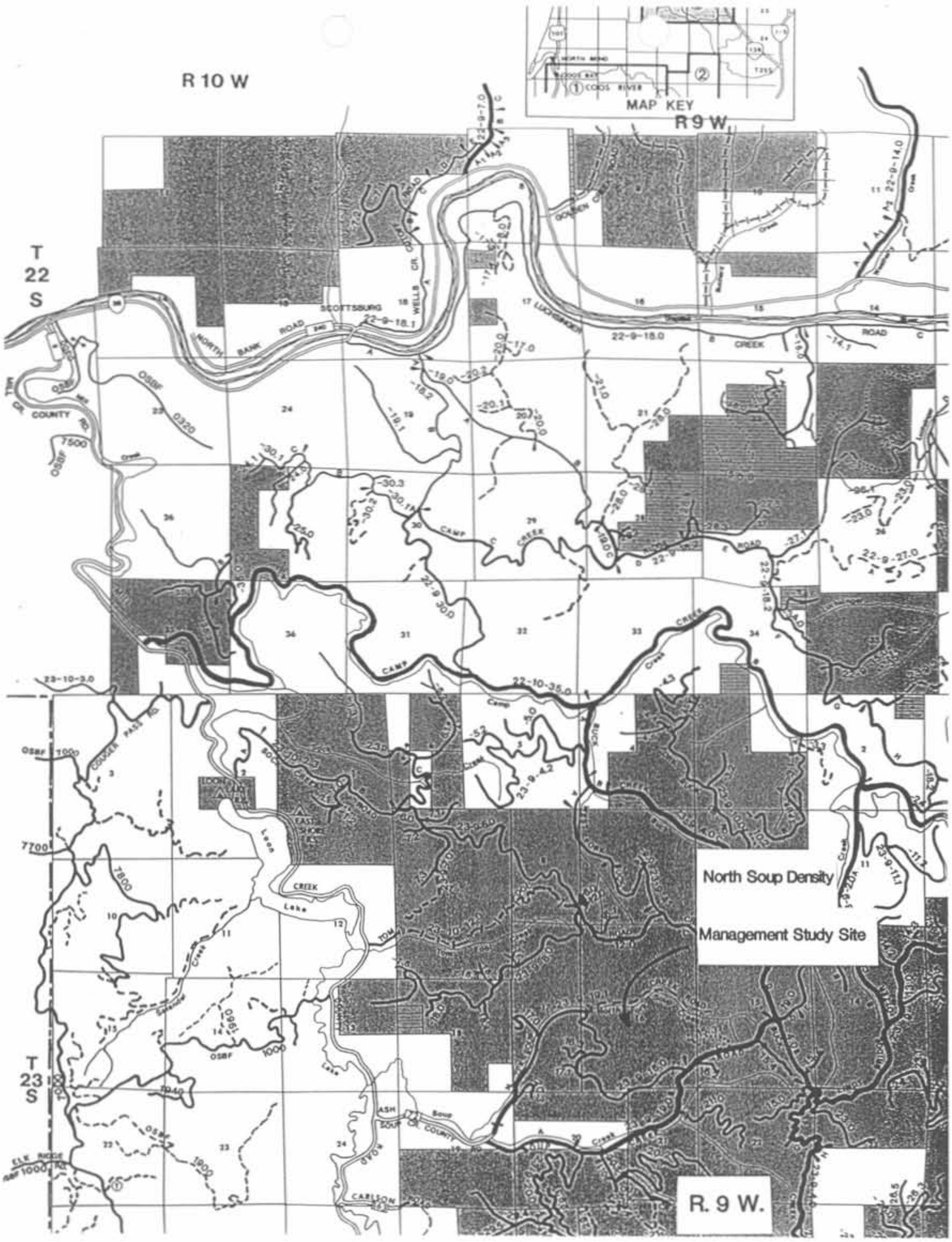
The proposed project is being reviewed by the U.S. Fish and Wildlife Service through the consultation process provided under section 7(A) (4) of the Endangered Species Act of 1973.

The project was reviewed by the Regional Ecosystem Office (REO)and has been granted a Research Exception for this project.

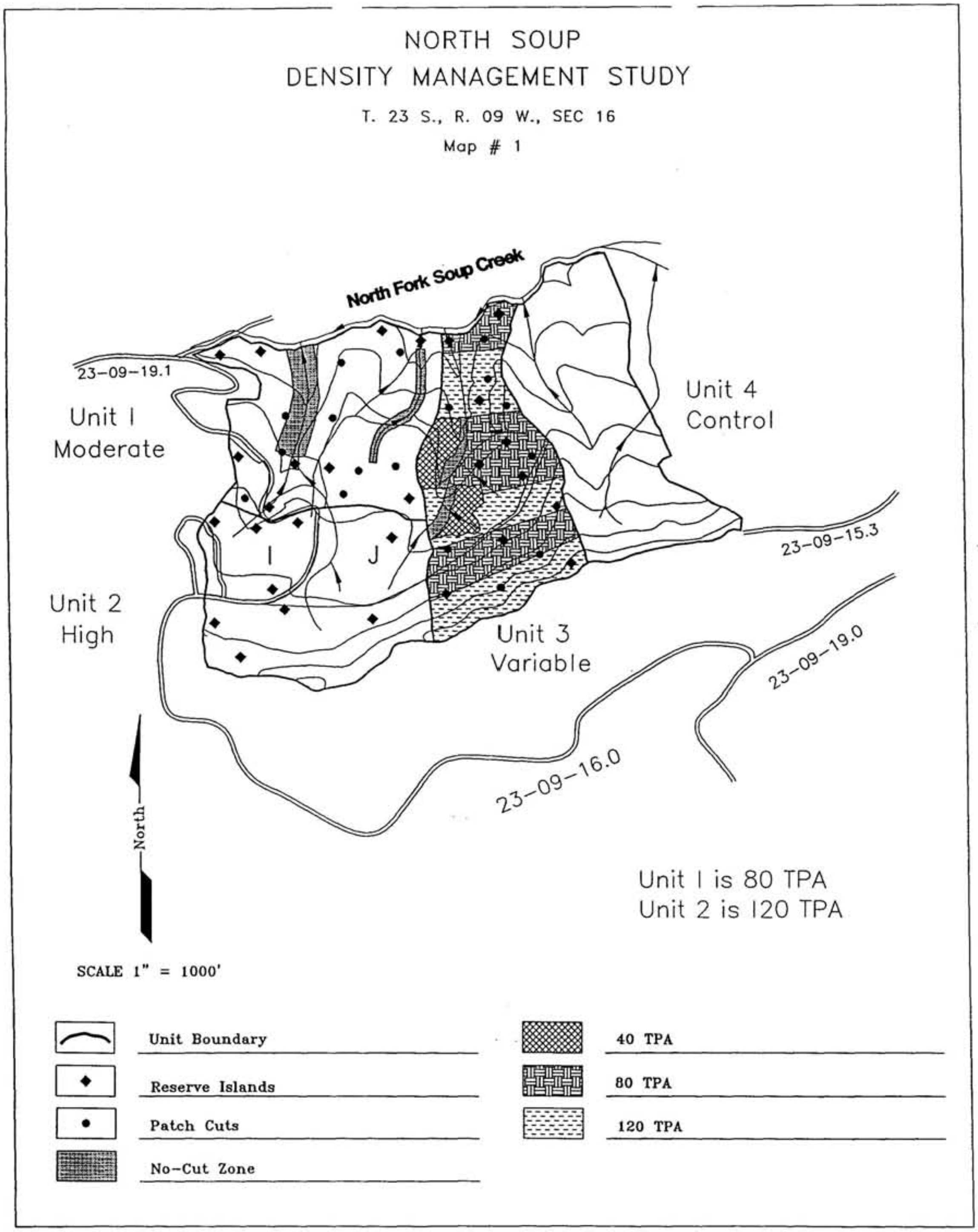
APPENDIX

Location Map 1





Location Map 2



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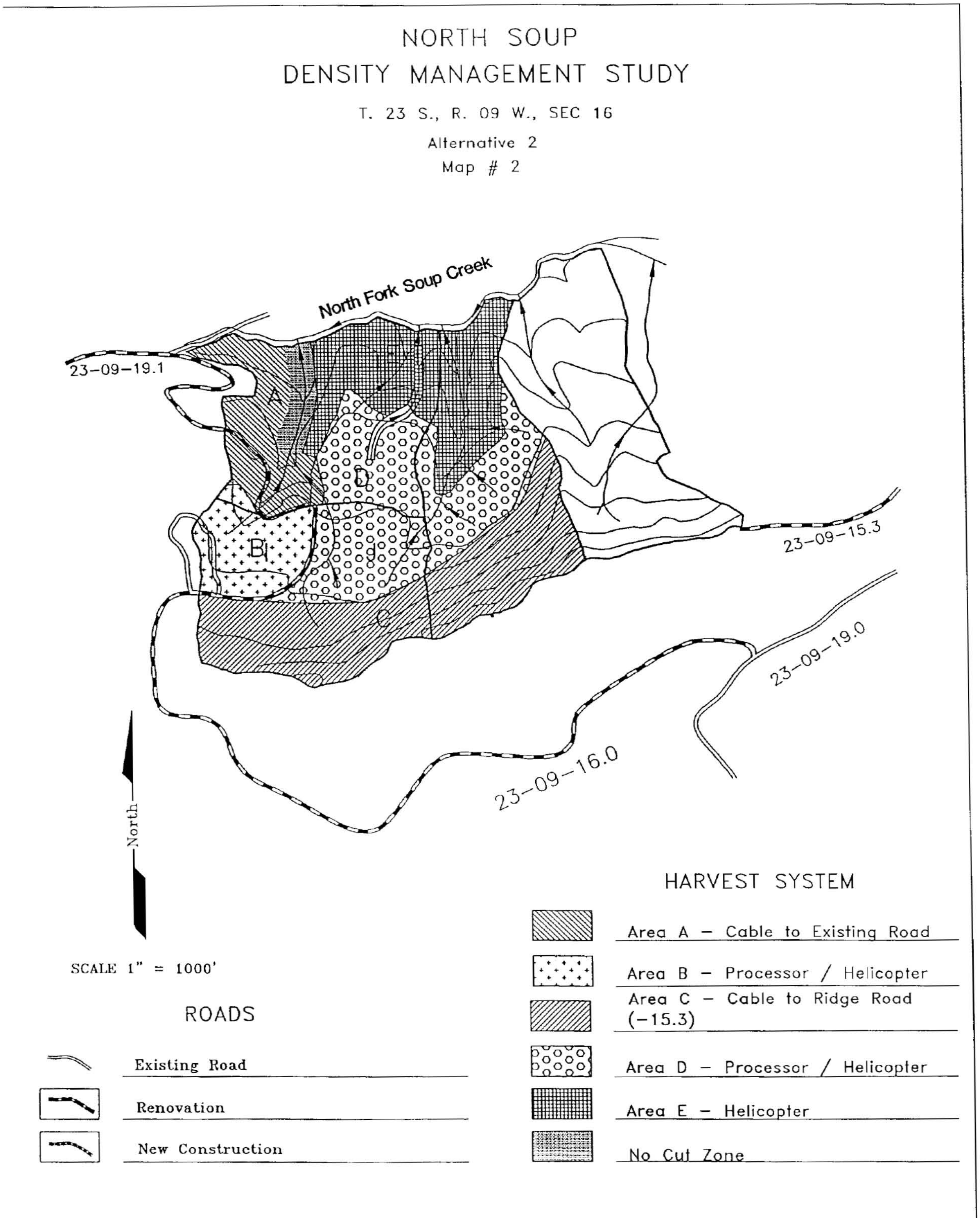
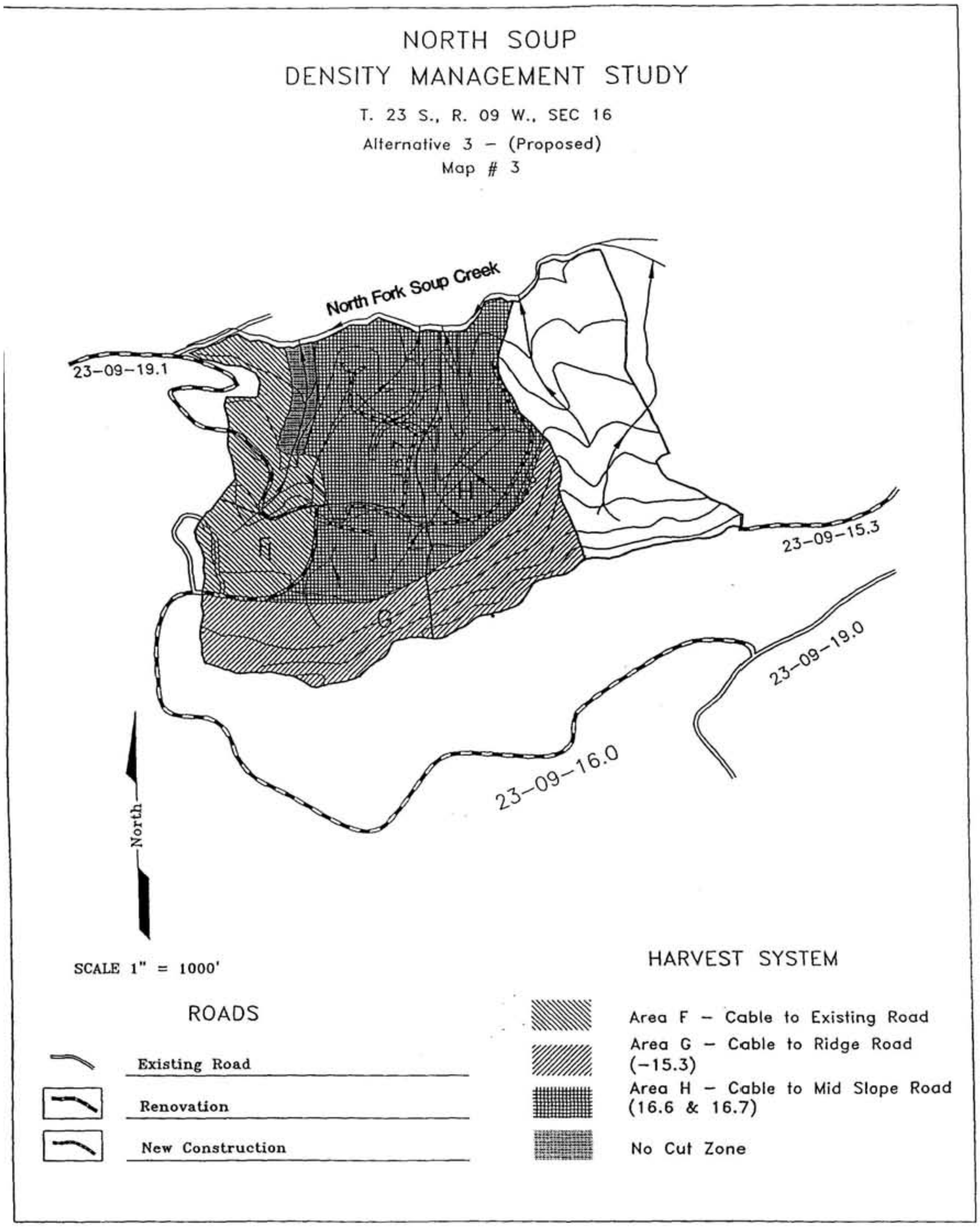
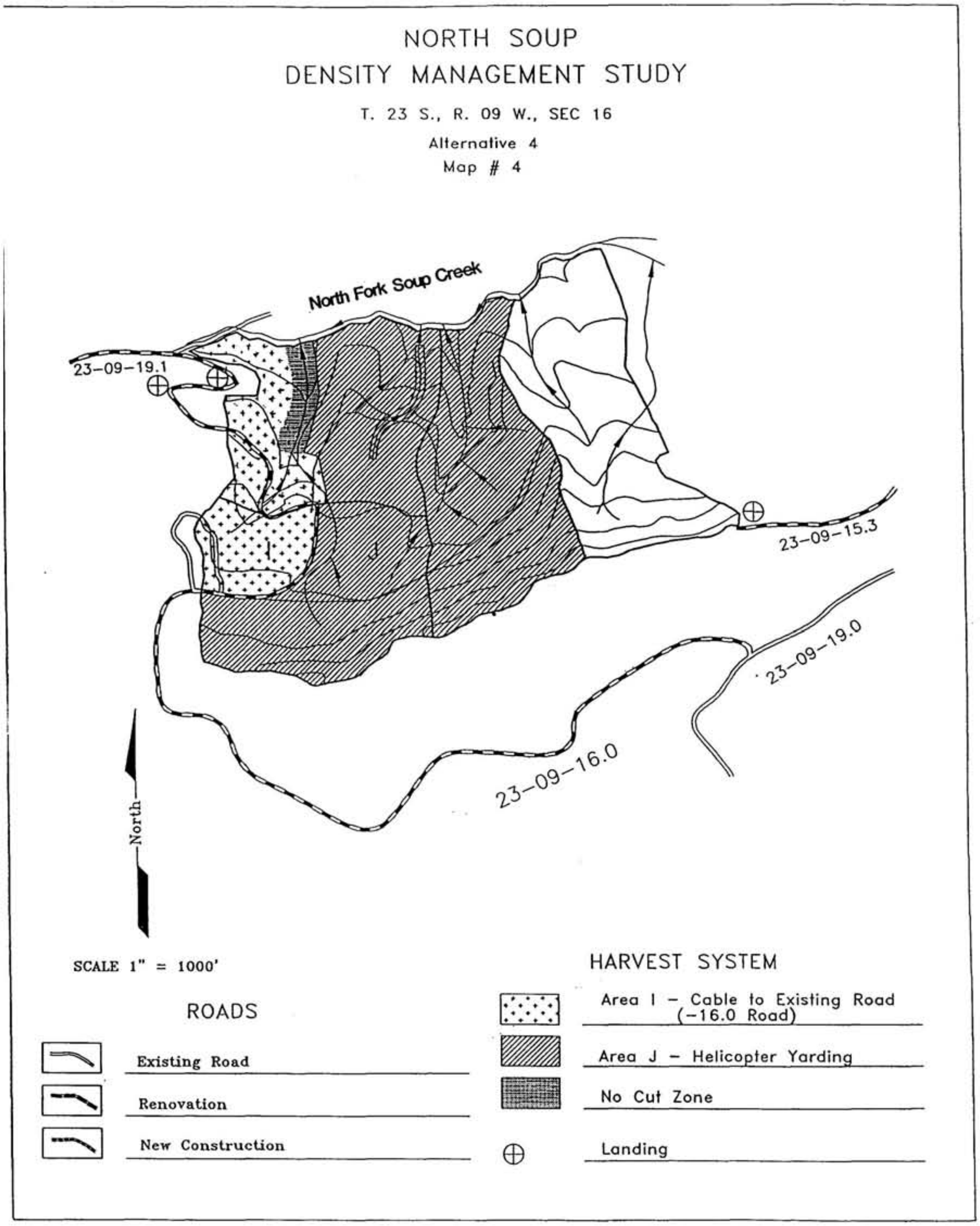
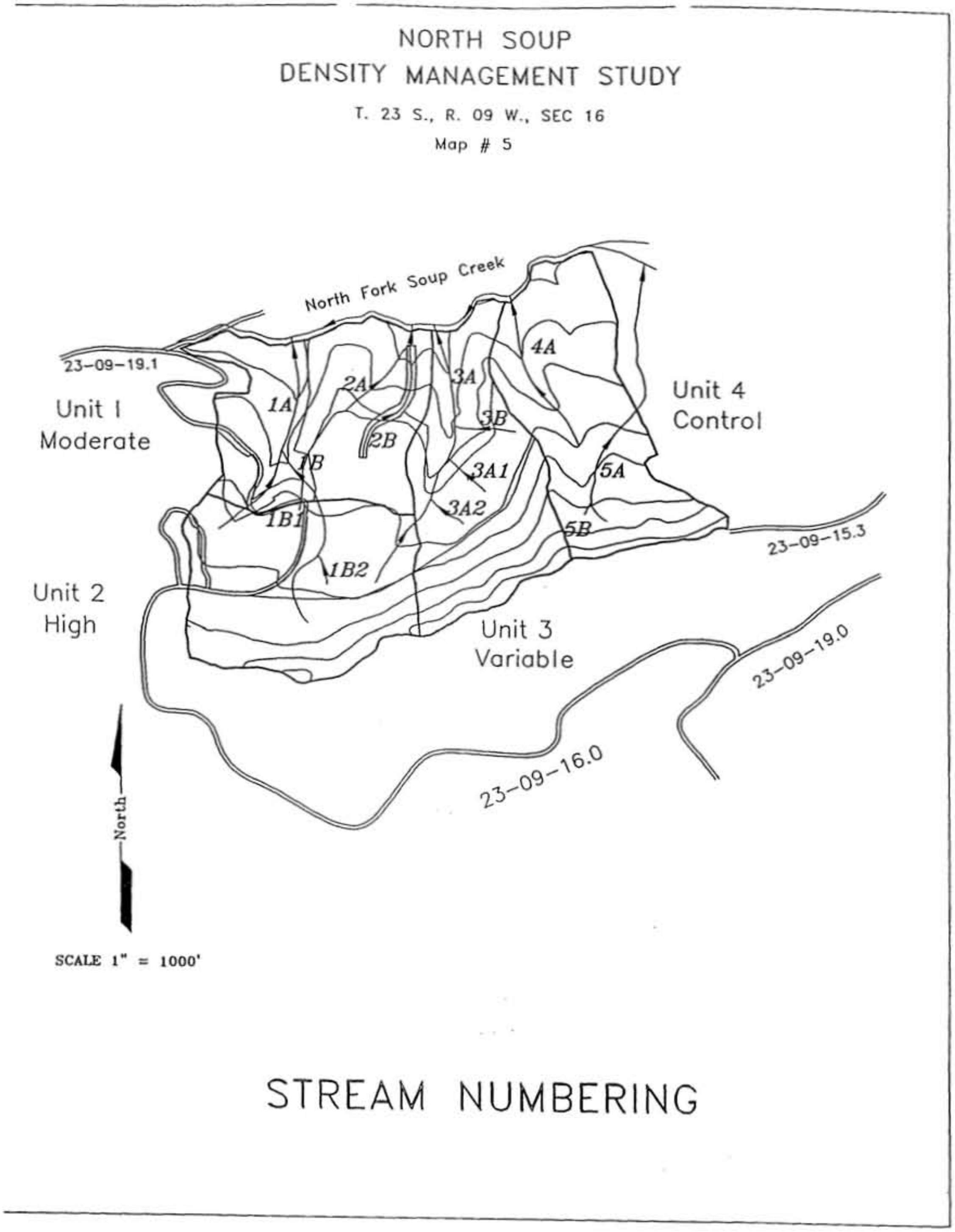

NORTH SOUP
DENSITY MANAGEMENT STUDY
T. 23 S., R. 09 W., SEC 16
Alternative 2
Map # 2
North Fork Soup Creek
23-09-19.1
23-09-15.3
23-09-19.0
23-09-16.0
A
B
C
D
E
North
SCALE 1" = 1000'
ROADS
Existing Road
Renovation
New Construction
HARVEST SYSTEM
Area A – Cable to Existing Road
Area B – Processor / Helicopter
Area C – Cable to Ridge Road (–15.3)
Area D – Processor / Helicopter
Area E – Helicopter
No Cut Zone


NORTH SOUP
DENSITY MANAGEMENT STUDY
T. 23 S., R. 09 W., SEC 16
Alternative 3 – (Proposed)
Map # 3
North Fork Soup Creek
23–09–19.1
23–09–15.3
23–09–19.0
23–09–16.0
F
G
H
North
SCALE 1" = 1000'
ROADS
Existing Road
Renovation
New Construction
HARVEST SYSTEM
Area F – Cable to Existing Road
Area G – Cable to Ridge Road (–15.3)
Area H – Cable to Mid Slope Road (16.6 & 16.7)
No Cut Zone


NORTH SOUP
DENSITY MANAGEMENT STUDY
T. 23 S., R. 09 W., SEC 16
Alternative 4
Map # 4
North Fork Soup Creek
23-09-19.1
23-09-15.3
23-09-19.0
23-09-16.0
North
SCALE 1" = 1000'
ROADS
Existing Road
Renovation
New Construction
HARVEST SYSTEM
Area I - Cable to Existing Road (-16.0 Road)
Area J - Helicopter Yarding
No Cut Zone
Landing


NORTH SOUP
DENSITY MANAGEMENT STUDY
T. 23 S., R. 09 W., SEC 16
Map # 5
North Fork Soup Creek
23-09-19.1
Unit 1
Moderate
Unit 2
High
Unit 3
Variable
Unit 4
Control
1A
1B
1B1
1B2
2A
2B
3A
3B
3A1
3A2
4A
5A
5B
23-09-15.3
23-09-19.0
23-09-16.0
North
SCALE 1" = 1000'
STREAM NUMBERING

APPENDIX E.: 1997 BLUE RETRO COMMERCIAL THINNING DECISION DOCUMENTATION AND ENVIRONMENTAL ASSESSMENT (EA OR125-97-19)

EA OR125-97-19

FINDING OF NO SIGNIFICANT IMPACT (FONSI)
for
BLUE RETRO TIMBER SALE: EA OR125-97-19

An Interdisciplinary (ID) Team for the Umpqua Resource Area, Coos Bay District, Bureau of Land Management has
analyzed a No Action Alternative and a Proposed Action to commercially rethin approximately 45 acres of Federal forest land and to provide safe helicopter access to the Steinnon Creek waterhole for fire suppression activities on the
south half of Blue Ridge. The proposed rethin and waterhole improvement project is located in Fairview subwatershed,
T 26 S., R 12 W., Section 25, 26, 35, and 36, Willamette Meridian. A watershed analysis was prepared September, 1996 for Fairview subwatershed. The proposal is a research request by the Biological Resources Division of the United
States Geological Survey, formerly the National Biological Survey, to commercially rethin a young stand of timber and
its riparian reserves from the General Forest Management Area (GFMA). Also, the ID team proposes to cut down danger trees and snags in the riparian reserves adjacent to Steinnon Creek waterhole to provide safe helicopter access
into and out of the waterhole for fire suppression activities. In compliance with the Standards and Guidelines of the Record of Decision (ROD) for the Northwest Forest Plan, there would be no entry into Late Successional Reserves. Snags, except adjacent to Steinnon Creek waterhole and Steinnon Creek, and down logs would be retained for biodiversity to meet or exceed the requirements in the *Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl* (Northwest Forest Plan). The proposal would also provide jobs and supply society with wood products.

This EA is tiered to the *Coos Bay District Resource Management Plan*/*EIS* and its *Record of Decision* (RMP) (BLM,
May 1995) and conforms with the Northwest Forest Plan and its *Record of Decision* (Interagency, 1994)
The No Action Alternative and the Proposed Action, with its design features, are described in the attached EA entitled
Blue Retro Commercial Thinning (EA OR125-97-19).

Consultation by the U.S. Fish and Wildlife Service was not required for this project. There are no Bald Eagle, Northern
Spotted Owl, Marbled Murrelet sites or suitable habitat located within the prescribed distances from the project that would require consultation by the U.S. Fish and Wildlife Service.

The analysis of the potential effects of the Proposed Action was based on research, professional judgement, and experience of the Interdisciplinary Team. There are no known negative effects on (1) Threatened or Endangered Species, (2) Floodplains or Wetlands/Riparian zones, (3) Wilderness Values, (4) Areas of Critical Environmental Concern, (5) Cultural Resources, (6) Prime or Unique Farmland, (7) Wild and Scenic Rivers, (8) Air Quality, (9) Native American Religious Concerns, (10) Hazardous or Solid Waste, (11) Water Quality or (12) Spread of Noxious Weeds.

The Proposed Action is in compliance with the Standards and Guidelines of the ROD, recommendations of the Fairview subwatershed analysis and does not retard or prevent the attainment of the Aquatic Conservation Strategy.

DETERMINATION

On the basis of the information contained in the Environmental Assessment, and all other information available to me,
it is my determination that neither alternative analyzed constitutes a major Federal action affecting the quality of the human environment. Therefore, an Environmental Impact Statement is unnecessary and will not be prepared.

________________________________ ________

Daryl L. Albiston Date
Umpqua Resource Area Manager

proposed
DECISION DOCUMENTATION

BLUE RETRO

EA No. OR125-97-19

Background:

An Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) for the Blue Retro commercial thinning timber sale were prepared by the Umpqua Resource Area, Coos Bay District Office, using input from District resource staff. The proposal is to commercially rethin approximately 45 acres of timber from the General Forest Management Area (GFMA), and to open safe helicopter access to Steinnon Creek waterhole, by removing danger trees and snags adjacent to the waterhole and Steinnon Creek for fire suppression activities on Blue Ridge. Details of the timber sale plan and EA are available for public review at the Coos Bay District Office.

Management objectives are to:
1) Implement a retrospective density management study by the Biological Resources Division of the U.S.G.S. to rethin a previously thinned area in order to conduct research on understory response to a density management (thinning) prescription; 2) Help offer economic opportunities for year-round, highwage, high-skill jobs by producing a predictable and sustainable level of timber harvest; 3) Protect and maintain the biodiversity and long-term health of the forest ecosystem through compliance with the Standards and Guidelines of the Record of Decision (ROD); 4) Provide safe helicopter access into and out of Steinnon Creek Waterhole; 5) Comply with the objectives of the Aquatic Conservation Strategy of the ROD.

In accordance with the *Forest Management Regulations* at CFR 5003.2, the decision for this timber sale will not become effective or be opened to formal protest until the *Notice of Sale* is published "in a newspaper of general circulation in the area where the lands affected by the decision are located." For this project, the *Notice of Sale* will be published in *The World* newspaper and constitutes the decision document for purposes of protests and appeals, 43 CFR Subpart 5003 - Administrative Remedies. Protests of the decision to offer timber for sale described here must be filed within 15 days after the first publication of the newspaper notice.

Decision:

My decision is to implement the Proposed Action of EA OR125-97-19 analyzing the environmental effects of the Blue Retro Commercial Thinning timber sale.

The Blue Retro Commercial Thinning is located in T. 26 S., R. 12 W., Sections 25, 26, 35, and 36, Willamette Meridian. An estimated 45 acres of Federal timberland would be commercially rethinned for research purposes and Steinnon Creek waterhole would be opened for safe helicopter access. The Design
Features and Management Requirements described in the EA are hereby adopted.

The design features and management requirements will be implemented as described in the *Coos Bay District Resource Management Plan/EIS* and its *Record of Decision (RMP)* (BLM, May 1995) which is in conformance with the *Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl* and its *Record of Decision* (Interagency, 1994).
This sale has been surveyed for sensitive, threatened or endangered wildlife and botanical species. No threatened or endangered species as defined by the Endangered Species Act of 1973, as amended, were
found on the project area.

Rationale:

The proposed action meets the intent of the *Record of Decision* for the RMP by providing a balance of forest products and biodiversity for future health of the forest and contributes valuable information that may
help promote old forest characteristics in young stands. A watershed analysis, Fairview subwatershed, was completed as required by the (ROD) when entering the Riparian Reserves. The project meets the objectives of the Aquatic Conservation Strategy as listed on pages S-6 and S-7 of the RMP. Consultation by the U.S. Fish and Wildlife Service was not required for this project. There are no Bald Eagle, Northern Spotted Owl, Marbled Murrelet sites or suitable habitat located within the prescribed distances from the project that would require consultation by the U.S. Fish and Wildlife Service.

____________________ ____________________

Daryl L. Albiston Date
Umpqua Resource Area Manager

BLUE RETRO COMMERCIAL THINNING
ENVIRONMENTAL ASSESSMENT
EA OR125-97-19

Umpqua Resource Area
Coos Bay District
Bureau of Land Management

Prepared this _____ day of ________________, 1997, by

Interdisciplinary Core Team

David Hardin	Umpqua RA Forester, Team Leader
Paul Fontaine	Umpqua RA Silviculture Forester
Scott Poore	Umpqua RA Fuels Management Specialist
Pat Olmstead	Umpqua RA Fisheries Biologist and T&E Species
Sabrina Keen	Umpqua RA Wildlife Biologist and T&E Species

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Chapter 1 - Purpose and Need for Action

The Bureau of Land Management (BLM), Coos Bay District at the request of the Biological Resources Division (BRD) of the United States Geological Survey (USGS), formerly the National Biological Survey, proposes a retrospective density management study by commercially rethinning approximately 45 acres within a 60 acre study area of 45-50 years old timber. The stand was originally commercially thinned in 1983. The study area is located on Blue Ridge in the Umpqua Resource Area T. 26 S., R. 12 W., Sections 25, 26, 35, and 36 Willamette Meridian in the Fairview subwatershed. The project is in the General Forest Management Area (GFMA) land allocation (designated as "Matrix" lands in the Northwest Forest Plan). GFMA lands are forest lands managed on a 70-110 year regeneration harvest cycle with retention of biological legacies for forest health. The Umpqua Resource Area Fuels Management Specialist has also indicated a need for safe helicopter access into and out of Steinnon Creek Waterhole for fire suppression. The Seinnon Creek Waterhole is located near the study area in Section 35. The proposed action should attain the following management objectives:

- Implement a retrospective density management study requested by the Biological Resources Division of the USGS by rethinning a previously thinned area in order to conduct research on understory response to a density management (thinning) prescription that could help young stands attain old growth characteristics faster by promoting a second layer of conifers and hardwoods, shrub and herb understory, fuller crowns, larger branches, and furrowed bark on overstory trees.

- Help provide economic opportunities for year round, high-wage, high-skill jobs by producing a predictable and sustainable level of timber harvest by helping to meet the Coos Bay District's harvest commitment from the GFMA for FY97.

- Protect, maintain, or enhance the biodiversity and long term health of the forest ecosystem through compliance with the Standards and Guidelines contained in the Record of Decision (ROD) for the *Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl* (Interagency, 1994) (Northwest Forest Plan), and also the Record of Decision for the *Coos Bay District Resource Management Plan* (BLM, May 1995).

- Provide safe helicopter access into and out of Seinnon Creek Waterhole.

- Comply with the objectives of the Aquatic Conservation Strategy of the ROD.

This Environmental Assessment (EA) is tiered to the *Coos Bay District Resource Management Plan* and a *Final Environmental Impact Statement* and its *Record of Decision* (RMP) (BLM, May 1995) and conforms with the Northwest Forest Plan and its ROD. An Analysis File, containing additional information such as Interdisciplinary (ID) Team notes and resource staff input used by the ID Team to analyze impacts and alternatives, is hereby incorporated by reference.

Proposal

The Umpqua Resource Area of the Coos Bay District proposes to implement the Blue Retro Density Management Study on approximately 60 acres of Federal forest land, and to open safe helicopter access to Steinnon Creek Waterhole, by removing danger trees and snags in the riparian reserves, for fire suppression of the Blue Ridge area of the Fairview subwatershed, in accordance with the Standards and Guidelines of the ROD. The proposed study area and waterhole are not located in a tier 1 or 2 key watershed. The study area will be divided into two treatment areas with one control area of 15 acres and one study area of 45 acres. The study area would be rethinned to retain an average of 45 Douglas-fir trees per acre. In accordance with the Fairview subwatershed analysis and the research request from the BRD, the riparian reserves would be commercially rethinned to provide future durable woody material which can be recruited as in-stream structure and help promote old-forest characteristics. A cable logging system would be used from existing rock surfaced roads to harvest the excess trees. All snags, except those deemed a safety hazard, coarse woody debris, and minor tree species would be retained. The study areas will be monitored by scientists from the

Pacific Northwest Experiment Station (PNW) in Corvallis, Oregon, researchers from the Biological Resources Division of the USGS, and Coos Bay District personnel.

A Watershed Analysis was completed for Fairview subwatershed in September 1996. Watershed Analysis is a systematic procedure to characterize the aquatic, riparian and terrestrial features within a watershed and is required on the GFMA land base if there is any modification of the Standards and Guidelines for GFMA lands. The research proposal of the Biological Resource Division conforms with the recommendations of the Fairview Subwatershed. The Fairview Subwatershed Analysis is hereby incorporated by reference.

Additional information such as vegetation maps, topographic maps, and Timber Production Capability Classification maps are contained in the Blue Retro timber sale plans folder, hereby incorporated by reference.

Scoping

The scoping process afforded the opportunity for the public and agency personnel to identify their concerns relating to the proposed project, and define the issues that are analyzed in the EA. The general public was notified of the planned EA through publication of the District's semi-annual planning update and letters to interested individuals and organizations on the District's NEPA mailing list. There was no response to this invitation to become involved. Scoping information can be found in the EA analysis file, hereby incorporated by reference.

Identified Issues

The Interdisciplinary Team reviewed the proposal for potential issues and determined that there were no significant issues for analysis in the EA. Therefore, no alternatives to the proposed action were recommended by the ID Team.

Potential issues identified, but eliminated from further analysis:

1. Reduction of organic materials because of treetops and limbs being removed from the unit: To insure the retention of organic materials on-site a contract provision will be used to require logs to be no longer than 40 feet in length when yarded to the landing. This will require bucking of unmerchantable tops and limbs, thereby leaving organic material on site.

2. There is potential for noxious weeds to become established: To mitigate this issue a provision would be included in the contract requiring logging and road construction equipment to be washed prior to moving into the area.

3. Due to the proximity of the project area to a rural population center there is concern for the public safety while they are pursuing recreational interests on the back roads in the project area: This has not been a problem on past timber sales. The purchaser normally posts a watchman for equipment security and fire protection and is required by law to post signs when falling trees along a road. A provision will be included in the contract requiring the purchaser to display warning signs while operating in the project area.

4. Impacts on wildlife due to logging: With retention of snags, downed woody material and various hardwoods, forest diversity will be maintained.

5. Potential for soil compaction: Although the compaction hazard for Blachly soil is severe, there should be very minimal soil compaction resulting from this project. This project will utilize cable logging systems and there will be no new roads or skid roads constructed for this project, which will significantly reduce compaction potential.

6. Potential for damage to the creek bank and junction of two creeks: To insure minimal damage, the purchaser will be required to maintain one-end log suspension over the creek, and be restricted to 1 or 2 yarding corridors across the creek, and yard away from the creek junction.

7. Theft of excess down woody material in the riparian reserve of Steinnon Creek and the waterhole: Due to the proximity of Blue Ridge to a population center some of the trees cut in the Riparian Reserves, within 50 to 75 feet of the gravel road, would have a high probability of being stolen if left on site. If funding for future riparian/stream enhancement is available at time of the sale, excess logs in danger of being stolen would be transported to a safe location and stockpiled for future riparian/stream enhancement projects. If funding is not available at the time of the sale the excess logs would be included with the Blue Retro timber sale.

Chapter 2 - Alternatives Including the Proposed Action

Alternative 1 - No Action

Under this alternative the density management study would not take place at this time, but may take place in the future. Another site may be selected for the study.

Alternative 2 - Proposed Action

Under this alternative the commercial thinning density management study would consist of an approximately 60 acre unit located on Blue Ridge(See maps in Appendix 1). The unit would be broken into two treatment areas with one control area 15 acres in size, and one 45 acre study area. The control area would be used to monitor the amount and type of change in the study area. The study area would be rethinned down to approximately forty-five (45) remaining Douglas-fir trees per acre with an acceptable range of approximately thirty (30) to sixty (60) remaining Douglas-fir trees per acre.

Also under this action all minor tree species and Douglas-fir trees 10" diameter at breast height (DBH) and less would be reserved from cutting to promote the growth of the understory canopy. All non fish bearing perennial and intermittent riparian reserves will have a one tree width streamside buffer as requested by the Biological Resources Division's project design and the RMP. Cable logging systems would be used from existing rock surfaced roads to harvest excess trees.

To provide safe helicopter access into Steinnon Creek Waterhole for fire suppression activities, all standing green trees and snags designated by the Fuels Management Specialist to be in the flight path would be cut. Cut trees not sold or used for riparian projects and snags would be used as coarse woody debris. The resulting slash would be hand piled, covered, and burned during the following winter. The wooden walkway, used to open and close the culvert, would be repaired and additional rock would be added to the parking space to make a stable area for fire trucks to fill their tanks with water. Fuels Management Specialist's report and maps are in the analysis file.

Design Features and Management Requirements

The following design features and management requirements would apply to Alternative 2 (the proposed action):

- Existing roads will be maintained during the life of the sale to minimize the disruption of the hydrologic flow.

- One-end log suspension shall be maintained where possible within the unit and when yarding logs through the Riparian Reserve. Thinning corridors will be aligned perpendicular to the stream and not exceed 15 feet in width. Thinning corridors will be required to be 100 feet horizontal distance from the junction of the second order streams that lay within the boundary of the unit.

- All existing classes of Coarse Woody Debris (CWD) will be retained on the unit in accordance with the Standards and Guidelines of the ROD.

- A half round culvert will be attached to the outflow side of the Steinnon Creek waterhole to assist cutthroat trout leaving the waterhole to reach deep water down stream.

- With the exception of those that are deemed to be possible safety hazards during logging and those located adjacent to Steinnon Creek waterhole, existing snags would be retained across the treatment areas. Any snags felled or knocked over would remain on site as CWD.

- All residual material piled on landings and along existing roads or down material (except reserved Coarse Woody Debris) which could be reached from existing roads would be available for disposal as special forest products (firewood, fenceposts, poles, etc.).

- All standing woody material 1/2" to 3" in diameter located within 20 feet of the ditchline of the -35.4 road shall be slashed and chipped with a portable chipper and blown back into the project area.

- All logs yarded to the landings will be limited to forty (40) feet in length.

- To reduce damage to bark on reserved trees and impacts to animals rearing young at this time, cutting and yarding will not be permitted from March 1 through June 30.

- The proposed unit has been surveyed and the locations identified of all perennial non fish-bearing streams, intermittent streams and seeps. There are no fish-bearing streams located within the project area. All non fishbearing and intermittent streams would have one tree width stream side buffers as requested by the Biological Resources Division's project design and the RMP. Seeps and unstable areas would also be buffered according to the Standards and Guidelines.

- In addition to research monitoring, other monitoring would be accomplished in the form of logging inspections, snag and down log surveys, and noxious weed monitoring.

- All Douglas-fir trees 10 inches and less in diameter at breast height (DBH) and all minor tree species will be reserved.
- To help prevent the spread of noxious weeds all logging equipment, trucks and road construction equipment that enter the project site from outside our local area shall be washed.

- The purchaser shall display warning signs when conducting logging operations within the project area.

- A standard special provision would be included in the contract to protect T&E species found on the site after the contract is awarded.

The following table illustrates how the alternatives relate to the objectives:

Objective Matrix

Objective	No Action Alternative	Proposed Action Alternative
To implement the retrospective density management study by the Biological Resources Division to rethin a previously thinned area in order to conduct research on understory response to a density management (thinning) prescription	No	Yes
Help provide economic opportunities for year round, high-wage, high-skill jobs by producing a predictable and sustainable level of timber harvest by helping to meet the Coos Bay District's harvest commitment from the GFMA for FY97	No	Yes
Protect and maintain the biodiversity and long term-health of the forest ecosystem through compliance with the Standards & Guidelines	Yes	Yes
Provide safe helicopter access into and out of Steinnon Creek Waterhole for fire suppression activities on Blue Ridge	No	Yes
Comply with the objectives of the Aquatic Conservation Strategy of the ROD	Yes	Yes

Alternatives Considered but Eliminated from Further Analysis

None identified

Chapter 3 - Affected Environment

Physical and Geographic Characteristics

The project area is located on Blue Ridge in the Umpqua Resource area T. 26 S., R. 12 W., Sections 25, 26, 35, and 36, Willamette Meridian, approximately eleven miles Southeast of Coos Bay, Oregon in the Fairview subwatershed. The elevation of the treatment area ranges from 1400 to 1600 feet. The topography is gentle, with slopes ranging from 10 to 35 percent. An all weather road currently accesses the study area. See maps in Appendix 1

Soils

The dominant soil for the study area is the Blachly association. This association occurs on gently sloping to steep ridgetops, sideslopes, and slump benches. The Blachly soils are very deep, 3½ to 10 feet, red, clayey, and well drained. These soils occur at elevations of 1200 to 3000 feet with slope gradients ranging from 5-50 percent. Permeability is moderately slow and is associated with an annual precipitation of 60-120 inches. The compaction hazard for the Blachly association is severe. Soil productivity is high for Douglas-fir trees. The Timber Production Capability Classification for the study area is RLR (reforestation problems due to light - 100% of the area) and RAR (reforestation problems due to animals - 30% of the area). (Soil Inventory of the Coos Bay district, Townsend, et. al., 1977). The Soil Scientist's report is in the analysis file.

Vegetation, Including T & E Species

Timber: The primary overstory consists of 45-50 year old Douglas-fir trees with minor amounts of Western Hemlock and Western Red Cedar scattered through the stand. The study area has an approximate stocking level of 169 trees per acre with an average diameter at breast height (DBH) of 16.4" (stand exam data is in the analysis file). The average gross volume for this stand is approximately 47,700 board feet per acre. The stand received a very light commercial thinning in 1983.

The approximate stand composition of trees 10" dbh and larger based on data from the July, 1993 stand exam is:

Douglas-fir	90%
Western red cedar	4%
Western hemlock	6%

Understory brush: Rhododendron, Oregon grape, Vine maple, Salal and Sword fern are the major brush species found on the forest floor of this stand. There are also numerous fungal mats in the stand as evidenced by the high production of various types of mushrooms.

T & E Plants;
There are documented locations of a special status plant in the Blue Ridge area. Cusick's checkermallow (*Sidalcea cusickii*) inhabits grassy openings and rock outcrops. Its status as a tracking species indicates that it does not require management consideration. There is no habitat for this species in the unit. There are no other special status plants known to be in the area. There are no known locations of any survey and manage strategy 1&2 species in or near the project. The Botanist report is in the analysis file.

Aquatic Resources and Fisheries, Including T&E Species

Hydrology
The unit is located on top of the ridge between Steinnon Creek to the west and Woodward Creek to the east. The northern third of the unit is a flat knoll that does not have any clearly defined channels. The middle third of the unit is drained to the east by two 2nd order perennial channels. Each of these channels fork just above the east boundary of the unit. The southern third of the unit is relatively flat and does not have any clearly defined channels. The Hydrologist report is in the analysis file.

Aquatic/Fisheries Resources
The Blue Retro timber sale is contained within the Fairview Subwatershed and is located within the Woodward Creek Drainage. The streams located within the Blue Retro timber sale boundary consist of headwater streams of a third order tributary to Woodward Creek. The closest known fish population to the unit boundary is in Woodward Creek, approximately one mile below the sale unit boundary. No fish were found in streams within the sale unit during field inspection. This unit is situated on Blue Ridge on an east facing bench. The perennial streams within the sale unit boundary have a low average gradient. This stream gradient gets steeper in the third order stream as it leaves the unit and drops off Blue Ridge toward Woodward Creek. These streams generally have low sinuosity and encompass small wetland habitats on flat wide areas or at confluences. These wide wetland habitats along the stream channel contain multiple seeps and are mostly small (approx. 25'X25') in area. Reaches with multiple channels result from spring seep areas. Streambanks are well vegetated, although there are a few areas of downcutting and lateral streambank scour. Stream bottom substrate consists mainly of small sand and silt particles with large amounts of small organic material (leaves, twigs and branches). Reaches of clay streambed and streambanks are scattered along the streams. Cobble size basalt dominates the streambed at the confluence of the secondod, 6" to 30" in diameter is distributed on and over the third order tributary.

As the gradient increases below the confluence of the second order streams, woody debris in the stream becomes more important and forms step/pool habitat. This woody debris contributes structure and maintains the integrity of the streambanks and streambed. This third order reach is approximately double the size of the second orders and currently averages three to four feet wide and about five inches deep.

Water quality appears to be good. Water temperature was 48 degrees on February 5th, and low flow summer time water temperature is likely maintained below 60 degrees because of the dense canopy cover. An observation of aquatic macro-invertebrates indicate a wide range of functional feeding groups present with good abundance. With little gravel substrate in the streams, macro-invertebrates utilize the abundant organic matter and the rooted emergent vegetation in the wetland areas.

The riparian vegetation within the sale unit boundaries has not been previously surveyed. Observations of riparian zone vegetation in the sale unit shows that most of the overstory shade on the streams and wetland areas is provided by a canopy of dense conifer (Douglas-fir, western red cedar, and western hemlock) with a mix of large red alder. A shrub layer consists of vine maple, salmonberry, and huckleberry while the understory vegetation consists of dense swordfern, sedges, mosses, and skunk cabbage. Dense streamside understory vegetation and conifer/hardwood overstory provides these streams with nearly 100% shade. This cover allows a moderating micro-climate to exist around the seeps, springs, and streams, and shades them from direct sunlight during the summer months.

Threatened and Endangered Aquatic Species
No threatened or endangered fish species have been found in streams within the sale unit. Coho and winter steelhead have been found in Woodward Creek approximately one mile downstream from this sale unit and in Steinnon Creek below the waterfall approximately one quarter mile below the fire pond. Both fish species hing by the National Marine Fisheries Service is pending.

Steinnon Creek Waterhole
This pond is constructed on the upper reach of Steinnon Creek. This area of Steinnon Creek is a perennial fish bearing stream with full Riparian Reserve protection. Aquatic surveys from 1980 indicate that there were no fish present in Steinnon Creek above a water fall approximately one quarter mile below the helipond. Subsequent surveys found cutthroat trout in the stream above and below the pond, as well as in the pond. It is not known whether the earlier surveys overlooked these fish or if they were subsequently transported to this reach of stream and the pond by the public. This pond is 0.90 acres in size and is approximately 25 years old.

Wildlife, Including T&E Species

General Wildlife
The site is classified as a *temperate coniferous forest*, based on plant species present. These forests are the common lower elevation type in the Coast Range. Based on the tree diameter and canopy closure, the stand is considered a *closed sapling-pole-sawtimber* stand. There are also several “wet areas” with flowing or standing water during the wet season with corresponding plant species. These areas are small but important refugia for the species which depend on them. The stand is very homogeneous in it’s features; this is one of the reasons it was chosen for the study. A list of potential wildlife which could use the area for either resting, breeding, or foraging purposes is contained in the analysis file.

T&E Species: A Threatened and Endangered species review of the area shows that there are no Bald Eagle, Northern Spotted Owl (NSO) or Marbled Murrelet (MM) sites near the project site. The closest MM sites are 2.5 miles to the north and 2.1 miles to the east. No Suitable Habitat is within .25 mile of the project. Cliffs, associated with Peregrine Falcon nesting, are limited in the area.

Although the Blue Retro timber is only 47 years old, it is large for its age due to high quality soil. It is considered dispersal habitat for both MM and NSO. Other areas around the proposed thinning unit, if not already cut, are expected to be cut since they are in private ownership.

The Blue Retro study area is in matrix lands and is not part of any Critical Habitat Unit. Based on this information, and a phone call to the U.S. Fish and Wildlife Service (12/96), consultation is not required for this project. The Wildlife Biologist report is in the analysis file.

Chapter 4 - Environmental Consequences

This chapter describes the scientific and analytical basis for the comparisons of the alternatives, and the probable consequences as they relate to the alternatives.

The environmental consequences for both alternatives are outlined in the following table which lists the Critical Elements required to be addressed by the National Environmental Policy Act (NEPA) and whether they are affected by the alternatives.

Critical Element Evaluation of Each Alternative

Critical Element	No Action	Proposed Action
Air Quality	No	No
Area of Critical Environmental Concerns	No	No
Cultural Resources [1]	No	No
Farm Lands (prime or unique)	No	No
Floodplain	No	No
Native American Religious Concerns [1]	No	No
Noxious Weeds [1]	No	No
Threatened or Endangered Species (wildlife)[1]	No	No
Threatened or Endangered Species (botanical) [1]	No	No
Threatened or Endangered Species (fish)[1]	No	No
Wastes; Solid or Hazardous [1]	No	No
Water Quality; Drinking/Ground	No	No
Wetlands/Riparian Reserves	No	Yes
Wild and Scenic Rivers	No	No
Wilderness	No	No

[1] **On-site evaluations have been conducted and documented in the Analysis File by the District Archaeologist, the Resource Area Botanist, the Resource area Wildlife Biologist, the Resource area Fisheries Biologist, the District Hazardous Materials Coordinator, and the Resource Area Noxious Weed Coordinator.**

Alternative 1 - No Action

The proposed study area would not be treated at this time, and a safe helicopter flight path into and out of Steinnon Creek Water hole would not be provided for fire suppression activities; therefore, the environment described in Chapter 3 would not be altered.

Alternative 2 - Proposed Action

Soils

Due to the gentle topography of the study area very little erosion or sedimentation of streams is anticipated following cutting and yarding operations. The excess trees in the study area will be yarded from existing rock roads and will contribute very minor amounts of erosion or sedimentation to streams within the study area. With no new road construction and the utilization of cable yarding systems on existing rock roads only very minor amounts of soil compaction should occur in the yarding corridors.

Vegetation, Including T&E species

In the short term the proposed project would change the structure of the vegetation within the study area, but no loss of species is anticipated. The removal of standing timber would allow more heat and light to reach the forest floor and stimulate the growth of the brush and herb layer. The humus layer on the forest floor would be somewhat disturbed from the felling and yarding operations. Rethinning may help promote old forest characteristics by further reducing overstory density while creating an irregular distribution of overstory trees. It could also promote the continued development of the following characteristics: a second layer of conifer or hardwoods, a shrub and herb understory, fuller crowns, larger branches and furrowed bark on overstory trees. Thinning the stand will increase the vulnerability to infestations by exotics, which may thrive in the resulting disturbed soils and brighter light conditions. However, the canopy will eventually close, shading out weedy species. The potential invasion of weeds may be negated by well-established native brush species and small Western Hemlock trees which may out compete exotic vegetation.

Aquatic Resources and Fisheries, Including T&E Species

Hydrology
There are some indications that due to the edge effect (the remaining vegetation will utilize the water that is made available due to the removal of vegetation) there would be little if any change in the annual yield (the amount of water running off the basin in a year). Although it is difficult to detect outside the scope of natural variability until 20-30% of the basin is in a clear cut condition, the peak flows and low flows are probably also affected.

Aquatic/Fisheries Resources

Direct Impacts

Cable yarding through streams and riparian areas could cause some streambank damage and resulting water quality impairment. This is especially true if it occurs on streambanks and streambeds composed of clays or if the wetland habitats are disturbed by yarding. The suspension of one end of yarded logs through riparian areas and over streams will minimize streambank disturbance. Streams are moderately downcut, so in effect, there will likely be full suspension over the stream channels.

Steinnon Creek Waterhole
The proposed cutting pattern on the west and east sides of the pond will reduce some shading to the surface waters of the lower one half of the pond. This pond currently has mid-day exposure to the sun, however the maximum surface temperature is not known at this time. Outflow from the pond is from the surface by way of 3 culverts and a screw gate. This outflow water may slightly increase the surface water temperature of Steinnon
Creek for a short distance, at least until mixing with cooler water. What impacts the removal of additional trees will have on surface water temperatures in the pond and in Steinnon Creek is unknown, but expected to have minimal impact.
Water temperature monitoring will be done before and after timber removal.
The cutting of trees in the Riparian Reserve of Steinnon Creek below the road will slightly reduce stream shading over approximately a 125 foot section of stream. This reduction in shade will be short term since existing smaller trees will quickly grow and fill canopy openings. There will be no direct impacts to the fishery or other aquatic biota from this action. Cut trees that are left on site will contribute shade and large wood to the stream channel and the riparian zone. Aquatic Conservation Strategy objectives will be met under this action because an adequate numberon site for habitat and nutrient cycling purposes in the riparian and aquatic habitats.

Indirect Impacts
None are identified at this time.

Wildlife, Including T&E Species

Short-term Effects

Logging during wildlife breeding and rearing of young will always cause displacement and destruction of animals; especially young, who can not move quickly and consequently get buried, crushed, or injured. Excluding cutting and yarding activity between March 1 and June 30 should minimize impacts to wildlife that breed and rear their young during the spring and early summer. A certain amount of animals will still be displaced as a result of the logging during the winter, however, numbers are not expected to be as high. Species, especially susceptible include hibernating or resting bats, which may be underneath bark. They are unable to escape, and subsequently die when the tree comes down. Other tree dwelling species such as squirrels, raccoons and porcupine have the same fate if they are in the "wrong" tree.

Underground and ground dwelling mammals such as salamanders, boomers, voles, shrews, moles, chipmunks, rabbits, mice and woodrats usually hunker down when activity and noise is going on around them. They rarely leave their nests - or hiding spots, therefore, they too commonly die when trees fall on them. Above ground species die directly, while underground species are crushed or suffocate to death as their tunnel or hole systems collapse on them.
Overall, logging has the most negative effect on smaller, less mobile species. In addition to effects on site specific animals, logging operations produce noise which all animals, in the vicinity, hear. Technically, one could argue that these operations may disrupt foraging behaviors, thereby reducing fitness (and breeding potential) in animals within hearing range. However, no definitive studies come to mind to verify this assumption in northwest forests.

No known Threatened and Endangered Species should be affected in the short-term.

Long-term Effects

The result of this thinning should be a large sawtimber categorized stand. Crown cover may be less than 100 percent and average trees exceed 21 inches d.b.h. There already is downed woody material (and that will be increased after the thinning), but not enough yet to classify the stand officially as old-growth.
Wildlife species endemic to and favoring older aged stands should benefit. These species include Marbled Murrelet and Northern Spotted Owl. The animals displaced during the logging will be replaced by others of their species - dispersing youngsters looking for new habitat and territories. Other species may move in to the area to fill the older-growth nitch now created. Almost all the species found in the closed sapling-pole sawtimber stand would also use a large sawtimber stand to one extent or another.

Cumulative Effects

Alternative 1 - No Action

If the no action alternative is selected, the study may be proposed for other locations on BLM-administered lands in order to meet the objectives of the RMP and the Northwest Forest Plan. There would not be any impact to this specific site. The cumulative effects cannot be analyzed for an alternative location for the study.

Alternative 2 - Proposed Action

The study area is located in the Woodward Creek drainage in the Fairview subwatershed which is part of the North Fork Coquille Analytical Watershed. The Fairview subwatershed drains approximately 19,267 acres. The BLM manages 6,726 acres or approximately 35% of the subwatershed. This project would affect approximately 0.3% of the area drained by the Fairview subwatershed. This project does not affect any late successional forest in the Fairview subwatershed. Road density for the section will remain the same since there will not be any new road construction for this project.

There are approximately 183 miles of stream in the Fairview subwatershed of which 64.3 are managed by the Federal Government This study will affect 0.39 miles of streams and their associated riparian reserves or 0.2% of the streams contained in the Fairview subwatershed.

Steinnon Creek Waterhole serves as the only viable source for helicopter bucket use on the entire south end of Blue Ridge during fire suppression activities. Nearly all of upper Steinnon Creek is in Federal ownership. Land use allocation is Matrix. The proposed action, as well as any future timber harvest on Federal lands within this drainage will have adequate Riparian Reserve widths to protect aquatic and riparian vegetation values and meet the Aquatic Conservation Strategy objectives.

From a wildlife standpoint, the hoped for “end result” of this project is to advance the stand toward an older age. Some animals will die in the process. Other animals will move in to take their place. This cycle is much preferred over a scenario when the habitat is removed and there is nothing to move back into (ie., clearcuts which only provide habitat for edge species, new or invading species and generalists). Conversely, the habitat provided in this project is considered scarce and beneficial to most of the historical wildlife inhabitants of the Coast Range temperate coniferous forest. Therefore, the cumulative effect is overall positive for wildlife.

Anticipated impacts from future Federal timber sales in the Fairview subwatershed through fiscal year 2001 should be minimal as shown below:

Subwatershed	Total Harvest Ac.	Regeneration Harvest Ac.	Commercial Thinning Ac.
Fairview	630	0	630

Through fiscal year 2001 the total Federal timberlands affected in the Fairview subwatershed would be approximately 3.3%.

The commercial thinnings shown above are anticipated to produce positive impacts in the short and long term with improvements in tree growth, stand diversity, understory plant diversity and wildlife habitat. In addition the Blue Retro Commercial thinning should provide valuable information on thinning prescriptions that could help young stands attain old growth characteristics faster by promoting a second layer of conifers and hardwoods, shrub and herb understory, fuller crowns, larger branches, and furrowed bark on overstory trees.

Irreversible and Irretrievable Commitment of Resources

None identified in any of the alternatives

Chapter 5 - List of Agencies and Individuals Contacted

The general public was notified of the planned EA through the publication of Coos Bay Districts semi-annual *Planning Update.* Those requesting notification by scoping notices were contacted with no response.

Consultation was not required by the U.S. Fish and Wildlife Service because there were not any threatened or endangered species located within two miles of the project site.

The following District personnel were contacted for input:

Brian Thauland	Forest Engineer, Umpqua RA
Estella Morgan	Botanist, Umpqua RA
Craig Garland	Soil Scientist, Umpqua RA
Stephan Samuels	District Cultural Specialist
Mark Storzer	Hydrologist, Umpqua RA
Tim Votaw	District Hazardous Materials Coordinator
Scott Knowles	Noxious Weed Coordinator, Umpqua RA
Terry Evans	Plans Forester, Umpqua RA
Paul Rodriguez	Forestry Technician, Umpqua RA

The following public agencies and interested parties were notified with scoping letters:

Association of O&C Counties
David S. Barrows, Exec. Dir.

Cape Arago Audubon Society

Coast Range Association
Lisa A. Brown

Defenders of Wildlife

Kalmiopsis Audubon Society

Oregon Natural Resources Council
D. Heiken, SW Field Representative

The Pacific Rivers Council

Wilderness Watch

Sierra Club
Many Rivers Group

Swanson Superior Forest Products

APPENDIX F: GEOLOGY

1.0 INTRODUCTION

The North Soup and Blue Retro Density Management Study project is to rethin two Density Management Study Sites in the Coos Bay District, as part of a long-term research project, initiated in 1994. Thinning is to occur between September 2010 and March 2012. It is the second thinning entry on the North Soup Site and the third thinning entry on the Blue Retro Site. The project will be completed by logging with a cable system and utilizing existing roads. Approximately 11.1 miles of road would be renovated and approximately one mile of road improved. No new roads would be constructed. Roads not needed for study management would be decommissioned. The North Soup DM Study area contains approximately 233 acres of mixed management and control forest land. The Blue Retro DM Study area contains approximately 63 acres of mixed management and control forest land. Total EA acreage is approximately 296 acres.

The study plan covering these areas is the BLM Density Management and Riparian Buffer Study: Establishment Report and Study Plan, issued by the U.S. Department of the Interior and U.S. Geological Service in 2006.

The purpose of this report is to detail the existing geology and soils conditions and to make interpretation of impact to these conditions by completion of the proposed timber operations.

During the completion of this study, the following resources have been reviewed:

- Historic Aerial Photography from 1960 to present.
- Soil Surveys of Douglas County and Coos County, Oregon.
- North Soup density Management Study Environmental Assessment EA OR125-96-08, dated 1996.
- Blue Retro Commercial Thinning Environmental Assessment EA OR125-97-19, dated 1997
- Numerous Professional Publications.
- Review of geologic map of the project areas.
- Review of maps and information gathered in the project files.
- Site visit to the project sites, with emphasis on road renovations, recreational trail crossings, and stream connections/interfaces.

2.0 EXISTING CONDITIONS

Table 1 provides descriptions of the mapped geology, geologic structure and soil types of each of unit. The geology is based on Niem and Niem (1990). Soil interpretations are based on Johnson et al (2003).

Table 1. Geology and Soils of Projects.

Unit	Geology	Structure	Soil-Percent Slope
North Soup	Elkton Fm.	Strike W-NW, 5º-9º N	Absaquil-Blachly-McDuff Complex, 3%-30%
			Digger-Bohannon-Umpcoos Complex, 60%-90%
			McDuff-Absaquil-Blachly Complex, 30%-60%
			Preacher-Bohannon-Blachly Complex, 30%-70%
Blue Retro	Roseburg Volcanics	No mapped strike or dip	Blachly Silt Loam, 0%-30%
			Preacher-Bohannon Loams, 60%-90%

2.1 Geologic Description and Interpretations

Based on a review of the literature, the following provides a brief description of the units and their associated hazards. Field visits conducted during this study revealed geologic exposures that confirmed the mapping.

Tee-Elkton Formation consists of siltstone with thin to thick sandstone lenses and rhythmically interbedded thin graded sandstone and siltstone. It may interfinger with the upper part of the Tyee Formation (Niem and Niem, 1990). Associated hazards include erosion and mass movement. Mass movement includes all forms of movement, ranging from creep to slumps to debris torrents (Beaulieu, 1975). The silt portions of the unit are more susceptible to slumping and rotational failures.

The North Soup Creek project is located in the Elkton Formation. Thicker soils and steep slope angles can facilitate slump or rotational failures. Siltstone and mudstone layers can facilitate block slides of overlying stratigraphy. However, the project area is located on gentle to level slopes. Likewise, stratigraphy dip angles are gentle (maximum of 9º mapped in the area), reducing potential for block slides. This potential is increased with the increase of the stratigraphy dip angles. Therefore, the potential for management activities to initiate catastrophic or chronic mass movement is minimal to non-existent.

Tev-Roseburg Volcanics consist of pillow basalts, breccias, and massive subarial flows, interbedded with minor conglomerate and basaltic sandstone (Niem and Niem, 1990). Associated hazards include flash flooding and mass movement (Beaulieu, 1975). Thinner soils and steep angles can facilitate debris flows and debris torrents.

The Blue Retro project is located in the Roseburg Volcanics Formation. Volcanics can create impervious surfaces, with thin soils at steep angles. This increases the probability of debris flows. However, the project area is located on gentle to level slopes. Therefore, the potential for management activities to initiate debris flows is minimal to non-existent.

While the management operations would have little impact on the geology, the geology can have impacts on operations. Care must be exercised in road construction to minimize intersections with stratigraphy dip angles inclined with the slope (BLM, 1995). Such intersections would provide for slide potential. However, no new road construction is anticipated with this project. Therefore, slide initiation by management activities is unlikely.

No faults were identified within the project boundaries.

2.2 Soils Description and Interpretations

Based on a review of the literature (Johnson et al, 2003; Haagen, 1989), the following provides a brief description of the units and their associated hazards.

2E-Absaquil-Blachly-McDuff complex is located on the 3 percent to 30 percent slope of broad mountain ridge tops, forming in residuum and colluvium from sandstone and siltstone. The soil ranges in elevations from 300 to 2,500 feet above sea level.

The Absaquil soil is a silt loam forming on broad ridge tops and side slopes. It is deep and well-drained. Depth to bedrock is 40 to 60 inches.

The Blachly soil is a very deep, well drained soil forming on ridges and side slopes, derived from sandstone and siltstone Depth to bedrock is 60 inches or greater

The McDuff soil is a silty clay loam forming on ridges and side slopes. It is a moderately deep, well-drained soil. Depth to bedrock is 20 to 40 inches.

The Complex is susceptible to erosion and compaction, has a moderately slow permeability and low soil strength. Management concerns are also related to the steepness of slope. While wheeled and tracked equipment can be used, cable yarding and low-pressure ground equipment is preferred. It is recommended that to reduce compaction, skid trails be laid out in advance and timber harvest be restricted to times when the soils are least susceptible to compaction. It is further suggested that seeding and waterbars be applied; care be used in road drainage design to reduce erosion; and that roads, landings, and skid trails can be ripped after use to improve plant growth. Trees on McDuff soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

58G-Digger-Bohannon-Umpcoos is located on 60 percent to 90 percent slopes of side slopes and headwalls, forming from colluvium derived from sandstone. The complex ranges between 200 feet and 3,000 feet above sea level.

The Digger soil is a very gravelly loam forming on side slopes and ridges. It is a moderately deep, well drained. Bedrock can be found between 20 to 40 inches depth.

The Bohannon soil is a gravelly loam forming on the convex midslopes and lower slopes. It is moderately deep and well drained. Bedrock can be found at a 31-inch depth.

The Umpcoos soil is a very gravelly sandy loam forming on the convex side slopes adjacent to areas of rock outcrops. It is shallow and well drained. Bedrock can be found at a 16-inch depth.

The Complex is susceptible to erosion and potential for slope failure (based on steepness). The Bohannon soil is susceptible to compaction. Cable yarding is preferred. It is recommended that, to reduce compaction, timber harvest be restricted to times when the soils are least susceptible to compaction.

It is further suggested that seeding and waterbars be applied (The Digger and Umpcoos soils may not respond well to seeding due the exposure of bedrock); care be used in road drainage design to reduce erosion; roads, landings, and skid trails can be ripped after use to improve plant growth; end haul waste material to reduce damage to vegetation and potential for sedimentation; avoid headwall areas in road construction; and, due to slope failure, complete onsite investigations before disturbing soils.

147F-McDuff-Abasquil-Blachly complex is located on 30 percent to 60 percent slopes of convex and concave slopes and ridges, forming from residuum and colluvium derived from sandstone and siltstone. The complex ranges between 300 feet and 2,500 feet above sea level.

The McDuff, Absaquil, and Blachly soils are described above.

The Complex is susceptible to erosion and compaction, has a moderately slow permeability and low soil strength. Management concerns are also related to the steepness of slope. While wheeled and tracked equipment can be used, cable yarding and low-pressure ground equipment is preferred. It is recommended that to reduce compaction, skid trails be laid out in advance and timber harvest be restricted to times when the soils are least susceptible to compaction. It is further suggested that seeding and waterbars be applied; care be used in road drainage design to reduce erosion; and that roads, landings, and skid trails can be ripped after use to improve plant growth. Trees on McDuff soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

198F-Preacher-Bohannon-Blachly complex is located on 30 percent to 70 percent slopes of concave and convex side slopes and ridges, forming from residuum and colluvium from sandstone and siltstone. The complex ranges between 200 feet and 3,000 feet above sea level.

The Preacher soil is a deep and well-drained loam forming on the concave side slopes. It is very deep and well drained. Bedrock can be found at depths greater than 60 inches.

The Bohannon and Blachly soils are described above.

The Complex is susceptible to erosion and compaction. Management concerns are also related to the steepness of slope. The Bohannon soils have a hazard of windthrow during periods when the soil is excessively wet and the winds are strong. The Blachly soils have a hazard of moderately slow permeability and low soil strength. While wheeled and tracked equipment can be used, cable yarding and low-pressure ground equipment is preferred. It is recommended that to reduce compaction, skid trails be laid out in advance and timber harvest be restricted to times when the soils are least susceptible to compaction.

It is further suggested that seeding and waterbars be applied; care be used in road drainage design to reduce erosion; and that roads, landings, and skid trails can be ripped after use to improve plant growth.

4D-Blachly Silt Loam is located on zero percent to 30 percent slopes of broad ridgetops and benches of mountains, forming from colluvium from sedimentary rock or basalt. The soil ranges from 250 feet and 2,500 feet above sea level.

The Blachly soil is described above.

The soil is susceptible to surface layer compaction and erosion. Use of wheeled and track equipment when the soil is moist will result in rutting and compaction. Use of low-pressure ground equipment is preferred in ground-based harvest. It is suggested that seeding, mulching, and waterbars be applied; care be used in road drainage design to reduce erosion. Unsurfaced roads and skid trails may become impassable during rainy periods. Logging roads require suitable surfacing for year-round use.

46F-Preacher-Bohannon Loams are located on 60 percent to 90 percent slopes of narrow ridgetops and side slopes of mountains, forming from colluvium and residuum of arkosic sandstones and siltstones. The loams range between 500 feet and 3,800 feet above seal level.

The Preacher and Bohannon soils are described above.

The loam is susceptible to surface layer compaction and hazard of erosion. Management concerns are also related to the steepness of slope. Highlead or other cable logging systems are most suitable. It is suggested that seeding, mulching, and waterbars be applied and care be used in road drainage design to reduce erosion. Unsurfaced roads and skid trails may become impassable during rainy periods. Logging roads require suitable surfacing for year-round use.

2.3 Existing Compaction

Historical aerial photographs were reviewed for each of the projects to determine the amount of pre-existing compaction existing due to historic harvest operations. The Coos Bay District Record of Decision and Resource Management Plan (RODRMP) (BLM, 1995) specifies that for Ground-Based Yarding Systems,

> *"...a. If tractors or rubber-tired skidders are used for log skidding, skid trails will be designated with the objective of having less than 12 percent of a harvest area affected by compaction. Existing skid roads will be used to the extent practical..."*

However, ground-based operations are not proposed for either project and no new roads will be constructed. Therefore, there is no anticipated increase of compaction associated with this project.

Existing compaction for the Blue Retro project included both historic roads and current recreation trails. Existing compaction for the North Soup Creek project included only historic roads. Historic road width was assigned an average 16 feet, based on previous project research. Current trail width was assigned an average of three feet. Complete compaction analysis of the two projects is presented in Table 2

Table 2. Project Soil Compaction Analysis

Project	Blue Retro	North Soup
Road Inches from Aerial Photos	3	6
Trail Inches from GIS Maps	6	0
Feet of Road (Inches X 1000'/1")	3,000	6,000
Feet of Trail (Inches X 1000'/1.25"	4,800	0
Road Area (Road length X 16')	48,000ft2	96,000ft2
Trail Area (Trail length X 3')	14,400ft2	0
Total Acreage of compaction/acreage of Project	1.4/63	2.2/233
Total Percent Compaction	2.2%	1%

Based on the analysis of the historic and existing compaction, as well as review of the harvest systems, total compaction for these projects will not exceed the 12 percent threshold defined in the RODRMP.

There are no anticipated ground-based harvest operations. Therefore, soil moisture for compaction is not a restrictive element.

3.0 FIELD REVIEW

Field reviews of the project sites were conducted in January 2008. Field observations of soil and geology verified that identified in the literature review. It appears that the trail system in the Blue Retro project follow the historic road/skidder trail systems. Therefore, the actual compaction of the Blue Retro project may be less than the calculated 2.2%. Wetland areas were identified in the North Soup Creek project. Yarding through these areas should be full suspension or limited to when these soils are dry to ensure no damage to the hydric soils.

The existing recreational trail systems of the Blue Retro project cross potential yarding corridors. Single-end suspension yarding will cause the drag end of the log to intersect with these trails. This could compromise the trails. Such interception could also create erosion connections between the mineral soil trails and any exposed mineral soil in the downslope yarding corridor. The potential for a continuous connection of mineral soil could exist until vegetation grows in the corridors. Therefore, it is recommended that at the end of harvest operations, the trails be re-established, with connection to yarding corridors disrupted, and any exposed mineral soils of the yarding corridors adjacent to the recreational trails be seeded and mulched. It is further recommended that slash be piled in the yarding corridors at these intersections, or other barriers, to discourage the use of off-road use outside of the existing recreational trails.

The field recommendations are based on BMP's, not requirements of the RODRMP.

4.0 RECOMMENDATIONS

Based on literary research, colleague advice, and field observations, the following recommendations are made.

1. Existing roads are utilized, as defined in the project descriptions.

2. Soil recommendations cited in the Douglas County and Coos County Soil Surveys (Johnson *et al*, 2003; Haagen, 1989) include:
   a. Cable yarding and low-pressure ground equipment is preferred.
   b. Seeding and waterbars be applied
   c. Care be used in road drainage design to reduce erosion

3. Decommissioned roads should be designed according to Best Management Plans as outlined in the RMP, including removal of culverts and placement of waterbars.

4. Utilize one-end suspension and full suspension over yarding corridor stream crossings

5. Restore any damage to existing recreational trails to reduce the risk of connected erosion systems.

6. In the Blue Retro project, seed and mulch exposed yarding corridor mineral soils adjacent to the corridor/trail intersection.

7. Place slash on any mineral soil exposed from log yarding that is adjacent to yarding corridor/recreational trail intersections.

8. Protect any identified wetlands, according to RMP regulations, from soil disturbance.

5.0 SCOPING RESPONSE

Two comments were received during the Scoping process for this Environmental Assessment. The comments were received from Chandra LeGue of Oregon Wild and Francis Eatherington, of Umpqua Watersheds, Inc. Issues described in the comments directly related to soils and geology includes:

ONRC geology and soil relevant comments, e-mail dated February 13, 2008:

> *"…The projects would jointly thin 294 acres of previously thinned lands in riparian reserves, LSR, and matrix allocations. We understand that the projects are part of a scientific study. While we support this type of research that can lead to a better understanding of how forest management can potentially impact or benefit old-growth species. We do not believe this is an excuse to rubber-stamp the proposal. The EA needs to take a serious look at the impacts of road management and timber haul, yarding, and removing canopy trees (especially in riparian reserves) on water quality, soils, vegetation, recreation, and wildlife in the project areas. In particular, since these projects are being rethinned, cumulative impacts must be thoroughly analyzed…"*

Umpqua Watersheds, Inc. geology and soil relevant comments, e-mail dated February 22, 2008:

> *"…Blue Retro*
>
> *We submitted EA comments on phase-one of this project on May 16, 1997. Please consider those comments as scoping for this second EA. In 1997 we were concerned about impacts to creek banks from logging and yarding through creeks…"*
>
> *"…Roads and soils*

The scoping notice says that roads not needed would be decommissioned. Good. However, the EA should define decommission, and the definition should include subsoiling and reforesting.

OHV use should be documented in the EA if it exists in the project areas. OHV use could expand if the forests next to roads are thinned, opening up areas available for cross-country use. If this is a possibility, the EA should describe how the OHV use will be mitigated…"

No new roads are proposed for the project. Existing roads will be upgraded. Therefore, there will be no impacts beyond those present. Current impacts will be reduced by renovation of existing roads.

Wetlands and stream banks are to be protected by yarding restrictions listed in the recommendations.

Historic compaction was analyzed through field investigation and historic aerial photography interpretation. As described above, the total amount of compaction is 2.2% for the Blue Retro project and 1% for the North Soup Creek project. The Coos Bay ROD allows for 12 percent surface compaction. Activities within these projects will not result in additional compaction. Therefore, as compaction is below the 12 percent threshold for ground based operations (and there are no ground based operations proposed), decompaction of existing road beds is not warranted.

OHV operations outside of established trails will be discouraged by the restoration of the trail system and establishment of slash or other barriers within the yarding corridors, as detailed in the recommendations.

6.0 REFERENCES

BLM (Bureau of Land Management, Department of the Interior), 1995, Coos Bay District Record of Decision and Resource Management Plan and associated Environmental Impact Statement, Volumes I, II, and III.

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APPENDIX G: BOTANY

PRE-FIELD REVIEW

There are no Threatened or Endangered species known or suspected to occur in the project areas. Several sensitive vascular and nonvascular plant species are suspected to occur in the project area. This is due to the presence of potential habitat and the location of the propose project areas. Appendix Table 1 and Appendix Table 2 identifies Special Status Species that are suspected to have habitat within the proposed project area.

Surveys are conducted if sensitive vascular and nonvascular species are known or suspected to occur in a proposed project area, provided the plant species are practical to survey. Practical surveys substantially reduce the risk of unintentional loss of undiscovered sites. They also help to minimize ground disturbance activities potentially injurious in meeting species persistence objectives (USDI and USDA 2007). Surveys are not conducted for species that are considered impractical to survey for (USDI and USDA 2007). The project area has openings along the roads that contain marginal potential habitat for California globe mallow (*Iliamna latibracteata)*, a sensitive species (Oregon Natural Heritage Information Center [ORNHIC] 2007). California globe mallow occurs in two general areas near the towns of Powers and Remote. There is also minimal potential habitat for giant folded leaf (*Diplophyllum plicatum*), Sensitive status liverwort (ORNHIC 2007), and for *Bryoria subcana*, a sensitive status lichen (ORNHIC 2007). Populations of these species are located near the density management project areas. Potential habitat is determined by aerial photographic interpretation and review of information on each species habitat requirements. Habitat for fungi is marginally present for most of the project areas. The special status fungi species are considered impractical to survey. However, incidental finds can occur during the nonvascular surveys.

Recommended Surveys for Special Status Species Surveys on the Analysis Area

1. Survey for special status vascular plants on all units. There are eight Bureau Sensitive vascular plant species that are practical to survey for and that are suspected of occurring in the project area.
2. Survey for special status lichen and bryophyte surveys on all units. There are 26 Bureau Sensitive lichens and bryophytes that are practical to survey for and that are suspected of occurring in the project area.
3. Do not conduct fungi surveys on any of the units. Fourteen fungi species are suspected of occurring in the project area. However, these species are not considered practical to survey for (USDA and USDI 2000).

Survey Methods.

Field surveys for Special Status plant species (vascular plants, lichens & bryophytes) will be completed according to approved survey protocols. These typically involve using the intuitive controlled method where the likelihood habitats are surveyed more intensively than other areas within the project (Whiteaker *et al.*, 1998, USDI 1998, USDA 1997, USDA and USDI 1999 & 2007) Survey routes, dates of survey, and any suspected sites will be flagged in the field and recorded on data sheets and topographic maps.

Mitigation Methods

Management recommendations would be followed to protect microclimate and maintain local persistence of any Threatened or Endangered or Special Status plant species found in proposed project area (Castellano and O'Dell 1997, Brian *et al.* 2002, USDI and USDA 2007).

Bureau Sensitive Plant Species Known or Suspected to Occur in the North Soup and Blue Retro Density Management EA Areas

Surveys are recommended for some Bureau Sensitive species that are known or suspected to occur in a proposed unit. If a Bureau Sensitive species is known or suspected to occur in the project area but the management activity is not likely to impact the species, then surveys are not recommended. In addition, surveys are not recommended for species considered impractical to survey for (USDA and USDI 2000). Surveys are considered practical "if characteristics of the species (such as size, regular fruiting) and identifying features result in being able to reliably locate the species, if the species is present, within one to two field seasons and with a reasonable level of effort" (USDA and USDI 2000, Vol. 1 p. 479). Characteristics determining practicality of surveys include: "individual species must be of sufficient size to be detectable; the species must be readily distinguishable in the field or with no more than a simple laboratory or office examination for verification of identification; the species is recognizable, annually or predictably producing identifying structures; and the surveys must not pose a health or safety risk" (USDA and USDI 2000, Vol. 1 p. 479).

References cited are listed in the EA

Appendix Table 1: Vascular Plant Special Status Species Suspected to Have Suitable Habitat in Project Areas

*Scientific and Common Name	Documented (D) or Suspected (S)	Status/ practicality of surveys	Habitat	Likelihood of Occurring in the Project Area	Management Activity Likely to Impact Species if Found in Project Area	Survey Recommended (if habitat present, mgmt. activity likely to impact species)
Adiantum jordanii (California maidenhair fern)	S	Bureau Sensitive (surveys practical)	Perennial herb, moist shaded seeps, hillsides, or moist woods and forests, <1,200 m.	Moderate. Known from Bear Creek Rec. site T30S-R09W-9.	Yes.	Yes.
Carex gynodynama (wonderwoman sedge)	S	Bureau Sensitive (surveys practical)	Perennial, moist meadows and open forests, <600 m, Smith Pond off of Signal Tree road at T30S, R9W, Sec 3.	Low. The habitat this species prefers is scarce in the proposed project area.	Yes.	Yes.
Cimicifuga elata var. *elata* (tall bugbane)	S	Bureau Sensitive (surveys practical)	Perennial forb or herb, coniferous forest, north of Umpqua River, and east side of district, flowers June to early August.	Low. Present in the western hemlock forest association on Eugene and Roseburg BLM lands directly adjacent to Coos Bay BLM land.	Yes.	Yes.
Eucephalus vialis (=Aster vialis) Wayside Aster	S	Bureau Sensitive (surveys practical)	Dry, open oak or coniferous woods with Douglas-fir, golden chinquapin and Oregon white oak, edges between forest and meadow, 200 to 500 m in Lane, Douglas, and Linn Counties.	Low. It prefers areas with more light- openings in the forest along roadside, etc.	Yes.	Yes.
Iliamna latibracteata (California globe mallow)	S	Bureau Sensitive (surveys practical)	Perennial forb or herb, moist ground and stream banks, blooms June and July, Big Sandy Tie road at T28S, R10W, Sec 31; a site at T31S, R12W, Sec 17 was extirpated during culvert replacement in 1999.	Low. The only known site of this species on district is along the Big Creek mainline. It prefers areas with more light- openings in the forest, recent burns, roadsides, etc.	Yes.	Yes.
Pellaea andromedifolia (Coffee fern)	S	Bureau Sensitive (surveys practical)	Perennial forb or herb, fern, rocky outcrops up to 5900 ft, Cherry Creek Ridge at T27S, R10W, Sec 25, and Irwin Rocks.	Low. The habitat this species prefers is scarce in the proposed project area.	Yes.	Yes.
Polystichum californicum (California sword-fern)	S	Bureau Sensitive (surveys practical)	Perennial fern, woods, stream banks, shaded rocky outcrops, Pistol River T38S, R14W, Sec 22 and Indian Creek Road at T29S, R12W, Sec 24.	Low. The habitat this species prefers is scarce in the proposed project area.	Yes.	Yes.
Scirpus pendulus (drooping bulrush)	S	Bureau Sensitive (surveys practical)	Marshes, wet meadows, and ditches, 800 to 1,000 m, KM Ecoregion.	Low. The habitat this species prefers is scarce in the proposed project area.	Yes.	Yes.

*****Pre-disturbance surveys are recommended for bolded species.

Appendix Table 2: Non-Vascular Plant Special Status Species Suspected to Have Suitable Habitat in Project Areas

*Scientific Name	Plant Group	Documented (D) or Suspected (S)	Status/ practicality of surveys	Habitat	Likelihood of Occurring on the Project Area	Management Activity Likely to Impact Species if Found in Project Area	Survey Recommended (if habitat present, mgmt. activity likely to impact species)
Arcangeliella camphorata	fungi	S	Bureau Sensitive (surveys impractical)	Associated with pines, especially Douglas-fir and western hemlock, 200 to 950 m, March through November; known from Oregon (Benton, Coos, Curry, and Polk Counties), Washington (Clallam, Grays Harbor, and Jefferson Counties), British Columbia, and Mexico (State of Queretaro, under oaks); CR & KM Ecoregions and Washington.	Low-Moderate. Several sites have been found on district.	Yes.	No.
Boletus pulcherrimus	fungi	S	Bureau Sensitive (surveys impractical)	West side Cascades in Lane County, sporocarps usually solitary in association with mixed conifer (grand fir, Douglas-fir) and hardwoods (tanoak) in coastal forests.	Low. Recent site from Blacklock Point area of coastal Curry Co.	Yes.	No.
Bryoria subcana	lichen	S	Bureau Sensitive (surveys practical)	Coastal forest and high precipitation summit. Several Coos Bay BLM sites have been located; Species seem to prefer ridgelines.	Moderate. Several BLM sites located in 60yr. old+ Douglas-fir stands.	Yes.	Yes.
Calicium adspersum	lichen	S	Bureau Sensitive (surveys practical)	Growing on bark on boles of old growth conifer trees.	Low. There are very few legacy trees left on the project area.	Yes.	Yes.
Codriophorus depressus (Racomitrium depressum)	Moss	S	Bureau Sensitive	Forming mats on rocks in perennial or intermittent streams, and in the spray zone of waterfalls, between 400 and 11,000 feet elevation. Habitats are subject to scour at high water. Bednarek-Ochyra and Ochyra (2006) stress its occurrence in intermittent streams and other seasonally wet habitats that dry out by midsummer.	Low Habitat is scarce on project area	Yes.	No.
Cortinarius barlowensis	fungi	S	Bureau Sensitive (surveys impractical)	Coastal to montane mixed coniferous forests up to 4,000 feet elevation with western hemlock, Pacific Silver fir, Sitka spruce, and Douglas-fir. Known from Takenitch Lake in Douglas Co.	Low Habitat is scarce on project area	Yes.	No.
Cudonia monticola	fungi	S	Bureau Sensitive (surveys impractical)	Grows on spruce needles and coniferous debris, several district sites in the Burnt Ridge area, fruits in late summer and autumn.	Low Habitat is scarce on project area	Yes.	No.
Dermatocarpo n mieophyllizum (=D. luridum)	lichen	S	Bureau Sensitive (surveys practical)	Occurs between 1,000-4,400 feet on rock and boulders in seepy terraces, slopes, and riparian edges with red alder, Douglas-fir and maple spp., and on granite rocks along stream edges hemlock and red cedar in riparian areas.	Low. Habitat is scarce on project area	Yes.	Yes.
Diplophyllum plicatum	liverwo rt	S	Bureau Sensitive (surveys practical)	Tree boles of western hemlock and red cedar in riparian areas.	Low. Several sites on district mainly in late-successional and old-growth stands.	Yes.	Yes.
Gomphus kauffmanii	fungi	S	Bureau Sensitive (surveys impractical)	Site located in Lut Hedden ridge area. Douglas-fir/hemlock/Grand fir zone in 50 year old stand with older remnant trees. Also known from South Slough.	Low-Moderate. One location in the Middle Umpqua River watershed has been found on district.	Yes.	No.
Heterodermia leucomela	lichen	S	Bureau Sensitive (surveys practical)	Wetter maritime, coastal western hemlock zone within highly oceanic northern temperate zone and appears to be restricted to twigs of Sitka spruce in sheltered, humid, foreshore situations.	Low. Habitat is scarce within project sites	Yes.	Yes.
Hypogymnia duplicata	lichen	S	Bureau Sensitive (surveys practical)	Mid-elevation moist western hemlock stands, old-growth Douglas-fir, mature western hemlock/Douglas-fir forest, moist Pacific silver fir or noble fir forests, Sitka spruce, riparian forest and later-successional forest along ridge-tops in Oregon Coast Range, also occurs on red alder in sedge-sphagnum bogs in Oregon Coast Range, elevation ranges from 1,100 to 5,450 feet.	Low. Habitat is scarce within project sites	Yes.	Yes.
Hypotrachyna revoluta	lichen	S	Bureau Sensitive (surveys practical)	Usually on bark and rarely on rock, Coast Range and immediate coast in OR, at Cape Arago, also from Rocky and Appalachian Mountains, east coast of Canada, Great Lakes area, and southwest border of US with Mexico.	Low. Habitat is scarce within project sites	Yes.	Yes.

*Scientific Name	Plant Group	Documented (D) or Suspected (S)	Status/ practicality of surveys	Habitat	Likelihood of Occurring on the Project Area	Management Activity Likely to Impact Species if Found in Project Area	Survey Recommended (if habitat present, mgmt. activity likely to impact species)
Leptogium cyanescans	lichen	S	Bureau Sensitive (surveys practical)	Tree bark of deciduous trees, but also occurs on juniper and western red cedar, decaying logs, and mossy rocks in cool, moist microsites, widely scattered. Location in CR Ecoregion in Lane & Lincoln counties ONLY.	Low. Habitat is scarce within project sites.	Yes.	Yes.
Leucogaster citrinus	fungi	S	Bureau Sensitive (surveys impractical)	Sub-surface soil. Roots of white fir, sub-alpine fir, shore pine, western white pine, Douglas-fir, and western hemlock,	Low. Has been found as far south as Douglas Co.	Yes.	No
Lobaria linita	liche n	S	Bureau Sensitive (surveys practical)	Mature to old growth forests, oak forests with rock outcrops, late-mature tan-oak and madrone forests, 1,800 to 6,700 ft; CR & WC Ecoregions	Low. Has been found as far south as Douglas Co.	Yes.	Yes.
Metzgeria violacea	liverwort	DU	Bureau Sensitive (surveys practical)	Hyper-maritime, on tree trunks, usually shaded, near coast; growing in dense mats or mixed among other bryophytes.	Low. Has been found at Spruce Reach Island and Catching Slough and inland on the Siuslaw NF	Yes.	Yes.
Niebla cephalota	lichen	S	Bureau Sensitive (surveys practical)	Coastal habitats but may extend up to 15 miles inland where influenced by the coastal fog belt, occurs on exposed trees, shrubs, and less often on rocks, rock or bark; known from northern CA, Oregon coast (North Spit), and part of WA coast' CR Ecoregion.	Low. Habitat is scarce within project sites.	Yes.	Yes.
Phaeocollybia californica	fungi	S	Bureau Sensitive (surveys impractical)	Mature and old-growth, Douglas-fir forests, associated with the roots of oak, Pacific silver fir, Sitka spruce, Douglas-fir, and western hemlock, three known sites on district.	Low. Of the three known sites on district, one was in a thinning unit.	Yes.	No.
Phaeocollybia dissiliens	fungi	S	Bureau Sensitive (surveys impractical)	Mature and old-growth Douglas-fir forests, associated with the roots of Pacific silver fir, Sitka spruce, Douglas-fir, and western hemlock	Low. Known sites on district include sites found in thinning units.	Yes.	No.
Phaeocollybia olivacea	fungi	S	Bureau Sensitive (surveys impractical)	In mixed woods and under conifers in southern OR and N. Cal. Form ectomycorrhizal associations with Douglas-fir, western hemlock, and Sitka spruce. Scattered to densely gregarious. 20+ sites known from Coos Bay BLM lands. Fruits from mid-November through mid-December.	Medium. Known sites on district include sites found in thinning units.	Yes.	No.
Phaeocollybia oregonensis	fungi	S	Bureau Sensitive (surveys impractical)	Associated with the roots of Pacific silver fir, Douglas-fir, and western hemlock; one site on district in a >200 year old Douglas-fir forest.	Low.	Yes.	No.
Phaeocollybia pseudofestiva	fungi	S	Bureau Sensitive (surveys impractical)	Mature and old-growth Douglas-fir forests, scattered to dense clumps under mature, mixed conifers and hardwoods, several sites on district, fruits October through December. 10+ sites on Coos Bay BLM lands.	Medium. Known sites on district include at least one site found in a thinning unit.	Yes.	No.
Phaeocollybia scatesiae	fungi	S	Bureau Sensitive (surveys impractical)	Mature and old-growth Douglas-fir forests, associated with the roots of spruce, Sitka spruce, and *Vaccinium* species, 0 to 1,250 m;	Medium. Known sites on district include at least one site found in a thinning unit	Yes.	No.
Phaeocollybia sipei	fungi	S	Bureau Sensitive (surveys impractical)	40 year old plantations to >400 year old-growth forests, associated with the roots of Pacific silver fir, Douglas-fir, and western hemlock; many sites on district, fruits in October and November. 25+ sites on Coos Bay BLM lands.	Medium. Known sites on district include several sites found in thinning units.	Yes.	No.
Phaeocollybia spadicea	fungi	S	Bureau Sensitive (surveys impractical)	40 year old plantations to >200 year old old-growth Douglas-fir forests and in mature Sitka spruce stands in coastal lowlands regions; solitary to scattered to closely gregarious. 35+ sites on Coos Bay BLM lands.	Medium. Known sites on district include several sites found in thinning units.	Yes.	No.
Porella bolanderi	Liverwort	S	Bureau Sensitive (surveys practical)	On outcrops and boulders (limestone, silica, serpentine, or sandstone), soil, and epiphytic on oaks, myrtlewood, bigleaf maple, Douglas-fir, Shasta red fir, redwood, and ponderosa pine; commonly at 100-750 m but known from 0 to 2,000 m; KM & WV Ecoregion	Low.	Yes.	Yes.

*Scientific Name	Plant Group	Documented (D) or Suspected (S)	Status/ practicality of surveys	Habitat	Likelihood of Occurring on the Project Area	Management Activity Likely to Impact Species if Found in Project Area	Survey Recommended (if habitat present, mgmt. activity likely to impact species)
Ramaria largentii	fungi	S	Bureau Sensitive (surveys impractical)	Associated with spruce, western white pine, Douglas-fir, and western hemlock,	Low	Yes.	No.
Rhizopogon exiguus	fungi	S	Bureau Sensitive (surveys impractical)	Mainly grows close to coast. Known site near Mapleton, on the Siuslaw NF. Hypogenous fungi in coniferous forest, CR & KM Ecoregion.	Low. Habitat is present and it occurs in coniferous forest near Mapleton on the Siuslaw NF.	Yes.	No.
Schistostega pennata	moss	S	Bureau Sensitive (surveys impractical)	Mineral soil in shaded pockets of overturned tree roots, often with shallow pools of standing water at the base of the root wad: attached to rock or mineral soil around the entrance to caves, old cellars, and animal burrows: CR & WC Ecoregions.	Low.	Yes.	No.
Sowerbyella rhenana	fungi	S	Bureau Sensitive (surveys impractical)	Groups in duff of moist, undisturbed mature conifer forests, one collection from a tan oak stand in Curry County; CR & WC Ecoregions. Fruits October through December. One site on Coos Bay BLM lands.	Low. Known on Coos Bay BLM lands from a tan oak stand in Curry Co.	Yes.	No.
Tayloria serrata	moss	S	Bureau Sensitive (surveys practical)	Grows on humus and animal dung; KM, WV, & WC Ecoregions.	Low.	Yes.	Yes.
Tetraphis geniculata	moss	S	Bureau Sensitive (surveys practical)	Found on down logs in late-successional conifer forests in W. OR and WA.	Low. Few pockets of remnant legacy trees on proposed thinning units & some large down wood throughout the project area.	Yes.	Yes.
Tetraplodon mnioides	moss	S	Bureau Sensitive (surveys practical)	In the Pacific Northwest, forming stiff, densely-packed sods on old carnivore dung, or soil and rotten wood enriched by dung, on roadsides, trails, in dry to moist coniferous forest of various age classes	Low. *Tetraplodon mnioides* has a fairly broad ecological tolerance	Yes.	Yes.

***Pre-disturbance surveys are recommended for bolded species.**

Appendix Table 3: Survey Times when Bureau Sensitive Species Are Identifiable

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Adiantum jordanii												
Bryoria subcana												
Calicium adspersum												
Carex gynodynama												
Cimicifuga elata var. elata												
Diplophyllum plicatum												
Eucephalus vialis												
Iliamna latibracteata												
Lobaria linata												
Metzgeria violacea												
Pellaea andromedifolia												
Polystichum californicum												
Porella bolanderi												
Schistostega pennata												
Scirpus pendulus												
Sidalcea malviflora ssp. patula												
Tayloria serrata												
Tetraphis geniculata												
Tetraphis geniculata												