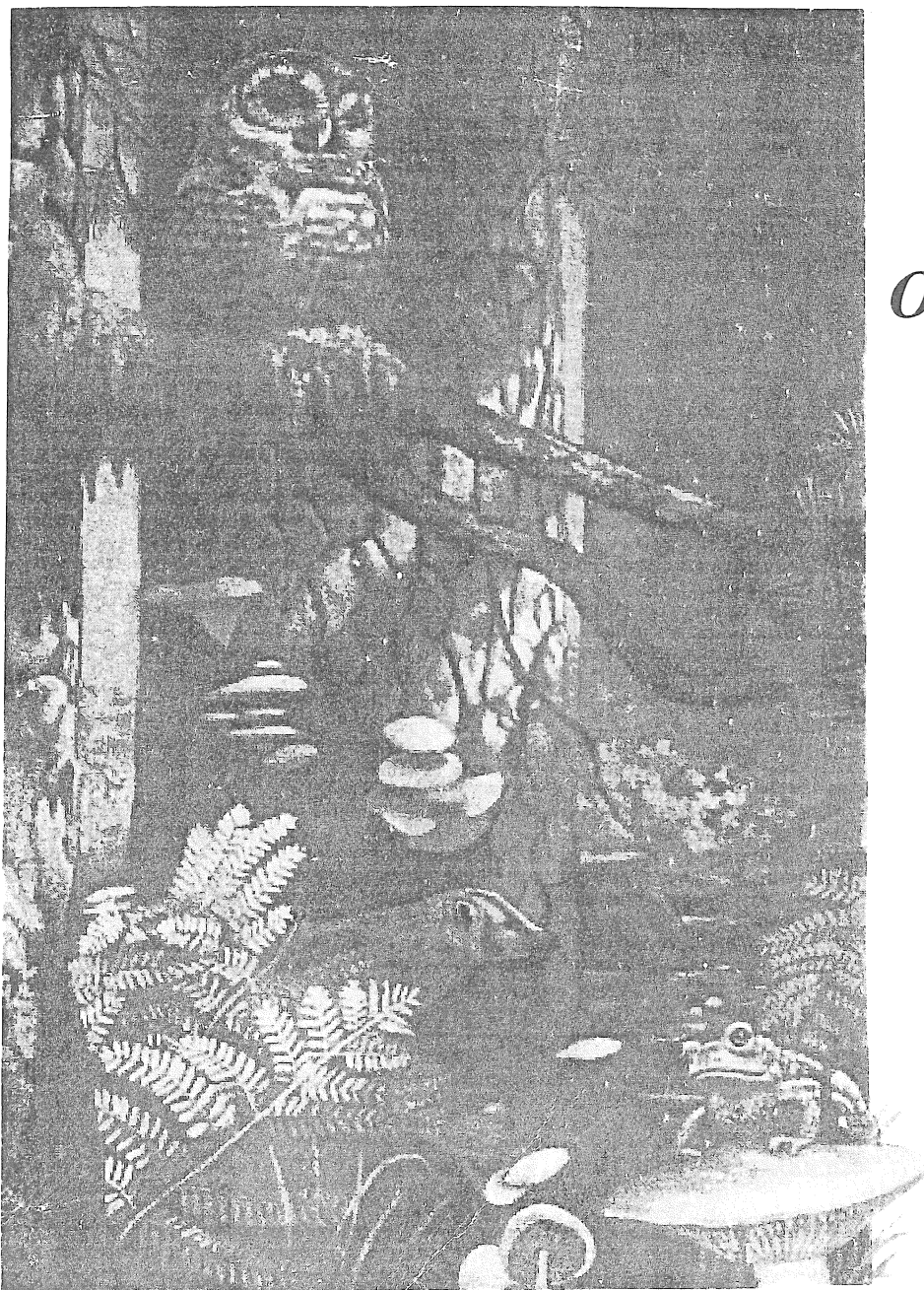


LATE-SUCCESSIONAL RESERVE ASSESSMENT



*Oregon Coast
Province*

*-Southern
Portion-*

(RO267,RO268)

Version 1. ²⁴/₇
November 2010

This Assessment was done in cooperation with Bureau of Land Management - Salem, Eugene, Roseburg, and Coos Bay Districts and the Siuslaw National Forest

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A special thanks to many other specialists in the Bureau of Land Management and the Siuslaw National Forest and scientists from the Pacific Northwest Research Station for their review of data and concepts that were developed for this assessment and who provided valuable critique of the assessment.

EXECUTIVE SUMMARY
Late-Successional Reserve Assessment
Oregon Coast Province - Southern Portion (RO267, RO268)

The Siuslaw National Forest and the Bureau of Land Management, Salem, Eugene, Coos Bay and Roseburg Districts participated jointly in the assessment of Late-Successional Reserves (LSRs) in the Oregon Coast Province. The assessment covered two designated LSRs totaling about 550,000 acres. The assessment will facilitate implementation of appropriate management activities and assure that activities further the objectives of LSRs.

The assessment provides an understanding of the environmental factors, such as climate and geology, that underlie the potential types of vegetation which develop in the area. In addition, the disturbance processes, both natural and human influenced, which have affected the arrangement and quantity of vegetation are described.

Plant and animal species adapt to the type and arrangement of vegetation on the landscape. The species that occupy or have occupied this landscape in the past are described and the ability of the LSRs to support those species is evaluated. Currently 46% of the LSR is in a mature forest condition. The distribution of that forest, however, has been fragmented and 18% is in blocks sufficient to function as suitable habitat for late-successional species.

Through management, the existing condition of vegetation on the landscape can be directed so that late-successional characteristics can be attained. Ecological principals which guide activities are highlighted and include:

- developing prescriptions which mimic the composition and structure of forests at different ages
- insuring that prescriptions "keep all the pieces" so that critical components of the forest ecosystem are intact
- utilizing natural successional pathways when developing prescriptions

The LSR assessment identified the need to secure the "best" habitat areas first before devoting limited funding and resources in more degraded areas. To accomplish this objective, a landscape plan was developed which assists land managers in the determination of priority areas for treatment.

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MEMORANDUM

DATE: November 13, 2006

TO: Forest Supervisor, Siuslaw National Forest

FROM: /s/Anne Badgley, Executive Director

SUBJECT: Clarification of Memo #940 and Memo # 1058

This letter concerns two memos issued from this office which are in need of clarification. The Regional Ecosystem Office memos, #940 (dated June 6, 1997) and # 1058 (dated December 17, 1997) each contain the following paragraph:

“Projects meeting the criteria in the REO memoranda “REO Review Exemption Criteria” (dated April 20, 1995) and “Criteria to Exempt Specific Silvicultural Activities in Late-Successional Reserves and Managed Late-Successional Areas from Regional Ecosystem Office Review” (July 9, 1996 and amended September 30) continue to be exempted from the REO review. In addition, silvicultural activities described on, and consistent with the criteria listed on, Table 7 (as supplemented by April 22, 1997 documentation) and consistent with NFP S&Gs are exempt from subsequent project-level REO review.”

Through this letter, this paragraph in both memos is corrected with the following change noted in bold.

*“Projects meeting the criteria in the REO memoranda “REO Review Exemption Criteria” (dated April 20, 1995) and “Criteria to Exempt Specific Silvicultural Activities in Late-Successional Reserves and Managed Late-Successional Areas from Regional Ecosystem Office Review” (July 9, 1996 and amended September 30) continue to be exempted from the REO review. **Alternatively**, silvicultural activities described on, and consistent with the criteria listed on, Table 7 (as supplemented by April 22, 1997 documentation) and consistent with NFP S&Gs are exempt from subsequent project-level REO review.”*

Projects need to meet either the REO exemption memo criteria or the Late-Successional Reserve Assessment criteria that has been reviewed by the REO, but do not need to meet both.

If you have any questions, please contact Shawne Mohoric, 503-808-2175.

cc: Shawne Mohoric, Region 6, FS (LSR Workgroup)
Frank Davis, Region 6, Siuslaw NF

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Memorandum

Date: June 6, 1997

To: Robert W. Williams, Regional Forester, Region 6, Forest Service
Elaine Y. Zielinski, State Director, Bureau of Land Management OR/WA

From: Donald R. Knowles, Executive Director

Subject: Regional Ecosystem Office Review of the Oregon Coast Province (Southern Portion) Late-Successional Reserve (RO267 & RO268) Assessment

Summary

The Regional Ecosystem Office (REO) and the interagency Late-Successional Reserve Work Group have reviewed the Oregon Coast Province (Southern Portion) Late-Successional Reserve Assessment (LSRA). The REO finds that the LSRA, as supplemented by an April 22 LSRA revision document, provides a sufficient framework and context for future projects and activities within the LSR. Future silvicultural activities described in the supplemented LSRA (as discussed below) that meet its criteria and objectives and that are consistent with the Standards and Guidelines (S&Gs) in the Northwest Forest Plan (NFP) are exempted from subsequent project-level REO review.

Basis for the Review

Under the S&Gs for the NFP, a management assessment should be prepared for each large LSR (or group of smaller LSRs) before habitat manipulation activities are designed and implemented. As stated in the S&Gs, these assessments are subject to the REO review. The REO review focuses on the following:

1. The review considers whether the assessment contains sufficient information and analysis to provide a framework and context for making future decisions on projects and activities. The eight specific subject areas that an assessment should generally include are found in the NFP (S&Gs, page C-11). The REO may find that the assessment contains sufficient information or may identify topics or areas for which additional information, detail, or clarity is needed. The findings of the review are provided to the agency or agencies submitting the assessment.

2. The review considers potential treatment criteria and treatment areas addressed in the LSRA. When treatment criteria are clearly described and their relationship to achieving desired late-successional conditions are also clear, subsequent projects and activities within the LSR(s) may be exempted from the REO review, provided they are consistent with the LSRA criteria and NFP S&Gs. The REO authority for developing criteria to exempt these actions is found in the S&Gs (pages C-12, C-13, and C-18).

Scope of the Assessment and Description of the Assessment Area

The REO reviewed the LSRA in light of the eight subject areas identified in the NFP S&Gs (page C-11) and sought additional information regarding seven subject areas. Supplemental information was submitted to the REO on April 22. The REO finds the LSRA, as amended, provides a sufficient framework and context for making future decisions on projects and activities within the LSR.

The LSRA addresses two large LSRs on BLM and National Forest System lands totaling 546,252 acres, plus references 4 additional 100-acre LSRs. These LSRs are in the southern half of the Oregon Coast Province. This assessment considers the LSR in the context of surrounding LSRs, including LSR connectivity across the Willamette Valley to the east.

Review of the Assessment

The REO reviewed the assessment's description of the process to be used, and elements to be included in the desired future conditions (DFC), current conditions, objectives, treatment criteria, possible treatments, and identified projects including the location of forest types to which they may be applied. The assessment provides a clear framework for designing future actions. The descriptions of current conditions, disturbance processes, and successional pathways were particularly illustrative in providing a framework for future interdisciplinary teams to identify specific management needs and prescriptions.

Projects meeting the criteria in the REO memoranda "REO Review Exemption Criteria" (dated April 20, 1995) and "Criteria to Exempt Specific Silvicultural Activities in Late-Successional Reserves and Managed Late-Successional Areas from Regional Ecosystem Office Review" (July 9, 1996 and amended September 30) continue to be exempted from the REO review. In addition, silvicultural activities described on, and consistent with the criteria listed on, Table 7 (as supplemented by April 22, 1997 documentation) and consistent with NFP S&Gs are exempt from subsequent project-level REO review. These activities include precommercial thinning, commercial thinning, salvage, conifer recruitment in Riparian Reserves, treating certain *Phellinus* risk, snag recruitment, soil improvement, and conversion of inappropriate species. Other risk treatments, such as those for Douglas-fir bark beetle risk, and treatments not meeting criteria described within the LSRA, remain subject to REO review.

The REO is working with the Research and Monitoring Committee to ensure that projects within LSRs, including projects exempted from the REO review, are considered in the development of the effectiveness, implementation, and validation monitoring programs. We also expect the local

units to continue their long-standing partnership with key researchers regarding management of late-successional stands, particularly in the area of young-stand management.

Conclusions

Based on documentation found in the LSRA, the REO finds that the LSRA provides a sufficient framework and context for future projects and activities within the LSR. As identified above, silvicultural activities and specific projects identified in amended Table 7 and further described in the LSRA which are consistent with the NFP S&Gs and the treatment criteria identified in the assessment are exempted from project-level REO review.

cc:

REO, RIEC

Arnie Holden, R-6

Karen Bennett, Siuslaw NF

Jim Furnish, Siuslaw Forest Supervisor

Van Manning, Salem District Manager

Ed Shepard, Coos Bay District Manager

Judy Nelson, Eugene District Manager

Cary Osterhaus, Roseburg District Manager

940/ly

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LATE-SUCCESSIONAL RESERVE ASSESSMENT

Oregon Coast Province - Southern Portion

(RO267, RO268)

I. INTRODUCTION

This Late-Successional Reserve Assessment (LSRA) was developed to help facilitate implementation of appropriate management activities for the Late-successional Reserve (LSR) and assure that these activities meet the LSR standards and guidelines and further LSR objectives. It presents sideboards for determining where and when to employ various management techniques.

LSRAs are required by the Northwest Forest Plan (USDA et al. 1994). These assessments, for each LSR (or group of smaller LSRs), are to be developed prior to habitat manipulation activities.

Background

Late-Successional Reserves (LSRs) were created to provide a distribution of late-successional forests sufficient to avoid foreclosure of options for the management of late-successional forest species (USDA et al. 1994, ROD B-4,5). The networks of Late-Successional Reserves throughout the range of the Northern Spotted Owl are deemed to be sufficient over time, in quality and quantity, to provide habitat which supports viable populations of species that are associated with late-successional forests. The LSR network will help to ensure that native species diversity will be conserved (Map 1).

Throughout this document, the term late-successional will be used to define both mature and old-growth seral stages of forest development. Due to the type and timing of disturbances in this LSR Assessment (LSRA) area, older forest conditions are primarily in the mature seral development class with vegetation ranges from 75-150 years of age. Single layered canopy conditions also predominate.

The following goals and objectives have been established for late-successional reserves by the Northwest Forest Plan:

Objective: To protect and enhance conditions of late-successional forest ecosystems, which serve as habitat for late-successional forest species. Late-successional reserves are designed to maintain a functional, interacting late-successional ecosystem.

Goals:

1. Create and maintain late-successional habitat and ecosystems
2. Create and maintain biological diversity associated with native species and ecosystems

In response to these goals and objectives, all management within LSR boundaries on federal lands must assure the protection and/or enhancement of conditions of late-successional forests. The standards and guidelines of the *Record of Decision* (ROD) (USDA et al. 1994) govern all management activities in the LSR. This LSR Assessment is tiered to the ROD.

Area Included In This Assessment

This LSRA covers two designated Late-Successional Reserves, RO267 and RO268 (**Map 2**). LSR RO267 occupies 175,280 acres of federal land, LSR RO268 occupies 370,972 acres of federally managed land. The total LSR land base included in this assessment is 546,252 acres (**Map 3**). The assessment area includes lands managed by both the Siuslaw National Forest and the Bureau of Land Management - Salem, Eugene, Coos Bay and Roseburg Districts.

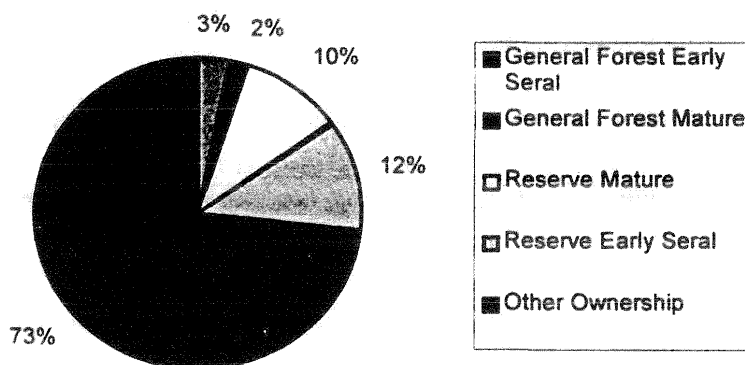
LSR	BLM acres	SNF acres
267	108,430	66,850
268	86,736	284,236

The majority of the assessment area is within the Oregon Coast Province. However, since terrestrial species are not confined by watershed boundaries, the LSR RO267 extends into a portion of the Umpqua River Basin which is in the Southwest Oregon Province. The assessment area ranges from the Umpqua River drainage on the south to the Yaquina River drainage on the north, west to the Pacific Ocean, and east to the Willamette Valley. This grouping of LSRs into one assessment occurred due to their proximity, their location within the Oregon Coast Province boundary, and their interdependence on each other. There are several additional LSR designations to the south (RO263, RO264, RO265, RO266) and to the north (RO269, RO270) (**Map 1**) of this assessment area which tie to and influence the populations of species within this LSR. It was determined that an analysis which covered all of these LSRs would be too broad and lack the specifics necessary for providing management recommendations.

Context Of This LSRA Area Within the Oregon Coast Province

Currently, 46% of all federal land in the Oregon Coast Province is in a late-successional stage of development with the majority of stands around 150 years old (USDA 1995). If one assumes that most other ownerships in the Oregon Coast Province have either converted forest land to farm land or manage their timber on a less than 80 year rotation, then only the lands managed by federal

Figure 1: Late-Successional Reserves and Mature Habitat in the Oregon Coast Province



agencies are supporting and will continue to support late-successional habitat. Given that assumption, about 12% of the vegetation in the entire Oregon Coast Province is currently in a mature condition (Figure 1).

How This Assessment Will Be Used

LSRAs are not decision documents. They are intended to establish criteria and guidance which will provide managers with the information necessary to make appropriate decisions.

LSRAs provide a context at the landscape scale for such things as disturbance regimes, vegetative parameters, and functional roles of different portions of the landscape. Finer scale assessments; i.e., watershed analysis, can utilize this information to understand the significance of local areas in relation to the larger landscape.

Along with other planning documents, this LSRA provides a landscape strategy for implementation of restoration activities by prioritizing treatment areas and itemizing types of appropriate treatments. In doing so, the LSRA facilitates inter agency working agreements about the type and timing of treatments across the landscape.

This is a broader perspective than that which is provided by watershed assessments. Watershed scale assessments are finer scale assessments which enhance our ability to estimate direct, indirect, and cumulative effects of management activities. They are better able to show relationships between terrestrial and aquatic systems and prescribe specific type, location, and sequence of appropriate management activities within a watershed. Refer to **Appendix H** for information from this assessment displayed by fifth field watershed.

The Assessment Process

As specified in the ROD, LSRAs include eight components: 1) a history and inventory of overall vegetative conditions; 2) a list of identified late-successional associated species known to exist within the LSR; 3) a history and description of current land uses in the LSR; 4) a fire management plan; 5) criteria for developing appropriate treatments; 6) identification of specific areas that could be treated under these criteria; 7) a proposed implementation schedule tiered to higher order plans; and 8) proposed monitoring and evaluation components to help evaluate if future activities are carried out as intended and desired results are achieved.

In July 1995, an Assessment Report on Federal Lands In and Adjacent to the Oregon Coast Province (USDA 1995) was published. That document provides much of the background information utilized in this assessment. This LSRA expanded from the concepts presented in the Assessment Report to describe the vegetative patterns historically and currently found on this landscape. This included an understanding of climate, geology, landforms, and disturbance regimes. Disturbances in this area include fire, wind, landslides, floods, insects, disease, and human influences.

Reference and current vegetative conditions on the landscape were used to determine how the LSRs are functioning in relation to objectives established in the Northwest Forest Plan. The best available information from County surveys from the mid-1900's was utilized to indicate a reference condition from which to evaluate current conditions of vegetation within the LSRA area. The effects on the populations of certain late-successional species were evaluated based on assessment of the changes in vegetative structure, pattern, and processes that have occurred on the landscape.

Criteria for developing appropriate management treatments included a determination of the conditions on the landscape which would trigger management activities. The determination was based on understanding functional or structural components of the landscape which are necessary to achieve attainment of late-successional characteristics. For each condition that would trigger a management activity, management criteria and appropriate treatment types were established which will assure that LSR goals and objectives will be achieved. Further guidelines for developing appropriate management treatments include: successional pathways which vary based on sub-series environments and disturbance regimes, and an indication of the ranges of structural components that are found in both mature and old-growth forests in this LSRA area.

Landscape analysis techniques were utilized to identify specific areas that could be treated and to propose an implementation schedule. This step in the process included a synthesis of the information collected to understand and characterize the landscape. Three LSR ZONES were delineated within the LSRA boundary. These zones include: an important CORE area which provides the genetic source for populations of late-successional species, two critical CORRIDORS which serve as refugia areas for late-successional species which are dispersing from and to adjacent LSRs, and a BUFFER zone which is important for dispersal of late-successional organisms within these LSRs and other portions of the landscape.

In addition to these broad areas, LANDSCAPE CELLS were delineated based on either amount and arrangement of mature forest vegetation or the functional role of that particular area in the reserve network. These LANDSCAPE CELLS were prioritized for treatment based on restoring the best remaining late-successional habitat first.

The final component of the assessment, monitoring and evaluating management activities, helps identify those key features that need to be measured to determine if the proposed activities are meeting LSR objectives.

Aquatic characterization efforts in this LSRA highlight priority watersheds and sub-watersheds for restoration. A detailed assessment of the aquatic resource was not an objective of this LSRA. A large scale assessment of aquatic resources was undertaken for most of this area in the Assessment Report - Federal Lands in and Adjacent to Oregon Coast Province (USDA 1995). Readers who are interested in aquatic characterizations at the landscape scale can refer to the information provided in the Assessment Report.

II. HISTORY AND INVENTORY OF CONDITIONS

Physical Characterization

LSRs R0267 and R0268 are in the Oregon and Washington Coast Ranges section of the Cascade Mixed Forest-Coniferous Forest-Alpine Meadow Province (McNab and Bailey 1994). This physiographic province is characterized by highly dissected low mountains that were shaped by debris slide processes on slopes of 20-120%. Incised valleys are distributed throughout the section. Dunes and bogs occur along the coast, with numerous headlands formed of more resistant rock. Elevation ranges from sea level to 4100 feet. Most mountain tops are below 2000 feet, though a few dominant peaks are 3000-4000 feet (i.e., Marys Peak, Grass Mountain, Prairie Peak, Roman Nose).

Soils generally developed from Cenozoic sandstones and marine volcanics. Typical soils are moderately deep and have dark, humus-rich surface horizons. Predominant soil orders are andisols and inceptisols that are not dry for more than a quarter of a year, with mean annual soil temperatures of 0-15 °C. In the coastal lowlands and hills, seasonal soil temperature differences are moderated by fog and sea breezes.

The LSRA area has a maritime climate resulting from its proximity to the Pacific Ocean and influence of the Japanese current. Cool, wet winters and relatively warm, dry summers are characteristic of the area. Low-pressure systems feed a stream of cool, moist air from the North Pacific Ocean onto the Oregon Coast from November through March. The moist air rises over the Coast Range and drops large amounts of precipitation. Occasionally, Arctic air meets an onshore flow, producing snowfall. In general, snow persists for only a few days except for the tops of the highest peaks.

Orographic effects are pronounced in the Oregon Coast Range. Major ridges receive substantially more precipitation than do nearby lowlands. Coastal areas average 75 to 95 inches of precipitation annually, and interior areas west of the crest receive an average of about 120 inches annually. East of the Coast Range crest, in the Willamette Valley margin, annual precipitation averages about 50 inches.

High potential evapotranspiration and low precipitation during warm, sunny summers may produce moisture deficits where soil and bedrock have low waterholding capacities. Moisture deficits are more pronounced in the southern LSR, R0267, than in R0268 because soils are generally thinner, higher in rock fragments, and bedrock tends to be only slightly permeable to impermeable. Throughout the LSRA area, stands on ridges and exposed south-facing slopes with thin, rocky soils can develop substantial plant moisture stress in late summer.

Due to the geographic variability of soil and climate attributes in the Oregon Coast Province, we have developed soil/climate zones to describe the physical environment (USDA 1995). Each zone represents a unique combination of landforms, soils, geology and

climate. These groupings of physical factors, in combination with natural disturbance processes such as fire and wind, influence the vegetation characteristics of each area. **Table 1** summarizes the differences between each soil/climate zone found in the LSRA area with regard to climate, soil physical characteristics, soil temperature, and soil moisture regimes. **Map 4** displays the delineation of these zones with respect to the LSRs on the landscape.

Aquatic Characterization

Aquatic characterization efforts in this LSRA highlight priority watersheds and sub-watersheds for restoration. A detailed assessment of the aquatic resource was not an objective of this LSRA. A large-scale assessment of aquatic resources was undertaken for most of this area in the Assessment Report - Federal Lands in and Adjacent to Oregon Coast Province (USDA 1995). Readers who are interested in aquatic characterizations at the landscape scale can refer to the information provided in the Assessment Report.

Since 1990, there have been a myriad of efforts to prioritize watersheds in the Pacific Northwest for habitat restoration and recovery of anadromous fish runs. Earliest efforts focused on watersheds with the most intact landscapes and the most fish stocks of concern (Johnson et al. 1991; Nehlsen et al. 1991; Reeves and Sedell 1992; Scientific Advisory Team 1993; Siuslaw National Forest 1993). These ultimately led to the network of key watersheds in the Northwest Forest Plan (USDA et al. 1994). Subsequent efforts focused more on details of habitat and health of the fish stocks (Nickelson et al. 1992; Oregon Chapter American Fisheries Society 1993; Nicholas 1993; Huntington et al. 1996), while most recent efforts have been broader and included the above considerations as well as many other measurements of watershed health and risk (Daggett 1994; Bradbury et al. 1995).

Table 2 shows which watersheds and sub-watersheds in the LSR study area were identified as high priority by the above efforts. Because many of these reports are highly interrelated, and identification of a watershed as high priority in one report was in a large part due to its being identified as such in earlier efforts, any synthesis of them is highly subjective. Nevertheless, within this LSRA area, four basins identified in the most independent reports - Drift and Lobster Creeks of the Alsea, West Fork Indian Creek, and North Fork of the Smith River - appear to be the highest priority for projects that benefit anadromous fish. All are key watersheds and American Fisheries Society aquatic diversity areas and home to particularly healthy Chinook or coho salmon, or endangered Umpqua cutthroat trout. Next in priority is a group including Mill Creek, North Fork Beaver Creek, Yachats River, Cummins/Tenmile Creeks, North Fork Siuslaw River, and Five Rivers. The relationship of these watersheds to the priority treatment areas in this report will be discussed in chapter V.

Table 1: Soil Climate Zones Located Within LSRs R0267 And R0268

SOIL/ CLIMATE ZONE	CLIMATE	SOIL CHARACTERISTICS	SOIL TEMPERATURE	SOIL MOISTURE
COASTAL FOG	very high winter rainfall accompanied by high winds; fog and low clouds common	deep to very deep, moderately fine-textured soils overlying slowly to moderately permeable bedrock; high in amorphous clays--often thixotropic; high accumulation of organic matter	slight difference from summer to winter (isomesic)	high in summer (except on few very shallow soils on south slopes); fog and low clouds increase effective soil moisture in summer
CENTRAL INTERIOR	wet winters and moist summers; occasional high winds in winter	deep to very deep moderately fine-textured soils overlying slowly to moderately permeable bedrock; high biologic activity accompanied by high decomposition rates and moderate accumulations of soil organic matter	significant difference between summer and winter (mesic) below 3000 feet; winter temperatures range to very cold (mesic to cryic) above 3000 feet	moderate fluctuations from winter to summer; summer levels varying from very high on lower slopes to moderately dry on upper sideslopes
SOUTHERN INTERIOR	very wet winters and moist summers; occasional high winds in winter	shallow to deep, fine to medium textured soils overlying impermeable bedrock; high biologic activity accompanied by high decomposition rates and moderate to low accumulations of soil organic matter	significant differences between summer and winter (mesic) below 3000 feet; winter temperatures range to very cold (mesic to cryic) above 3000 feet	moderate to great fluctuations from winter to summer
VALLEY MARGIN	moist winters and dry summers; high winds are uncommon	shallow to deep fine textured soils overlying moderately permeable bedrock; moderately high biologic activity and moderate decomposition rates and low to moderate accumulation of soil organic matter	significant difference from summer to winter (mesic)	high fluctuations from winter to summer, with low soil moisture common in summer

Table 2. High-Priority Watersheds And Sub-Watersheds Identified By Various Authors.

Watershed Name	Key W'shed	AFS ADA	ODFW SRCE	SNF/BLM	BRAD-BURY	DSL	Healthy Chinook	Healthy Coho	T&E Cutthroat	Chum
Mill Cr. - Yaquina R.	X		X	X						X
N.Fork Beaver Cr.	X	X	X	X						
Drift Cr. - Alsea R.	X	X	X	X	X	X	X			
Five Rivers			X	X	X	X	X			
Lobster Creek	X	X	X	X	X	X	X			
Tobe Creek				X						
Canal Creek		X	X							X
Yachats River	X	PART	PART	X						
Cummins/Tenmile	X	X		X						
Bailey Creek	X			X						
W.Fork Indian Cr.	X	X	X	X			X			
Lake Creek				X			X			
Upper Siuslaw R.				X			X			
N. Fork Siuslaw R.	X		X	X			X			
W. Fork Deadwood			X	X			X			
Whittaker Creek				X			?			
North Fork Smith R.	X	X		X			X	?	X	

Key watershed - USFS and BLM 1994.

AFS ADA - Aquatic diversity area; Oregon Chapter American Fisheries Society 1993

ODFW SRCE - OR Dept. of Fish and Wildlife source watershed; Bradbury et al. 1995

SNF - Siuslaw National Forest 1993.

BLM - Personal communication, Salem, Eugene, Coos Bay Districts, Bureau Land Management
Bradbury et al. 1995.

DSL - Daggett 1994, Oregon Division of State Land

Healthy Chinook and coho salmon - Huntington et al. 1996; ? = assessment of healthy is questionable.

Vegetative Characterization

Plant series describe forest vegetation by the dominant, or climax, tree species that would be maintained over time without disturbance (i.e., western hemlock series) (Franklin and Dyrness 1973). A series describes the general biological environment, in terms of potential natural plant communities, climate, geology, and soils. Plant series distribution provides us with a general sense of large-scale biological environments. This can be related to overall site potential.

Four plant series are present in this LSRA area. The Sitka spruce series occupies the maritime, coastal fog zone in the western most portion of these LSRs (**Map 5**). The western hemlock series is the most dominant series present in the LSRA area, occupying 77% of the landscape (**Map 5**). It is found in the interior soil/climate zone, associated with a range of environments. The noble fir series is limited to highest peaks of the Coast Range (Marys Peak, Grass Mountain, etc.) in the interior soil/climate zone. The grand fir series is found on the far eastern fringe of the LSRA area, associated with the margins of the Willamette Valley. Noble and grand firs series are not delineated, mapping is currently underway.

Table 3: Relationship Between Series, Sub-Series Environments, and Plant Associations Found In LSRs RO267 and RO268

SERIES	SUB-SERIES ENVIRONMENTS	UNDERSTORY INDICATOR SPECIES IN PLANT ASSOCIATIONS
Sitka Spruce*	WET	*devil's club, salmonberry
Sitka Spruce	MOIST	Oregon oxalis, swordfern, fool's huckleberry/red huckleberry
Sitka Spruce	DRY	salal, salmonberry/salal
Western Hemlock* (Douglas-fir/red alder)	WET	devil's club, salmonberry, salmonberry/vine maple
Western Hemlock (Douglas-fir/red alder) (Western hemlock/Douglas-fir/red alder) (Western hemlock/Douglas-fir)	MOIST	Oregon oxalis, swordfern, vine maple/swordfern, vine maple/salal
Western Hemlock (Douglas-fir) (Douglas-fir/Oregon white oak) (Douglas-fir/Western hemlock)	DRY	Oregon grape, Oregon grape/salal, salal, salmonberry/salal, rhododendron/Oregon grape, rhododendron/salal, rhododendron/evergreen huckleberry, rhododendron/swordfern, evergreen huckleberry, (ocean spray/herbs, chinquapin/madrone)
Noble Fir	COLD	(vine maple/rhododendron)
Grand Fir	WET	(snowberry/swordfern)
Grand Fir	DRY	(salal-snowberry/swordfern)

*Plant Association and Management Guide, Siuslaw National Forest, Hemstrom and Logan 1986.

() current tree and understory species. Resource Management Plan USDI, BLM, Salem District Office, May 1995 and Resource Management Plan USDI, BLM, Eugene District Office, June 1995

Plant associations describe the dominant plant community (a combination of tree and shrub and/or herb layers) that would inhabit a site over time without disturbance (Hemstrom and Logan 1986). A plant association defines a biological environment in terms of the species composition, productivity, and response to management. Knowledge of the presence and distribution of indicator understory species further refines the biological environment, allowing us to more accurately assess site potential.

Plant associations with similar attributes have been aggregated into groups (**Map 5**). These plant association groups have been arranged into "sub-series" based on the broad environmental conditions in which they are found. This is a key stratification in identifying the range of structural and compositional characteristics that can be expected under natural conditions on a given site. Sub-series characterizations will be referred to throughout this assessment. **Table 3** characterizes the relationship between series, sub-series environments, and plant associations found in these LSRs.

Disturbance Processes

Historical and Current Land Uses

Settlement Patterns

The coastal and interior valleys of western Oregon have been the homeland of culturally and economically diverse American Indian societies for millennia. The Euroamerican settlement of western Oregon resulted in catastrophic population decline and displacement among the region's Indian peoples. During the mid-1850s, surviving Indians from throughout western Oregon were placed on a large, multi-tribal Indian reserve encompassing parts of the Oregon coast and Coast Range. Throughout the late-1800s, in an effort to bring tribal peoples into the "American mainstream", and to open the area to white settlers, this reserve was drastically reduced in size. Tribes living there were finally "terminated" from Federal supervision and control in the early 1950s; western Oregon's reservations were closed. A reversal of American Indian policy in the mid-1970s has led to federal re-recognition of western Oregon tribal peoples. Today, western Oregon's Indian peoples are grouped into Tribal confederations whose centers of government and small reservations are located in Coos Bay, Grand Ronde, and Siletz.

The assessment area includes areas once used by American Indian peoples as villages, fishing and shellfish gathering stations, religious sites, and cemeteries, and thus is rich in archaeological evidence and artifacts. Land ownership maps and archival data document the boundaries of the Coast Range reservation and the location of Indian Allotments. Current Tribal interest in management issues include fisheries, wildlife, water quality, special forest products, and timber.

The Oregon Coast was "discovered" by European maritime explorers in the late 1700s.

Soon thereafter, land-based explorations and the fur trade brought mountain men, fur traders, and missionaries into the Willamette Valley and Coast Range. Trading outposts in the wilderness, such as Fort Vancouver on the Columbia River, eventually attracted settlers to the fertile soils of the Willamette Valley. The Donation Land Act of 1850, and the Homestead Act of 1862, provided enough incentives for settlement that the Willamette Valley and the Coast Range were quickly populated. Large tracts of timberland, and homesteads that never "proved up", became incorporated in the National Forest System.

BLM ownership patterns in Western Oregon were created in 1866 when Congress granted to the Oregon and California Railroad Company all odd numbered sections of land 30 miles on each side of the railroad right-of-way. When the stipulations of the grant were violated, Congress passed legislation to have the lands reverted to the United States government, eventually to be managed by the Bureau of Land Management.

Eventually, agriculture, logging, and commercial fishing provided the economic foundation for the development of large communities and the current way of life in the Willamette Valley, Coast Range, and the coast.

Pioneer cemeteries, historic trails and wagon roads, homestead remains, and fruit orchards are the remnants of Willamette Valley and Coast Range pioneer history, and occur throughout the assessment area. Related to these historic remains, implementation of various federal "homestead" acts (i.e., Forest Homestead Act of 1906, Western Scattered Settlers Project of 1906) required close government scrutiny of "homesteads", resulting in inspection records, inventories, and detailed maps denoting building locations, land features, and vegetation types. Thus, these records not only add insight into local pioneer and settlement history, they are an invaluable source of baseline data about the area's environment at the turn of the century.

The assessment area likely contains an abundance of historic sites dating from the mid-1850's to the 1930's. Some sites have likely been recorded during previous cultural resource inventories for timber sales and other projects. These records are housed in the Siuslaw National Forest Supervisors and Ranger District Offices and the Bureau of Land Management District Offices. These files should be consulted preparatory to any project in the assessment area. Additional compliance-level cultural resource inventories may also be required. The Siuslaw NF has developed a detailed data base concerning extant settlement records and these should be used to guide effective field inventories. These records would also provide temporal/baseline information useful in reconstructing the historic Coast Range environment. For example, Coast Range settlers logged the forest, created innumerable meadows and forest openings for buildings, gardens and pasture, planted fruit orchards and other "exotics" trees and shrubs. Settlers were responsible for many of the huge fires that swept through the Coast Range since the 1850s with many areas being repeatedly burned. While the specific impacts of these homesteads may be difficult to see today, cumulatively they are in part responsible for the current condition of the assessment area, and human land use patterns within it.

Logging

Logging operations in the assessment area began in earnest in the latter half of the 19th century. In the Siuslaw River system, stream channels were cleared, and logs were floated out to sawmills or to the estuary for shipment. Most major tributaries of the Siuslaw River were splashed-dammed, and "high grade" logging of bottom areas was common.

Timber patents also played a significant role in shaping the economy of the assessment area as they enabled local mills to tap the supply of Federally owned timber. Beginning in the early 1900s, timber patents were granted by agents of the Government Land Office to timber companies, allowing a company to harvest timber from a specific tract of Federal land for a set rate.

There were a number of mills operating in the area during the first two decades of the twentieth century. The dominant commercial activity in the assessment area has been, and continues to be, timber harvesting.

Agriculture

Agriculture is limited mainly to the flatter, wider interior Coast Range valleys, and the coastal plain. Residential areas are located primarily in association with agricultural lands.

Minerals

The Siuslaw Basin is within an area considered to have moderate potential for the leaseable minerals of oil and gas. This classification is based on the indirect evidence of geologic inference.

The assessment area in general is considered to have low potential for locatable minerals.

Salable minerals in western Oregon are often located in areas where volcanic rock was deposited as dikes, sills, flows, etc. Several prospective and/or developed rock quarries are located along another large volcanic deposit crossing public and private lands. Small feeder dikes and sills of basaltic rock have also been identified, but have not been developed as salable mineral sources. The alluvium along many river bottoms is considered to have moderate potential for sand and gravel. However, at this time, none of the area within the LSRA with alluvium have been developed as a mineral material source. The location and status of existing quarries is available in GIS at each administrative unit. (Existing quarry sites impact local habitat but are not considered to have an overall effect on the integrity of LSRs.) Since quality bedrock areas are so few, expansion of quarry activities in the future is not expected to inhibit attainment of LSR objectives.

Recreation

Recreational uses include but are not limited to canoeing, kayaking, drift boating, fishing, hunting, All Terrain Vehicle (ATV) use, driving for pleasure, sightseeing, mountain biking, professional bicycle racing, water play activities, watching wildlife, and hiking along coastal trails. Recreation attracts moderate to heavy amounts of visitation throughout most of the year, focused primarily on the coastal strip. Some specific recreational uses (i.e.,

hunting, berry picking) are strictly seasonal. Refer to BLM Land Management Plans and the Siuslaw National Forest Land and Resource Management Plan for details on proposed and existing recreation in the LSRA.

Wilderness and scenery objectives tend to be compatible with late-successional reserve objectives. Old-growth areas, patches of old growth, and individual trees are valuable for scenery and Wilderness. There are remnant mature and old growth trees in many developed recreation sites within the assessment area.

The types of recreational impacts that potentially affect the ability to attain LSR objectives are mostly related to harassment of wildlife species and changes in habitat by manipulation of vegetation. For example, if All Terrain or Off Highway Vehicle use expanded into new, now relatively undisturbed areas, disturbance could affect viability of wildlife (i.e., northern spotted owl) and some plant species. Cummins Creek Wilderness Area was identified as an area of potential impact because of the intensity of human use there. In the Marys Peak area, large numbers of people near northern spotted owl nesting areas are a potential impact. Road construction and access are issues where human use of the assessment area has potential impact on attainment of late-successional reserve objectives. Impacts can range from illegal removal of live trees or snags, to dumping of waste.

Radio tower and other administrative sites (i.e., campgrounds, facilities, picnic areas, parking lots, progeny sites, utility and road right-of-ways) influence the ability to attain late-successional reserve conditions locally, because of permanent clearing of the site. However, a number of administrative sites are located either in developed areas, or on hills that are currently in a very early seral stage of development. Maintaining these early seral conditions is thought to have little impact on the overall late-successional reserve conditions (ROD, C-15,17,18).

Economic Values

The area contains substantial economic values, predominantly in the form of wood fiber or timber. Of considerably less economic significance are other forest products including firewood, decorative grasses and boughs, Christmas trees, mushrooms, mosses, bark, and burls. Anadromous fish spawning and rearing habitat, recreational facilities, and activities (campgrounds, visitor centers, etc.) contribute economic value as well.

Fire

Fire and wind are the two dominant natural disturbance processes affecting the terrestrial vegetation pattern at the large scale in this LSRA area. The frequency, severity, and size of these disturbances have greatly influenced the composition and structure of habitats across the landscape. Understanding the geographic variability of soil/climate and disturbance effects can guide expectations of spatial landscape patterns and structural landscape components. Since plant and animal species and populations have adapted to the range of historic landscape patterns, an understanding of these patterns is important in managing

LSRs.

Both physical and biological elements of the landscape affect disturbance patterns. Physical features such as landform type (relief and drainage density patterns), soil, and geologic substrates influence fire behavior patterns. Climatic features, such as precipitation, fog and east wind patterns, control fire spread and effects on vegetation composition and pattern. The distribution of sub-series environments, successional stages, and the arrangement, composition, and structure of vegetation all influence the amount and arrangement of fuel and thus fire behavior patterns.

The long-term history of fire in the entire area has not been systematically documented. Fire disturbances in Northwest coastal zones are described as low frequency (more than 200 years between disturbances), high severity regimes (Agee 1993). Ongoing and recently completed projects in these LSRs have refined this general description. Analysis of charcoal distribution in a sediment core from Little Lake (in LSR R0268, revealed a mean fire return interval of 160-190 years from 2000 years ago to the present (Long 1995). Preliminary results from a large-scale dendrological fire history project covering approximately 340,000 acres, spanning from the coast to the valley margin, indicate that there is spatial variability in historic fire patterns over the last 500 years. Coastal and interior zones in the study area were dominated by single or two-age class stands, with fire return interval ranging from 200-300 years. Southern interior/valley margin sites had a much higher proportion of two to four age-classes, with fire return intervals ranging from 100-200 years (Impara, personal communication). This information suggests that there is large-scale geographic variability in fire regimes across the landscape. A Fire Management Plan is included in **Appendix A** to establish a fire control strategy should a fire event occur within the LSR boundary.

Native American and Euroamerican settlement of the area during the period 1850-1940 was responsible for many of the large-scale fires in that time period. Teensma et al. (1991) mapped age class distributions (inferred from various sources) at four years: 1850, 1890, 1920, and 1940. Several human-caused fires between 1850 and 1940 have changed landscape patterns; from a young/old forest in 1850 to a multi-aged landscape in 1940. The total number of age-class patches has increased from 1850 to 1940 as a result of small human-caused fires and suppression efforts on potentially large-scale events. Geographic variability is apparent in both the number and type of age-class patches within these LSRs.

Disturbance Regime Blocks

Fire history Information suggests there is spatial variability in fire effects across the LSRA. An attempt was made to map, at a landscape scale, the general geographic distribution of fire regimes in the Assessment Report of Federal Lands in and adjacent to the Oregon Coast Province (USDA 1995). The concept that fire regimes are stable temporally and spatially, and can be discreet geographic entities, are working hypotheses that will be revisited and refined as more information becomes available.

Distribution of physical and biological environments were used to map disturbance regimes across the North Coast Province. Landform types (USDA 1981) and plant series delineations were used to group geographic areas into blocks predicted to have similar fire behavior patterns. Relief patterns and climatic influences (fog, east wind) were considered in the groupings (**Map 4**).

These working boundaries were overlaid on the age-class distribution maps (Teensma et. al, 1991) to validate assumptions about the effects of physical and biological elements on disturbance processes and resultant vegetation patterns. Geographic variability in patch sizes and types was captured fairly well in overlaying the working boundaries on the age-class distribution maps. This supported the hypothesis that landform/topography, climate, and vegetation distribution influence disturbance processes and landscape pattern. The fire patch sizes were used to describe each block. These hypothesized disturbance regime blocks are continuing to be refined and represent an initial attempt to group landscapes. Watershed analysis will test our assumptions of the relationships of landscape patterns and disturbance.

Five of the eight disturbance regime blocks described in the Assessment Report (USDA 1995) are located within these LSR boundaries. Since only the very southern edge of the Central Interior --Lincoln County (Block 5) was present in a small portion of LSR 268, we grouped this block with the Central Interior --Alsea (Block 6). It will be referred to as the Central Interior -Alsea block in the following discussion. **Table 4** displays the environmental conditions that describe each of the fire disturbance regime blocks.

Wind

Wind is also a natural disturbance process within this LSRA area. Its significance is dominant in the Coastal Fog Zone. In this zone, there are frequent small disturbances. Yearly windstorms are responsible for small patches, often less than 10 acres in size, of blowdown across the Zone.

Infrequently, windstorms can cause blowdown of large (hundreds to thousands of acres) tracts of land. Efforts to predict wind patterns and potentials for blowdown across the landscape have not been successful in the past.

Insects

The Douglas-fir beetle is indigenous to the Coast Range of Oregon. This beetle maintains its normal low-level populations by infesting trees weakened by root disease or other stress factors and in scattered windfall. After a significant disturbance event, populations will increase in down and damaged Douglas-firs to levels at which beetles, in subsequent years, will attack and kill healthy standing trees. If significant amounts of windthrow do not occur in following years, these outbreaks typically will last only 3 years with the beetles attacking and killing successively fewer trees each year (Hostetler et al. 1996).

Table 4: Disturbance Regime Blocks

DISTUR- BANCE BLOCK	LAND- FORM	SUB-SERIES ENVIRONMENT	DISTURBANCE TYPE; REGIME DESCRIPTION*	LANDSCAPE PATTERN
COASTAL FOG BLOCK	low relief, scattered headlands and hummocks same area as soil / climate zone	wet and moist Sitka spruce dominate area	wind dominant process; operates at two scales. High-mod.frequencies of small-medium size/ and high severity. Also, storms occur with low frequency/large-giant size with high severity; fire very uncommon; low frequency/large-giant size - high severity. Native Americans and European settlers have influenced fire pattern.	heterogeneous mix of patch sizes and seral stages; earlier seral patches most frequently small to medium, resulting from small-scale wind events; large and giant patches created infrequently and move from early to late seral conditions
CENTRAL INTERIOR- ALSEA	moderate relief and high dissection	moist and wet environments of the western hemlock series dominate; wet and moist Sitka spruce found along stream corridors and in local fog zones	fire occurs at low frequencies/large-giant size/high severity	single to few large to giant patches of the same seral stage that will move through time to late seral conditions
CENTRAL INTERIOR- MARYS PEAK / ALSEA VALLEY	variable; valley fringe, moderate to high relief features, and mountain peaks	variable; noble fir occupies highest peaks; wet and dry grand fir may occupy eastern fringe; wet, moist and dry environments of the western hemlock series about equal area throughout block	fire occurs in variable regimes; heavy use by Native Americans and European settlers have influenced fire patterns	variable sized patches (medium to giant), with high variability of remnant trees within and between patches
SOUTHERN INTERIOR	moderate relief, high dissection	moist to dry environments of the western hemlock series dominate; grand fir may be located along eastern fringe	fire occurs in low to moderate frequencies/variable size/moderate to high severity	variable size (small to giant) patches, with some patches developing into late seral, and some patches experiencing more than one non-stand replacing disturbance (variable distribution of remnant trees and stands)
VALLEY MARGIN	valley foothills of low relief, low - mod. dissection	dry western hemlock and wet and dry grand fir	fire occurs at shortest intervals; variable sizes and severities	variable pattern

*Disturbance Frequency (years)

Low >300
Moderate 100-300
High <100

*Severity (% mortality)

Low <30%
Moderate 30-70%
High >70%

*Size (acres)

Small <100
Medium 100 - 1,000
Large 1,000 - 10,000
Giant >10,000

This Douglas-fir beetle-caused mortality can be benign, beneficial, or harmful, depending upon management expectations and desired forest conditions. Moderate amounts of beetle-caused tree mortality, for instance, can significantly improve habitat diversity for numerous species of vertebrate and invertebrate fauna. Conversely, large amounts of mortality can severely damage high value recreation sites, timber stands, old-growth areas, habitat conservation areas, or adjacent landowners and plantations. It is of particular significance that some of these areas depend on the number and sizes of old-growth trees to meet habitat requirements. Some of the older, less vigorous trees, weakened by disease or other factors, will be the most vulnerable to the Douglas-fir beetle. (Hostetler et al. 1996).

Disease

Laminated root disease, caused by the fungus *Phellinus weirii*, is the most commonly encountered and damaging forest disease disturbance agent in the analysis area. This fungus is a highly effective and efficient parasite that kills host trees of all sizes and ages. The fungus extensively decays roots of highly susceptible host trees and either causes windthrow or kills standing trees by destroying their ability to take up water and nutrients. Infected saplings and small poles usually die standing; larger trees are more likely to be windthrown (Hostetler 1996). *Phellinus weirii*, like other root pathogens, has co-evolved with its host through time and thus is a natural, perhaps even a necessary, part of many forest ecosystems. Laminated root disease spreads through forest stands by means of root contacts. It kills susceptible host trees, resulting in scattered groups of dead trees. This condition creates openings in the canopy, increases volume of down woody debris, increases species diversity in the plant community, and enhances visual quality on a landscape scale (Hostetler 1996).

Before human activities became the dominant agents of disturbance on the landscape, the distribution and spread of the fungus was most likely mediated by the fire history and pattern in an area: the fire determined the location, spread and longevity of the host trees over the landscape and thus, that of the fungus. A study in the northern Oregon Coast Range found a significant association between laminated root disease and slope position in 70 to 100-year-old Douglas-fir stands. The percentage of plots containing *P. weirii*-infected Douglas-firs was highest on ridges and decreased downslope. No relation was found, however, between laminated root disease and plant community type or aspect (Hostetler 1996). This disease moves relatively slowly through stands and is persistent for up to 50 years in large roots and stumps of trees that have been cut or killed (Hostetler 1996).

Suppression of natural fire and planting stands dominated with Douglas-fir are the human activities that have contributed the most to the potential for increasing the spread and intensification of laminated root disease in those stands where it existed prior to harvest. Because of the *extensive* amount of human disturbances in the Indian/Deadwood and Upper Five Rivers/Lobster portions of the assessment area (**Map 5**) where the concentrations of this root rot are dense, it is likely that in the future laminated root rot levels will be higher and the disease more widely distributed than in the past.

Landslides, Floods, and Earthquakes

Landslides and floods are integral to the formation of Coast Range landforms, soils, streams, and fish habitat. They introduce sediment (including gravels necessary for spawning) and large trees that act as energy dissipaters and sediment storage sites into the stream systems.

Logging and attendant road construction altered landslide rates by destabilizing steep slopes within most watersheds in the LSRA area. Instead of a single short period of intense landsliding which would have normally been associated with large-scale fires, repeated sliding results from moderately severe storms. Landslides from logged sites mainly introduce sediment without the large logs that control stream channel gradients and sediment load over several decades. The supplies of large trees to the stream channels have been greatly reduced or eliminated. Although no systematic studies of this effect have been conducted across the area, these activities are thought to have drastically changed stream channel shapes and function. Instead of complex step/pool profiles with multiple side channels produced by log jams, many channels in heavily logged watersheds have become simple bedrock chutes. The streams are lacking the pools and side channels necessary for quality anadromous fish habitat. As a result, during flood events there is a lack of calm water areas for the fish to rest in and many fish get swept into the lower channels or out to sea where they cannot survive.

Locally, landslides and floods influence the productivity of a site and its ability to produce vegetation. Successional stages of development and thus, attainment of LSR objectives, locally can be delayed.

Periodic earthquake activity can result in large mass failures. The relationship of earthquake activity to slope movement has not been quantified.

Vegetative Patterns - Reference and Current Conditions

Disturbance processes, plant series and sub-series environments, and successional trends all influence the range of landscape patterns. Comparisons over time of the amount and distribution of seral stages allow us to evaluate landscape changes. Plants and animals have adapted to the range of natural conditions across the landscape. Knowledge of the range of patterns allows us to evaluate and prioritize future management direction.

Ideally, comparisons in vegetative pattern should be made at many points in time over a long period (several hundred years) to get a complete picture of the range of natural conditions. Comparisons can provide some insight into historic pattern, and allow us to put current condition in context. It is rarely possible to get specific landscape pattern information for such long time periods. We can make assumptions about historic landscape pattern based on what we know about historical disturbance regimes and management history.

Seral stage distribution was only available for two points in time. A mid-1900s seral class map was derived from a series of county-wide vegetation coverages completed between 1940 and 1956 (MAP 7). Although some industrial forest practices were in effect prior to the 1940s, this seral class map provides the best information available on the composition of post-fire, pre-intensive forest management vegetation pattern. Logging had been occurring on private land for about 50 years. Intensive logging on federal lands was just beginning. We are not setting the mid 1900s time period as our desired future condition but, instead, are using it in conjunction with what we know about disturbance regimes to compare against current vegetation pattern. The maps derived from other sources (Teensma et al. 1991) were too coarse of a mapping unit to use for this exercise.

Current vegetation seral stage condition was developed by combining BLM and Forest Service vegetation layers. **Appendix B** describes the process for delineating and the definitions of seral stages. With these two efforts to delineate seral stages, we can compare the effects of our forest practices on landscape patch distribution.

Because mapping standards between the mid-1900s coverage and the current vegetation coverage are different, care must be taken in interpreting exact vegetation distribution changes. However, several general trends in vegetation pattern across the landscape emerge from the above analysis (USDA 1995).

- **Patch Size:**

Patch sizes on the landscape are reduced from reference conditions (mid 1900s) in all disturbance regimes. The largest change has occurred in the Central Interior Alsea (Map 7) with a shift in dominant patch size from jumbo (>10,000 acre) to medium-sized patches (100-1000 acres in size).

- **Number of Patches:**

The number of patches across the landscape has increased for mature conditions. Numbers of patches within each disturbance regime have at least doubled. The biggest change occurs in the Central Interior Alsea disturbance block where current mature patches are six times as many as occurred in the mid-1900s.

- **Area of Mature:**

The percentage of the disturbance regime blocks in a late seral condition has been reduced. The greatest change, based solely on federal ownership, is in the Central Interior Alsea disturbance block with a 46% reduction in late seral vegetation (78% to 42%). The smallest change is in the Central Interior Marys Peak/Alsea Valley block with a 15% reduction in late seral vegetation (60% to 51%)

LSR R0267 landscape pattern in the mid-1900s was largely that of a late seral forest, with approximately 75% of the LSR acres in that seral stage (USDA 1995). Current conditions consist of a landscape composed of approximately 46% late, with early-mid seral conditions significantly represented (**Map 8**) (**Table 5**).

The mid-1900's vegetation pattern in LSR R0268 was dominated by the late seral stages encompassing approximately 70% of the LSR acres (Assessment Report 1995). Disturbance history indicates that many of these stands generated in the 1840-50 fire period (Teensma et al. 1991). Today, the landscape is more varied, with 46% in late seral, and higher proportions of early-mid seral stands than occurred previously (**Map 8**) (**Table 5**).

SERAL STAGE	PERCENT OF LSR BY SERAL STAGE	
	R0267	R0268
GRASS/FORB	0%	1%
VERY EARLY <10 yrs	6%	6%
EARLY 11-24 yrs	16%	14%
EARLY 25-50 yrs	18%	15%
MID 50-80 yrs	7%	7%
LATE >80 yrs	46%	46%
HARDWOOD/MIX	6%	10%
UNTYPED	1%	1%

**Table 5: Current Seral Stage
of Federal lands in LSR
R0267 and R0268**

Loss of late seral conditions, increases in patch numbers, and decreases in patch sizes have contributed to late-successional habitat loss and fragmentation across the two LSRs . Both LSRs are affected, but LSR R0268 has a higher degree of fragmentation and loss of giant patches (USDA 1995).

III. CONDITION OF THE LSRs FOR WILDLIFE AND PLANT SPECIES

Late-Successional Forest Species

As defined at the beginning of this assessment and in the FSEIS, the term “late successional” is applied to both mature and old-growth stands. However, from a functional standpoint, these two stand types are used differently by wildlife species. Thus the term “mature” will be used in this section to describe natural stands which are approximately 80-150 years old.

Due to the extensive homesteading and forest management activities within the LSRA area since the turn of the century, most of the forest habitat has been heavily fragmented and consists of a mosaic of mature stands (predominantly 150 yrs old), hardwood mixed stands, young plantations, and early seral types (**Map 8**).

Consequently, habitat conditions for late-successional species within the LSRA area are marginal. Large patches of contiguous mature forests (>2,000 acres) are limited to areas where road access and timber harvest activities were difficult or restricted (i.e., Wilderness areas, unstable areas). **Map 7** shows the condition of mature forest habitat around the mid-1900s (prior to extensive logging), while **Map 9** shows the remaining amount and distribution of larger patches (>2000 acres) of mature stands within the LSR area today. These contiguous mature patches currently occupy approximately 18% of federal lands in the LSRA area.

Forest fragmentation has also diminished the amount and quality of interior forest habitat. Interior forest habitat is defined as the portion of a stand which is beyond the “edge effect”. Edges have been shown to influence stand dynamics, understory vegetation, species composition, humidity, and microclimate a distance of two tree lengths or more into the stand (approximately 500 feet) (Chen 1991 and Spies 1994). For this analysis, only the effects of “severe” edges (i.e., mature stands adjacent to young plantations or pure alder stands) were analyzed at the landscape scale. For some late-successional forest species (such as spotted owls and marbled murrelets), increased forest fragmentation and edge effects may directly affect survival due to increased predation and/or competition for limited resources, such as food or nesting sites. **Map 10** shows the proportions of the remaining mature forest stands within the LSR which are functioning as interior forest versus the portions which are considered to be edge (See also **Appendix H.4**). Species which are potentially negatively affected by forest edges include many of the non-vascular plants, amphibians, several species of mammals (such as red tree voles), and many species of birds (Lehmkuhl, 1991).

LSR Condition for Listed Species and Species Proposed for Listing

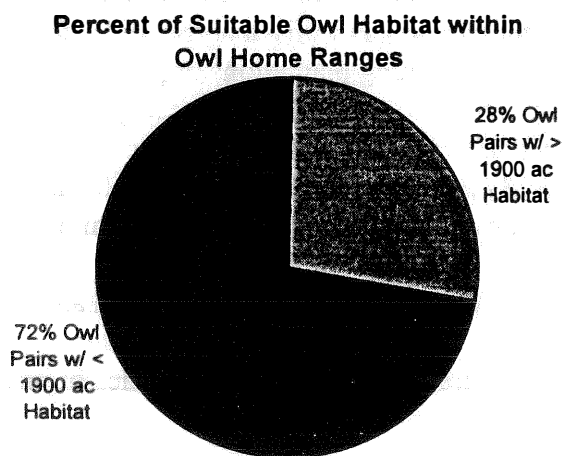
There are numerous species of vertebrates, invertebrates, and vascular and non-vascular plants associated with late successional forests that are known or suspected to occur within the LSR analysis area (**Appendix C**). However, there is little or no specific information about the abundance and distribution of most of these species. Since survey information and coverage is relatively good for the northern spotted owl (marbled murrelet and bald eagle to a lesser extent), the condition of these sites was used to determine habitat quality and function of the remaining mature forest for other late-successional species. Spotted owl inventories cover approximately 80% of the LSRA area whereas inventories for marbled murrelets are limited to individual project sites (i.e., timber sales, commercial thinning, stream enhancement).

Owl pairs with less than 1900 acres of suitable habitat (nesting, roosting, and foraging) within the median home range (1.5 mile radius circle) are considered to be marginally viable, based on US Fish and Wildlife Service definition of "incidental take". Any further removal of suitable habitat within these activity areas may result in loss of the pair site.

The following chart displays the percent of owl activity sites within the LSR which are considered to be healthy (i.e., have sufficient habitat) compared to the number of sites which are considered to be marginally viable.

Draft recovery goals for the spotted owl are aimed at reaching self-sufficient population levels within the designated habitat conservation areas (approximately 20 pairs/area). Current population levels are far below recovery goal objectives.

Figure 2:



Most of the spotted owl sites are at or below marginal levels for habitat availability. While owls and other late successional forest species may be surviving in the Coast Range, habitat limitations are affecting reproductive success and survival. The continued existence of these species will depend on habitat protection and restoration.

In lieu of adequate information for most of the remaining terrestrial vertebrate species which occur within the LSR, a guilding analysis was used to evaluate habitat quality and function for different species guilds at the landscape scale. Species guilds are defined as groups of species which have similar habitat requirements, home range sizes, and dispersal abilities. The guilding analysis (HABSCAPES) is a computer model which analyzes the quality, size, and distribution of habitat patches on the landscape and then rates them based on their contribution for a given species guild. The resulting maps and habitat ratings allowed us to look at how the landscape as a whole is functioning for most of the terrestrial species and to identify key areas for protection and/or areas of concern.

For late successional forest species (both small and large home ranges), the HABSCAPES model run correlated well with the interior forest habitat analysis (**Map 10**) and seral patch map (**Map 9**), and rated the habitat based on quality and distribution across the landscape. For the complete guilding analysis, please refer to the Forest-wide Assessment.

The habitat analysis for late successional forest species was verified by overlaying known locations of spotted owls (ranked by the amount of suitable habitat for each site) and marbled murrelet-occupied sites and proved to be an accurate representation of how the landscape is currently functioning for these species. This process proved to be instrumental in identifying areas of concern (such as important linkages or isolated populations) and helped us to prioritize areas for restoration (building from the refugia concept). This analysis was utilized in determining LSR Zones and Landscape Cells - Chapter V.

There are additional known Spotted Owl reserve areas outside of LSR boundaries. These were identified prior to January 1994. There are 2 on the Siuslaw, 1 on Salem BLM, 1 on Eugene BLM. Locations are available at Siuslaw National Forest Headquarters and District offices and at BLM District offices. This will be referenced in Chapter 3 pages 22-23. Vegetation within these areas if less than 80 years of age, will be treated as defined by the management triggers section in this document. Canopy will not be reduced below 40% cover. Goals that are consistent with the adjacent LSR landscape cells will be applied.

Of the more than 280 vertebrate species which are documented to occur within the LSR (coastal species were excluded from the analysis), approximately 33% are habitat generalists; that is, they have no particularly strong associations with any stand age class or vegetation type and utilize the landscape in an opportunistic fashion. Approximately 25% are strongly associated with mature and older forest types. Many of these species have relatively large home ranges (such as the spotted owl, goshawk, and marten). Another 25% or so prefer early seral habitat types. Most of these species have relatively small home ranges (i.e., rodents, reptiles, waterfowl) and include some non-native species or species which have moved west with increased forest fragmentation. Of the remaining species, about 10% require a mosaic of patch types and prefer edge habitats (i.e., elk) while the rest have special habitat requirements (cliffs, caves, etc.). Many of the edge species have mid-sized or larger home ranges. There is a considerable amount of overlap in the way most of these species utilize the landscape and very few are found exclusively in one habitat type or another. This breakdown merely gives us a representative picture of how species are

utilizing the various habitat types on the landscape. Please refer to tables in the **Appendix C** for these species lists.

Habitat conditions for fish stocks of concern (primarily coho and cutthroat trout, but also including some populations of steelhead and chum) within the Oregon Coast Range has been evaluated in several aquatic assessment efforts (ODFW, Siuslaw NF, American Fisheries Society). Aquatic habitat conditions and status of fish stocks of concern, as well as integration of the aquatic and terrestrial emphasis areas within the LSR, are addressed on **pg. 7** and **pg. 63** of this assessment.

Connectivity Among LSRs

Lands that surround these LSRs are either checkerboard public/private lands, blocked public lands, or large sections of private lands (**Map 2**). The checkerboard public lands are managed primarily by the Bureau of Land Management and the majority of habitat conditions are early seral (approximately 35% mature conifer when considering only federal land but less than 20% mature conifer when considering all ownerships). These checkerboard lands, as a result, have isolated and highly fragmented older forest conditions.

Many of the public lands outside of this LSRA area are managed under a variety of Land Use Allocations as identified in the ROD. Along the southern boundary of LSR RO267, the public lands are designated as a combination of LSR and Matrix (60 - 80 yr. rotations). Public lands along the east and southeast of LSR RO267 are designated predominately as Connectivity/ Diversity blocks. The Connectivity/Diversity blocks were designed to be managed on 150-year rotations with a minimum of 25-30% of the designated block in a late-successional condition (ROD C-42). These blocks are designed to provide connectivity (along with other allocations such as Riparian Reserves) between LSRs for animal and plant species associated with older forest habitat.

Due south of the western edge of the LSR RO267 area is the Smith/Umpqua block. It is managed by the Siuslaw National Forest and Coos Bay District of the BLM and contains contiguous late-successional forested habitat. This block is a designated LSR RO265. It currently contains habitat conditions suitable for use by late-successional forest species.

North and East of LSR RO268, private land holdings predominate. Directly north of LSR RO268, there is no federally managed land within 12 miles. After that point, scattered sections of BLM land, which have been designated as LSR in the North Coast Adaptive management Area, are encountered.

Private lands can generally be classified as industrial forest lands, agricultural lands, or small private in-holdings. Many of the industrial forest lands are currently early seral forests stands (< 60 yrs old) and are assumed to be managed on a short rotation (40 - 50 yrs) into the future. These lands will have an impact on the ability of some late-successional

forests species to migrate to adjacent LSR lands that occur outside of this LSRA area. Species with limited dispersal mechanisms (i.e., salamanders, ground beetles, fungus) may find it difficult, if not impossible, to disperse to older forest habitats outside the boundaries of these LSRs.

Agricultural lands will remain in very early seral habitat. In a natural condition, these valleys were a mix of open, native grassland habitats and forested habitats, many of which have been cleared by landowners to make way for homes, food crops, and pastureland.

The management of lands owned by small private landowners will vary greatly. These lands are not expected to have a major impact on the ability of these LSRs to function as late-successional forest habitat due to the small amount of area occupied across the landscapes. Industrial forest lands will likely continue to be managed on short harvest rotations (40-50 yrs.) providing scattered areas of early seral habitat conditions throughout the LSR over time.

By following the management objectives and activities as described in **Table 7**, current stands in early to mid-seral conditions will begin to develop late-successional stand characteristics. This will increase the available habitat for the existing late-successional associated species as well as provide opportunities for some of the extirpated species to become reestablished.

While the late-successional habitat within the LSR is expected to gradually improve over time (under current management direction), habitat conditions on private lands adjacent to the LSRs likely will remain constant (early seral classes). As late-successional habitat conditions improve on BLM lands in the SE section of the LSR, connectivity between this reserve and reserves in the Cascades will improve. However, due to the amount of private lands to the north of the LSR, dispersal conditions will likely remain similar to the current condition.

Other Species of Concern (State Sensitive, ROD, and Species of Social Value)

Since the major habitat type within the Oregon Coast Range historically was a forested ecosystem, with openings limited to the river bottoms and the tops of the highest peaks, most of the species in this LSRA area adapted in an environment with little or no forest fragmentation and relatively long disturbance return intervals (Teensma, 1991 and Agee, 1991). Habitat alteration and fragmentation by humans since the turn of the century has resulted in a shift in species composition (both plant and animal) from species which prefer a forested environment to those which benefit from openings (Lehmkuhl, 1991). While populations of many species, such as elk and some neotropical migratory birds, have been positively affected by this shift in habitat condition over the past 50-100 years, most of the late successional forest species and several species of large carnivores, such as gray wolf, grizzly bear, and Pacific fisher, have either been extirpated entirely from the Coast Range (**Appendix D**) or are listed as threatened or endangered (**Appendix E**). In addition, loss of

overwintering habitat in Central and South America affects many populations of migratory species, making recovery efforts for some species an international challenge.

The white-footed vole is listed as a sensitive species at both the state and federal level. Due to their scarcity and limitations in trapping techniques for this nocturnal species, little is known about the distribution and condition of the population of this species in the Coast Range. Research studies indicate that this species is strongly associated with riparian hardwood stream habitats, especially those containing large logs. The LSRA is right in the middle of this species' distribution range. Aggressive conversion of alder-dominated stands in riparian areas, especially small stream systems, may negatively impact white-footed voles. More studies are needed to determine the impacts of this activity to the populations of this species.

There are a few species of management concern which may be negatively affected by the LSR objectives (i.e., species which require early seral or severe edge habitats). These include some sensitive (state and federal) species or species which have a high public profile. The level of impact from this conflict is difficult to accurately assess due to a variety of influences which are not directly associated with LSR management objectives; i.e., migratory species. Also, it is assumed that the ownership pattern associated with this LSR area will provide the early seral habitat conditions with which some of these species are associated. While management of the federal lands towards a late successional forest condition is not likely to cause populations of any of these species to decline within their ranges, it may cause a shift in their distribution and habitat use within the LSR area over time. Species which depend primarily on early seral habitats to fulfill their life requirements likely will move to the industrial forest lands (assuming approximately 40-year harvest rotations) and valley habitats. These species were part of the biological diversity across the landscape prior to European settlement and, therefore, were always present in the Coast Range.

The species of concern which prefer a combination of early seral and forest edge habitats include the Roosevelt elk (a species of social and state value), the western bluebird, purple martin, and mountain quail. While some of their life requirement needs, such as feeding, breeding, and resting, are associated with early seral conditions (grass/forb through early seral), all of these species are dependent on forest ecosystems (snags and winter/summer thermal cover) for at least portions of their life cycles.

Botanical Resources

Of the more than 200 plants, primarily non-vascular, that are listed for survey and manage in Table C-3 of the ROD, 182 species are found in forested habitats. Of these, 177 are strongly associated with late-successional forests. Similarly, of the 39 species which are found in riparian or wetland habitats, 30 are strongly associated with late-successional forests.

Little is known concerning vascular and non-vascular plant and fungal species distribution. Less than 5% of the area within the LSRA area has been surveyed for vascular plants. The acres surveyed have been associated with various management activities (e.g., timber sales, silvicultural projects, roads, etc.). Even less is known about the health and distribution of non-vascular (lichens and bryophytes) and fungal species.

One threatened species, Nelson's checkermallow, (*Sidalcea nelsoniana*), and several sensitive species and species of management concern may occur within the LSRA (Appendix E).

A conservation management plan was prepared in April 1992 for loose-flowered bluegrass, *Poa laxiflora*, the only sensitive species known to occur within the LSRA. This species has since been downlisted and known populations are being monitored.

The FSEIS/ROD identified many vascular and non-vascular plants and fungi to be considered under ecosystem management. Under the ROD, implementation of the standards and guidelines for Survey and Manage (S&M) species (Table C-3 of ROD) will be required. Standards and guidelines for survey protocols and plans for the implementation of these surveys are currently being drafted.

The lack of current information about Survey and Manage species and their distribution, abundance, and habitat preferences, makes it difficult to predict the potential occurrence of these species in the LSRA area. Information currently provided that describes potential habitat for these species is likely to change as more information is available. It is likely that there will be habitats within the assessment area to support several of these species other than those currently known to occur within the area (Appendix E).

Field surveys to specifically locate S&M species have not been implemented in the LSRA area. However, three S&M species on the Strategy 1 list, *Allotropa virgata* (candystick), *Bauxbaunia piperi* and *Loxospora sp. nov. "corallifera"* (a lichen), are known to occur within the assessment area. The FSEIS/ROD indicates that known sites of Strategy 1 species should be managed for these species.

Noxious and Non-native Plants

The following list of "noxious" weeds, designated by the Oregon Department of Agriculture (ODA), are known to occur in the LSRA area:

Meadow knapweed	<i>Centaurea pratensis</i>
Canada thistle	<i>Cirsium arvensis</i>
Bull thistle	<i>Cirsium vulgare</i>
Field bindweed	<i>Convolvulus arvensis</i>
Scotch broom	<i>Cytisus scoparius</i>
St. Johnswort	<i>Hypericum perforatum</i>
Japanese knotweed	<i>Polygonum cuspidatum</i>

Tansy ragwort	<i>Senecio jacobaea</i>
Evergreen blackberry	<i>Rubus laciniata</i>
Gorse (along coast)	<i>Ulex europaeus</i>

Invasive exotic plant species that are not designated by ODA as noxious weeds are also present in the assessment area. Invasive exotic plant species may present as large a threat to biological resources as those species designated "noxious". Some species of particular concern known to occur in the LSRA area include:

Common burdock	<i>Arctium minus</i>
Foxglove	<i>Digitalis purpureum</i>
Teasel	<i>Dipsacus sylvestris</i>
Burnweed	<i>Erechtites minima</i>
Robert's geranium	<i>Geranium robertianum</i>
Sweet pea	<i>Lathyrus latifolia</i>
Creeping buttercup	<i>Ranunculus repens</i>
Himalayan blackberry	<i>Rubus discolor</i>

All noxious and other non-native species may pose a threat to the future development of late-successional and old-growth forests, since these species tend to dominate early seral plant communities and inhibit the ability of the site to convert back to a forested ecosystem. Non-native plants are generally very successful competitors, particularly within the disturbance regimes that humans generally impose on the natural environment. Non-native plants generally have dispersal mechanisms (e.g., wind-born and animal-carried seed) that allow for their rapid spread. Weeds are especially advantaged by movement along disturbed road corridors. However, all of the non-native plant species of concern thrive in open-sun environments and decline in abundance once a forest overstory develops. Thus, once trees do become established on a site, these species will drop out of the system with canopy closure.

Noxious weeds are particularly a threat to early seral native plants. Early seral native plants that inhabit light gaps and small disturbance patches are important additions to the overall species diversity in older forest ecosystems. We do not know the interactions and thus the importance of these early seral species in the overall functioning of these mature and old-growth forest systems. Replacement of early seral native species with invasive, highly competitive (and often times, monocultural growth) species certainly has ramifications beyond our current understanding. We should stick to the concept of "keeping all of the cogs and wheels" in order to maintain functioning ecosystems, particularly in light of our uncertainty of the functioning of these systems.

The standard and guidelines outlined in the ROD give guidance on the management of non-native species in late-successional reserves. In addition, a recent policy was signed regarding the control of non-native plants on federal lands within the region (Forest Service, 1994).

IV. IDENTIFICATION OF SPECIFIC AREAS FOR TREATMENT

Landscape Analysis

The objective of forest management in LSRs is to protect and enhance conditions of late-successional forest ecosystems. Following successional pathways with prescriptions that focus on desired structural characteristics will meet those objectives. In addition, attainment of late-successional conditions can be accelerated by focusing treatments both spatially and temporally.

The following section, which defines a landscape analysis process, attempts to set that strategy for future management activities. This strategy is based on conservation biology - conserving the best habitat first and then working with more degraded habitats.

LSR Zones

Coarse scale functional differences in the landscape were derived from a synthesis of physical, biological, and social attributes. The dominant difference was in the ability of certain portions of the landscape to produce contiguous late-successional habitat while other areas could not be expected to serve that function. Another functional difference that surfaced during this synthesis of information was the importance of specific areas within these LSRs for providing connectivity to and from adjacent LSRs. Initially, three zones were delineated based on the above functional differences. These LSR Zones are described below.

The CORE LSR Zone located in the western portion of the LSRA area (**Map 11**) is primarily managed by the Siuslaw National Forest with contiguous federal ownership (except for minor areas adjacent to larger streams that are in private ownership). Fire disturbance regimes in this area have historically resulted in the largest patches within this LSRA area. Most of the spotted owl sites with sufficient habitat to be considered viable in the future are located within the CORE. As a result, the function of this LSR Zone is to provide the genetic source for populations of late-successional species (especially those with large home ranges) within and to populations outside of the CORE surrounding this area.

There are significant opportunities in this area to restore aquatic habitat and assist in recovery of Coho Salmon. One of the components of late-successional forests is the accumulation of large wood in the stream channels. Fish habitat quality is poor throughout much of this LSRA area. This is primarily due to the loss of large wood and elevated stream temperatures. Some of the same processes that result in forest fragmentation and loss of mature forest vegetation on the landscape are responsible for the loss of in-stream structure and conditions which will not supply large wood to stream channels within the foreseeable future.

The conservation strategy for aquatic species supports restoration of the best aquatic habitat first. The prioritization of restoration practices for late-successional habitat for terrestrial

species highlights all but one of the key watersheds as high priority for restoration. The blending of these two strategies for restoration, provides a focus to restoration activities for whole landscapes, from stream channels to the ridgetops. **Map 13** shows the relationship between these LSRs and Key watersheds. **Appendix H** lists information from this report by watershed.

The CORRIDOR LSR Zones (**Map 11**) are located in the north of LSR RO268 and southeast of LSR RO267. They provide a key connectivity function with the surrounding LSR network. The majority of spotted owl sites within these areas do not currently contain adequate levels of suitable habitat and are considered to be marginally viable. Habitat restoration on federal lands will improve this condition. Due to the checkered federal ownership patterns within the CORRIDOR zones, this area will serve as a refugia area for late-successional forest species which are dispersing from the stable populations in the CORE to adjacent LSRs and vice versa.

To the north, the closest designated LSR is 12 miles away and current suitable habitat is minimal with limited checkerboard federal ownership. The northern portion of LSR RO268 could provide the first suitable habitat for large home range late successional species migrating south. This migration both coming south and going north is critical to mixing of gene pools and ensuring survival of these associated species. The southeastern portion of LSR RO267 has also been identified as a critical wildlife corridor for the same reasons. In this case, however, this is a critical passage for linking the gene pools of the Cascade Range with the Coast Range. This is the first forested corridor over which large home range species can travel to mix with Cascade species south of the Columbia River. The Northwest Forest Plan has identified the area directly south and southeast of LSR RO267 as a critical connecting corridor by allocating sections of federal land as Connectivity/Diversity Blocks.

The BUFFER LSR Zone designation is for that portion of the LSRs which does not directly link to areas outside of these LSRs but is important for connectivity and dispersal of organisms within these LSRs and between other portions of the landscape (**Map 11**).

Both the CORRIDOR and BUFFER LSR Zones are in fire disturbance regimes which have historically produced variable patch sizes with much more landscape variability in seral conditions than would have been found in the CORE LSR Zone. Intermediate disturbances in this area were common and the multilayered characteristic of late-successional forests may have established earlier in this LSR Zone. As a result, this area will support a different species mix of organisms than the CORE LSR Zone. These areas have the potential to support late-successional animal species that have small home ranges. Late-successional habitat and connectivity will be provided based on ownership with small to medium patches in mixed ownerships and large patches where possible.

Based on the potential ecological functions of these different areas, we have established specific goals that future management should consider when prescribing activities within these LSRs.

CORE LSR Zone goals:

- Minimize fragmentation. Provide contiguous large patches of late-successional habitat.
- Increase connectivity and dispersal habitat both within large interior blocks and by development of late-successional habitat in the mixed seral areas adjacent to the large interior blocks.

CORRIDOR / BUFFER LSR Zone goals:

- Improve, create, and maintain connectivity across the landscape.
- Within stands, increase connectivity and dispersal habitat. Priority is on northern spotted owl site centers that do not have good habitat.

For all LSR Zones, the primary goal is:

- To maintain and restore habitat to support well-distributed populations of late-successional forest species.
- Maintain high priority fire protection, especially along high use travel corridors and on the mixed ownership areas in the CORRIDOR/BUFFER LSR Zone designation.
- Land exchanges and changes in land use allocations i.e., changing some allocations to block up areas should be considered wherever it assists in attainment of the above goals.

Landscape Cells And Treatment Priorities

Intermediate scale functional differences were used to further divide the LSR Zones into "Landscape Cells". Each cell was based either on its existing condition or the functional role that that portion of the landscape needs to play to facilitate the attainment of a landscape which will allow species survival and dispersal. The initial landscape analysis was done for the whole area, disregarding land use allocations or ownerships. Therefore, existing condition (size and distribution of remaining mature forest) is based on information known or assumed (i.e., 40-year rotations on industrial forest land) from all ownerships. This provided an overall assessment of the conditions for late-successional species. The amounts of mature would be higher if only federal lands were considered. With this process, the landscape was divided into six Landscape Cells.

These areas have been delineated on maps to display the concepts of the landscape analysis. They are not intended to be another land allocation. It is inappropriate to calculate acreages of certain treatment opportunities within these areas. They are conceptual boundaries.

Within these Landscape Cells, treatment priorities were established based on the concept of protect and stabilize the best. Priority 1 areas were given to the large contiguous patches of mature conifer habitat. With focused effort, connectivity and increase in the size of these blocks could be attained.

Priority 2 areas focus on building late-successional habitat between smaller patches that currently exist. In the case of Landscape Cell # 4, priority was given to the existing large contiguous mature blocks and the desire to connect this habitat.

Priority 3 areas were given to those portions of the landscape where the late-successional conditions are currently of low quality. Even though these areas are important for establishing connectivity between LSRs, considerable efforts will need to be employed to restore these landscapes.

The 4th priority was given to that portion of the landscape where the late-successional conditions are of low quality and the area is not in a critical corridor. While these lands contain small patches of late-successional habitat which are important to maintain, these areas will take considerable efforts to restore.

Landscape Cell #1 (Contiguous Mature -Dark green patches on Map 12) contain the largest contiguous blocks of late-successional vegetation. The minimum patch size within these Landscape Cells is 2000 acres. These areas currently contain over 40% late-successional habitat. When the existing active northern spotted owl site centers are overlayed on these Landscape Cells, nearly all of the sites within these areas contain adequate levels of suitable habitat to be viable over the long term. These areas are the foundation for recovery of contiguous late-successional habitat in the CORE and CORRIDOR LSR Zones. **Treatment Priority = 1.** Management goals within Landscape Cell #1 include:

- Accelerate attainment of late-successional characteristics
- Treat the complete range of seral stages in plantations, prescribe treatments which set the trajectory to accomplish objectives with a limited number of entries.
- Emphasize road closures consistent with the ATM/TMO plans
- Leave some stands to develop on their own; i.e., if mid-seral 50 to 80 year old stands are on a suitable trajectory, do not treat

Landscape Cell #2 (Mixed Seral - Light green patches on Map 12) are those portions of the CORE LSR Zone where there are a variety of seral classes. The late-successional habitat in these Landscape Cells ranges from 27% to 40% with the majority around 33%. Most active Spotted Owl site centers within Landscape Cell #2 do not have sufficient suitable habitat and are considered minimally viable by the US Fish and Wildlife Service. There are two overall goals for this Landscape Cell.

- Goal # 1 is to grow out from the adjacent large late-successional blocks that are in Landscape Cell 1. Specific management goals are exactly the same as for Landscape Cell #1. **Treatment Priority = 1**
- Goal # 2 is to create new and enlarge existing small, scattered late-successional patches. **Treatment Priority = 2.** Specific management goals within these portions of Landscape Cell #2 are:
 - Use successional pathways as guidelines for prescriptions
 - Prescribe treatments which will attain late-successional characteristics with continued implementation of management activities. Multiple entries are appropriate.

Landscape Cells #'s 3 - 6 are all currently in an early seral condition. They have been separated because of the different functional roles that they play in the landscape. This resulted in either different overall management goals or in different treatment priorities.

Landscape Cell #3 (Early Seral - Brown patches on Map 12) are those areas within the CORE LSR Zone that are blocks of contiguous early seral vegetation. There is currently less than 20% late-successional habitat in these Landscape Cells. **Treatment Priority = 3.** Management goals within Landscape Cell #3 include:

- Maintain dispersal habitat. This is critical habitat that is being used
- Around T&E species locations, use low risk silvicultural treatments
- Treatments should first focus on lands that are currently unsuitable habitat within northern spotted owl provincial home ranges (i.e., within a 1.5 mile radius of the activity center).

Landscape Cell #4 (Early Seral Link to Mature - Red patches on Map 12) are those areas outside of the CORE LSR Zone which were identified as critical linkages between large patches of late-successional habitat. There is currently less than 20% late-successional habitat in these Landscape Cells. **Treatment Priority = 2.** Management goals within Landscape Cell #4 are exactly the same as Landscape Cell #2.

Landscape Cell #5 (Early Seral Connectivity - Purple patches on Map 12) are those areas in the CORRIDOR LSR Zone identified as critical links between adjacent LSRs. There is currently less than 20% late-successional habitat in these Landscape Cells. **Treatment Priority = 3.** Management goals within Landscape Cell #5 are exactly the same as Landscape Cell #3.

Landscape Cell #6 (Early Seral - Light blue patches on Map 11) are in the BUFFER LSR Zone. There is currently less than 20% late-successional habitat in these Landscape Cells. **Treatment Priority = 4.** Management goals within Landscape Cell #6 are exactly the same as Landscape Cell #3.

Access and Travel Management / Travel Management Objectives

It was beyond the scope of this assessment to do a site-specific road plan. This assessment has provided objectives to develop Access and Travel Management or Transportation Management Objectives within the LSR Zones and Landscape Cells. Many other objectives, besides LSR objectives, need to be considered in that planning effort. The Siuslaw ATM plan has been completed and a very cursory review by the team did not see major conflicts with meeting LSR objectives given the current ATM plan. TMO plans are currently being developed. These planning efforts need to be a cooperative effort with integrated plans as an outcome. BLM is constrained by mixed ownerships. Also, shared construction costs and user fees fund some of the roads on BLM lands. The ROD B-19 and C-16,19,32 all provide direction for roads within LSRs.

When finalizing access and travel management (ATM) plans or travel management objectives (TMOs), consideration for the type of management cell should be considered when designating routes; for instance, contiguous large mature blocks should be a priority consideration for road closures/obliterations. This allows for large blocks of harassment-free landscapes where some of the more reclusive species could be reintroduced.

V. CRITERIA FOR DEVELOPING APPROPRIATE TREATMENTS

It is important that activities that are employed within late-successional reserves maintain all of the pieces necessary to attain late-successional stand characteristics. This section of the assessment describes the criteria and the process for developing appropriate treatments within LSRs. **Figure 3** is a flowchart which depicts the process and displays some examples of how an Interdisciplinary Team (IDT) would utilize this section of the document.

There are 5 steps to the process. The first is the identification of a condition on the landscape which would trigger a management action (**Table 7**). Second is a determination of the seral stage of development. Third and fourth steps are done in conjunction with each other. The IDT determines what the site-specific issues of an area are and then works as a team to establish the appropriate management criteria (**Table 7**) and sideboards (**Tables 8-12**) that guide implementation of the project through an integrated prescription. The outcome, the fifth step in the process, is a proposal of an appropriate management activity.

Management Triggers

There are a variety of existing or potential conditions on the landscape which would trigger a management action. Site-specific analysis is necessary to determine if an area would require some sort of vegetative manipulation to accelerate attainment of late-successional characteristics.

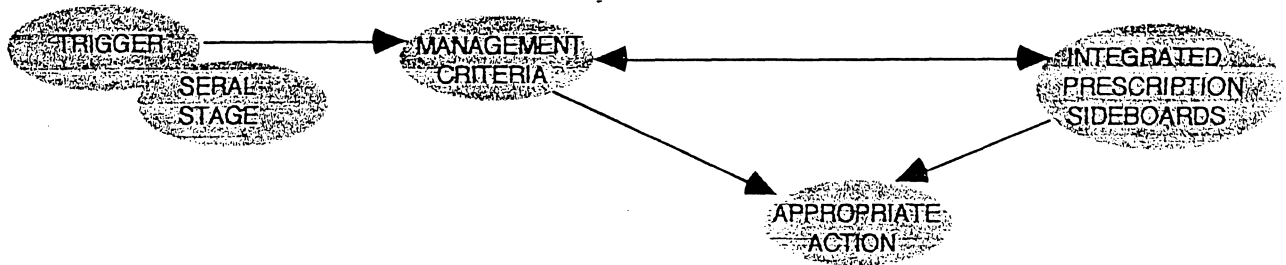
Site-specific analysis may determine that an area is on a trajectory for attainment of late-successional characteristics (refer to discussion on the range of late-successional characteristics and **Tables 8-12**). When this situation is encountered, regardless of seral stage of development, that area should be left to develop on its own.

There are certain conditions that exist on the landscape that result from past land use patterns and/or practices that would trigger a management activity within late-successional reserve land allocations. It must be remembered, however, that all activities that occur within the LSR land allocation must be beneficial to the creation of late-successional forest conditions over the long -term. (ROD C-12).

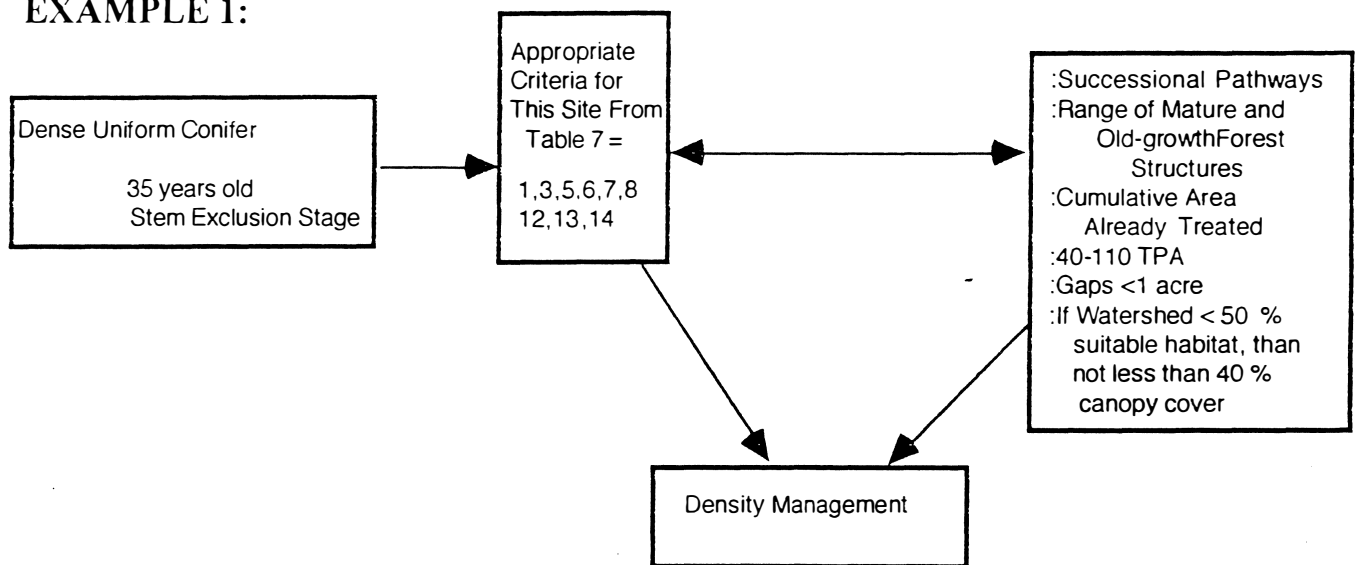
Studies have shown that accelerated development of many of the structural components of late-successional stands can be achieved (Oliver 1992, Marshall 1991). Wide spacing provides the site condition for open-grown trees and the development of lateral branches which result in a "wolfy limb" character to individual trees. Through time, the large wood will die, decay, and fall to the ground as a source, first as snags, then as large woody material that will either stay on site or move into a stream channel. As a result, it can be suggested that growing big trees also accelerates development of the down wood and snag

Figure 3: Flow Chart - Utilizing Information in LSRA to Develop Appropriate Management Action

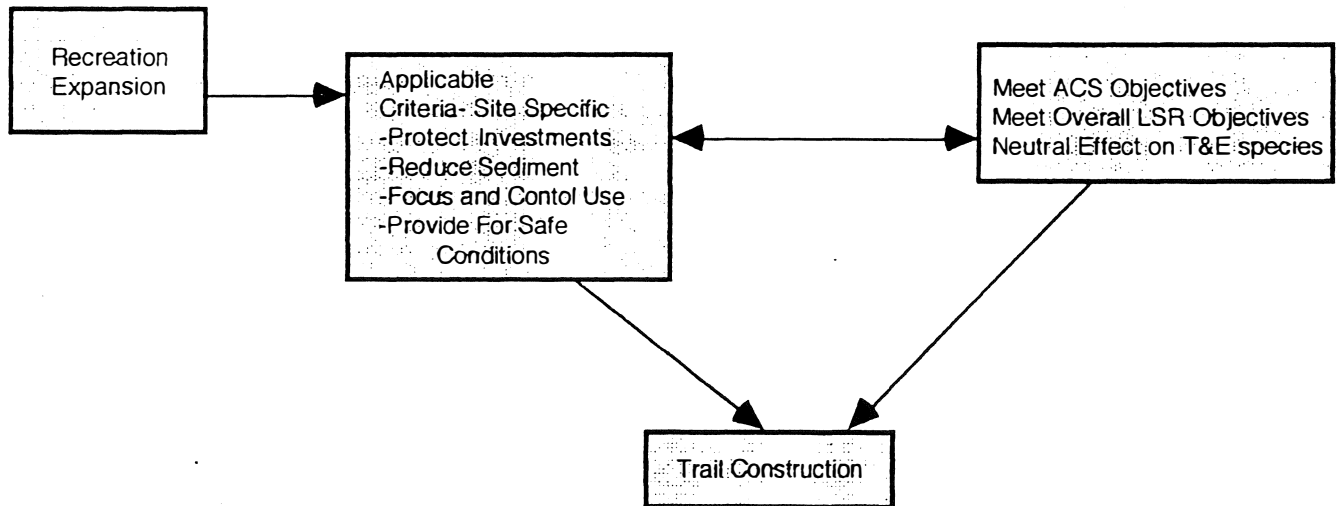
PROCESS:



EXAMPLE 1:



EXAMPLE 2:



component in size classes typical of late-successional structural character. Multiple canopy layers, canopy gaps, and the development of a patchy understory can be created. However, understanding the spatial distribution of these features at the stand and landscape scales is currently a research topic.

The effects of accelerated development of structural characteristics on ecosystem processes (i.e., tree growth and maturation, death and decay, disturbances), and functions (i.e., nutrient and hydrologic cycling, buffering of microclimates, storing carbon) is not known. Some processes and functions cannot be accelerated, such as time since disturbance. Thus, there should be enough variability in treatments and enough unmanaged land to serve as refugia for any unknown elements, functions, and processes.

Dense uniform conifer stands in managed plantations (25-50 yrs) will be the primary focus for manipulating vegetation to provide the structural conditions associated with late-successional characteristics. Although dense, uniform stands have been a part of the landscape, the amount and distribution of these stands now occurring in these LSRs is inconsistent with the range of natural conditions. Trees which have been uniformly spaced from planting and precommercial thinning will interact differently when developing through the inter-tree competition phase or stem-exclusion phase than natural stands seeding in after a stand replacement disturbance. Trees have less chance to express dominance when they have all been put on an even footing in terms of growing space and selection through precommercial thinning. Therefore, when these stands reach density levels in which individual trees are competing with each other for growing space, it will take longer for individuals to express dominance. As trees go through this stagnation stage, stems will become tall and slender as height growth continues but diameter growth drastically slows in response to loss of crown. These trees will become more dependent on neighboring trees for support. Eventually, as some trees dominate and others fall behind, the dominant trees will develop more crown and diameter growth and therefore more individual stability. Still, as trees go through this period, they are more likely to blow down or, if drought conditions persist, be more susceptible to insects and disease.

The uniformity of trees within a stand determines the rate of differentiation and self-thinning. Although plantations are generally more uniform, portions of the stands are as non-uniform as many natural stands, and some portions of natural stands developed as uniformly as the plantations. So it's a continuum, with a wide range of development which has taken place in natural stands. The plantations are skewed towards the more uniform end of the spectrum. Thinning dense, uniform stands such as these to a wider spacing would provide the remaining trees more of an opportunity to differentiate without stagnating.

Active management, such as thinning and underplanting, would accelerate attainment of at least some late-successional stand conditions (large trees, multiple layers, for example). Many of these conditions begin to develop within 30 - 75 years. Without thinning and underplanting, the managed stands would eventually develop late-successional characteristics. However, attainment of many of stand characteristics, such as large snags and logs, may take centuries.

Stands less than 80 yrs old currently occupy about 211,898 acres (**Table 6**) of land within the LSR allocation across the landscape. Approximately 86,000 acres are in 25 to 50-yr old managed stands, while younger plantations (0 and 24 yrs old) make up approximately 114,000 acres. Many of these stands may require some sort of density management within the next 30 years. There is scientific research to support that it is appropriate to change these stands from the current trajectory that they are now taking with activities that manipulate the density and spacing of trees (Oliver and Larson, 1990; Marshall, 1991) in order to achieve more natural stand characteristics. In addition, another 37,000 acres are in 51 to 80 year old stands (i.e., fire-regenerated stands, early railroad logging). While the majority of the stands in this older age group are natural or on a trajectory which meets LSR objectives, a few of these stands may also benefit from some vegetation manipulation.

Commercial thinning opportunities are predominately in the "dense uniform conifer stands" in the 25-50 year old age group (**Table 6**). Throughout the LSR, federal forest management agencies are predicting that about 6500 acres per year will be scheduled for manipulation of vegetation to accelerate the attainment of late-successional conditions. Only a small portion of the 50 to 80 year old stands would be treated. Locations of these treatment areas will be based on the priorities described in Landscape cells with the "best" habitat areas being secured first then moving treatments to restore the more degraded habitats (pp. 56,57). Habitat conditions within spotted owl activity centers will be evaluated and if vegetative treatment is required to restore suitable habitat, 40% canopy closure will be maintained to provide dispersal habitat.

Table 6. LSR Acres With Potential Treatment Opportunities

LSR	AGE CLASS	ACRES BLM	ACRES SNF
RO267	0-10 YRS	9,652	1,525
RO267	11-24 YRS	16,864	11,615
RO267	25-50 YRS	23,304	7,606
RO267	51-80 YRS	9,532	3,025
RO268	0-10 YRS	7,403	14,358
RO268	11-24 YRS	12,112	39,987
RO268	25-50 YRS	15,439	39,474
RO268	51-80 YRS	10,537	14,215

Another condition on the landscape where management activities would assist in attainment of late-successional characteristics is when soil productivity is so severely degraded that the site can no longer support or maintain the plant communities that it was once capable of supporting. Soil restoration activities could be employed to restore the soil quality at the sites.

Every effort should be made to employ management practices

which maintain a low risk of creating catastrophic disturbances. However, there may be times when a catastrophic disturbance, whether insects, disease, wind or fire, occurs and has led to conditions that if allowed to persist, would be detrimental to the goals and objectives of the LSR. In this situation, it is appropriate to employ some management activities. In

the case of insect outbreaks, only as a last resort should activities which apply chemical treatment be employed. All management responses to disturbance events will follow the guidelines in the ROD.

The area outlined on **Map 6** indicating Phellinus includes both mature and young stands. Treatment would occur in plantations within that area. Seral classes within that delineation are:

Grass/Forb	518 ac	Very Early (<10 yrs)	2,858 ac
Pole (11-24 yrs.)	9,892 ac	Young Conifer (25-50 yrs)	10,442 ac
Conifer (51-80 yrs)	1,584 ac	Mature Conifer (>80 yrs)	26,109 ac
Hardwood	4,872 ac		

The majority of treatment would occur in the 25-80 year age classes, as described for a preventative treatment. We estimate that about 300 acres per year may be treated. This acreage would be included in the total LSR acreage treated per annum.

In some areas, existing species mixes may be inappropriate for the site and detrimental to the attainment of late-successional characteristics. This is often the case when past disturbances, especially if human-caused, result in a species shift from what was there naturally, or has introduced noxious or non-native species onto a site which are inhibiting the regeneration of the native plant communities.

At times, there will be conditions on the landscape which are unacceptable and are in conflict with Aquatic Conservation Strategy objectives. These areas will be manipulated to bring them in line with ACS objectives over time.

There are some areas in the assessment area which are not and are not expected to be on the trajectory of attaining late-successional structural characteristics. These areas occupy a small component of the landscape (less than 1%) and are considered unique and important for the contribution they add to diversity across the landscape. These include areas in a non-forested condition for a variety of reasons which include rock outcrop areas, wetlands, and meadows. Management activities will be employed to maintain these special characteristics. Non-silvicultural activities which manipulate vegetation may be proposed within these LSR boundaries. These activities need to be neutral or beneficial to the LSR. The ROD C- 16, 17, 18 provides good direction on these types of activities. Existing facilities (i.e., campgrounds, electronic sites) are compatible with LSR objectives. Most existing and planned recreation facilities are along the coastal strip which is not within the LSR designation. Areas that exist or are planned, within LSR boundaries, occupy such a small area when looking at the whole LSR that the function of the overall LSR will be maintained. There may be some site-specific areas that are outside of ACS objectives. These will need to be reviewed at a finer scale either in Watershed Analysis or project environmental assessments. Marys Peak and the Wilderness areas are identified as areas that may possibly have conflicts with LSR objectives if increased use or major expansion of developed recreation occurs. All projects must meet ACS Objectives over the long term, meet T&E

species requirements, and avoid known T&E locations. This list is for projects that actually disturb vegetation.

In **Table 7** we have delineated those site conditions which would trigger a management action. We also noted, in some cases, that such site conditions would have different objectives and thus a different response from management, depending on the seral stage of development. For example, in the very early seral stage, (i.e., less than 10 years of age), a management activity would not space trees so widely that the risk of predation by animals or competition with herbs and shrubs would be so high that the desired tree species would be lost. Instead, a management goal in the very early seral stage would be to plant and maintain enough trees on site that one could be assured that adequate stocking to meet long-term objectives would be attained. It would not be until the later seral stages that confidence in survival would be high enough that a management activity would risk thinning trees widely.

Management Criteria

Management criteria have been established (**Table 7**) to guide prescriptions for the appropriate management activities. These criteria are designed to help to “keep all the pieces” and assure attainment of late-successional characteristics. Not all criteria will be applicable with every project. The criteria vary by condition on the landscape (or “Management Trigger”) and/or seral stage of development. If these criteria cannot be met with a proposed prescription, then that prescription must either be revised or the project dropped or sent to the REO for project-specific approval.

Existing Guidelines For Habitat Manipulation

The US Fish and Wildlife Service recommends that silvicultural activities be limited to stands which do not currently serve as suitable habitat for spotted owls and other T&E species. Suitable habitat for owls includes nesting, roosting and foraging habitat. Nesting habitat is defined as mature stands with sufficient structure and large snags or old-growth remnants which provide nesting opportunities. However, owls frequently use younger stands including natural stands 50 to 80 yrs old for roosting, and foraging. So, caution needs to be taken when recommendations are made to treat these stands, especially if they are located within 1.5 miles of a known owl activity center, as they are likely being used by the resident owl pair.

The ROD addresses maintaining dispersal habitat for terrestrial species through Riparian Reserves (RRs). The RR network was designed to facilitate dispersal of both terrestrial and aquatic species. The reserve system and other mitigating measures found in the ROD replaces the 50-11-40 rule. Dispersal habitat for the owl is defined as stands with an average tree diameter over 11” dbh and a minimum crown closure of 40%. Stand treatments which

reduce the crown closure to below 40% (or approximately 60 trees per acre in a 35-yr.-old stand in the Coast Range) may affect dispersal for owls. The effects of silvicultural prescriptions on dispersal habitat will be identified and evaluated at the watershed (5th field) level in consultation with USFWS and the level one consultation team for the Oregon Coast Province.

In these LSRs, the RR network covers approximately 80% of the landscape. In general, activities proposed in this assessment are planned both inside and outside of RR boundaries within LSRs. Many of the objectives for LSRs are similar to RR objectives and thus, similar treatments are appropriate.

Activities should be directed at stands that were regenerated following previous harvest activity and that show no significant development of multi-canopy tree structure.

Appendices F.1 and F.2 contain two letters of direction from the Regional Ecosystem Office (REO) which outline specific types of treatment that are already exempt from REO review. It has been sufficiently demonstrated that implementation of the activities listed is consistent with the attainment of late-successional characteristics.

Appropriate Management Activities

The activities listed in **Table 7** are a list of management options that may be appropriate for a given management trigger.

Activities not addressed may be appropriate on a site-specific basis and should be brought to the REO for approval.

The appropriate management activities listed in **Table 7** are intended to be the result of an integrated prescription which considers the management criteria, the successional pathways appropriate for a given site, and the desired future conditions of the area. Implementation of these activities will accelerate attainment of late-successional characteristics. Resource managers are presented with a range of appropriate treatments so that they are able to select the most appropriate treatment following site-specific assessment of certain areas.

Although we have listed many management activities that would be appropriate in late-successional reserves, they have been kept very general. This was done purposefully to allow specialists to make recommendations based on site specific evaluation. However, some management activities are so encompassing that they do need clarification.

Density treatment means any manipulation of the density of vegetation on a given site. Activities to achieve desired density will vary by site condition and to be exempted from further REO review, typically will include:

- Manual release for survival of individual trees in younger plantations (<24 yrs.)
- Thinning of young trees to provide adequate growing space for adjacent trees.
- Selective thinning in young conifer and older stands to create groups of trees or provide variable spacing (25-80 yr. old stands).
- Creation of openings - generally less than 1 acre in size in 25 - 80 yr. old stands.
- Thinning densities can vary depending on the management objective and the successional pathway for a given environmental condition. Densities normally range from 40 - 110 trees per acre in 25-80 yr. old plantations.
- In Riparian Reserves if there is less than 50% suitable dispersal habitat, densities should not be reduced below 40% crown closure (or about 60 tpa at age 30-35).
- Unthinned areas (all age classes).
- Snag and CWD levels within the ranges indicated in **Tables 11 and 12**.

Treatments not meeting all of the above items will remain subject to REO review.

Salvage is defined as the removal of trees from an area following a stand-replacing event such as those caused by wind, fires, insect infestations, or diseases. Removal of dead trees from an area is an appropriate management tool. The decision to do so must be based on site-specific conditions, with the understanding that salvage operations should not diminish late-successional habitat suitability now or in the future. Appropriate reasons to remove trees from an area are defined on pages C-13-16 of the ROD.

Treatment from disturbances on less than 10 acres of land may be appropriate in the following instances, although these conditions were not specified in the standards and guidelines of the ROD. However, for these salvage or risk reduction treatments, REO review would be required. These conditions include:

- When the quantity of fresh material (less than 1 year old) on the ground is sufficient with a distribution that is contiguous and poses a high risk of Douglas-fir bark beetle outbreak. Consideration must be given to whether or not the predicted kill of surrounding large trees would render the surrounding stand non-functional for late-successional habitat (Hostetler, 1996).
- When disturbance occurs adjacent to private property boundaries, removal of portions of trees would be allowed if they: threaten the survival of trees on adjacent land owners, are a hazard to surrounding owners, or impact the management of surrounding lands.

Table 7: Management Triggers, Criteria, and Appropriate Activities Within Late-Successional Reserves

The following management criteria will be referenced throughout **Table 7**

1. Maintain minor native species, gaps, clumps, animal predation, natural mortality
2. Maintain site occupancy (stocked to maintain options for LSR objectives)
3. Maintain vigor and health to keep options open
4. Provide for natural regeneration from edges
5. Provide for variable spacing
6. Encourage natural diversity of floral species in the overstory and the understory
7. Grow large trees
8. Maintain snags and CWD to levels shown in tables 11 and 12
9. Create wolfy limbs
10. Grow large wood for fish habitat structure
11. Maintain and or establish multiple canopy layers
12. Recruit snags in larger diameter classes to levels shown in tables 11 and 12
13. Consider windfirmness
14. Consider understory shrubs/herbs/fungi/lichens
15. Provide CWD for structure in streams
16. Maintain Connectivity function of stand
17. Maintain Wolfy limbs
18. Restore soil productivity
19. Reestablish natural communities
20. Protect Green Trees
21. Maintain low risk of and reduce incidence of insect and disease outbreaks
22. Protect investments
23. Provide for safe conditions
24. Reduce sediment
25. ATM/TMO consistency
26. Provide adequate light for growth of conifer
27. Restore hydrologic function
28. Maintain early seral conditions
29. Meet RNA, ACEC, Botanical area objectives

MANAGEMENT TRIGGER	SERAL STAGE	MANAGEMENT CRITERIA	APPROPRIATE MANAGEMENT ACTIVITIES
Area on trajectory for attainment of late-successional structural characteristics (confirmed by site-specific evaluation) a. Natural hardwood stands b. Diverse natural stands c. Dense natural stands (50-80 yrs)	All (except mature) Refer to dense conifer for management objectives by seral stages	LSR management objectives are being met (Tables : 9,10,11,12)	No treatment Recruit snags Close roads

Table 7 cont.: Management Triggers, Criteria, and Appropriate Activities Within Late-Successional Reserves

MANAGEMENT TRIGGER	SERAL STAGE	MANAGEMENT CRITERIA	APPROPRIATE MANAGEMENT ACTIVITIES
Dense Uniform Conifer	Very Early < 10 yrs	1 - 8	Density treatment No treatment if management objectives cannot be met
	Early 11-24 yrs	1 - 10	Stand density treatment Fertilization No treatment if management objectives cannot be met
	Early 25-50 yrs	1, 3 - 15	CWD placement in streams Snag creation (refer to LSR components Table 11) Prescribed fire for creation of structure and control of species composition Underplanting Stand density treatment Down wood recruitment Fertilization No treatment if management objectives cannot be met
	Mid seral 50-80 yrs	1, 3 - 17	All of the above
Long-term productivity issues	All (except mature)	18	Silvicultural treatments to add nutrients to the site (i.e., fall and leave) Recruit snags Close roads

Table 7 cont.: Management Triggers, Criteria, and Appropriate Activities Within Late-Successional Reserves

MANAGEMENT TRIGGER	SERAL STAGE	MANAGEMENT CRITERIA	APPROPRIATE MANAGEMENT ACTIVITIES
An Existing Condition Of Phellinus >10 Ac. In Size That May Affect The Goals And Objectives Of The LSR	All (except mature)		Thin to low densities Replant resistant or non-host species No treatment if management criteria cannot be met
An Existing Condition Of Disturbance > 10ac And <40% Canopy Closure That Affects The Goals & Objectives Of The LSR	All (includes mature)	ROD C-13 - C-16	
a. Insect and Disease		1, 2, 4 - 8, 11, 14 - 16, 19 - 22	Thin to low densities Replant resistant or non-host species Replant appropriate species
1. Phellinus		same as above	No treatment if management criteria cannot be met
2. Douglas-fir Beetle			Apply pheromones, insecticides
b. Fire		1, 2, 4 - 8, 11, 14 - 16, 19, 20, 23	If objectives cannot be met with other treatments, salvage excess over CWD and snag requirements (refer to successnl. pathways and Tables 9-12)
c. Windthrow Areas		same as above	Salvage to ensure safe conditions
d. Landslides / debris torrents		23, 24, 25	Road restoration Slope stabilization

Table 7 cont.: Management Triggers, Criteria, and Appropriate Activities Within Late-Successional Reserves

MANAGEMENT TRIGGER	SERAL STAGE	MANAGEMENT CRITERIA	APPROPRIATE MANAGEMENT ACTIVITIES
Existing Species mix inappropriate for site potential a. Hardwood established in original conifer site i.e., conversion of site b. Inappropriate species for plant community c. Brush field (understocked) d. Noxious weeds/ non-native species	All	1,2,4 - 12, 14 - 17, 20, 26	Site conversion Establish appropriate species Control exotics/ noxious plants Stand density treatment Release Prescribed fire No treatment if management objectives cannot be met
Aquatic Conservation Strategy needs a. Degraded in-stream habitat b. Excess sedimentation c. Accelerated runoff d. Elevated stream temperatures e. Restore conifer recruitment potential	All	24, 27	Road closures / obliteration Slope stabilization Culvert replacement/ maint. Create stream channel complexity Place CWD in channels Soil restoration; i.e., subsoiling Recruit wood off-site Plant conifers in riparian zone
Special Habitat Areas a. Alpine Meadows b. Wetlands c. Rock outcrops d. Homestead meadows	Very Early	3, 6, 14, 28, 29	Prescribed fire Manual or mechanical clearing of vegetation Soil restoration Control exotics / noxious plants No treatment if management objectives cannot be obtained

Table 7 cont.: Management Triggers, Criteria, and Appropriate Activities Within Late-Successional Reserves

MANAGEMENT TRIGGER	SERIAL STAGE	MANAGEMENT CRITERIA	APPROPRIATE MANAGEMENT ACTIVITIES
Non-Silvicultural Activities: Recreation: Improvement of existing facilities Expansion of existing facilities Development of new facilities Recreation Events	All	15,16,19, 22, 23, 24, 25, 29 ROD C-17 Meet ACS objtvs. Neutral effect on T&E species Apply Seasonal Restrictions Focus and Control Use	Trails/site relocation or construction Campsite construction or relocation Roads: stabilize, close, obliterate Culvert replacement / maintenance Restore Riparian condition Control exotic and noxious plants Designate appropriate use areas Provide information on resource protection
Genetic Development; i.e., Progeny sites Seed Orchards	All	22, ROD C-17	Manage existing sites
Special Forest Products	All	ROD C-18 Siuslaw NF Forest Products EA, BLM Handbook	Monitor to evaluate long term effects
Grazing	Early	ROD C-17	Upgrade or develop allotment management plans
Research	All	ROD C-18, 19	Allow as appropriate
Other: Rock Quarries Mining Mineral extraction Realty Actions Habitat Improv. Projects Electronic Sites * This is not an all-encompassing list *	All	ROD C-17	Identify appropriate areas

Desired Condition, Based on Successional and Structural Pathways

The overall goal for management of the LSR is to protect, maintain, and create late-successional forest ecosystems which serve as habitat for late-successional and old-growth related species. Management treatments will strive to re-establish connectivity of that habitat in the least amount of time to maintain functional, interacting late-successional forest ecosystems.

When attempting to accelerate attainment of late-successional characteristics, it is important to understand how successional pathways will affect proposed management activity. Successional pathways are defined by the typical, dominant compositional and structural stages that can be expected as vegetative communities develop following a disturbance. They describe the dominant tree species, relative tree density patterns, regeneration and lower layer species development, and ground cover trends through time. The pathways are controlled by local environment, original composition, and type of disturbance. Sub-series vary in their successional pathways both in the variety of species supported and the number of individual plants of a given species present.

To use successional pathways in evaluating proposed management requires knowledge of the physical environment (soil/climate zone, landform, and slope position), the biological environment (sub-series environment), and where the stand is in its successional development. This information would be used, in addition to other concerns (ACS, wildlife habitat distribution, etc.), to determine if the outcome of a particular management activity was acceptable. There may be instances when the dominant vegetation development pathways are bypassed to create conditions desired for specific purposes. For example, a wet environment in the western hemlock series densely stocked with conifer would be an uncommon site condition for that environment but, due to a severe deficit of large woody structure in the stream system, it might be desired and maintained for the benefit of other ecosystem components.

In characterizing the vegetative communities, sub-series environments (which group plant associations and communities into broad biological environments from wet to dry) (**Table 3**) (**Map 5**) were described and delineated. Sub-series environments were selected as the appropriate vegetation filter through which to assess possible management prescriptions.

Appendix G displays graphic examples of the successional pathways for each plant series environment by sub-series and by disturbance regime. Conceptual models of succession were developed for each environment by using inventory information (**Table 9**) and field observation. The following is a working hypothesis of successional pathways that would occur for four different climax vegetation series and their sub-series environments.

Series - Sitka Spruce

Zone - Coastal Fog

Environments - Wet, Moist, and Dry

Stands with a mix of western hemlock, Douglas-fir, Sitka spruce, and varying amounts of red alder, are found across all environments. Sitka spruce and western hemlock are prevalent throughout all environments because they are prolific seeders and shade tolerant enough to compete in all environments. The primary intermediate disturbance is wind. Unlike fire, these non-stand replacing events favor regeneration of the shade-tolerant conifers, such as western hemlock and Sitka spruce. Finer scale successional pathways and refined differences between environments need to be explored.

Series - Western Hemlock

Zones - Central Interior Alsea, Central Interior Marys Peak/Alsea Valley, Southern Interior

Environment -Wet

- The wet environments occur most often on lower slopes and in riparian areas. Soils have a high water table. Moving west to east through the Coast Range, from Central Interior Alsea to Southern Interior, the wet area becomes more restricted to narrow bands in the valley bottoms. After disturbance, regeneration of conifers is sporadic due to high vegetation competition. Salmonberry is the predominant understory shrub species. Red alder has a larger presence than conifer in early seral stages and remains a large component in young and mature stages.
- Two dominant tree communities occur in this environment. The first is a pure alder type, usually found in areas too wet for Douglas-fir, and in areas in which a significant amount of bare soil following a disturbance has created a desirable seed bed for alder. If undisturbed, the alder areas will begin to lose vigor and decay after 80 to 100 years of age. Shade-tolerant conifer species (western hemlock, western redcedar) will become established on a variable basis, depending on seed source. These conifers will begin to occupy the overstory as the alder deteriorates. In areas on or near the floodplain which experience higher frequencies of flooding or debris torrents, the alder will constantly be regenerated and kept in the system.
- The second type of tree community occurs where microsite conditions allow establishment of scattered Douglas-fir. A mix of red alder, in some places bigleaf maple, and Douglas-fir will predominate through the early and mid-seral stages. If no major disturbance occurs, alder will decline. The site will be dominated by scattered large Douglas-fir and variable amounts of shade-tolerant conifers filling in through the stages. **Table 9** illustrates this mature condition with 63 total trees per acre, 28% red alder and 40% Douglas-fir as the dominant species. This type has the lowest total trees per acre and the highest percentage of red alder of all the sub-series environments.
- Stands consisting of pure hemlock will also occupy these sites. Salmonberry brush fields may dominate in some areas as well. However, these types are considered more minor in distribution.

Environment - Moist

- The moist environments occur on deep, well-drained soils, usually mid-slope. After disturbance, regeneration of conifers is predominant, with initial densities dependent on exposure of organic/mineral soil, density of competing vegetation, and seed source.
- Two dominant tree communities predominate in this type. The first is a pure conifer type, usually found in areas following a disturbance which has created some exposed mineral soil seed bed that Douglas-fir prefers. Varying amounts of shade-tolerant species (especially western hemlock) may be present, depending on how much litter and duff exist in the newly disturbed stands. In these areas, usually dominated by Douglas-fir, stands will develop at a variety of densities. Herbs and shrubs will occupy most of the growing space the first 10 years after a stand-replacing disturbance. From age 11 to 80, Douglas-fir will dominate the growing space, in dense areas, going through intense inter-tree competition. By age 80, portions of these areas could be occupied by dense stands with slim tree boles and crown ratios less than 25%. Portions of stands with initial stocking levels of less than 100 trees per acre would have significantly larger diameters and crowns. Ground vegetation will begin to appear as these stands become more open. From age 81 to 150, mortality by inter-tree competition will continue and tree density will be reduced. As the stand opens, shade-tolerant conifer species will become established or be released, on a variable basis, depending on seed source and tree suppression conditions. **Table 9** illustrates this stand condition with 81 total trees per acre, 57% of which are Douglas-fir. Red alder accounts for only 10% of the stand density.
- The second type of tree community occurs in areas wet enough and with adequate seed source to favor some alder establishment. These areas could subsequently take two successional pathways, depending on the disturbance regime. Areas with small disturbances, such as landslides, will have frequent regeneration of alder. Without disturbance, the alder will begin to lose vigor and decay after 80 to 100 years of age, leaving more of an open Douglas-fir stand or establishment of shade-tolerant conifer species, depending on seed source.
- In all stands, after age 150, wind, root rot, inter-tree competition, and insects will continue to lower the overall density of Douglas-fir trees creating more variation in stocking. Varying densities and ages of alder, shade-tolerant conifer species, and Douglas-fir will be found in the understory.

Environment - Dry

- The dry environments occur on upper slope positions which experience droughty conditions in the summer. Due to the dryness of this area, fires usually burn hotter, removing competing vegetation and providing a good seed bed for Douglas-fir. Pure Douglas-fir stands are predominately found in these areas.
- Shrubs, such as salal, Oregon grape, and Pacific rhododendron will occupy most of the growing space the first 10 years after a stand-replacing disturbance. Like the moist sites, from age 11 to 80, Douglas-fir will dominate the growing space and in dense areas will be going through

intense inter-tree competition. The primary differences between the moist and dry areas is the higher proportion of dense stands and lower site productivity due to droughty soil conditions and lower available nutrients. This lowers the rate of stand development. By age 80, as in the moist areas, portions of these areas could be occupied by dense stands. From age 81 to 150, mortality will continue and overall tree density would be reduced. As the stand opens up, shade-tolerant conifer species will become established on a random basis depending on seed source. After age 150, wind, root rot, inter-tree competition, and insects will continue to lower the overall density of Douglas-fir trees creating more variation in stocking. **Table 9** shows that these stands are the most dense of the three environments with an average of 99 trees per acre; 68% of these are Douglas-fir and only 1% are red alder.

Mid-seral disturbances - Moist and Dry Environments

- Fires have a variable severity and occur more frequently in the Central Interior-Marys Peak/Alsea Valley and Southern Interior Disturbance Zones. These fires create more diversity in stand structure due to low-moderate intensity fires. This results in a two or more layered overstory canopy. Late seral conditions are achieved earlier here than in the Central Interior Alsea Zone.
- Wind is a common intermediate disturbance in the dry environment, producing small patches of blowdown along upper ridges and ridgetops. It may also accelerate late-successional structural characteristics if it occurs in mid-seral successional stages by removing overstory Douglas-fir and releasing shade tolerant western hemlock.

Series - Grand fir

Zone - Central Interior Mary's Peak/Alsea Valley, Southern Interior (outside of LSR boundaries)

Environment - Wet

- The wet environment for the grand fir occurs along creek bottoms that characterize the low elevations of the eastern slopes of the Coast Range.
- After a major disturbance the successional pathway would start with the establishment of sedges and grasses. Western swordfern, common snowberry, and vine maple are common ground cover in the early stages after disturbance. Co-dominant hardwoods such as Oregon ash and bigleaf maple are scattered in the early stages. Initially, conifers will be scattered due to high competition from the ground cover. As the hardwoods mature and the area begins to differentiate into different layers, scattered amounts of grand fir regeneration underneath the hardwood canopy begins to emerge in increasing density. The ground cover will become less dense as the canopy begins to close due to less light reaching the forest floor. Grand fir, western red cedar, and western hemlock are found in along the creek bottoms in this environment.

As the canopy cover begins to close, the shade-tolerant Grand fir would begin to increase in the understory and ground cover species would begin to thin out due to competition for available light

filtered by the dense overstory. Eventually, as the forest reaches late seral conditions, Grand fir will become the dominant conifer species in the canopy layer.

Environment - Dry

- The dry environment occurs on the slopes and rolling ridges that characterize the low elevations of the eastern slopes of the Coast Range.
- After a major disturbance, the successional pathway would start with the establishment of sedges and grasses from the valley, and a shrub layer of swordfern, salal, and common snowberry. The majority of the sedges and grasses would be annuals which would persist for 10 years and then decline. As ground cover becomes well established, seedlings of Douglas-fir, Oregon white oak, bigleaf maple, and lesser amounts of grand fir would dominate.
- As the area begins to differentiate into understory and canopy layers, several other tree and shrub species would become dominant. These species include bigleaf maple, golden chinquapin, oceanspray and poison oak. The ground cover will become less dense as the canopy begins to close.
- As the canopy cover begins to close, the shade-tolerant grand fir and golden chinquapin would begin to increase in the understory. As the forest matures, the canopy would be codominated by Douglas-fir, Oregon white oak, and bigleaf maple. Grand fir would then become the dominant conifer understory species. If the forest were to reach its climax stage, grand fir alone, or grand fir in combination with Douglas-fir, would become the dominant conifer in the overstory. In an old-growth condition, Douglas-fir, grand fir, and hardwoods would occupy various strata within the stand and coarse woody debris would become common and scattered throughout the forest.

Series - Noble Fir

Zone - Central Interior Marys Peak/Alsea Valley

- The alpine environment occurs at elevations greater than 3200 feet in this zone. Primary locations include Marys Peak, Grass Mountain, and Prairie Mountain. However, there is little noble fir on Prairie Mountain; western hemlock dominates this site, which tends to be dryer, with extensive grassy balds to the south.
- The successional pathway after a major disturbance would start with the immediate establishment of a variety of sedges and grasses; vine maple and Pacific rhododendron would soon follow. Shortly after the establishment of ground cover noble fir seedlings would become established. As the vegetation begins to differentiate into understory and overstory layers, the sedges and grasses will retreat to the shallow-soiled grassy balds. A major component of this environment, the grassy balds will remain dominated by sedges and grasses, with noble fir reproduction common around the perimeter. It is unclear how stable these balds will remain without some level of disturbance (wind, fire, or heavy snowpack, for example).

- Noble fir will continue to grow and be the dominant overstory conifer species for about the next 80 years. Douglas-fir and western hemlock will slowly become established as the understory conifer species sometime during the first 15-20 years after the disturbance and will remain there until a minor disturbance (i.e., snow or wind event) creates openings in the noble fir overstory. Where openings have been created, the Douglas-fir and western hemlock will then create a mixed canopy layer in this environment (a more mixed canopy layer of noble-fir, Douglas-fir, and western hemlock will be common at the lower elevations of this environment). The understory can be characterized as mostly open with the dominant shrub species consisting of vine maple and Pacific rhododendron. As the stand matures, so will its complexity, with conifers occupying various strata within the stand.

Management Implications Of Successional Pathways

Specific prescriptions for management activities should consider what is possible and appropriate for a given site. **Table 8** highlights some of the key components of late-successional forest habitat and evaluates the **potential** for a given environment to be able to support that component (or management objective). These are general relationships.

Table 8: Potential for sub-series environments to meet key structural components when considering dominant natural successional pathways.

MANAGEMENT OBJECTIVES RELATING TO LATE-SUCCESSIONAL STRUCTURAL COMPONENTS	SUB-SERIES ENVIRONMENT (western hemlock series)		
	WET	MOIST	DRY
Grow large trees	H	H	M
Establish multiple canopy of conifer	M	H	M-L
Establish multiple canopy of conifer/hardwood or hardwood	H	H	M-H
Recruit large diameter snags/coarse woody debris	M-H	H	M-L
Maintain high stocking (high stand density)	L	M	H
Provide coarse woody debris for aquatic structures	M-H	H	L
Provide variable spacing (gaps, clumpiness)	H	H	M-L
OTHER MANAGEMENT OBJECTIVES			
Consider wind firmness	L	M	H

H=High probability M=Moderate probability L=Low probability

Table 8 displays that not all management objectives occur equally in every environment. These are not absolutes; these conditions occur over a continuum throughout the various environments.

THE “WET” ENVIRONMENT has as the highest probability of supporting:

- A low density of conifers and have high spacing variability (due to competitive nature of shrubs)

- A canopy composed of a variety of species in each layer, with a large component of hardwood species
- A place to grow the largest trees (but not many of them)
- A good place to recruit those few large trees for future aquatic structure.

THE “MOIST” ENVIRONMENT, on the other hand, would have slightly different potential:

- The overstory will have moderate density of conifers and have variable spacing
- There will be multiple species in the canopy composed mainly of conifers with some hardwood component.
- There will be multiple canopy layers of conifer
- This is the place to grow and recruit a quantity of large diameter snags and coarse woody debris both on-site and for aquatic structure.

THE “DRY” ENVIRONMENT would support different structural characteristics:

- The highest density of conifers could be expected here, spacing could be less variable, however, harsh sites with shallow soils and fine scale disturbances may result in variably spaced trees with gaps.
- Wolfy limbed trees may be found in this environment, due to either fine scale disturbances (wind or disease) or harsh site conditions.
- There would be few hardwoods in the canopy
- Wind firmness is a consideration for management activities

IN ALL ENVIRONMENTS management activities would strive to:

- Maintain health and vigor of the plant communities on site
- Encourage natural diversity of species in all layers for all flora
- Maintain existing structure i.e., large trees, wolfy limbs, CWD, snags;
- Recruit snags and CWD
- Encourage vertical and horizontal diversity in stand development

Late-Successional Structural and Compositional Characteristics

The structure of natural Douglas-fir forests is extremely diverse because of numerous processes operating at different spatial and temporal scales. Stand development and succession are important processes that determine forest habitat. Differences in forest structure should be viewed on a continuum rather than in discrete classes (Spies and Franklin 1991). No one condition is appropriate across the landscape. Knowledge of late-successional structural and compositional characteristics is key in identifying the desired future conditions to strive for in management activities.

Differences In Forest Structure: Young - Mature - Old

Changes in vegetation structure and composition occurs between young, mature, and old-growth that may influence late-successional forest function (Spies and Franklin 1991). The condition of existing late seral forests within the LSRs provides a reference point to compare younger stands against when determining desired future conditions. Since the majority of the late-successional stands currently present in the LSRA are 75-150 years of age (USDA 1995, Teensma et al. 1991), there is sufficient local information available to characterize mature age-class conditions only. There is limited information available for the old-growth condition of late successional forests in the Coast Range. Recent (1994,1995) photo interpretation of vegetation for a few watersheds shows that 1.5 to 3 percent of those landscapes are in an old-growth, multilayered condition. Higher percentage may be found in areas where Wilderness areas have been established.

Tree density, mean stand diameter, and basal area are most important in discriminating among age classes. Tree density is about twice as high in young stands as it is in mature and old-growth stands. Basal area increases with age class, and mean tree diameter is highest in mature stands which lack the smaller diameter shade-tolerant trees common in the old-growth (Spies and Franklin 1991).

Stand condition also is influenced by the age of the stand. Percentages of snags with natural cavities, percentage of Douglas-fir boles with resinosis, and percent of tree crowns with broken tops all were higher in old-growth than in the younger age classes (Spies and Franklin 1991).

Understory vegetation also changes with stand age. Herb and deciduous shrub cover increased with stand age class. Density of shade-tolerant saplings is highest in old-growth, lowest in mature stands, and intermediate in young ones (Spies and Franklin 1991).

General characteristics of old-growth forests that differ from mature include: codominance of western hemlock in the overstory, diverse vertical distribution of vegetation, and large amounts of CWD.

Mature Forest Structural Characteristics

In **Table 9**, the description of stand conditions is expressed in terms of trees per acre by species and size class. Data is based on plot information from the 1987 Siuslaw National Forest Vegetation Resource Survey and the 1984 Siuslaw Ecology Intensive Survey. Those surveys sampled late-successional mature (less than 200 years old) and old-growth (greater than 200 years old) stands, so the data represents a mix of these conditions; however, given the limited occurrence of old-growth on the Siuslaw National Forest, the effect on the average is insignificant.

These structural element data represent the averages of mature conifer stand conditions. They should not be targeted as an average stand condition. There are a wide range of stand conditions

that are found across the Siuslaw National Forest. They do, however, provide a reasonable representation of the differences in species and trees per acre by sub-series environments. This information is appropriate within the Siuslaw National Forest boundaries in the LSRA. On lands in the eastern portion of the LSRA, stand structural components could be different. Identification and mapping of sub-series environments on these lands are currently in progress, and data from these inventories should be utilized when it becomes available.

The following statistically significant trends have been interpreted from the information in **Table 9 for mature stand conditions** :

Western Hemlock Series:

- total live trees per acre significantly increase from wet to dry environments
- the number of Douglas-fir trees per acre increase from wet to dry environments
- the percentage of red alder decreases from wet to dry environments

Western hemlock and western redcedar were found in all environments. Trends in snags and coarse woody debris (CWD) were not significant.

Sitka Spruce Series:

- live trees per acre increase from wet to dry to moist environments

Western hemlock is a common codominant component in all environments, more common than western redcedar. Snags and CWD did not significantly vary among environments and were not included in the table.

It is important to note that these trends may also be associated with fine-scale disturbance differences as well as environmental differences. Dry environments may experience more within-stand wind and disease-related events than the other environments, for example.

Table 9. Structure and Composition of the Mature Condition of Late-Successional Stands by Sub-Series Environments. Information is expressed in number per acre

	Hemlock- Dry (120 plots)					Hemlock- Moist (73 plots)					Hemlock- Wet (95 plots)				
Species	Small	Med.	Large	Giant	Total	Small	Med.	Large	Giant	Total	Small	Med.	Large	Giant	Total
Bigleaf maple	3				3	3				3	4	1			5
Red alder	8				8	7	1			8	15	2			18
Sitka spruce						1	1			2					
Douglas-fir	34	22	9	2	67	16	15	13	3	46	7	8	8	2	25
Western redcedar	4	1			5	4	1			5	6	1			7
Western hemlock	13	3	1		17	11	5	1		17	5	2	1		8
Total Live Trees	62	25	10	2	99	42	22	14	3	81	38	15	9	2	63
	Hemlock -Dry (56 plots)					Hemlock - Moist (59 plots)					Hemlock - Wet (30 plots)				
Snags	12.03	2.95	2.44	0.39	17.81	9.30	2.67	2.49	0.64	15.10	7.26	2.29	3.26	0.93	13.74
Logs	18.13	2.86	1.89	0.44	23.32	23.57	7.05	2.78	0.67	34.07	20.01	5.24	3.42	0.53	29.20
	Spruce- Dry (13 plots)					Spruce- Moist (45 plots)					Spruce- Wet (32 plots)				
Red alder	4				4	10	1			11	11	1			12
Sitka spruce	6	5	4		15	11	10	6	1	28	13	6	3	1	23
Douglas-fir	10	14	12	1	37	10	7	4	1	21	14	10	7		30
Western redcedar	1				1	2				2	2	1	1		3
Western hemlock	25	10	3		38	24	12	4		40	4	3	2		8
Total Live Trees	46	29	19	1	95	58	30	13	2	102	43	21	12	1	76
	Spruce -Dry (4 plots)					Spruce - Moist (5 plots)					Spruce - Wet (7 plots)				
Snags	3.31	1.32	2.10	0.81	7.54	13.13	5.29	1.53	0.81	20.76	9.31	1.30	1.35	0.48	12.44
Logs	3.40	1.34			4.74	19.24	4.71	1.91		25.86	11.18	0.38	0.80	0.95	13.31

Data Sources:

Live tree data from
 1987 Vegetation Resource Survey - 194 plots
 1984 Siuslaw Ecoplot Intensive Survey - 184 plots.

Snag and Log data from
 CVS and Ecology plots. Hard and soft snag and log condition were not separated.

Size classes:

Small = 9.0-20.9 inches dbh
 Medium = 21.0-31.9 inches dbh
 Large = 32.0-47.9 inches dbh
 Giant = 48.0+ inches dbh

Old-Growth Forest Structural Characteristics

Basal area of shade-tolerant tree species is an important characteristic of old-growth forests. In general, moist sites have higher basal areas of shade-tolerant species than do moderate or dry sites. The density of large-diameter Douglas-fir decrease with increasing moisture in the Coast Range. The density of subcanopy trees generally decreased with increasing site moisture, probably as a result of increasing basal area of shade-tolerant trees in the upper canopy that creates low-light conditions unfavorable to understory trees (Spies and Franklin 1991). **Table 10** outlines significant structural and compositional characteristics by moisture classes. Moisture classes are similar to the sub-series environments identified earlier in this document.

Stand condition (snags, cavities, broken tops, etc.) did not seem to vary by moisture class in the Coast Range in work done by Spies and Franklin, 1991.

Table 10. Mean And 95% Confidence Limits Of Some Structural Components Of Old-Growth Stands In The Coast Range By Moisture Classes (From Spies And Franklin 1991)

STRUCTURAL COMPONENT	DRY	MODERATE	MOIST
Basal area of shade tolerant (ft²/acre)	9.6 (0 - 47.5)	69.7 (26.1 - 139.4)	135.0 (43.6 -274.4)
Basal area of shade-intolerant (Douglas fir) trees (ft²/ac)	261.6 (147.8 - 369.7)	222.4 (117.5 - 322)	169.6 (17.4 - 317.6)
TOTAL basal area (ft²/acre)	283.1 (200.4 - 405.1)	304.9 (222.2 - 418.2)	313.6 (196.0 - 500.9)
> 40 inches dbh Douglas-fir density (#/acre)	12 (4-23)	10 (4-19)	7 (1 - 10)
> 40 inches dbh total tree density (#/acre)	12 (4 - 23)	11 (4 - 21)	10 (2 - 25)
Density subcanopy trees (#/acre)	17 (0 - 59)	21 (2 - 61)	0

Snags and Coarse Woody Debris (CWD)

Coarse woody debris (CWD) includes both snags and down logs, however, for this LSRA, CWD will be separated into snag components and down log components, since these ecosystem components are evaluated separately in management prescriptions. Research indicates that the numbers of fallen trees are generally similar to those of snags - or, about 50 percent (range 40% - 60%) of the coarse woody debris component of a stand is snags (Spies et. al. 1988).

Both snags and down logs are important components of forest ecosystems. The variability with which they are expressed across the landscape, however, needs to be understood. Recent work by the Pacific Northwest Forest and Range Experiment Station (Spies in progress) with the Pilot Province Monitoring Project has shown that the two forest structural characteristics that help to define late-successional and old-growth forests are: 1. The number of trees in the larger size classes (70cm and 100cm respectively); and 2. The degree of layering. Although CWD is a critical component of old-growth ecosystems, the number of snags and log biomass were not good predictors of late-successional and old-growth forests due to the wide variation of these structural components in forest ecosystems. The following recommendations for management of the CWD components in young forest plantations need to always be balanced with the need to apply thinning regimes which will accelerate the attainment of other late-successional and old-growth structural components as well.

Snag Levels in Unmanaged Forests

Table 11 displays the range of snags levels for various size classes found when natural forest conditions were assessed in the Oregon Coast Range. This table represents the best information available at this time for natural conditions in the Coast Range and will be utilized to indicate reference and desired conditions. When looking at the values, the degree of variability becomes readily apparent. The greatest variability shows up in the numbers of snags less than 20" in diameter for both the young (24-58 tpa) and mature (11-83 tpa) age classes. Variability should be applied in both quantity and spatial arrangement of snags in prescriptions.

The measured field data in **Table 11** shows that the majority of snags found in natural forests are less than 20 inches in diameter at breast height (dbh). While all size classes serve an important ecological function, it is the larger snags (greater than 20" dbh and 20' tall) which are critical for wildlife, such as cavity-dependent species. Large snags provide nesting habitat for the northern spotted owl and are used by colonies of bats and swifts.

The values for "all heights" represents the number of snags greater than 4 inches in diameter and greater than 4.5 feet tall. Also included in **Table 11** are the cu.ft./acre values from a recent CWD model done for the Siuslaw National Forest. The values from the Wright Model represent half of

the CWD component that is modeled to occur in these systems, the other half of the values are displayed in **Table 12** with the down wood component.

Table 11: Range of Snag Levels in Natural Stands in the Oregon Coast Range. The numbers represent the mean values with the expected ranges of conditions shown in parentheses.

Stand Age	Number of Snags/Acre (Spies 1988)			Snag Biomass	
	Total >= 20" dbh all heights	>= 20" dbh and > 16' tall	Total < 20 dbh all heights	cu.ft./ac (Spies 1988)	cu.ft./ac (Wright Model)
Young (<80 yrs)	7 ** (4-10)	2** (0-4)	41** (24 to 58)	1229 (697 - 1761)	3794 (2844-4839)
Mature (80-199 yrs)	7 (2-12)	3 (1-5)	47 (11-83)	1486 (649-2326)	1644 (1603-1686)
Old-Growth (>199 yrs)	7 (5-9)	4 (2-6)	9 (7-11)	2115 (1247-2983)	1906 (1867-1946)

** Knowledge of the types of forests where this data was taken suggests that these values and ranges are on the low end of the range of conditions for the Oregon Coast Range. Natural forests that are less than 80 years of age that were sampled included many stands that resulted from settlement-related fires (some burned 2-4 times) after the Yaquina fire. Under this type of disturbance, the levels of down wood would be low. To find the average levels of woody material following a single disturbance event, other studies may be more appropriate.

+ Modeling completed recently by Wright suggests that the mean range for CWD in young stands at 30-50 years of age under natural conditions would be 265 m³/ha or 3794 cu.ft./acre. These values represent what would be expected following a single fire event in 30-50 year age class of forest stands in the Central soil/climate zone. (note: values displayed are half of the actual values modeled since model values included snags and down logs which are found in approximately equal proportions in stands)

Existing Condition of Snags

Management activities (i.e., falling, yarding, and site preparation), resulted in a loss of snags in harvest units across the landscape. Much of the material described as the "lost legacy" (**Figure 4**) - that quantity of wood that has been removed from the system during timber harvest activities would have contributed to this snag component.

Loss of that large snag component is long-term. There is very limited opportunity to create snags >20" in diameter in the 25-50 year old plantations. Prescriptions can be implemented which would establish conditions that would accelerate the attainment of green trees in the larger size classes for creation of snags at a later date. **Table 11** provides guidelines for snag levels over

time on a landscape level. At the time of initial commercial entry, i.e. 25-50 years, prescriptions are usually not going to meet the young stand levels of snags, even those in the small size classes. Treatments should set stands on a trajectory to meet the mature and old-growth snag levels and sizes.

Management Options for Snags

- Considerations for prescriptions in young managed stand ages could include:
- Protect all existing large snags. Smaller existing snags, if knocked over during management activities, will be retained as down wood.
- Accept a short-term deficit in the quantity of snags in order to manage for long-term gain in appropriate sizes and numbers - establish trajectory. This is appropriate since smaller trees are not persistent as snags, mostly sap wood.
- May have few 15-20" snags in younger age classes (25-50 years).
- The largest green trees available may be ones you want to keep for future structural components (i.e., to become wolf trees for marbled murrelet nesting habitat).
- Leave enough trees to grow and become snags at a later date
- Stem inoculation of small trees to initiate heart rot so that cavity nesters can use them earlier.
- Create snags in adjacent mature stands

The priority decision is to meet the range of snag levels outlined in **Table 11** in the mature and old-growth stands. If conditions are appropriate to meet the larger size classes of snags in young stands, then meet those levels in young stands. Subsequent entries (i.e., at 60-80 years), may be needed to initiate snag development in the larger size classes. It's more important to reserve larger green trees at the initial entry and not be so concerned about the numbers of snags less than 20" in diameter in the younger age classes.

In stands over 50 years old, snag numbers within the ranges listed on Table 11 will be met if recruitment trees of sufficient size are available within the stand, or the project will remain subject to REO review. In stands younger than 50 years, meeting Table 11 numbers in the short term may prevent meeting snag requirements in the longer term. Where that is the case, short term snag numbers will be reduced from Table 11.

Log Levels in Unmanaged Forests

Table 12 displays the mean and the range of conditions that could be expected in the Oregon Coast Range under natural conditions. The amount of down wood in young natural stands (measured at 50-80 years of age) ranges from 596-1604 cu.ft./ac. These values represent conditions following various types of disturbances. At the time of measurement, much of the initial input of down wood from the disturbance event (**Figure 4**) had already been incorporated into the soil. Mature forests have less down wood ranging from 776-2682 cu.ft./ac. Old-growth forests have higher levels of down wood at 2390-4126 cu.ft./ac.

Table 12 represents an assessment of current ranges of the variability, both measured and modeled, in the down wood component in natural forests in the Oregon Coast Range. This information, along with the inventory of existing down wood levels in plantations (**Tables 13 & 14**) and the management alternatives at the end of this section will be utilized when prescribing down wood for activities implemented in the LSR.

Table 12. Range of down wood in unmanaged forests in the Oregon Coast Range

Down Wood Volume (Spies 1988) CWD Volume			
Stand Age	cu.ft./ac (Spies Data)	Percent Cover !	cu.ft./ac (Wright Model)
Young (<80 yrs)	1100 ** (596 - 1604)	3.9% ** (2.8 - 5.0%)	3794 (2844 - 4839)
Mature (80-199 yrs)	1729 (776 - 2682)	5.2% (2.8 - 7.5%)	1644 (1603 - 1686)
Old-Growth (>199 yrs)	3258 (2390 - 4126)	6.1% (4.9 - 7.3%)	1906 (1867 - 1946)

! Coast Range had the lowest % down wood ground cover of PNW ecosystems assessed. Percent cover is an expression of projected horizontal area covered by wood. It is from log length and diameter.

** Knowledge of the types of forest where this data were taken suggests that these values and ranges are on the low end of the range of conditions for the levels of down wood found in the Oregon Coast Range. Natural forests that are less than 80 years of age that were sampled include stands which resulted from repeated settlement-related fires (some may have burned 2-4 times) after Yaquina fire. Under this type of disturbance, the levels of down wood would be low. To find the average levels of woody material following a single disturbance event may require additional research

+ Modeling completed recently by Wright suggests that the mean range for CWD in young stands at 30-50 years of age under natural conditions would be 265 m³/ha or 3794 cu.ft./acre. These values represent what would be expected following a single fire event in the Central soil/climate zone. (note: values displayed are half of the actual values modeled since modeled values included both snags and down logs which are found in approximately equal proportions in stands)

Dynamics of CWD (Snags and Down Wood) Over Time and Space (Information from Research)

The CWD Cycle

Figure 4 displays the cycle of coarse woody debris over time for a single disturbance event. It is presented to display the quantities of coarse woody material that are initially input following a disturbance event (Spies 1988, Wright -in progress). This diagram also assists in development of

a number of alternatives that can be employed by management that will guide the levels of CWD that are prescribed.

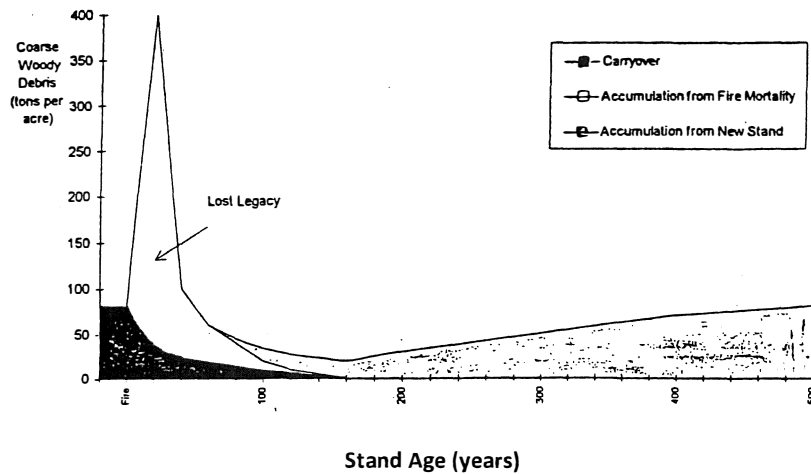


Figure 4. CWD Accumulation and Decay Over Time Following a Disturbance Event (Spies and Cline 1988)

As discussed by Spies and Cline, 1988, **Figure 4** displays that:

- Following an initial disturbance event, new CWD is not added into a stand until the stem exclusion and understory reinitiation stages. Mortality rates of young stands are estimated at 12% per year. These are mainly small (<4" trees) that will decay rapidly.
- CWD accumulates slowly over the 1st 100 years and more rapidly between 100-400 years.
- At 100-150 years, CWD accumulations begin to increase as trees die.
- The dynamics of CWD modeled for 3 fire histories each beginning with an initial fire in an old growth stand but differing in number and severity of subsequent fires. All three models exhibited low values of CWD between 80-200 years. The lowest and most prolonged minimum in CWD during succession occurred when additional fires burned early in succession (Spies et. al. 1988).
- Researchers have found three main differences in CWD between natural and managed stands (Spies and Cline 1988):
 1. The quantity of CWD is drastically different immediately following the disturbance event.
 2. The size of wood is different; what's left after logging is smaller and it decays faster
 3. In plantations, loss of trees is slower due to thinning and spacing of management. Thinned material is harvested and removed from the site.

- At least six times more wood carries over after wildfire in old-growth systems than is left after logging in old-growth.

These statements support the need to provide for CWD in density management prescriptions in the LSR to achieve wildlife habitat objectives.

The following is from Pam Wright's draft of "Coarse Woody Debris Groups of the Siuslaw National Forest:

- CWD enters the system in two ways:
 1. Through incremental mortality from the live stand
 2. Through disturbance. This is the biggest factor and the existing level of CWD depends on:
 - a. the time since disturbance
 - b. the magnitude of the disturbance
- Due the rapid decomposition rates in the Coast Range, most of the CWD from the previous stand is not detectable 100-150 years after it reaches the forest floor.
- It's important to look at levels of CWD based on soil climate zones. The Coastal Fog Zone has the greatest CWD mass of the ecosystems assessed at about a 10% increase over the Central Interior Zones in young stands and 33% increase in older stands.

These statements support evaluation of the types of disturbances and time since disturbance on individual sites to help establish appropriate levels of CWD. Soil/climate zones especially play a role in CWD levels and should be considered in management prescriptions.

Decay Classes

According to Spies, Franklin and Thomas, 1988:

- In general the proportion of total biomass in highly decayed material (decay classes IV, and V) was highest in young stands and lowest in old-growth.
- The distribution of woody debris in young stands (<80 years) was concentrated in decay classes III, IV, and V. In mature stands, woody debris was more evenly distributed among decay classes II through V, with a higher proportion of total CWD biomass attributed to decay class II. In old-growth stands, woody debris was concentrated in decay classes II and III.

The above statements from the Spies study support high proportions of CWD in young stands (<80 years) in the advanced decay classes III, IV and V. Under natural conditions, trees killed in a major disturbance would eventually fall and decay on the forest floor.

Distribution of CWD

Coast Range stands have less CWD in all three age classes than stands in the two Cascade provinces. Mass and volume in young stands (<80 yrs) in the Coast Range was <40% of the values in young stands in the Cascade provinces (Spies et.al. 1988).

Coarse woody debris is unevenly distributed in the forest. The amount may vary tenfold between closely adjacent areas and more than half of the coarse woody debris may fall on less than one-fifth of the total area. Several factors contribute to such patchy distribution: The large successional overstory trees that contribute heavily to the dead wood supply are irregularly distributed. Mortality from natural causes is often patchy. Dead wood may be moved downslope to accumulate at a resting place on concave topography (Spies and Cline 1988).

For Coast Range stands, aspect and topographic position alone accounted for 63% of the variance in CWD biomass. Moist sites had the highest amounts of CWD (more live biomass, larger tree boles, wetter, more slowly decaying wood, less subject to surface fires that can consume CWD). The importance of site characteristics in the Coast Range in explaining variation in CWD in relatively young stands suggests that fire history, as affected by topography, controlled the amounts of CWD in stands <150 years old. It is probable that stands on north facing slopes and moist sites experienced less severe and less frequent fires than the drier sites. Consequently young stands on more protected sites probably inherited more CWD than fire-prone sites because they were preceded by older, more massive stands rather than young stands or mixed-aged stands (Spies et. al. 1988).

These statements from Spies' study support the need for variability in the prescriptions to create varying levels of CWD relative to soil/climate zone as well as stand age and fire history.

Existing Condition of CWD

In order to evaluate down wood needs on a site specific level, existing levels of down wood should be evaluated. **Tables 13 and 14** display two data collection efforts on the Siuslaw National Forest which provide an indication of the average and range of down wood levels that can be found in managed stands. The existing levels are spatially highly variable.

Table 13 represents the levels of down wood at the time of final harvest. This information was collected for a fuels inventory by Peterson and Barnes and compared favorably to previous fuels data inventories. The information shows the majority of material is in the 9" to greater than 20" size classes. The smaller material is consumed by slash burning at a higher rate than the larger size classes. On the average, 2901 cu.ft./ac. of material remains on site after harvest activities. Approximately half of this is lost during site preparation, with an average of 1487 cu.ft./ac. remaining after slash burning.

Table 13: Down Wood Conditions Following Clearcut Harvest (1980 - 1990)**CWD Levels**

(cu.ft./ac by diameter class)

Site Condition	3-9"	9-20"	> 20"	Total
Pre burn ¹	801	1082	1018	2901
Post burn ²	81	541	865	1487

¹ Peterson, J.L. and D.A. Barnes, Comparison of Biomass Characteristics on clearcut units on the Siuslaw National Forest with other western WA and Oregon

² Post burn consumption based on professional judgment of worst case scenario. Assumed 3-9" material 90% consumed. 9-20" material 50% consumed, over 20" material 15% consumed.

Table 14 displays down log information collected from Siuslaw National Forest Managed Stand Survey data. The values indicate the average and one standard deviation (in parenthesis) representing the range. Depending on the plantation age, the average down wood volume ranges from 3010 to 3409 cu.ft./ac. This information is within the ranges reported by BLM - Salem and Coos Bay where stand exam information for 40 year old plantations shows down log quantities mostly in the larger diameter classes with an average of 3085 cu.ft./ac. (range 1831 - 4083 cu.ft./ac). Most of the down wood volume is in the soft log category (decay classes III-V). This is consistent with information presented by other researchers (Spies et.al. 1988). Log lengths were also surveyed. On the average, 51% of the down logs inventoried were greater than 20 feet in length. The values ranged from 29% to 61% greater than 20 feet in length.

The variability of CWD in plantations is readily apparent. Both the low and high ends of the range of existing conditions found in the managed stands are outside of the range of variability measured by Spies or predicted by Wright (**Table 12**). When these conditions are encountered, there are opportunities to bring CWD values within the historic range (low end) or to exceed the historic range (high end).

Table 14: Existing Down Log Volumes in Plantations

Plantation Age	Average Hard Log Volume (cu.ft./ac)	Average Soft Log Volume (cu.ft./ac)	Total Log Volume (cu.ft./ac)
11 - 24 yrs	630 (0 - 2094)	2423 (0 - 5049)	3010 (0-6084)
25 - 49 yrs	413 (0 - 1346)	2946 (0 - 7216)	3409 (0-7787)

The variation in the levels of down wood can be attributed to both natural and managed conditions. Age at which the stand was harvested and past disturbance regimes can effect the condition at the time of harvest. The amount of yarding and piling of unutilized material, the utilization standards, and the site preparation techniques all play a role in the quantities of woody material left on site following timber harvest activities.

The existing level of down wood should be assessed during project planning. Several inventory techniques are available (Harmon 1996) and the use of fuels inventory transects or stand exam information should be assessed. Statistically valid inventories of down wood, however, require extensive survey involving a number of transects. It is recommended that an individual on each interdisciplinary team take on the responsibility of assessing down wood levels. It is expected that the individual would be able to make qualitative assessments (low, moderate, high) based on previous experience of having done transects or surveyed areas with known down log biomass.

Management Alternatives

The peak in **Figure 4**, represents the “Lost Legacy.” This is the organic material (CWD) that has been removed from the system and sold as commercial forest products. We cannot expect to replace this loss. At this point, the existing levels of CWD are lower than the natural systems would be. The predominate reasons for this is that:

- The forest was harvested at an age when the levels of CWD were naturally at the lowest level in the chronosequence of development (Spies et al 1988).
- The majority of the biomass that would have been killed by a fire event and reincorporated into the system was removed and sold as commercial timber.

CWD levels identified in Table 12 will be met by existing and new material left after thinning. Table 12 lists a range, however. Where to hit on that range depends on the age or the stand and the conditions in and around the stand. Our decision space is to start at the decay portion of **Figure 4** in early stand development and select an approach which will determine at what rate the stands will approach the accumulation phase line of the CWD cycle. Management should not try to strive for the average condition all the time. There are opportunities to work within the whole spectrum of the historic natural range to replicate the natural variability found on the landscape and to take advantage of opportunities to exceed the natural range. Below are 4 alternatives which will help to determine that rate.

Alternative Prescriptions for Coarse Woody Debris

Alternative #1

Leave Large Amounts of CWD in the Short Term

Objective: Provide for soil nutrient/ fungal and soil invertebrate health and maintenance.

Prescription: Input down wood in the short term: Drop as many trees as possible, to meet the high end values of **Table 12** (1604-4839 cu.ft./ac) for young stands. Half of the CWD should be left as snags to spread the down wood input over time. **Goal:** Provide CWD as a substrate for

soil micro-organisms to restore nutrient cycling regimes in areas which currently have very low levels of CWD.

Consider this alternative when one or more of the following conditions occur:

- : there is a need to recover microorganisms, soil nutrients and or soil structure
- : areas have experienced hot or repeated burns which have resulted in low levels of soil organic material
- : severe erosion has occurred and bare mineral soil is exposed

It is expected that this alternative would only be applied in fairly isolated instances on sites or portions of sites that have experienced very harsh disturbances.

Benefit: Provides immediate increase in CWD levels for a while, a peak in CWD levels. Maintains fungal, microorganism, small mammal habitat.

Disadvantages: Short term, small diameter, rapid decay, lost potential for larger CWD and larger snags in the future. Size class insufficient for species that need large logs and snags. Minimum economic return for projects in short term. Limited number of trees left on site for the future.

Alternative #2

Leave Small Amounts of CWD Over Time

Objective: Supply a steady input of down wood and snags over time to provide conditions for down wood processes and snag-dependent species over time.

Prescription: Fell some now, leave some for the future: Drop trees and/or create snags to meet low to moderate ends of **Table 12** (1100-3794 cu.ft./ac.) at each entry. Leave up to half the volume as snags. Consider topping trees in adjacent mature stands to provide snags in the larger diameter classes. Insure that the prescription will be able to meet the low to moderate values of **Table 11** (0-7 snags >20" dbh which includes 0-3 >16' tall) and **Table 12** (776-1644 cu.ft./ac of down logs) in the mature condition in the future. Half of the CWD should be left as snags to spread the down wood input over time.

Goal: Balance long-term and short-term needs.

Consider this alternative when one or more of the following conditions occur:

- : nutrients in the forest floor, soil, and fungal communities are low, but not a major concern
- : primary cavity nester population levels are at or below the 40% level on the landscape.
- : the surrounding older forests can carry the habitat for most species in the short-term.

It is expected that this alternative would be the one of two (alternatives 2 and 3) applied most frequently. **Benefit:** Provides incremental input of CWD and snags over time. Strives to maintain habitat for CWD and snag dependent species while still maintaining future options. Some economic benefit in creating snags and CWD at a later date.

Disadvantage: May not have the optimum levels of CWD and snags in short-term. May take longer to get at desired sizes and quantities in the long-term since a higher number of trees per acre would be left on site to incorporate over successive entries.

Alternative #3

Grow Large Diameter Trees for Inclusion as CWD in the Future

Objective: Provide quality conditions for down wood and snag dependent species and processes in the future.

Prescription: Leave minimum levels of CWD and snags in the short term. Drop trees and/or create snags to meet the lowest ranges of **Table 12** (596-2844 cu.ft./ac.). Consider topping trees in adjacent mature stands to provide snags in the larger diameter classes. Half of the CWD should be left as snags to spread the down wood input over time.

Goal: Maximize long-term quantities and sizes of CWD and snags.

Consider this alternative when one or more of the following conditions occur:

- : the current levels of CWD and snags are within the parameters outlined in **Table 12** for natural young stands
- :the adjacent stands have sufficient CWD and snags to carry the habitat.

It is expected that this alternative would be one of the two (alternatives 2 and 3) applied most frequently.

Benefit: Maximizing the size and quality of down wood and snags for future use by down wood and snag dependent species and processes. There is an increased probability of providing large CWD and snag habitat in a mature condition. More economical to pay for logs and snags at a later date

Disadvantage: Minimizing short-term habitat for down wood and snag dependent species and processes.

Alternative #4

Let Natural Successional Processes Incorporate CWD

Objective: Allow natural succession processes to dominate

Prescription: No Action - natural suppression, no thinning.

Goal: Maintain some untreated areas.

Consider this alternative when one or more of the following conditions occur:

- : vegetation manipulation is not scheduled to occur in an area
- : stands are already on the trajectory for attainment of late-successional conditions
- : adjacent stands provide habitat.

Benefit: Diversity of habitat, constant input of wood over time. Can be used as an experimental control to monitor differences between treatments.

Disadvantage: No economic return. Will take longer to attain other LSR objectives and to accumulate quantities of large CWD and snags.

Selecting an Alternative: For project implementation, the "best" option, ecologically, is not known. As a result, it is important to apply the range of alternatives described above, sometimes even varying the treatments within a specific unit to accommodate special conditions. Management prescriptions need to balance the benefits and disadvantages of the various prescriptions to account for the overall LSR structural objectives. In addition, the application of any one of these alternatives needs to be considered in context with the conditions on the surrounding landscape. For multiple entries, consider what would/could be done at each entry.

The process to determine which Alternative(s) are appropriate in a given situation would include the following steps:

1. Determine the overall objectives of the area under consideration i.e. LSR Zones, Landscape Cells, and the objective for attainment of other structural features including accelerating growth to achieve the desired stand diversity and large diameter green trees as well as CWD levels.
2. Evaluate existing levels of CWD (qualitatively if quantitative measures are not known) in context of both the individual plantation and the surrounding landscape.
3. Determine specific project area resource objectives for soil, wildlife and aquatic resources.

Selecting CWD Levels Within an Alternative

Within each alternative there is a specified range of values for the volume of CWD that would be appropriate. These values are taken from **Table 12** and represent the range of historic conditions. There may be times, depending on specific resource objectives, when the target value selected may be above this range. An example would be when it is determined that the opportunity exists to provide habitat for small mammals or cavity-dependent species and the objective is to exceed historic levels to accomplish that objective. There are a variety of reasons to leave varying levels

of CWD within a unit. It is not appropriate to always meet the low end, the middle, or even the high end of the range. CWD is naturally variable on the landscape and prescriptions should strive to retain that variability.

In addition to the quantity of down wood, the quality of down wood (features such as size and decay class) and arrangement should be a consideration for management. While all size classes serve an important ecological function, it is the larger diameter logs and snags that are important for many wildlife species. Large logs serve as denning sites for marten and fisher and retain moisture through the summer months, thus providing important habitat for terrestrial amphibians and small mammals. Large snags provide critical habitat for many species, including spotted owls, bats and swifts. Bears also utilize the large hollow snags for denning.

Research has shown that in young natural forests, the down wood component is found mostly in decay classes III-V. The majority i.e. 60% of log pieces are in the small (<12") size class. A third of the pieces are in intermediate size classes (12"-24"), and about 6% are greater than 24" in diameter (Spies et.al 1988). If the larger size classes are not currently existing, prescriptions should accommodate the addition of this material at a later date. By the time a forest is in an old-growth condition about 11% of the down wood and snags are greater than 24" in diameter.

Determination of appropriate levels of CWD to leave would include:

1. Determine specific site resource objectives for soil, wildlife and aquatic resources.
2. Evaluate economics - the ability to pay for the operation versus the value. Current funding mechanisms often do not allow for some of the prescriptions that would be appropriate to employ. The choice is often between doing nothing or removing more trees from the site than is desirable in order to pay for the operation. ID teams often struggle with weighing the benefit of thinning plantations to encourage growth of larger trees and more diverse structure with attainment of CWD levels.

Evaluate the risk to the stands or watershed (blowdown, beetle, root rot, fire, etc.).

Example:

An Inter-disciplinary team (IDT) is assessing an area within the LSR to accelerate attainment of late-successional characteristics. Initial consultation of this LSRA shows that the planning area is within the CORE LSR Zone and specifically within Landscape Cell #3, which means that the vast majority of the landscape is in early an seral condition (about 30 years old). The goal of this area is to provide contiguous late-successional habitat and to increase the connectivity and dispersal habitat across the landscape. After reconnaissance, it was determined that the majority of the plantations in the planning area had low levels of down wood and snags, around 700 cu.ft./ac. The units have been densely planted to 350 tpa. The site-specific resource objective is to provide connectivity for late-successional species in both the short- and long-term.

Alternative 2 would be appropriate in this case - provide for CWD over time.

Using an average size tree for a 30-or 35-yr. old plantation in the Oregon Coast Range (12"dbh and approximately 90 feet tall to a 4 inch top), the volume of the average tree would be 31 cu.ft.

Alternative 2 provides a range of values that will provide CWD habitat over time (i.e., 1100-3794 cu.ft./acre). To be within this range, it would be appropriate to leave between 13 and 100 trees per acre as snags or down wood.

The great variability that is found in CWD levels leaves the team with a variety of levels that would be appropriate in different parts of the same unit or in different plantations throughout the planning area, depending on the desired resource objectives.

The number of trees in the stand (350 tpa) and the need to leave a fairly dense stand (100-120 tpa) for future recruitment of CWD and to maintain sufficient canopy closure for connectivity, still leaves a sufficient number of trees to sell to pay for the operation. The contract value of the sale is such that up to 40 tpa could be left as down wood or snags and the project still pay for itself. No hazard from a fire, insect, or disease standpoint is involved, so the team chooses to leave 40 tpa (or about 1200 cu ft./acre) as down wood and snags. This would be in addition to the existing CWD biomass of 700 cu.ft./ac, bringing the total up to 1900 cu.ft./acre after harvest operations.

If the current level of CWD in the above example was more in the average range of the existing conditions (i.e., around 3400 cu.ft./ac. from **Table 14**), a different determination of CWD needs would be made. In this case, the desired range (1100-3794 cu.ft./ac.) would result in a prescription which varied from 0-13 tpa needed for down wood and snags $((3794-3400)/31)=13$. Since the contract value supports leaving up to 40 TPA as down wood or snags, the team may decide to leave a minimum of 13 TPA as CWD or perhaps take the opportunity to exceed the natural range and again leave 40 trees per acre as down wood or snags which would result in a volume of CWD of 4600 cu.ft./ac.

Projects may be appropriate which do not employ this method of assessment and determination of CWD levels. These projects will be submitted to the REO for review prior to implementation.

VI. MONITORING

Monitoring is critical to evaluating our success in achieving late-successional structural characteristics across the landscape. Several large scale ecological questions surfaced in this assessment. These questions generally revolve around management activities to improve older forest patch function by increasing the area of interior forest, the connectivity between patches, and/or controlling human access. These questions are not new and have been extensively discussed in the literature and locally in the following documents: FEMAT (1993), First Approximation of Ecosystem Health (1993), in the Assessment Report. (1995), and a biodiversity conservation plan by Noss (1992). The following provides some background on the significance of these questions to this assessment.

Interior Habitat

It is assumed that the bigger the patch of older interior forest, the better it will function as habitat for old-growth dependent species. Interior forest conditions occur when microclimate conditions are stabilized -- beyond the influence of edge-effects. In this province, microclimate edge effects are stabilized within 3 tree lengths (Concannon 1996, Chen 1991). Patch size based on this definition provides an absolute minimum based only on microclimate. Other approaches to defining patch size have ranged from individual (OWL) or species groups (HABSCAPES) to historical landscape vegetation pattern analysis. Species approaches typically build on known home range sizes and progressively increases the patch size as a function of number of species. The historical landscape pattern approach assumes that patterns of the past to which the biota have adopted will be suitable for conserving these species into the future. Hence, knowing the range of historical landscape patterns will help us manage for the appropriate mix of patches in the landscape. Both approaches were considered in the establishment of these LSRs in the Northwest Forest Plan.

Interior forest habitat conditions and area may be increased by altering the structure of plantations next to or within existing older forest patches. Accelerating the development of these plantations to more nearly approximate the characteristics of the surrounding forest should stabilize microclimate changes at the perimeter and interior of older stands. These changes in humidity, temperature, light, and wind have important implications to growth rates, species composition, and organic matter decomposition rates (Concannon 1996, Chen 1991).

We would expect interior forest microclimate to develop and function differently depending on the silvicultural prescriptions. If plantations are "left alone", dense stands would develop which would reduce air flow, increase humidity, and reduce light in the surrounding natural stands. In some cases, this may be a desirable response. Eventually, these dense stands would self-thin and microclimate conditions would be expected to stabilize. This would likely take much longer than if the plantations were thinned because of the age-size gap between the natural stands and plantations.

If plantations are managed to "look" or function more like the surrounding natural stands, then microclimate variability would be expected to be similar to the surrounding stands over time. Following thinning, an abrupt change in micro-climate should occur depending on the density of

remaining trees. Initially air flow, temperature and light would be expected to increase and humidity to decrease. This effect could be moderated by light thins with multiple entries.

Alternatively, plantations could be managed to maximize old growth characteristics. In a landscape dominated by 100 to 150-year old homogeneous Douglas-fir stands, thinning plantations would create islands of diversity with very different structure than the surrounding natural stands. Through underplanting and multiple entry thinnings, this approach would moderate wind flows, and increase shading and humidity over time. However, if a heavy thinning is applied, considerable drying would be expected until the underplanted trees were well established.

At the stand scale, many alternative approaches are being tried and evaluated (Cataract-Wildcat-Yachats, Big Elk, Grant/Feagles, and Callahan Cr. Density Treatments, Black Rock, Hebo Restoration). These stand level treatments will help us better understand the responses of vegetation and some small home range animals to various silviculture density and coarse woody debris treatments. Whether these stand level treatments will produce the desired habitat response for animals preferring large areas of interior older forest conditions is questionable.

Since the ecosystem response, especially the cumulative landscape effects, to these three approaches (leave alone, look alike, or max old-growth) is unknown, it seems that the most prudent and effective approach would be to try all of them in a systematic way. In essence, use an adaptive management approach as described by Bormann et al. 1995. This will yield a variety of stands and landscape conditions which could then be compared, monitored, and evaluated by future managers, scientists, and citizens. Using an adaptive management approach to develop a landscape design directed towards monitoring will provide future managers with better information and more choices about what should or shouldn't be done to manage for older forest habitat.

Appendix G provides an example of how adaptive management could be used to increase the effectiveness of a monitoring program. This example is hypothetical and needs to be further refined and developed before it could be implemented. Development of a proposal would be in coordination with all BLM and National Forest management areas involved in the design.

Human Access

The Coast Range has been extensively roaded. Prior to 1945, the average size of security areas (areas greater than 1/4 mile from a road) was 3,000 acres. By 1990, it was reduced to 137 acres. This reduction corresponds to the loss of wolves, fisher, and wolverine (Siuslaw 1995). Indirect human disturbance and roads may have effects on use of older forest habitat for many other species. Considering the human population growth projections in the valley and coastal strip and the greater interest in outdoor experiences, these potential effects may become more significant over the next 20-30 years than possible positive effects from silviculture treatments.

The Access and Travel Management Plan for the Siuslaw N.F. identifies 700 miles of roads maintained for public travel. The existing road system is 2200 miles. To date, approximately 800 miles of road have been hydrologically stabilized. This reduction in miles of maintained roads has

been driven by declining road budgets. To evaluate the influence of roads and human disturbance on the functioning of older forest habitat, access and travel management plans should be addressed in a landscape design.

Connectivity

"Connectivity is a measure of the extent to which the landscape pattern of the late-successional/old growth ecosystem provides for biological and ecological flows that sustain late-successional/old growth animal and plant species" (FEMAT, IV-52). The term "connectivity" may have different connotations, depending on the species, ecological process, or scale being considered. Connectivity for large home range species such as spotted owls will require a province-wide perspective while stands or groups of stands may be a sufficient perspective for a mollusk species.

The Forest Ecosystem Management Assessment Team (FEMAT) developed a strategy of a network of reserve areas with an intervening matrix to meet the needs of late-successional forest species. This strategy was adopted in the Northwest Forest Plan. Connectivity, as addressed in the strategy, can be broken into 3 major categories:

- 1) The LSRs are intended to be large, contiguous blocks of habitat that can sustain populations or sub-populations of most late-successional associated species. The LSRs are spaced close enough together to allow for mobile species to disperse between LSRs and interact with at least an occasional genetic interchange. The intervening matrix does not need to be late-successional habitat but must provide needs for dispersing individuals.

- 2) Riparian Reserves (RRs) provide connectivity in the way of contiguous habitat for less mobile species unlikely to survive outside late-successional forests even during dispersal. "Riparian Reserves are used to ... improve travel and dispersal corridors for many terrestrial animals and plants, and provide for greater connectivity of the watershed. The Riparian Reserves will also serve as connectivity corridors among the Late-Successional Reserves." (ROD, B-13)

- 3) The matrix is designed to maintain small blocks of late-successional habitat to provide both "stepping stones" for species to move between LSRs and refugia for immobile species. "Isolated remnant old-growth patches are ecologically significant in functioning as refugia for a host of old-growth associated species, particularly those with limited dispersal capabilities that are not able to migrate across large landscapes of younger stands." (ROD, C-44)

Landscape scale connectivity corridors were identified in this assessment (**Map 12**). Monitoring the effectiveness of these corridors will need to be done at the province scale if not larger.

Snags and CWD

Assessing levels of CWD on the landscape is proposed as an essential component of the CWD assessment process. The field techniques to ascertain CWD levels have not been developed and agreed upon at this time. An essential monitoring component is to assure that these techniques are:

developed; appropriate for IDT use; reliable qualitative estimate of existing CWD levels. Implementation monitoring will ascertain if a variety of CWD levels are being left on the landscape. Effectiveness monitoring should determine the value of providing new, small diameter CWD and/or no additional CWD during the initial commercial entry into young plantations for resources which might benefit from that addition.

Risk Assessment

One critical phase of monitoring is testing assumptions and revising management actions when those assumptions are inappropriate. In this assessment, several hypothesis have been put forward to assist in the understanding of landscape function. The following is an assessment of the benefits and risk associated with following those hypotheses with management activities.

Landscape Analysis

LSR Zones provide a coarse assessment of the functions and roles of different parts of the landscape. Landscape Cells help to set priorities for treatment opportunities. These designations do not restrict management only to these areas. Prioritization of treatment areas does not restrict the management of plantations in lower priority landscape cells. There will be ecological or biological reasons to manage areas across the landscape; i.e., treatment windows, T&E habitat restoration. The prioritization scheme was developed to suggest to managers that with limited funding and people to implement activities that the most benefit, based on restoration of the best habitat first, would be gained by implementing treatments in certain areas before others.

Priorities were established based on the same approach that was taken for aquatic restoration. It ties to the refugia concept. Large blocks that are relatively intact and support intact populations of organisms, are more important to restore than more degraded habitats. Our goal is to create and maintain the most late-successional habitat within the least amount of time. With reduced budgets, it's important to focus efforts in areas where we can be most successful. Another option is to work with the most degraded habitat. In these areas, there are isolated, scattered blocks of mature forest and limited places to link those blocks; one would have to grow the vegetation more or less simultaneously. This approach would take much longer to achieve the desired goal and more funding would be necessary to treat larger areas of the landscape. However, management of these areas is important to help recover areas that once had habitat. If the priorities are wrong, there is a low risk to meeting LSR objectives. Project implementation will only be accomplished on relatively small acreages within the LSRs; it will take decades to implement activities. There will be enough flexibility to redirect our emphasis.

The team understands that some funding allocations are limited to work in matrix land use allocations. This assessment in no way attempts to guide type or spatial allocation of management on matrix lands.

Successional Pathways

The successional pathway models are a first attempt to understand how vegetation changes on the landscape based on site condition and disturbance processes. There are scientific articles which discuss successional models but we found none that try to understand succession by sub-series environment. It is expected that further refinement of these successional pathways will occur as more people begin to evaluate these concepts. Historic photography of the area suggests that these differences in vegetative conditions on the landscape do occur and are predictable. The drawbacks of following these pathways are, for example, that wider spacing in the wet environments cuts down on future options for conifer or you may lose the existing conifer due to erratic blowdown. Its strength is in the variability of prescriptions that can be expected across the landscape. Another alternative is to devise a limited number (1 or 2) of prescriptions that will be employed across the whole area. If in the wet environment, 80-100 conifers per acre is the prescription, for example, managers would have to spend extra money trying to reduce vegetative competition with the conifers in an area where wider spacing of conifers would have occurred naturally. ROD B-6 directs that silvicultural prescriptions be varied across the landscape. These successional pathways provide some guidance for achieving that diversity. Whatever prescription is employed, it is important to leave all the pieces that are necessary to maintain the health of the ecosystem.

Disturbance Regimes

There is a low risk of not attaining LSR objectives if the delineation of disturbance regime blocks is not accurate. These are an initial attempt to understand the processes operating in the landscape. Disturbance regimes were only one of the factors that went into landscape analysis. Types of appropriate management prescriptions that will be employed do not follow regime blocks at the stand level. On the landscape level, treatments will be spread out spatially and temporally. Implementation of activities will take decades, and the focus can always be changed if new information becomes available.

LSR Landscape Monitoring Goal

The long-term goal is to provide future managers, scientists, and citizens with better information and the opportunity to evaluate the effectiveness of different management approaches to achieving LSR objectives.

Many of the important issues about how to manage for older forest conditions will take at least 20-40 years to begin to address. This response time, which is relatively short, is due to the productivity of the Coast Range. While this response time is short, it is much too long for human careers. Consequently, we must setup and implement our management activities so future natural resource managers can evaluate the effectiveness of the treatments we prescribe.

Currently we approach activities on a "project by project" basis with emphasis being given to stand or reach level monitoring. Cumulatively, this approach may not "add-up" to the desired landscape level objectives for older forest ecosystems. Without a landscape monitoring strategy, this "project by project" approach may not provide adequate comparisons for future generations.

Monitoring Components

The ROD 1994 has outlined the minimum implementation monitoring components that need to be addressed in LSRs. Bureau of Land Management Resource Management Plans and the Siuslaw National Forest Plan all have incorporated sections on implementation monitoring. Those monitoring plans will be tiered to for LSR concerns.

Currently there are several ongoing efforts to evaluate effectiveness monitoring strategies. The REO and several subgroup task forces are addressing specific components that should be included in an overall strategy. The Eugene and Salem Districts of the BLM, the Siuslaw N.F., and the Pacific Northwest Research Station are initiating an effort to devise a pilot Province Monitoring Plan that will be implemented throughout the Region. Those strategies will address LSR components that must be monitored. Locally, we will tier to those higher level plans.

This LSRA highlights the following specific monitoring components that need to be addressed:

- An interagency evaluation of landscape structural changes over time. This would include an assessment of mature patch sizes, the number of mature patches and the acreage of mature forest.
- Specific T&E species habitat trends need to be evaluated. This would look at the changes in the conditions of, for example, known northern spotted owl activity centers over time.

VII. SUMMARY AND CONCLUSIONS

Several management concepts were developed during the LSRA process. They are summarized below.

Basing Prescriptions on Ecological Principals

1. There are differences in the composition and structure of young, mature, and old-growth forests. Site prescriptions need to acknowledge these differences. In general:
 - Older forests have large, shade-tolerant tree species in the overstory
 - Diverse vertical distribution of vegetation
 - Large amounts of CWD
2. Silvicultural treatments should be aimed at “keeping all the pieces”, i.e., not focusing on growing larger trees or developing an understory at the expense of other stand characteristics.
3. Silvicultural prescriptions should use the natural successional pathways that occur based on disturbance regime, and sub-series environment as a guideline to achieve LSR objectives.
4. Management objectives vary by seral stage of vegetative development. Prescriptions should employ objectives which are attainable given the seral stage of the vegetation.

Management Guidelines / Sideboards

1. Both the spotted owl and marbled murrelet draft recovery plans emphasize the need for a variety of silvicultural treatments to promote the natural diversity and variability found on the landscape.
2. Owls frequently use younger stands (i.e., natural stands 50-80 yrs old) for roosting and foraging. Thus, it is not recommended to treat these stands if they are located within 1.5 miles of a known owl activity center
3. The ROD emphasizes the need for the Riparian Reserve network to provide dispersal habitat for owls and other terrestrial species. All proposed activities which alter dispersal habitat should assure that adequate dispersal habitat exists prior to implementation.

Prioritizing the Landscape

1. The LSR assessment process identified the need to secure the “best” habitat areas first before devoting limited funding and resources in more degraded areas. This strategy affirms the aquatic conservation/restoration strategy objectives and priorities developed by the Northwest Forest Plan.
2. Based on the current condition, amount and distribution of remaining late-successional habitat within the LSR and ownership patterns, three primary zones were identified.
 - 1. The Core LSR Zone is designed to serve as the genetic pool or seed source for late-successional forest-dependent species.
 - 2. The Corridor LSR Zone will serve primarily to connect this LSR to adjacent LSRs to the North (Hebo) and East (Cascades)
 - 3. The Buffer LSR Zone consists primarily of checkerboard BLM lands in the central eastern portion of the assessment area. This area is vital for maintaining small patches of late-successional forest habitat.
3. From these zones, Landscape Cells were developed. Prioritization was based on securing the best habitat first, blocking up large patches and connecting isolated patches.
 - Priority 1 = Landscape Cell #1 (areas colored in dark green on **Map 12**)
 - Priority 2 = Landscape Cell #2 and #4 (areas colored in light green and red on **Map 12**)
 - Priority 3 = Landscape Cell #3 and #5 (areas colored in brown and purple on **Map 12**)
 - Priority 4 = Landscape Cell #6 (areas colored in light blue on **Map 12**)
4. At the watershed scale, the terrestrial priorities and restoration emphasis areas outlined above will be integrated with other resource concerns, such as aquatic and social needs.

Opportunities for Restoration and Potential Conflicts to Meeting LSR Objectives

1. The LSRA identified that certain areas, i.e., the Connectivity/Diversity blocks to the southeast of LSR RO267, the blocks of matrix in the Five Rivers, and the Big Elk areas are important for maintaining: connectivity to the Cascades; the integrity of the CORE; and connectivity to other LSRs, respectively. When finer-scale assessments, i.e., watershed analysis are done which evaluate Riparian Reserve widths, this importance should be considered. Until that time, as the ROD states (C-30,31), 1-2 tree height buffer recommendations should be maintained.
2. There has not been any site-specific identification of areas for changes in land use allocation. This assessment provides the manager with some guidance of where those changes would be appropriate should they be proposed in the future. Land Use Allocation (LUA) changes should be considered where they would assist in the ability of the LSR to function. The highest priority is in the Core and Connectivity LSR Zones and in Landscape Cell #4. The Buffer LSR Zone would have areas where like-kind changes in LUA (i.e., change LSR to Matrix in this area for

Matrix to LSR in other areas) would be appropriate if it would benefit the functioning of other higher priority areas. Although change proposals should assess the ecological value of these isolated blocks.

3. Land ownership exchanges or acquisitions of lands should be considered when it would facilitate the ability of the LSR to function. The ROD (C-17) itemizes legitimate reasons for land exchanges providing the benefits are equal or greater to current conditions of the LSR either in area distribution or habitat quality. The priorities of these exchanges are as follows.
 - Priority 1 = linkage areas, i.e., "Landscape Cell" #4
 - Priority 2 = strategic points in the "Corridor" LSR Zone
 - Priority 3 = other strategic places within the LSRs
 - The "Buffer" LSR Zone has the lowest priority for blocking ownership

It is not the intent of this document to prescribe activities on lands other than LSR allocations. REO requested (January 1996) that LSRAs consider the condition of adjacent lands and understand how they may influence the function of the LSRs.

Limitations of the LSRA and Analysis Needs at the Watershed Scale

The late-successional reserve assessment was a landscape level look at terrestrial ecosystems, how they are currently functioning, how they could be functioning, and how to identify and prioritize habitat restoration needs for late-successional forest species.

Several limitations were encountered during the analysis process which will need to be refined at the watershed analysis level. For example,

1. We were unable to analyze the current condition of vegetation within the riparian reserves across ownership lines. This limited our ability to determine the condition of dispersal habitat within the riparian reserve network.
2. We were not able to determine how much of the mature stands were remnant old-growth (i.e., what portion of the LSR currently met the desired future condition). The vegetation analysis will thus need to be further refined at the watershed level in order to assess these biological "hot-spots" or refugia.
3. Due to limitations in the vegetation coverages, the interior forest habitat analysis included a 500-foot buffer around all mature conifer patches. This results in a worse case assessment of the interior forest habitat condition. This analysis can be much more refined when done at the watershed scale and variations in edge severities and types are taken into consideration (buffer distances will vary, depending on edge type).
4. The TE&S species analysis was instrumental in determining priority restoration areas, refugia, and future recovery potential of owls and murrelets on the landscape scale. At this scale and given the limitations of matching survey efforts and species coverages, only the "big picture" pattern and distribution on the landscape was analyzed. Survey coverage, data gaps, locations of other TE&S

species, and the condition of individual sites (reproductive viability, etc.) will need to be further analyzed at the watershed scale.

5. Special habitats were not mappable at the LSR scale. Wetlands, meadows, and other unique features on the landscape will need to be addressed at the watershed scale.

6. Integration of the terrestrial system with the aquatic elements of an area is more appropriate at a smaller scale (i.e., watershed) and was not included in this LSR assessment. **Appendix H** provides information, attained through this assessment process, by 5th field watershed so that it can be utilized for finer-scale assessments.

LIST OF ACRONYMS

ACEC	Area of Critical Environmental Concern
ADA	Aquatic Diversity Area
AFS	American Fisheries Society
ATM	Access and Travel Management
ATV	All Terrain Vehicle
BLM	Bureau of Land Management
DBH	Diameter at Breast Height
DSL	Division of State Lands
EA	Environmental Assessment
EFSA	Escape Fire Situation Analysis
FSEIS	Final Supplemental Environmental Impact Statement
FSM	Forest Service Manual
LSR	Late-Successional Reserve
LSRA	Late-Successional Reserve Assessment
LUA	Land Use Allocation
NTMB	Neotropical Migratory Bird
ODA	Oregon Department of Agriculture
ODF	Oregon Department of Forestry
PNF	Prescribed Natural Fire
REO	Regional Ecosystem Office
ROD	Record of Decision
RR	Riparian Reserve
S&M	Survey and Manage
SNF	Siuslaw National Forest
T&E	Threatened and Endangered
TE&S	Threatened, Endangered and Sensitive
TMO	Travel Management Objectives
TPA	Trees Per Acre
USDA	United States Department of Agriculture
USDI	United States Department of Interior

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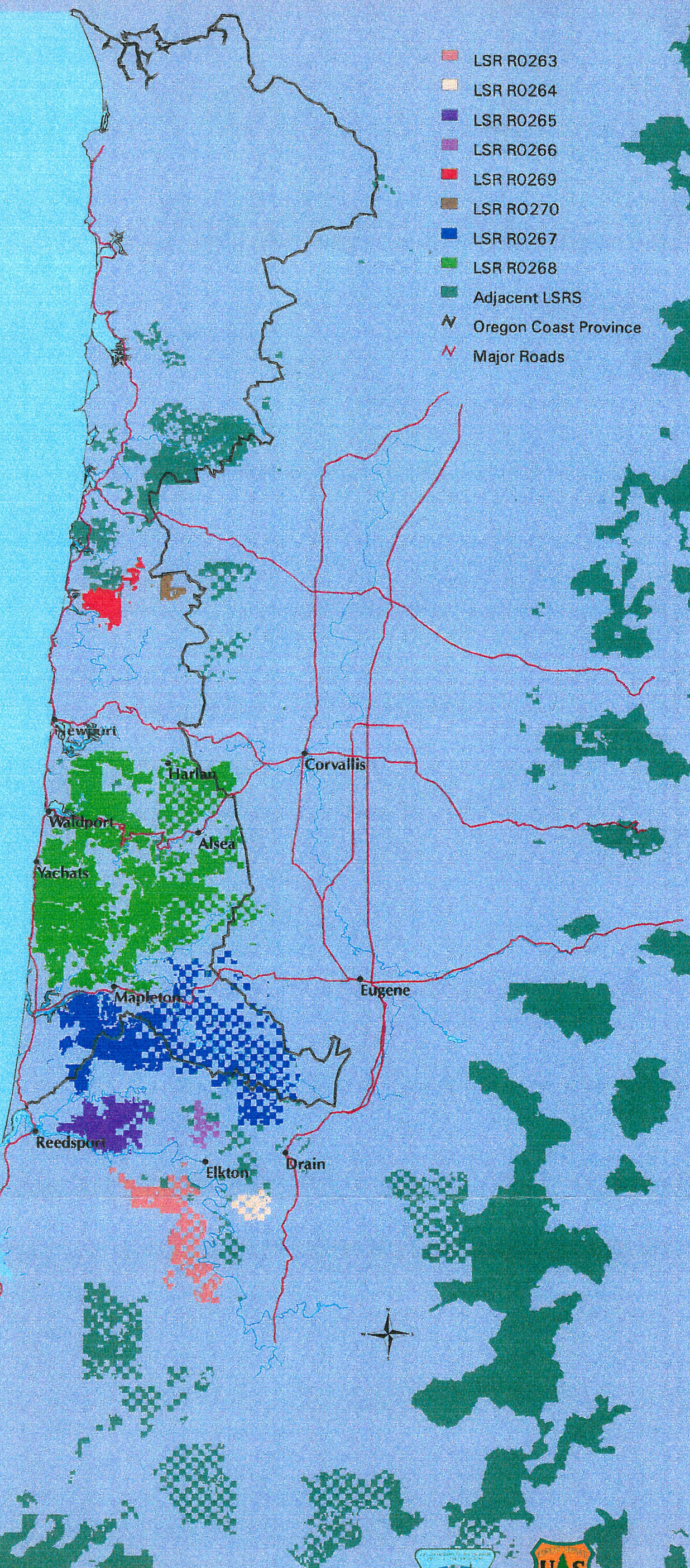
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LSR Assessment Study Area in Context with the Northwest Forest Plan Network of LSRs

209

- LSR R0263
- LSR R0264
- LSR R0265
- LSR R0266
- LSR R0269
- LSR R0270
- LSR R0267
- LSR R0268
- Adjacent LSRs
- Oregon Coast Province
- Major Roads

Pacific Ocean



Scale 1:1082803

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November 15, 1996

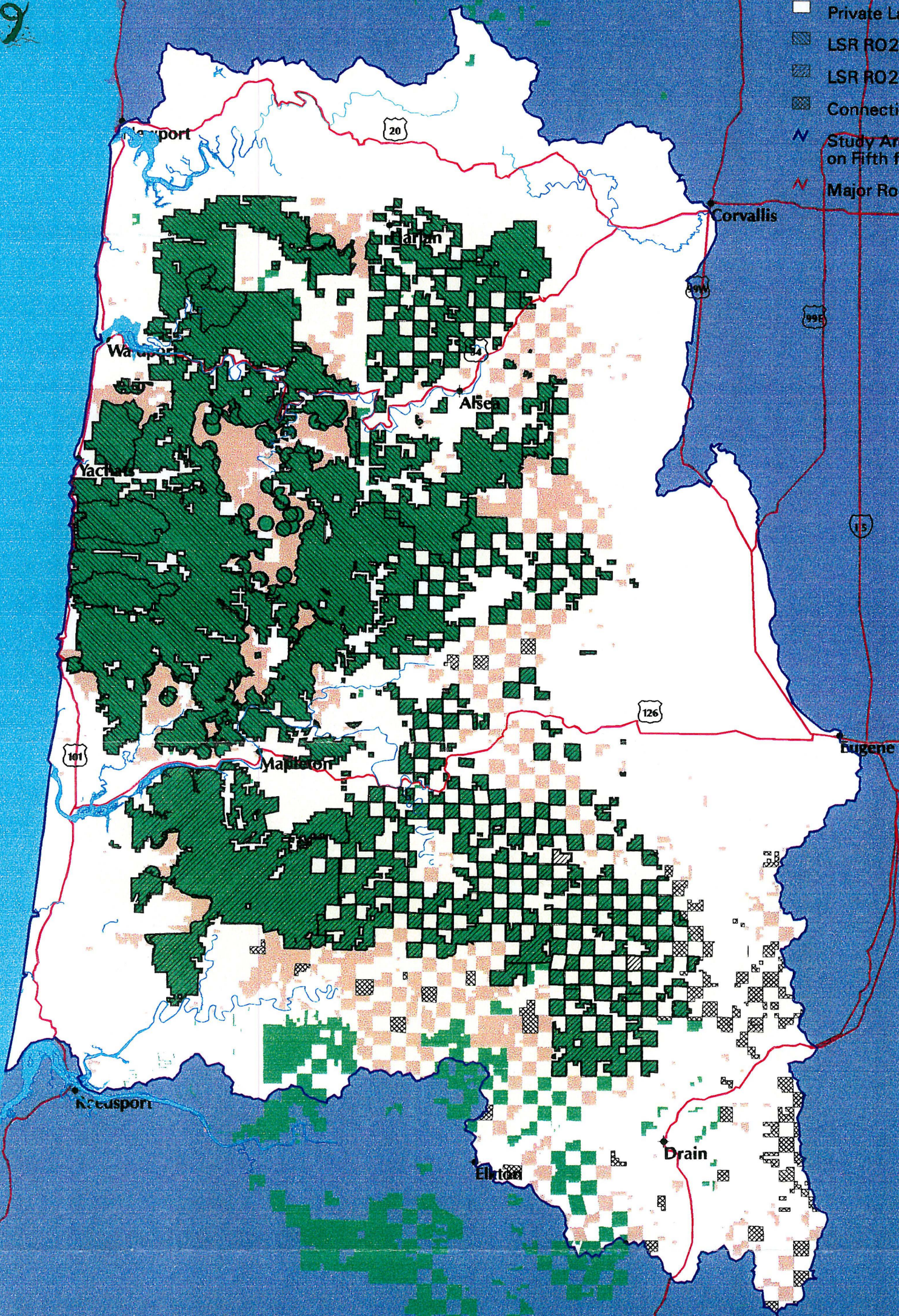
Map 1

LSR Assessment Study Area Land Use Allocations and Adjacent LSRS

Legend

- LSRS
- Matrix Lands
- Industrial Forest Lands or State Lands
- Private Lands
- LSR RO268
- LSR RO267
- Connectivity Blocks
- N Study Area Boundary based on Fifth field watersheds
- N Major Roads

Pacific Ocean



Scale 1:489907

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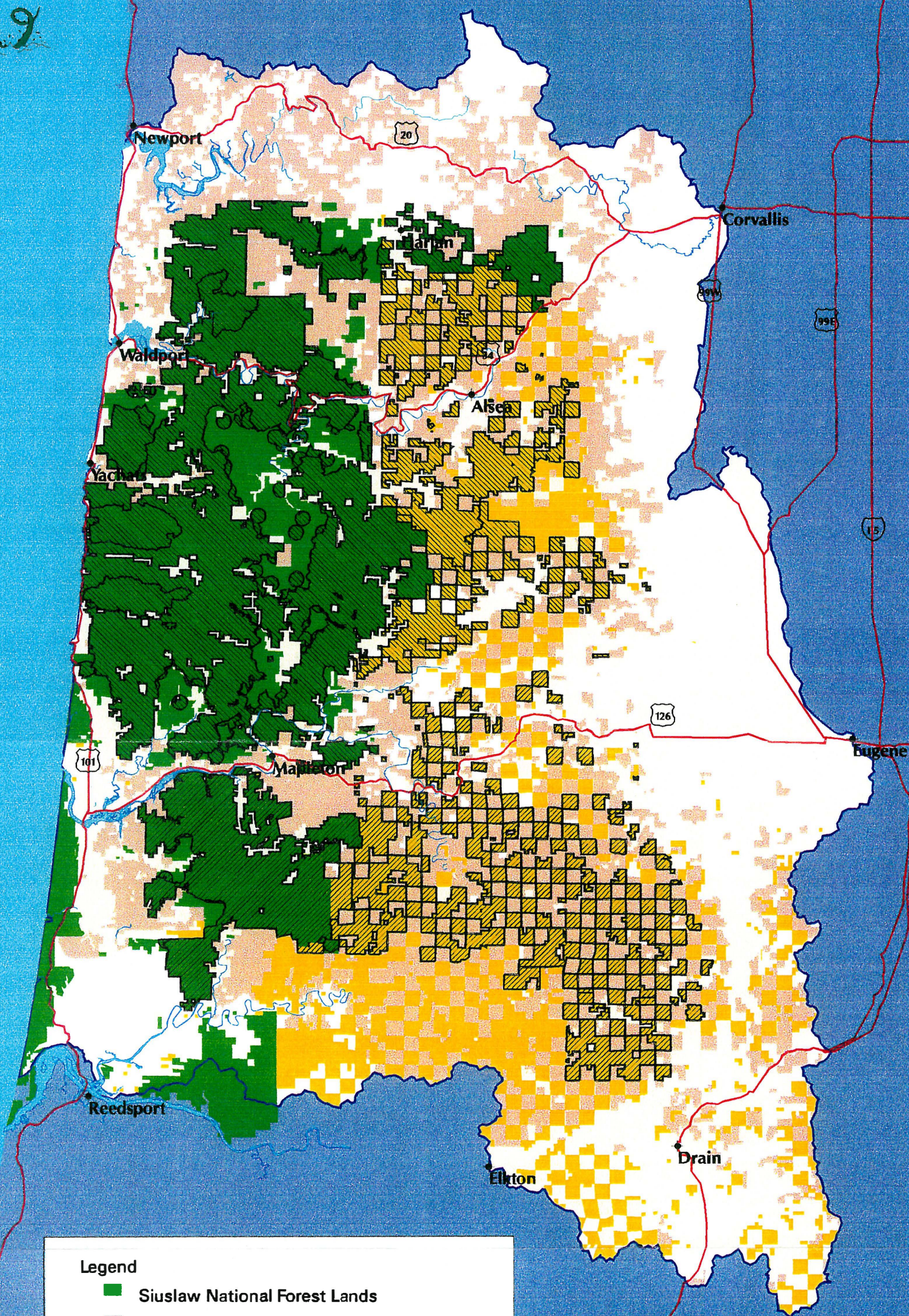


October 07, 1996

Map 2

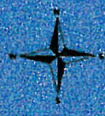
LSR Assessment Study Area Land Ownership

Pacific Ocean



Legend

- Siuslaw National Forest Lands
- Bureau of Land Management Lands
- Private Lands
- Industrial Forest Lands
- LSR R0268
- LSR R0267
- Study Area Boundary
based on Fifth field watersheds



Scale 1:489907

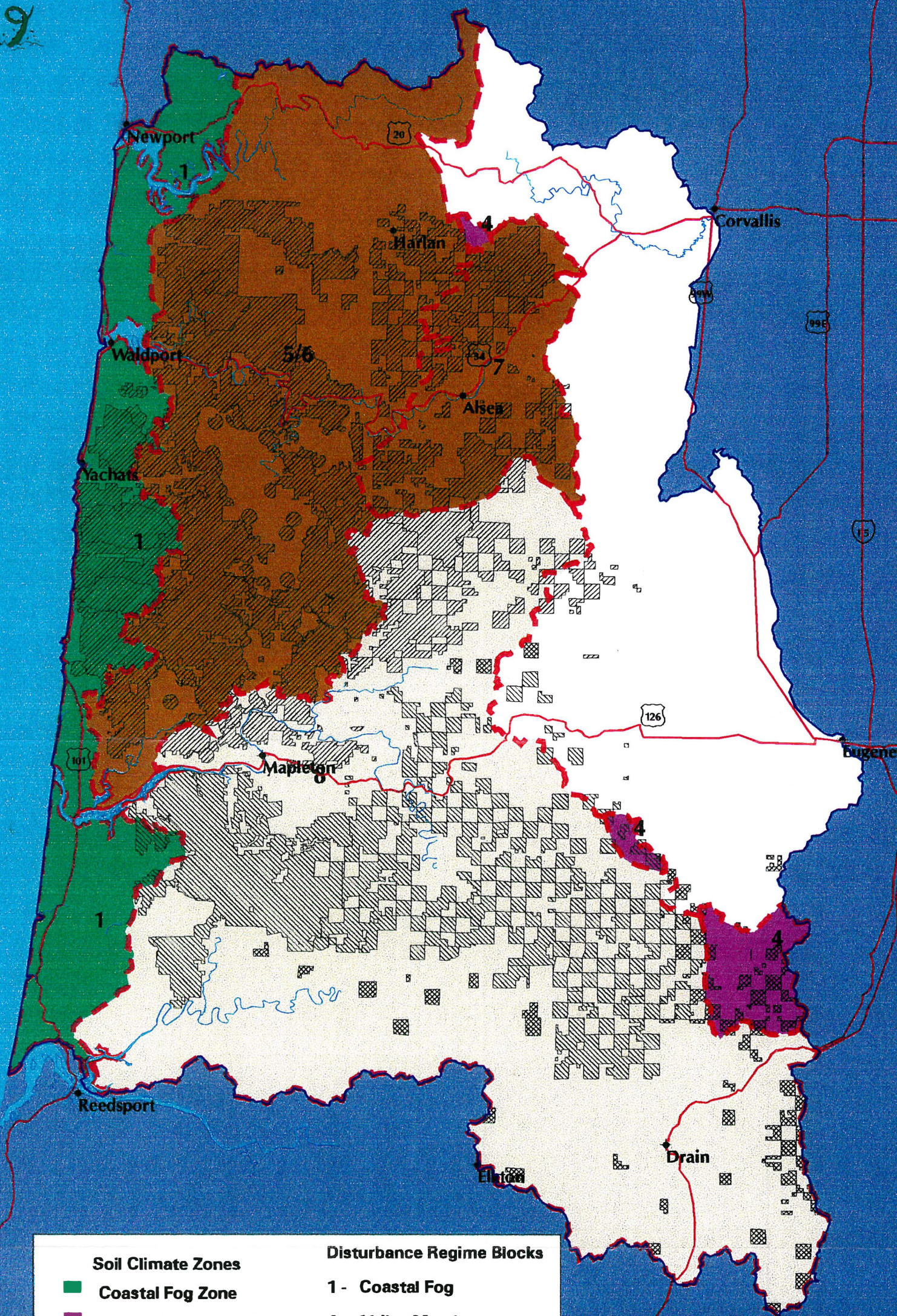
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October 07, 1996

LSR Assessment Study Area Soil-Climate Zones and Disturbance Regime Blocks

Pacific Ocean



Soil Climate Zones

Coastal Fog Zone

Valley Margin

Central Interior

Southern Interior

LSR R0268

LSR R0267

Connectivity Blocks

Fire Regime Blocks

Study Area Boundary

based on Fifth field watersheds

Disturbance Regime Blocks

1 - Coastal Fog

4 - Valley Margin

5/6 - Central Interior
Alsea

7 - Central Interior
Marys Peak/Alsea Valley

8 - Southern Interior

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Map 4

LSR Assessment Study Area Plant Sub-Series Distribution

Pacific Ocean

- Hemlock Dry
- Hemlock Moist
- Hemlock Wet
- Sitka Spruce Dry
- Sitka Spruce Moist
- Sitka Spruce Wet
- R0268
- R0267
- Connectivity Blocks
- Siuslaw National Forest
- Major Roads
- Study Area Boundary based on Fifth field watersheds



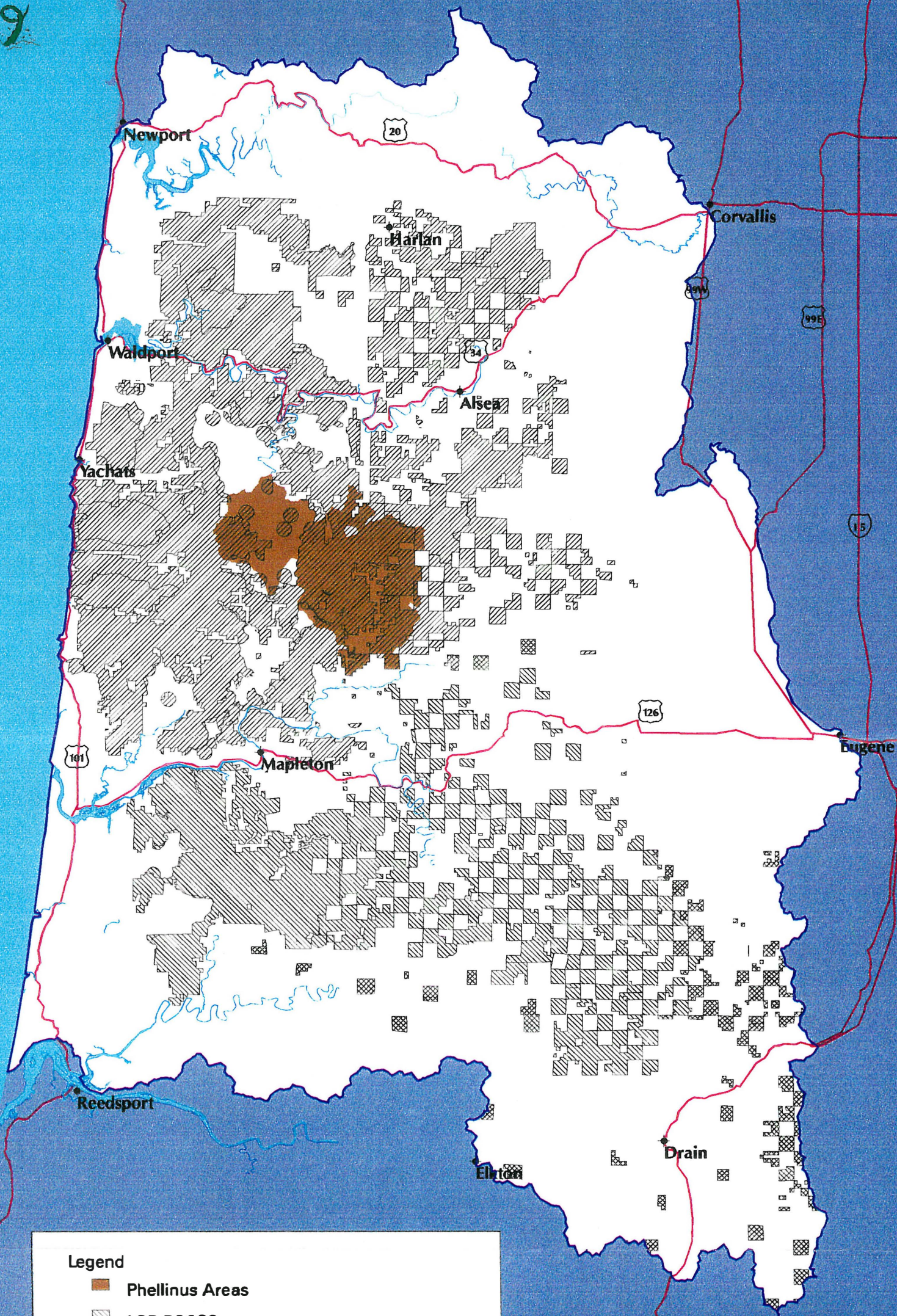
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LSR Assessment Study Area Phellinus Areas

Pacific Ocean



Legend

- Phellinus Areas
- LSR R0268
- LSR R0267
- Connectivity Blocks
- Study Area Boundary
Based on Fifth Field Watersheds



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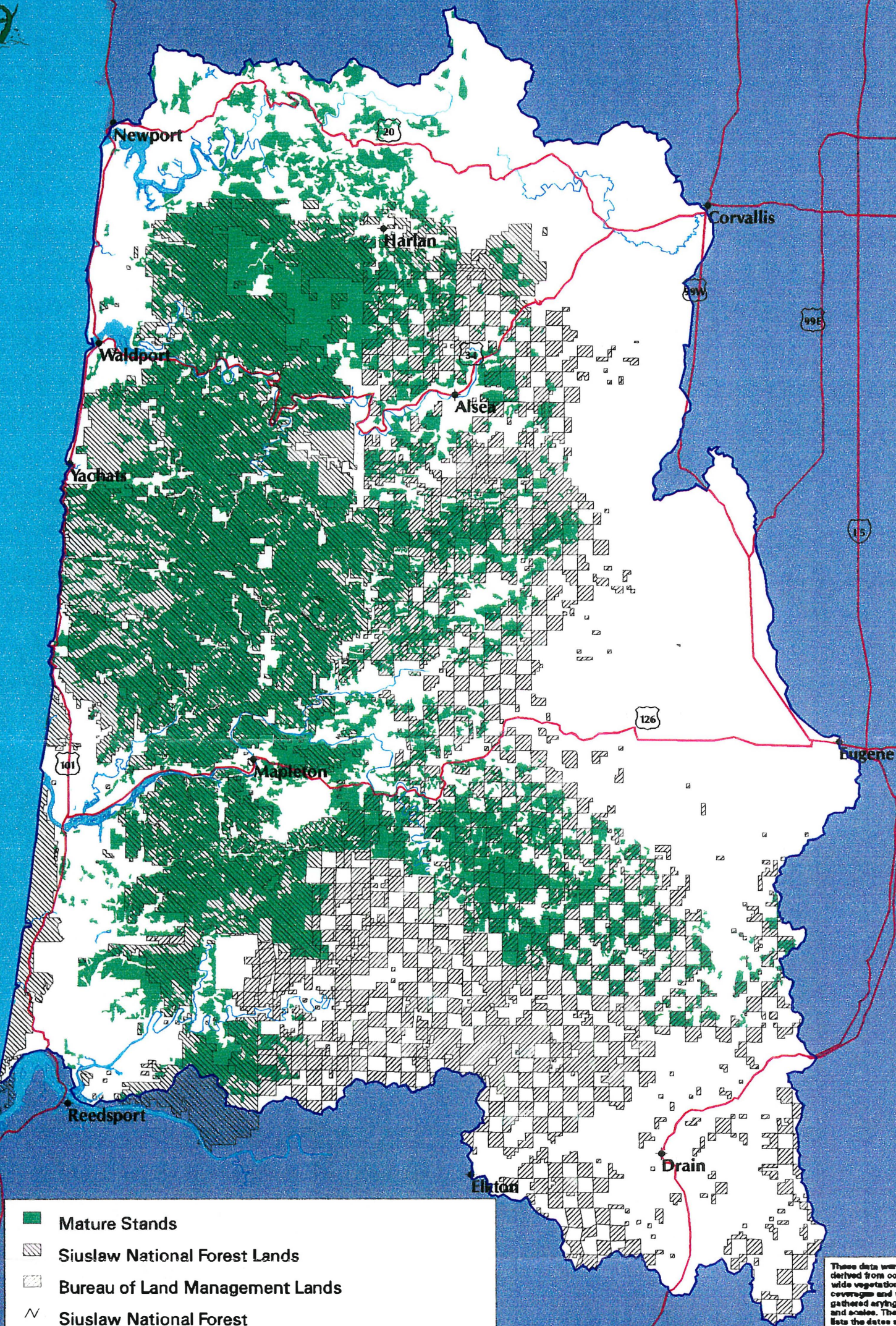


October 07, 1998

Map 6

LSR Assessment Study Area Mature Vegetation Distribution Mid 1900s

Pacific Ocean



- Mature Stands
- Siuslaw National Forest Lands
- Bureau of Land Management Lands
- Siuslaw National Forest
- Major Roads
- Study Area Boundary based on Fifth field watersheds

These data were derived from county-wide vegetation coverages and were gathered during these years and areas. The following lists the dates associated with each county vegetation layer:

Benton - 1940
Douglas - 1948
Lincoln - 1955
Lane - 1956

DBH Ranges vary from 20-40+ inches depending on the county in which the data was gathered.



Scale 1:489907

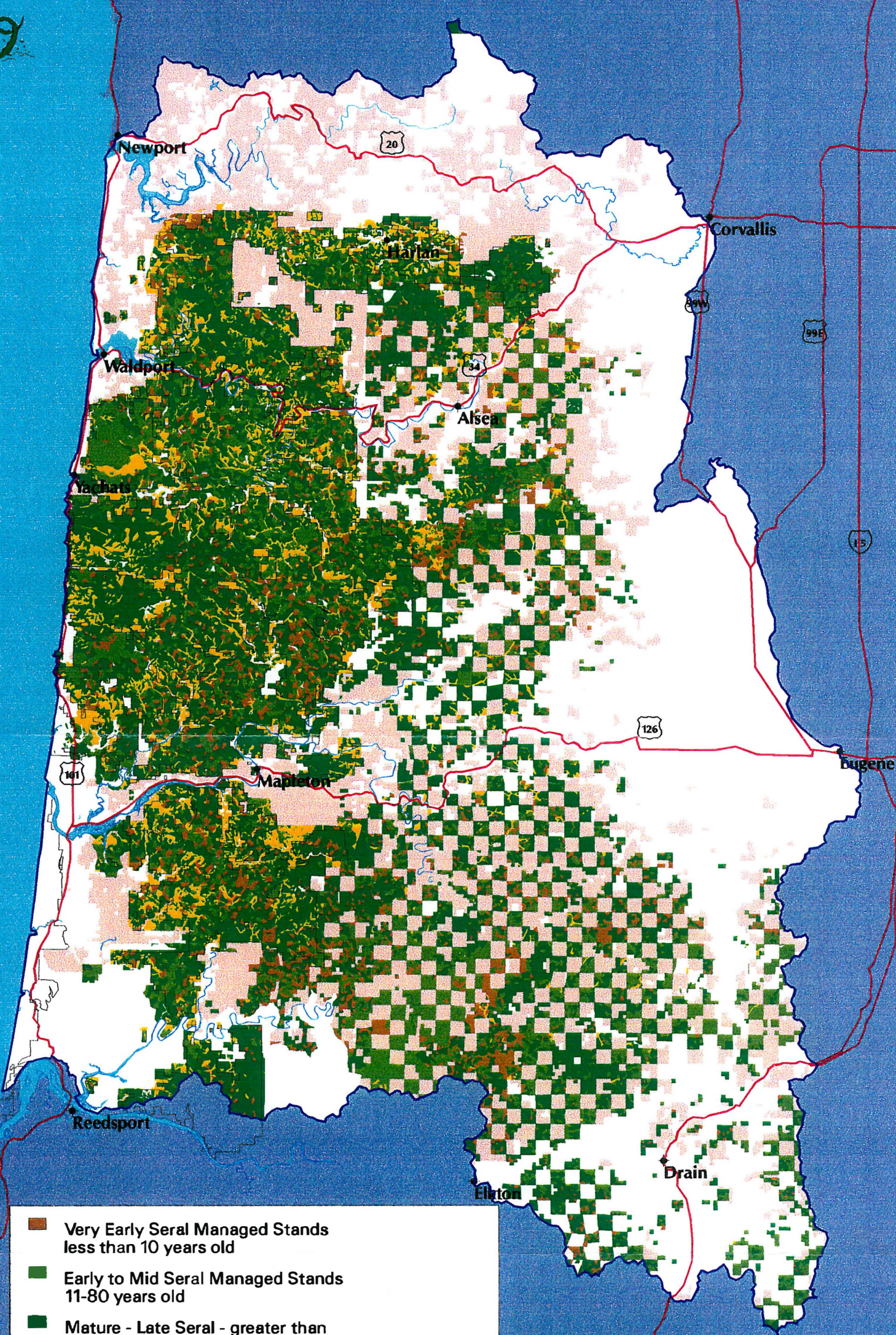
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October 07, 1996

LSR Assessment Study Area Seral Class Distribution

Pacific Ocean



- Very Early Seral Managed Stands less than 10 years old
- Early to Mid Seral Managed Stands 11-80 years old
- Mature - Late Seral - greater than 80 years old
- Pure Hardwood or Hardwood Dominated Stands - All ages
- Industrial Forest Lands or State Lands (assume less than 80 years old)
- Siuslaw National Forest
- Major Roads
- Study Area Boundary based on Fifth field watersheds

Scale 1:489907

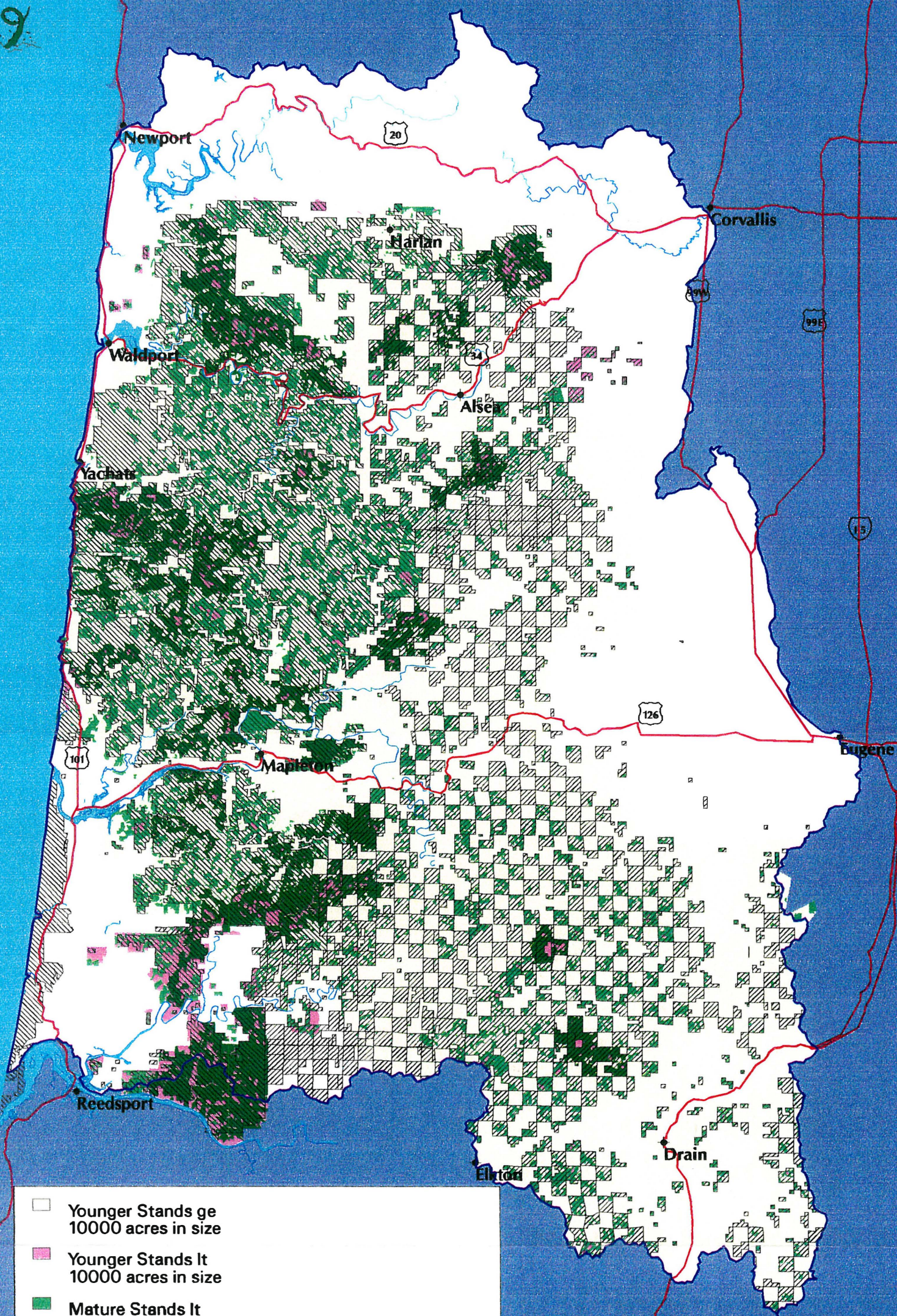
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October 07, 1996

LSR Assessment Study Area Seral Blocks

Pacific Ocean



- Younger Stands ge 10000 acres in size
- Younger Stands lt 10000 acres in size
- Mature Stands lt 2000 acres in size
- Mature stands ge 2000 acres in size
- Siuslaw National Forest Lands
- Bureau of Land Management Lands
- Siuslaw National Forest
- Major Roads
- Study Area Boundary based on Fifth field watersheds

Scale 1:489907

Original data was compiled from multiple source data and may not meet the U.S. National Mapping Standards of the Office of Management and Budget. For specific data source dates and/or additional digital information contact the Forest Supervisor, Siuslaw National Forest, Corvallis, Oregon or the Bureau of Land Management, Eugene, Oregon. This map has no warranties to its content or accuracy.

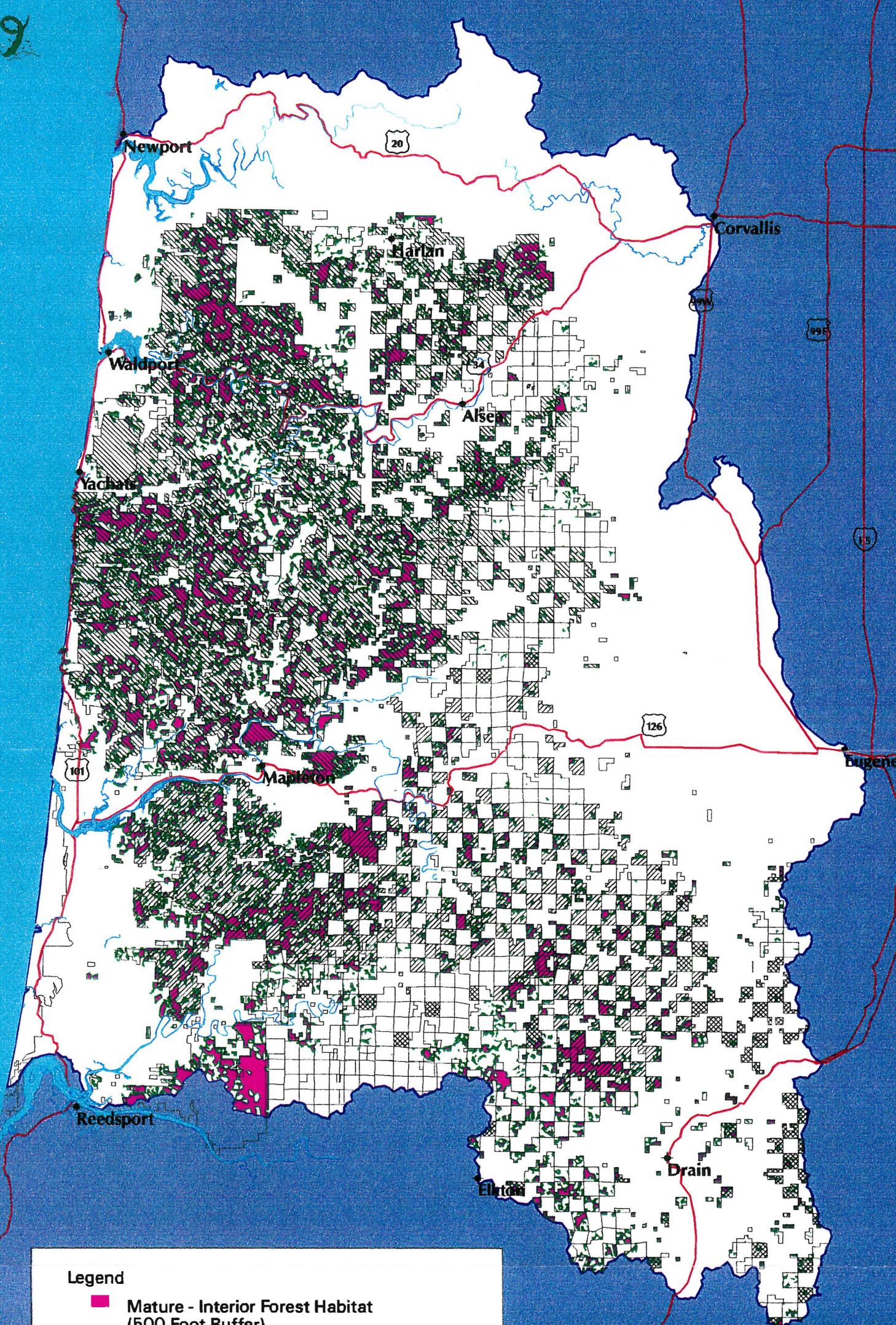


October 07, 1996

Map 9

LSR Assessment Study Area Interior Forest Habitat

Pacific Ocean



Legend

- Mature - Interior Forest Habitat (500 Foot Buffer)
- Mature - Non-interior Forest Habitat
- LSR R0268
- LSR R0267
- Connectivity Blocks
- Federal Ownership
- Study Area Boundary Based On Fifth Field Watersheds

Scale 1:489907

Original data was compiled from multiple source data and may not meet the U.S. National Mapping Standards of the Office of Management and Budget. For specific data source dates and/or additional digital information contact the Forest Supervisor, Siuslaw National Forest, Corvallis, Oregon or the Bureau of Land Management, Eugene, Oregon. This map has no warranties to its content or accuracy.



October 07, 1998

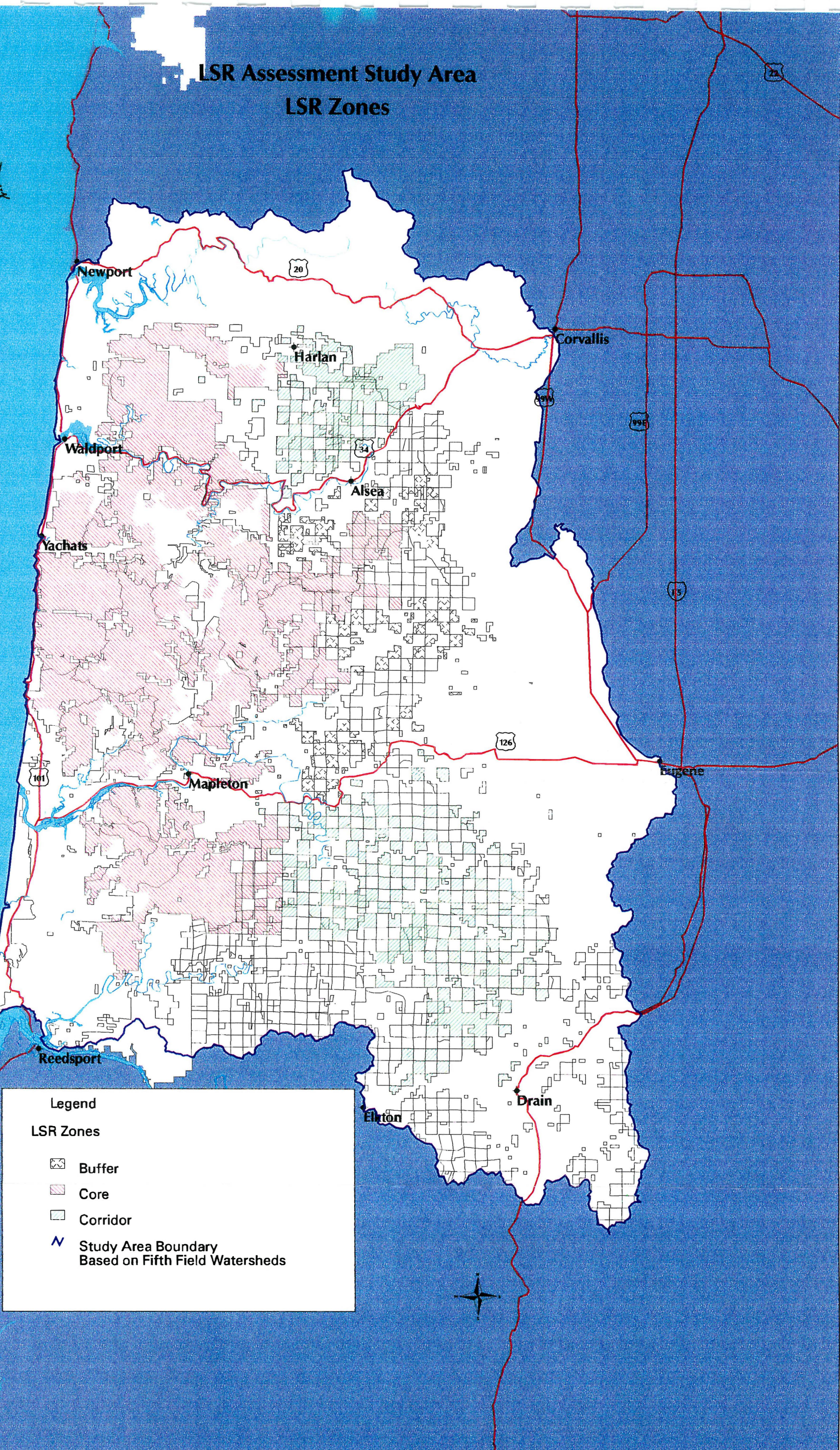
Map 10

LSR Assessment Study Area

LSR Zones



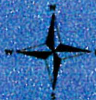
Pacific Ocean



Legend

LSR Zones

- Buffer
- Core
- Corridor
- Study Area Boundary
Based on Fifth Field Watersheds



Scale 1:489907

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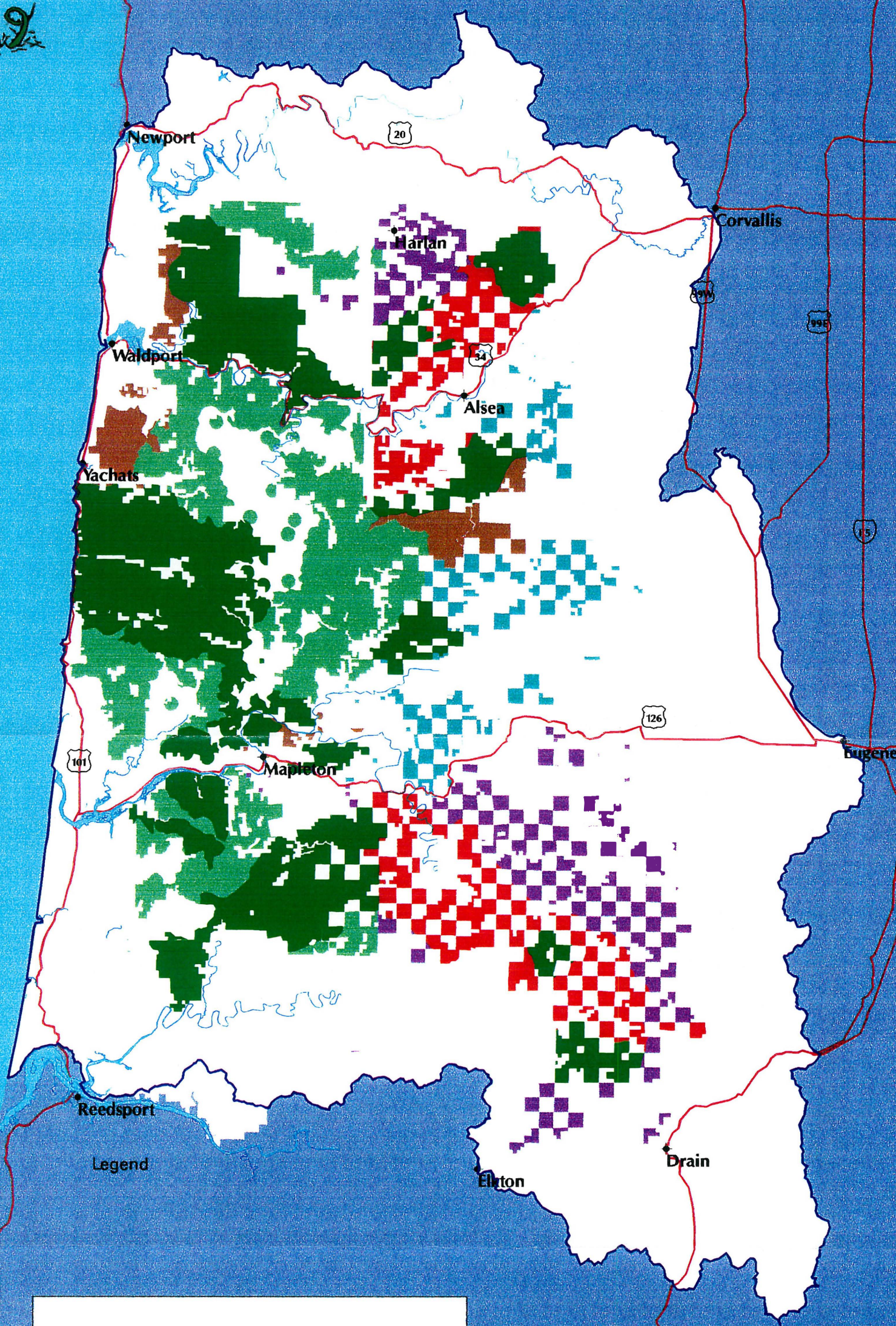


June 17, 1987

LSR Assessment Study Area LSR Landscape Cells



Pacific Ocean



Landscape Cells - Current Condition

- 1 - Mature
- 2 - Mixed Seral
- 3 - Early Seral/Core
- 4 - Early Seral/Link To Mature
- 5 - Early Seral/Corridor
- 6 - Early Seral/Buffer
- Study Area Boundary
- Based on Fifth Field Watersheds

Scale 1:489907

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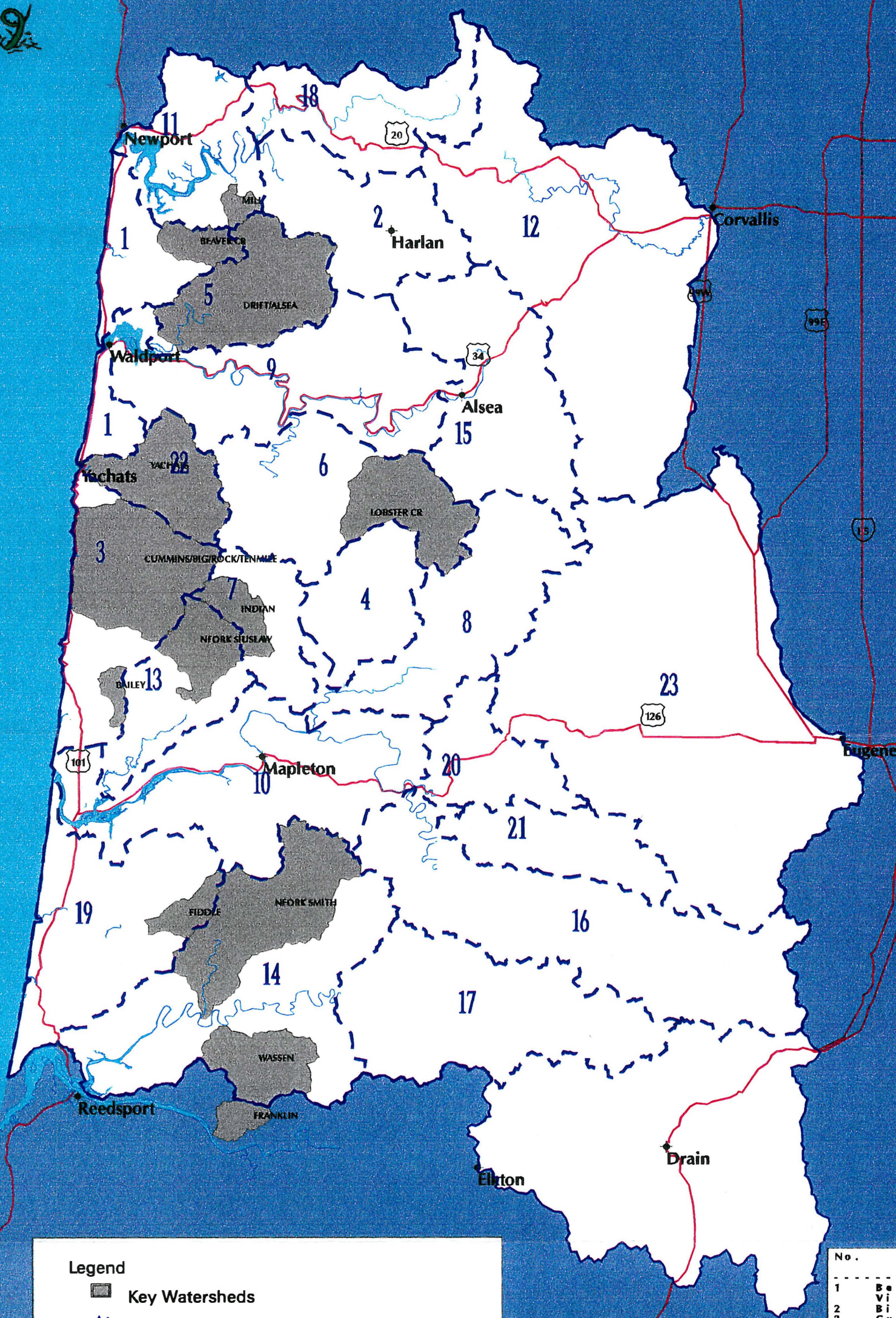


June 17, 1997

LSR Assessment Study Area LSR Fifthfield and Key Watersheds



Pacific Ocean



Legend

- Key Watersheds
- Study Area Boundary Based on Fifth Field Watersheds
- Fifth Field Watershed Boundaries

No.	Fifth Field Watersheds
1	Beaver / Waldport / Vingie Cr.
2	Big Elk Cr.
3	Cummins / Ten Mile / Mercer Lake
4	Deadwood Cr.
5	Drift Cr.
6	Five Rivers / Lobster Cr.
7	Indian Cr.
8	Lake Cr.
9	Lower Alsea R.
10	Lower Siuslaw R.
11	Lower Yaquina R.
12	Marys River
13	North Fork Siuslaw River
14	North Fork Smith / Lower Smith R.
15	Upper Alsea R.
16	Upper Siuslaw R.
17	Upper Smith R.
18	Upper Yaquina R.
19	Wahink / Siltcoos / Tahkenitch Lake
20	Wildcat Cr.
21	Wolf Cr.
22	Yachats River
23	Long Tom River

Scale 1:489907

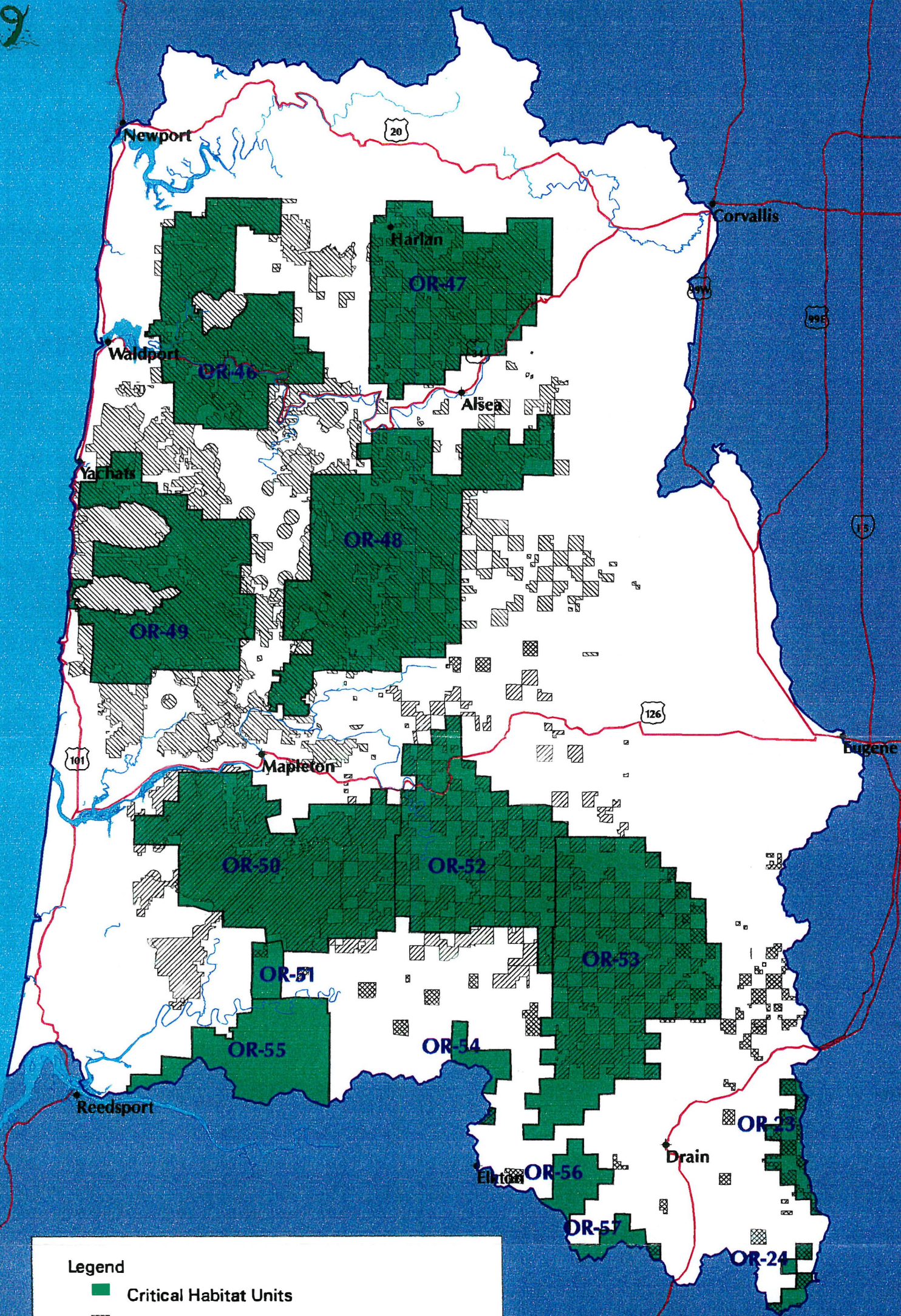
Original data was compiled from multiple source data and may not meet the U.S. National Mapping Standards of the Office of Management and Budget. For specific data source dates and/or additional digital information contact the Forest Supervisor, Siuslaw National Forest, Corvallis, Oregon or the Bureau of Land Management, Eugene, Oregon. This map has no warranties to its content or accuracy.



October 07, 1998

LSR Assessment Study Area Critical Habitat Units For The Northern Spotted Owl

Pacific Ocean



Legend

- Critical Habitat Units
- LSR R0268
- LSR R0267
- Connectivity Blocks
- Study Area Boundary
Based on Fifth Field Watersheds

Scale 1:489907

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October 07, 1996

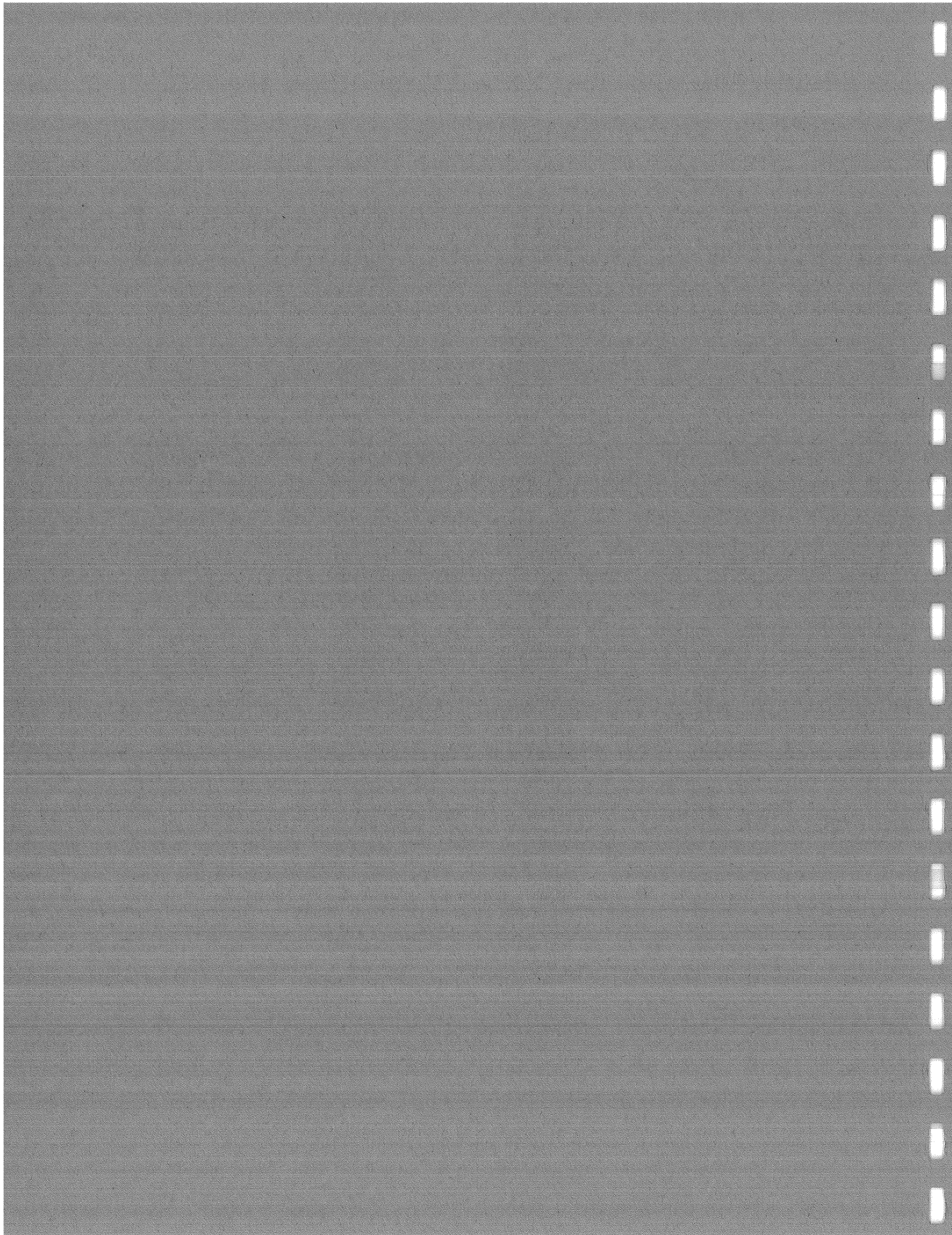
APPENDICES

LSR ASSESSMENT

Oregon Coast Province

-Southern Portion-

(RO267,RO268)



Appendices

A - Fire Management Plan

B - Seral Stage Documentation

C - Wildlife Species Lists by Habitat Type

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Animal Species of Concern (Federal and State)

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Riparian/Wetland Plants of Concern

Coastal Plant Species of Concern

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May 9, 1995

July 9, 1996

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Western Hemlock - Moist Sub-Series Environment - Disturbance Regime 5&6

Western Hemlock - Dry Sub-Series Environment - Disturbance Regime 5&6

Western Hemlock - Wet Sub-Series Environment - Disturbance Regime 8

Western Hemlock - Moist Sub-Series Environment - Disturbance Regime 8

Western Hemlock - Dry Sub-Series Environment - Disturbance Regime 8 without
intermediate disturbance

Western Hemlock - Wet Sub-Series Environment - Disturbance Regime 8 with
intermediate disturbance

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Acres and % Private/Federal Ownership by 5th Field Watershed

Current Seral Stage by 5th Field Watershed

Mature versus Other Seral Types on Federal Lands by 5th Field Watershed

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T&E Species Information by 5th Field Watershed

Percent of Seral Classes of Management Age by CHU

I - Adaptive Management Strategy Example

APPENDIX A

FIRE MANAGEMENT PLAN

FIRE MANAGEMENT PLAN

Risk from Ignition Sources

Fire occurrence in this LSR area between 1970-1995 was very low with .03 fires occurring per 1000 acres per year. These fires were predominantly human caused with slash burning and abandoned campfires accounting for the majority of the fires. Smoking, equipment use, and other miscellaneous sources accounted for the remainder of the human caused fires. Fifteen fires were caused by lightning over the 25 year period.

The most recent large fire in the area (the Oxbow burn) occurred in 1966. This human caused fire burned a total of 42,000 acres. A total of 1,700 acres in the eastern portion of LSR RO267, administered by the Bureau of Land Management burned in this fire.

The largest and highest intensity fires since 1970 were caused by slash burning. These fires occurred on the outside edge of broadcast burned clear-cut harvest sale areas. Generally the cause of these escapes can be attributed to burning under very dry conditions with east winds. This type of weather condition was necessary to meet objectives of the Oregon Smoke Management Plan, which was to avoid impacting the Willamette Valley with Smoke. The objective for these prescribed fires was to prepare the site for reforestation and to a lesser extent to reduce the fire hazard created after the harvest. A total of 44 fires in the LSR were caused by this activity. These fires ranged between 1 to 110 acres in size.

Since clear-cutting and broadcast burning will not be an activity within the federally managed portion of the LSR this cause of fire will be reduced. Management ignited prescribed fire will still be considered where appropriate for meeting LSR objectives (i.e. to maintain T&E species, to decrease excessive ladder fuels).

Prescribed fires that escape from private landowners onto federal land are still a possibility. This occurred in 1995 and burned 10 acres of the LSR, with moderate to high intensity. The Oregon Department of Forestry (ODF) regulates burning on private land. Considering fire danger and risk of the fire escaping, ODF issues a burning permit that requires specific fire fighting resources to be on the site of the burn. This greatly reduces the risk of a large scale fire event.

The remainder of human caused and lightning fires all burned at a very low intensity with little resource damage. The size of these fires ranged between .01 to .1 of an acre.

Wildfire Strategies

To achieve the objective of protecting and enhancing conditions of late-successional forest ecosystems in the LSR all wildfires will be suppressed. These ecosystems are not fire-dependent systems. To minimize burned acres and loss of habitat a control strategy will be employed. Resource protection, and maintaining existing late-Successional habitat will be the primary goals

of the suppression action. Direction on fire suppression is found in Forest Service Manual (FSM) 5100 Chapter 5130, Siuslaw National Forest Fire Management Action Plan, BLM Manual 9214 and BLM Resource Management Plans.

During fire suppression activities, fire managers will consult with resource specialist familiar with the area, refer to standards and guidelines for the LSR, and ensure that habitat damage is minimized. The responsible Line Officer will designate a resource advisor to the fire incident that will have responsibility equal to other members of the fire suppression organization. The designated resource advisor will be part of the team assembled by the Line Officer for development of the Escape Fire Situation Analysis (EFSA) as described in FSM 5132 and BLM Manual 9210, for Line Officer Approval.

Suppression Techniques to Minimize Habitat Damage

1. Avoid the draw down of pools of water in creeks and rivers during low water flows.
2. Do not allow the use of heavy equipment in stream channels.
3. Avoid the use of retardant and heavy equipment in riparian areas.
4. Locate base and spike camps outside of known locations of threatened and endangered species.
5. Minimize the building of any new roads or widening of existing roads.
6. Include construction of waterbars as standard procedures on all roads and firelines used by fire fighting equipment.
7. Develop a fire rehabilitation plan through an interdisciplinary process. Select treatments on the basis of on-site values, probability of successful implementation, social and environmental considerations (including protection of native plant community), and cost as compared to benefits.

Prescribed Natural Fire

Prescribed Natural Fire (PNF) is not recommended at this time for the following reasons:

The ecological role of fire in the LSR is well within the two fire return intervals as described in Chapter II.

Implementation of PNF would be risky due to the large private land holdings within the LSR.

Management ignited prescribed fire will still be considered where appropriate for meeting LSR objectives with less risk.

Short Term Risks

Thinning and creation of coarse woody material (CWD) in managed stands will temporarily increase the risk of a large scale fire event due to the increase in fine fuels created by these activities. Factors affecting the level of increased fire hazard are, stand age and density, spacing, and yarding method. The expected fine dead fuel loading after thinning should range between 7 to 25 tons per acre, depending on the number of trees that will be thinned from the stand. Fine dead fuels are defined as dead vegetative materials 3 inches in diameter or less fine fuels are an important consideration in the risk of a fire event since they represent the component of the fuel profile that most influences the rate at which a fire will spread. The fine fuels should decompose to background levels, within 3 to 10 years after the thinning. This portion of the fuel profile by itself represents a temporary risk that is acceptable as long as contiguous slash is not present over large areas and adjacent to main travel routes.

All of the human caused fires in the LSR the last 25 years have occurred in close proximity to roads. Over the next 5 to 10 years there will be up to 50% fewer roads in the LSR maintained for public travel (Siuslaw National Forest Access and Travel Management Plan). The decrease in available roads will concentrate traffic on the roads that are maintained and left open. When roads that are left open are adjacent to thinning areas an increased potential for a fire start will exist. Due to the mixed ownership surrounding the lands managed by the BLM, there will continue to be a higher risk for human caused fires adjacent to road corridors.

South aspects are another area of concern where risk of a fire is high. A review of 269 fire reports from 1970 - 1995 on the Siuslaw National Forest showed that 64% of the fires were on a south aspect, 19% on a west aspect, 12% on an east aspect and 5% on a north aspect.

Short Term Risk Reduction Treatments

Acceptable methods to accomplish short term risk reduction include: hand piling; grapple piling; swamper burning; yarding; lop and scatter; and chipping.

The following treatment may be prescribed when a thinning occurs adjacent to a private property line or an open primary or secondary road:

1. Piling and burning of material more than 2 feet long and up to 3 inches in diameter at the small end, within 50 to 100 feet of the road prism and the private property line will be allowed.
2. Burning will only occur outside of the summer months under moist soil and fuel conditions.
3. South aspects will have wider piling specifications.

Long Term Risks

The greatest risk of a large scale fire event occurring in the LSR is the propagation of a sustained independent crown fire. Current research indicates that when tree spacing is less than 20 feet by 20 feet (tree density is greater than 100 trees per acre), then sustaining crowning is possible. Thinning prescriptions that increase the spacing between trees to greater than 20 feet by 20 feet will reduce the threat of a running crown fire. The creation of Coarse Woody Material (CWD) will add a longer term duration of risk than the fine fuel load created by the thinning. The first additional risk associated with CWD is that of resistance to control. Resistance to control is defined as the relative difficulty of constructing and holding a control line as affected by resistance to line construction and by fire behavior. CWD would hinder the use of direct handline fireline construction. Heavy equipment may be necessary in some areas to construct fireline due to contiguous concentrations of CWD. The greatest risk with CWD would be in areas that have an excess of 40 pieces per acre, a minimum diameter at the small end of the log of 14 inches and a minimum length of 40 feet.

The second additional risk would come from the increased risk of crowning potential. The amount and condition of fuels at or near the forest floor and the intensity at which they burn greatly influences the propagation of a crown fire. Increasing amounts of CWD would increase the intensity and duration of surface fires, raising the likelihood of crown fires.

APPENDIX B

SERAL STAGE DOCUMENTATION

Appendix 6. Development of Seral Stage Classifications

The current seral stage coverage for the assessment area was developed by combining polygon vegetation datasets from both the Salem and Eugene Districts BLM and the Siuslaw National Forest. All vegetation datasets were developed from 1:12000 aerial photo interpreted data.

Items used in this classification that were common to both datasets were: primary and secondary species; mean sizeclass; age of stands; and type (managed or natural).

These items were used to designate seral stages using the following criteria:

	USFS	BLM
Very Early	-plantations <= 10 yrs	plantations <= 10 yrs
Early 11-25 yrs	-conifer plantations 11-24 yrs OR -natural conifer stands 5-10" dbh	-conifer plantations 11-24 yrs
Early mix 11-24 yrs	-conifer/hardwood mixed stands 11-24 yrs OR -natural conifer hardwood 5-10" dbh	-conifer/hardwood mixed stands 11-24 yrs
Early 25-50 yrs	-conifer plantations 25-50 yrs	-conifer plantations 25-50 yrs
Early mix 25-50 yrs	-conifer/hardwood mixed stands 25-50 yrs	-conifer/hardwood mixed stands 25-50 yrs
Mid	-conifer plantations >50 yrs OR -conifer natural stands 10-18" dbh OR -conifer natural stands 51-80 yrs	-conifer stands 51-80 years
Mid mix	-conifer/hardwood mixed plantations >50 yrs OR -conifer/hardwood natural stands 10-18" dbh OR -conifer/hardwood natural stands 51-80 yrs	-conifer/hardwood mixed stands 51-80 yrs
Late	-conifer natural stands >18" dbh	-conifer stands >80 yrs
Late mix	-conifer/hardwood mixed stands >18" dbh	-conifer/hardwood mixed stands >80 yrs

APPENDIX C

WILDLIFE SPECIES LISTS BY HABITAT TYPE

LSR Assessment (R0267/R0269) - Species which are strongly associated with mature or late-successional forests. Populations of these species will likely increase in the LSR

CLASS	COMMON NAME	SCIENTIFIC NAME	LOG	SNAG	COMMENTS
Amphibian	Northwestern Salamander	<i>Amphispemanoidea</i>	*		Uses underground burrows, rotting logs, moist crevices, lay eggs in slow water
Amphibian	Clouded Salamander	<i>Ambystoma opacum</i>	*		Found under decaying logs and forest litter. Eggs laid in cavities in wood
Amphibian	Tailed Frog	<i>Ascaphus truei</i>	*		Cold, fast-moving permanent forest streams, hides under rocks
Amphibian	Pacific Giant Salamander	<i>Dicamptodon ensatus</i>	*		In streams during breeding season, can be found in moist forests
Amphibian	Dunn's Salamander	<i>Plethodon dunni</i>	*		Lungless, moist, shade, mossy rock areas, seeps, along perennial streams
Amphibian	Western Redback Salamander	<i>Plethodon vehiculum</i>	*		Under leaf litter, bark and other forest floor debris, talus slopes
Amphibian	Southern Torrent Salamander	<i>Rhyacotriton variegatus</i>			Always in moist areas near flowing water (46-54 degrees F), mossy gravel
Amphibian	Rough-skinned Newt	<i>Taricha granulosa</i>			Most commonly found in moist forests
Bird	Northern Goshawk	<i>Accipiter gentilis</i>	*		Primarily forest dwellers, hunt from perch or while flying through forest
Bird	Wood Duck	<i>Aix sponsa</i>	*	*	Nests in hollow cavities of large living or dead trees
Bird	Marbled Murrelet	<i>Brachyramphus marmoratus</i>			Prefer large conifer nest tree with large limbs/deformities, feeds in ocean
Bird	Bufflehead	<i>Bucephala albeola</i>		*	Prefers forested water edges for breeding, nests in cavity in snags
Bird	Barrow's Goldeneye	<i>Bucephala islandica</i>	*	*	Lakes and ponds with forested edges, nests in tree cavities
Bird	Hermit Thrush	<i>Catharus guttatus</i>			Dense conifer stands with brushy understory, found in younger stands also
Bird	Brown Creeper	<i>Certhia americana</i>		*	Cavity nester, feeds on bark insects
Bird	Vaux's Swift	<i>Chaetura vauxi</i>		*	Cavity nester, needs large snags, forages over open waters and meadows
Bird	Northern Flicker	<i>Colaptes auratus</i>	*	*	Cavity nesters, found near large trees in open woodlands, clearings
Bird	Hermit Warbler	<i>Dendroica occidentalis</i>			Common in all age conifer stands, prefers stands with large trees
Bird	Pileated Woodpecker	<i>Dryocopus pileatus</i>	*	*	Feeds in younger forests also, if large snag component present
Bird	Pacific-slope Flycatcher	<i>Empidonax difficilis</i>			Well shaded forests, canyon bottoms w/flowing water, forages in openings
Bird	Hammond's Flycatcher	<i>Empidonax hammondi</i>			Usually drier habitats, stream bottoms with deciduous trees, edges
Bird	Northern Pygmy Owl	<i>Glaucidium gnoma</i>		*	Cavity nester, prefers edges/ecotones
Bird	Northern Bald Eagle	<i>Haliaeetus leucocephalus</i>			Nest in large conifer trees in close proximity to fish-bearing waterways
Bird	Harlequin Duck	<i>Histrionicus histrionicus</i>			Associated with forested streams, can be seen in estuaries, bays
Bird	Varied Thrush	<i>Ixoreus naevius</i>			Dense, moist coniferous forests
Bird	Hooded Merganser	<i>Lophodytes cucullatus</i>		*	Wooded lakes, ponds, rivers, streams, nests in large tree cavities
Bird	Red Crossbill	<i>Loxia curvirostra</i>			Mature coniferous forests only
Bird	Common Merganser	<i>Mergus merganser</i>	*	*	Rarely coastal bays, usually wooded lakes, ponds, rivers, streams, cavity nester
Bird	Chestnut-backed Chickadee	<i>Parus rufescens</i>		*	Cavity nester in snags, feed along shrubby edges
Bird	Hairy Woodpecker	<i>Picoides villosus</i>	*	*	Nest in large live trees in open conifer forests
Bird	Golden-crowned Kinglet	<i>Regulus satrapa</i>			Closed canopy stands of conifer to mix conifer/hardwood
Bird	Red-breasted Nuthatch	<i>Sitta canadensis</i>	*	*	Coniferous to mixed coniferous forests, eats bark insects and conifer seed

CLASS	COMMON NAME	SCIENTIFIC NAME	LOG SNAG		COMMENTS
Bird	White-breasted Nuthatch	<i>Sitta carolinensis</i>	*	*	Forests, woodlots, groves, shade trees, visits feeders
Bird	Red-breasted Sapsucker	<i>Sphyrapicus ruber</i>		*	Feeds on sap from live deciduous trees and insects, nest in cavity
Bird	Northern Spotted Owl	<i>Strix occidentalis caurina</i>		*	Nests in cavities or sheltered platforms, snags or broken top trees
Bird	Barred Owl	<i>Strix varia</i>	*	*	Increasing their range, prefer much the same habitat as the spotted owl
Bird	Winter Wren	<i>Troglodytes troglodytes</i>	*		Coniferous forests, shrubby undergrowth. Nests in brush piles, logs, cavities
Bird	Warbling Vireo	<i>Vireo gilvus</i>			Open deciduous stands, riparian alder thickets
Bird	Wilson's Warbler	<i>Wilsonia pusilla</i>			Mesic sites, along streams, deciduous woodlands
Mammal	Western Red-backed Vole	<i>Clethrionomys californicus</i>	*		Need rotting/punky logs, little ground vegetation, closed canopy conifer
Mammal	Big Brown Bat	<i>Eptesicus fuscus</i>		*	Roosts in cavities made by other animals, crevices
Mammal	Townsend Chipmunk	<i>Eutamias townsendi</i>	*		Mostly riparian alder but upland conifer habitat as well
Mammal	Northern Flying Squirrel	<i>Glaucomys sabrinus</i>	*	*	Conifer forests, occasionally in riparian hardwoods
Mammal	Silver-haired Bat	<i>Lasionycteris noctivagans</i>		*	Coniferous forests, rest under loose bark and in cavities
Mammal	Hoary Bat	<i>Lasiurus cinereus</i>			Primarily conifer or mixed conifer/deciduous
Mammal	Pine Marten	<i>Martes americana</i>	*	*	Need large amount of standing and down dead woody material near streams
Mammal	Pacific Fisher	<i>Martes pennanti pacifica</i>	*	*	Prefer mostly dense conifer stands with some hardwood, require dense cover
Mammal	California Bat	<i>Myotis californicus</i>		*	Mature conifer to grasslands, riparian areas
Mammal	Long-eared Bat	<i>Myotis evotis</i>		*	Mature to immature conifer, salal
Mammal	Little Brown Bat	<i>Myotis lucifugus</i>		*	Appear in all habitat types but affinity for conifer forests
Mammal	Fringed Myotis	<i>Myotis thysanodes</i>		*	Roosts in caves, buildings, crevices
Mammal	Long-legged Bat	<i>Myotis volans</i>			Mature to immature conifer and sometimes in riparian alder/salmonberry
Mammal	Yuma Bat	<i>Myotis yumanensis</i>		*	Large streams/rivers, ponds and lakes, feed close to water's surface
Mammal	Shrew-Mole	<i>Neurotrichus gibbsi</i>	*		Most common in alder/salmonberry but upland forests and meadows also
Mammal	White-footed Vole	<i>Phenacomys albipes</i>	*		Prefers large amount of dead and down woody material
Mammal	Red Tree Vole	<i>Phenacomys longicaudus</i>			Nocturnal, highly dependent on Douglas-fir but utilize Sitka spruce and hemlock
Mammal	Marsh Shrew	<i>Sorex bendirei</i>	*		Disperse to uplands in wet winters, skunkcabbage marshes small alder stream
Mammal	Pacific Shrew	<i>Sorex pacificus</i>	*		Alder/salmonberry, skunkcabbage marsh, less often in Douglas-fir stands
Mammal	Douglas' Squirrel	<i>Tamiasciurus douglasi</i>	*	*	Conifer, sometimes riparian hardwoods, spruce/salal habitat

Appendix C. LSR Assessment (R0267/R0268) - Neotropical Migratory Birds (Breed in North America and winter south of Mexico). Songbird populations will likely increase in the LSR. Species which use logs or snags are indicated with an "*".

COMMON NAME	SCIENTIFIC NAME	LOG	SNAG	COMMENTS
Cooper's Hawk	<i>Accipiter cooperii</i>	*		Prefers mosaic of hardwood/conifer with small clearings
Sharp-shinned Hawk	<i>Accipiter striatus</i>	*		Usually nest in even-aged young conifer stands
Golden Eagle	<i>Aquila chrysaetos</i>			Usually nests on cliff ledges but occasionally in large trees
Short-eared Owl	<i>Asio flammeus</i>			Meadows, marshes, pastureland (ungrazed or unmowed), nest on ground
Long-eared Owl	<i>Asio otus</i>			Breeds in hardwood and conifer, feeds in same and wet meadows and edges
Cedar Waxwing	<i>Bombycilla cedrorum</i>			Prefers deciduous but found in brush stages of conifer in breeding season
Bohemian Waxwing	<i>Bombycilla garrulus</i>			Winters in this area only, nests up North
Red-tailed Hawk	<i>Buteo jamaicensis</i>			Needs open areas to forage, usually nests along edges in large tree or cliff
Anna's Hummingbird	<i>Calypte anna</i>			Gardens, open woodlands, more common in California
Lesser Goldfinch	<i>Carduelis psaltria</i>			Open, brushy country with scattered trees and weedy streambanks
American Goldfinch	<i>Carduelis tristis</i>			Open country, forest openings, shrub stage in deciduous riparian areas
Purple Finch	<i>Carpodacus purpureus</i>			Small flocks among tree tops, mostly wooded areas
Turkey Vulture	<i>Cathartes aura</i>	*		Communal roosters, sometimes nest on ground
Hermit Thrush	<i>Catharus guttatus</i>			Dense conifer stands with brushy understory, found in younger stands also
Swainson's Thrush	<i>Catharus ustulatus</i>			More common in younger stands, likes riparian thickets, mesic areas
Belted Kingfisher	<i>Ceryle alcyon</i>			Deciduous and conifer riparian areas, nests in burrows on banks
Vaux's Swift	<i>Chaetura vauxi</i>		*	Cavity nester, needs large snags, forages over open waters and meadows
Killdeer	<i>Charadrius vociferus</i>			Highly adaptable, found in open habitats, pastures, plowed fields, mud flats
Lark Sparrow	<i>Chondestes grammacus</i>			Open areas, sparsely vegetated with scattered trees and shrubs, pastureland
Common Nighthawk	<i>Chordeiles minor</i>			Nests on dry ground in clearings, forages over clearings and riparian areas
Northern Harrier	<i>Circus cyaneus</i>			Often near marshes or dunes
Marsh Wren	<i>Cistothorus palustris</i>			Fresh to brackish water marshes, cattails, rushes/sedges
Band-tailed Pigeon	<i>Columba fasciata</i>			Mixed conifer/hardwood, mineral springs, more common in mature conifer
Olive-sided Flycatcher	<i>Contopus borealis</i>		*	Open conifer stands, likes high perching trees/snags, usually nests in conifer
Western Wood-pewee	<i>Contopus sordidulus</i>			Semi-open conifer or hardwood/conifer stands, shuns steep slopes
Yellow-rumped Warbler	<i>Dendroica coronata</i>			Conifer to mixed stands, avoids closed-canopy pure conifer, nest in conifer
Black-throated Gray Warbler	<i>Dendroica nigrescens</i>			Avoids pure stands of conifer, prefers open forest with shrub layer
Hermit Warbler	<i>Dendroica occidentalis</i>			Common in all age conifer stands, prefers stands with large trees
Yellow Warbler	<i>Dendroica petechia</i>			Most widespread warbler, found in riparian alder thickets, also clear cuts
Townsend's Warbler	<i>Dendroica townsendi</i>			Coniferous forest, usually high in trees
Pacific-slope Flycatcher	<i>Empidonax difficilis</i>			Well shaded forests, canyon bottoms w/flowing water, forages in openings
Hammond's Flycatcher	<i>Empidonax hammondi</i>			Usually drier habitats, stream bottoms with deciduous trees, edges
Willow Flycatcher	<i>Empidonax traillii</i>			Deciduous thickets, shrubby component, clearcuts with willow/vine maple
Horned Lark	<i>Eremophila alpestris</i>			Stocky ground bird, occurs in wide variety of open habitats
Brewer's Blackbird	<i>Euphagus cyanocephalus</i>			Meadows, mesic areas, ranches, riparian areas, thickets

COMMON NAME	SCIENTIFIC NAME	LOG	SNAG	COMMENTS
Merlin	<i>Falco columbarius</i>			Forages open habitats, salt marshes, estuaries, nests in conifer
American Peregrine Falcon	<i>Falco peregrinus</i>			Often near large body of water, hunts shorelines and over open water
American Kestrel	<i>Falco sparverius</i>		*	Nests in cavities, forages in clearings
Common Yellowthroat	<i>Geothlypis trichas</i>			Dense understory preferred
Cliff Swallow	<i>Hirundo pyrrhonota</i>			Bridges, cliffs or man-made structures for nesting
Barn Swallow	<i>Hirundo rustica</i>			Open forests, farmlands, rural areas, nest only in man-made structures
Yellow-breasted Chat	<i>Icteria virens</i>			Tangled thickets along riparian areas, upland deciduous scrub
Northern Oriole	<i>Icterus galbula</i>			Open deciduous woodlands, residential neighborhoods
Loggerhead Shrike	<i>Lanius ludovicianus</i>			Prefers open country, meadows, pastureland, thinly wooded areas
Northern Mockingbird	<i>Mimus polyglottos</i>			Inhabits thickets, woodland edges, rural areas on east side
Brown-headed Cowbird	<i>Molothrus ater</i>			Rural and agricultural areas, favors riparian areas, parasitic nester
Townsend's Solitaire	<i>Myadestes townsendi</i>			Occurs in small groups in coniferous forests, rocky cliffs, wooded streams
Long-billed Curlew	<i>Numenius americanus</i>			Largest shorebird, frequents marshes, mud flats, sandbars, shorelines
MacGillivray's Warbler	<i>Oporornis tolmiei</i>			Coniferous forest edges, small clearings
Osprey	<i>Pandion haliaetus</i>		*	Nests on top of snags/poles near fish-bearing lakes and streams
Savannah Sparrow	<i>Passerculus sandwichensis</i>			Dense grasslands, nest in grass, wet meadows, salt spray meadows
Lazuli Bunting	<i>Passerina amoena</i>			Often found in riparian areas and early seral stages of deciduous stands
Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>			Deciduous stands in conifer forests, common in young stands of conifer
Western Tanager	<i>Piranga ludoviciana</i>			Prefer open forest, nest in mature conifer, forages in shrubs, eats berries
Vesper Sparrow	<i>Poocetes gramineus</i>			Grasslands and agricultural areas, open grassy areas
Purple Martin	<i>Progne subis</i>		*	Along rivers, estuaries, nests in cavities in forest edges or openings
Ruby-crowned Kinglet	<i>Regulus calendula</i>			Conifer forests, moderate to high elevations
Bank Swallow	<i>Riparia riparia</i>			Need bare perpendicular banks with sandy or loam soils for nesting
Rock Wren	<i>Salpinctes obsoletus</i>			Open, rocky areas, found more commonly to the east
Rufous Hummingbird	<i>Selasphorus rufus</i>			Nest in shrubs or low tree branches, forages along edges and clearings
Chipping Sparrow	<i>Spizella passerina</i>			Common in gardens, forest edges and open woodlands and meadows
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>			Deciduous riparian habitat, nests in bare river banks
Calliope Hummingbird	<i>Stellula calliope</i>			Feeds in mountainous meadows, riparian areas, nests in decid/conifer trees
Western Meadowlark	<i>Sturnella neglecta</i>			Prefer dry grasslands and uplands
European Starling	<i>Sturnus vulgaris</i>		*	Cavities or crevices for nesting, farmlands, cities, widespread
Tree Swallow	<i>Tachycineta bicolor</i>		*	Requires snags for nesting (away from forest edges), associated with water
Violet-green Swallow	<i>Tachycineta thalassina</i>		*	Needs snags for nesting/perching, usu. near water, forages in open habitat
House Wren	<i>Troglodytes aedon</i>	*	*	Nest cavities in low trees <3m from ground
American Robin	<i>Turdus migratorius</i>			Open woodlands, rural areas, farmlands
Western Kingbird	<i>Tyrannus verticalis</i>			Prefers dry open country, riparian areas. Nests in shrubs and trees
Orange-crowned Warbler	<i>Vermivora celata</i>			Mesic, north-facing slopes, brushy tangles, openings in forest
Nashville Warbler	<i>Vermivora ruficapilla</i>			Occurs mostly in second growth woodlands, brushy wetlands, managed stands
Warbling Vireo	<i>Vireo gilvus</i>			Open deciduous stands, riparian alder thickets
Red-eyed Vireo	<i>Vireo olivaceus</i>			Mixed and deciduous forests, also suburban shade trees

COMMON NAME	SCIENTIFIC NAME	LOG	SNAG	COMMENTS
Solitary Vireo	<i>Vireo solitarius</i>	☐	☐	Nests in riparian deciduous trees, avoids grass/forb and brushy areas
Wilson's Warbler	<i>Wilsonia pusilla</i>	☐	☐	Mesic sites, along streams, deciduous woodlands
Yellow-headed Blackbird	<i>Xanthocephalus xanthocephalus</i>	☐	☐	Marshes, sloughs, sedges/rushes, wet meadows
Mourning Dove	<i>Zenaida macroura</i>	☐	☐	Open hardwood/conifer forests, dependent on pastures and meadows
White-throated Sparrow	<i>Zonotrichia albicollis</i>	☐	☐	Accidental during migration in Willamette Valley
White-crowned Sparrow	<i>Zonotrichia leucophrys</i>	☐	☐	Edges, riparian areas, open forests, clearings

LSR Assessment (R0267/R0268) - Contrast (Edge) species and species which utilize a mosaic of habitat types. Populations of these species may decline in interior forests, but will remain stable along riparian areas, and adjacent to industrial forest lands and agricultural areas. NTMB indicates neotropical migratory birds.

CLASS	COMMON NAME	SCIENTIFIC NAME	Log	Snag	NTMB	Comments
Bird	Cooper's Hawk	<i>Accipiter cooperii</i>	*		Y	Prefers mosaic of hardwood/conifer with small clearings
Bird	Scrub Jay	<i>Aphelocoma coerulescens</i>				Common in dry open brushland, valleys, near human habitation
Bird	Short-eared Owl	<i>Asio flammeus</i>			Y	Meadows, marshes, pastureland (ungrazed or unmowed), nest on ground
Bird	Great Horned Owl	<i>Bubo virginianus</i>		*		Forages along edges and clearings
Bird	Cattle Egret	<i>Bubulus ibis</i>				Prefers open pastures, agricultural areas, often away from water
Bird	Red-tailed Hawk	<i>Buteo jamaicensis</i>			Y	Needs open areas to forage, usually nests along edges in large tree or cliff
Bird	Rough-legged Hawk	<i>Buteo lagopus</i>				Frequents open areas, nests on rock ledges, hillsides or short trees
Bird	Lesser Goldfinch	<i>Carduelis psaltria</i>			Y	Open, brushy country with scattered trees and weedy streambanks
Bird	American Goldfinch	<i>Carduelis tristis</i>			Y	Open country, forest openings, shrub stage in deciduous riparian areas
Bird	Turkey Vulture	<i>Cathartes aura</i>	*		Y	Communal roosters, sometimes nest on ground
Bird	Olive-sided Flycatcher	<i>Contopus borealis</i>		*	Y	Open conifer stands, likes high perching trees/snags, usually nests in conifer
Bird	Brewer's Blackbird	<i>Euphagus cyanocephalus</i>			Y	Meadows, mesic areas, ranches, riparian areas, thickets
Bird	Merlin	<i>Falco columbarius</i>			Y	Forages open habitats, salt marshes, estuaries, nests in conifer
Bird	American Kestrel	<i>Falco sparverius</i>		*	Y	Nests in cavities, forages in clearings
Bird	Northern Oriole	<i>Icterus galbula</i>			Y	Open deciduous woodlands, residential neighborhoods
Bird	Northern Shrike	<i>Lanius excubitor</i>				Winters in this area only, nests in Alaska/Canada, hunts the edges
Bird	Loggerhead Shrike	<i>Lanius ludovicianus</i>			Y	Prefers open country, meadows, pastureland, thinly wooded areas
Bird	Mountain Quail	<i>Oreortyx pictus</i>				Brushy areas with open ground, roadsides
Bird	Osprey	<i>Pandion haliaetus</i>		*	Y	Nests on top of snags/poles near fish-bearing lakes and streams
Bird	Purple Martin	<i>Progne subis</i>		*	Y	Along rivers, estuaries, nests in cavities in forest edges or openings
Bird	Bushtit	<i>Psaltirparus minimus</i>				Shrub/forest edges, deciduous habitats, flock from shrub to shrub
Bird	European Starling	<i>Sturnus vulgaris</i>		*	Y	Cavities or crevices for nesting, farmlands, cities, widespread
Bird	Barn Owl	<i>Tyto alba</i>		*		Farmlands and marshlands, rural areas, nests in cavities, caves, structures
Mammal	Elk	<i>Cervus elaphus</i>				Edge species. Needs mature forest cover for winter survival
Mammal	Big Brown Bat	<i>Eptesicus fuscus</i>		*		Roosts in cavities made by other animals, crevices
Mammal	Silver-haired Bat	<i>Lasionycteris noctivagans</i>		*		Coniferous forests, rest under loose bark and in cavities
Mammal	Hoary Bat	<i>Lasiurus cinereus</i>				Primarily conifer or mixed conifer/deciduous
Mammal	Striped Skunk	<i>Mephitis mephitis</i>	*			Most common in foredunes and deflation plains, wet pasture, shrub habitat
Mammal	California Bat	<i>Myotis californicus</i>		*		Mature conifer to grasslands, riparian areas
Mammal	Little Brown Bat	<i>Myotis lucifugus</i>		*		Appear in all habitat types but affinity for conifer forests
Mammal	Fringed Myotis	<i>Myotis thysanodes</i>		*		Roosts in caves, buildings, crevices
Mammal	Townsend's Big-eared Bat	<i>Plecotus townsendii</i>				Roosts in caves or abandoned buildings
Mammal	Western Spotted Skunk	<i>Spilogale gracilis</i>	*	*		Use all habitats, common in riparian alder/salmonberry
Mammal	Gray Fox	<i>Urocyon cinereoargenteus</i>	*	*		Found in riparian hardwoods, headland shrub, den in hollow log or tree

LSR Assessment (R0267/R0268) - Species which are strongly associated with early seral habitats. Populations of these species may decline in LSRs, but will likely remain stable along riparian areas, industrial forest lands and agricultural and urban areas. Neotropical migratory species are listed as NTMB.

CLASS	COMMON NAME	SCIENTIFIC NAME	Snag	Log	NTMB	Comments
Amphibian	Western Toad	<i>Bufo boreas</i>	☐	☒	☐	Favor freshwater ponds in dunes on the coast during breeding season
Bird	Spotted Sandpiper	<i>Actitis macularia</i>	☐	☐	☐	Damp patches in meadows, forest streams, pools, ocean surf
Bird	Western Grebe	<i>Aechmophorus occidentalis</i>	☐	☐	☐	Marshes, lakes, coastal waters, fly in loose flocks
Bird	Red-winged Blackbird	<i>Agelaius phoeniceus</i>	☐	☐	☐	Marshes, wetlands with cattails, rushes/sedges
Bird	Northern Pintail	<i>Anas acuta</i>	☐	☐	☐	Second or third most abundant duck, found in shallow lakes and marshes
Bird	American Wigeon	<i>Anas americana</i>	☐	☐	☐	Ponds and marshes
Bird	Northern Shoveler	<i>Anas clypeata</i>	☐	☐	☐	Feed in shallow water, lakes, marshes
Bird	Green-winged Teal	<i>Anas crecca</i>	☐	☐	☐	Prefers feeding on mud flats, shallow marshes, flooded grain fields
Bird	Cinnamon Teal	<i>Anas cyanoptera</i>	☐	☐	☐	Marshes and other wetlands
Bird	Blue-winged Teal	<i>Anas discors</i>	☐	☐	☐	First duck to migrate south, feeds in shallow marshes, mud flats
Bird	Eurasian Wigeon	<i>Anas penelope</i>	☐	☐	☐	Usually seen alone in flock of other waterfowl in ponds and marshes
Bird	Mallard	<i>Anas platyrhynchos</i>	☐	☐	☐	Most abundant duck, found on pasturelands, lakes, marshes, swamps
Bird	Gadwall	<i>Anas strepera</i>	☐	☐	☐	Found on pasturelands, lakes, marshes, swamps
Bird	Great White-fronted Goose	<i>Anser albifrons</i>	☐	☐	☐	
Bird	Golden Eagle	<i>Aquila chrysaetos</i>	☐	☐	☒	Usually nests on cliff ledges but occasionally in large trees
Bird	Great Blue Heron	<i>Ardea herodias</i>	☐	☐	☐	Shallow water, river banks, lake shores, streams, ponds, flooded pasture
Bird	Redhead	<i>Aythya americana</i>	☐	☐	☐	Seen on ponds, marshes and estuaries in the winter
Bird	Brant	<i>Branta bernicla</i>	☐	☐	☐	
Bird	Canada Goose	<i>Branta canadensis</i>	☐	☐	☐	Pasturelands, shallow water
Bird	Dusky Canada Goose	<i>Branta canadensis occidentalis</i>	☐	☐	☐	Feeds in pastures, close to edges
Bird	Lapland Longspur	<i>Calcarius lapponicus</i>	☐	☐	☐	Found in coastal grass fields, open fields with short grass or bare ground
Bird	Baird's Sandpiper	<i>Calidris bairdii</i>	☐	☐	☐	Prefers muddy, sandy or grassy areas in migrations, often seen away from water
Bird	Semipalmated Sandpiper	<i>Calidris pusilla</i>	☐	☐	☐	Vicinity of water in tidal flats, lagoons and ponds
Bird	California Quail	<i>Callipepla californica</i>	☐	☒	☐	Brushy areas with open ground, roosts low in trees and bushes
Bird	Anna's Hummingbird	<i>Calypte anna</i>	☐	☐	☒	Gardens, open woodlands, more common in California
Bird	Great Egret	<i>Casmerodius albus</i>	☐	☐	☐	Typically found in saltwater and freshwater lagoons/marshes along shallow water
Bird	Willet	<i>Catoptrophorus semipalmatus</i>	☐	☐	☐	Usually seen in sloughs and marshes
Bird	Wrentit	<i>Chamaea fasciata</i>	☐	☐	☐	Deciduous hardwoods and riparian areas
Bird	Semipalmated Plover	<i>Charadrius semipalmatus</i>	☐	☐	☐	Most widespread plover, found on beaches, freshly plowed fields, mud flats
Bird	Killdeer	<i>Charadrius vociferus</i>	☐	☐	☒	Highly adaptable, found in open habitats, pastures, plowed fields, mud flats
Bird	Snow Goose	<i>Chen caerulescens</i>	☐	☐	☐	Pasturelands, marshes, wet meadows
Bird	Ross' Goose	<i>Chen rossii</i>	☐	☐	☐	Accidental.
Bird	Lark Sparrow	<i>Chondestes grammacus</i>	☐	☐	☒	Open areas, sparsely vegetated with scattered trees and shrubs, pastureland
Bird	Common Nighthawk	<i>Chordeiles minor</i>	☐	☐	☒	Nests on dry ground in clearings, forages over clearings and riparian areas
Bird	Northern Harrier	<i>Circus cyaneus</i>	☐	☐	☒	Often near marshes or dunes

CLASS	COMMON NAME	SCIENTIFIC NAME	Snag	Log	NTMB	Comments
Bird	Marsh Wren	<i>Cistothorus palustris</i>			Y	Fresh to brackish water marshes, cattails, rushes/sedges
Bird	Rock Dove	<i>Columba livia</i>				Bridges, beaches, bays and areas associated with human inhabitation
Bird	Yellow Rail	<i>Coturnicops noveboracensis</i>				Grassy marshes and wet meadows, grainfields and pastureland
Bird	Trumpeter Swan	<i>Cygnus buccinator</i>				Pasturelands, marshes, wet meadows
Bird	Tundra Swan	<i>Cygnus columbianus</i>				Pasturelands, marshes, wet meadows
Bird	Snowy Egret	<i>Egretta thula</i>				Found in most wetland habitats
Bird	Black-shouldered Kite	<i>Elanus caeruleus</i>				Prefer river valleys, wet meadows, hunt from perch or air
Bird	Horned Lark	<i>Eremophila alpestris</i>			Y	Stocky ground bird, occurs in wide variety of open habitats
Bird	American Coot	<i>Fulica americana</i>				Freshwater lakes, rivers, saltwater bodies also in winter
Bird	Common Snipe	<i>Gallinago gallinago</i>				Peat bogs, marshes and sodden fields
Bird	Black-necked Stilt	<i>Himantopus mexicanus</i>				Uncommon in this region
Bird	Cliff Swallow	<i>Hirundo pyrrhonota</i>			Y	Bridges, cliffs or man-made structures for nesting
Bird	Barn Swallow	<i>Hirundo rustica</i>			Y	Open forests, farmlands, rural areas, nest only in man-made structures
Bird	Herring Gull	<i>Larus argentatus</i>				Common along coastal beaches, urban garbage dumps, agricultural areas
Bird	Western Gull	<i>Larus occidentalis</i>				Common along coastal beaches, urban garbage dumps, agricultural areas
Bird	Long-billed Curlew	<i>Numenius americanus</i>			Y	Largest shorebird, frequents marshes, mud flats, sandbars, shorelines
Bird	Savannah Sparrow	<i>Passerculus sandwichensis</i>			Y	Dense grasslands, nest in grass, wet meadows, salt spray meadows
Bird	Wilson's Phalarope	<i>Phalaropus tricolor</i>				Migrates overland, winters in fresh and saltwater marshes, lakes, coastal bays
Bird	Vesper Sparrow	<i>Poocetes gramineus</i>			Y	Grasslands and agricultural areas, open grassy areas
Bird	Sora	<i>Porzana carolina</i>				Densely vegetated freshwater and saltwater marshes, also wet meadows
Bird	Virginia Rail	<i>Rallus limicola</i>				Mostly in freshwater and brackish marshes, but occasionally in saltwater marsh
Bird	Bank Swallow	<i>Riparia riparia</i>			Y	Need bare perpendicular banks with sandy or loam soils for nesting
Bird	Rock Wren	<i>Salpinctes obsoletus</i>			Y	Open, rocky areas, found more commonly to the east
Bird	Western Bluebird	<i>Sialia mexicana</i>	*			Forest edges and open hardwood or coniferous forests, nest in cavities
Bird	Western Meadowlark	<i>Sturnella neglecta</i>			Y	Prefer dry grasslands and uplands
Bird	Solitary Sandpiper	<i>Tringa solitaria</i>				Stalks shores or wades in shallow, slow-moving streams, ponds, marshes
Bird	Western Kingbird	<i>Tyrannus verticalis</i>			Y	Prefers dry open country, riparian areas. Nests in shrubs and trees
Bird	Yellow-headed Blackbird	<i>Xanthocephalus xanthocephalus</i>			Y	Marshes, sloughs, sedges/rushes, wet meadows
Mammal	Long-tailed Vole	<i>Microtus longicaudus abditus</i>		*		Most common in riparian alder and willow/sedge marsh habitats
Mammal	Townsend's Vole	<i>Microtus townsendii</i>				Deflation plains, willow/sedge marsh, wet pastureland, and tideland rivers
Mammal	Nutria	<i>Myocastor coypus</i>				Wetland habitat, herbivorous, introduced from South America
Mammal	Muskrat	<i>Ondatra zibethicus</i>				Coastal lake and tideland rivers, occasionally riparian alder/streams, ditches
Mammal	Marsh Shrew	<i>Sorex bendirei</i>		*		Disperse to uplands in wet winters, skunkcabbage marshes small alder stream
Mammal	Yaquina Shrew	<i>Sorex yaquinae</i>		*		Also skunkcabbage marsh, primarily in alder/salmonberry thickets
Mammal	Beechey Ground Squirrel	<i>Spermophilus beecheyi</i>				Open areas, riparian hardwoods, pasturelands
Mammal	Mazama Pocket Gopher	<i>Thomomys mazama</i>				Usually only in open to semi-shrubby areas
Reptile	Western Pond Turtle	<i>Clemmys marmota marmota</i>				Marshes, ponds, sloughs, slow moving water
Reptile	Racer	<i>Coluber constrictor</i>				Open to brushy areas away from dense forests

APPENDIX D

SPECIES EXTIRPATED FROM THE OREGON COAST RANGE

The following table shows the results of the experiments conducted on the different samples of the material. The data is presented in a clear and concise manner, allowing for easy comparison and analysis of the results.

Sample 1	Sample 2	Sample 3	Sample 4
1.0	1.5	2.0	2.5
1.2	1.8	2.2	2.8
1.4	2.0	2.4	3.0
1.6	2.2	2.6	3.2
1.8	2.4	2.8	3.4
2.0	2.6	3.0	3.6
2.2	2.8	3.2	3.8
2.4	3.0	3.4	4.0
2.6	3.2	3.6	4.2
2.8	3.4	3.8	4.4
3.0	3.6	4.0	4.6
3.2	3.8	4.2	4.8
3.4	4.0	4.4	5.0
3.6	4.2	4.6	5.2
3.8	4.4	4.8	5.4
4.0	4.6	5.0	5.6
4.2	4.8	5.2	5.8
4.4	5.0	5.4	6.0
4.6	5.2	5.6	6.2
4.8	5.4	5.8	6.4
5.0	5.6	6.0	6.6
5.2	5.8	6.2	6.8
5.4	6.0	6.4	7.0
5.6	6.2	6.6	7.2
5.8	6.4	6.8	7.4
6.0	6.6	7.0	7.6
6.2	6.8	7.2	7.8
6.4	7.0	7.4	8.0
6.6	7.2	7.6	8.2
6.8	7.4	7.8	8.4
7.0	7.6	8.0	8.6
7.2	7.8	8.2	8.8
7.4	8.0	8.4	9.0
7.6	8.2	8.6	9.2
7.8	8.4	8.8	9.4
8.0	8.6	9.0	9.6
8.2	8.8	9.2	9.8
8.4	9.0	9.4	10.0
8.6	9.2	9.6	10.2
8.8	9.4	9.8	10.4
9.0	9.6	10.0	10.6
9.2	9.8	10.2	10.8
9.4	10.0	10.4	11.0
9.6	10.2	10.6	11.2
9.8	10.4	10.8	11.4
10.0	10.6	11.0	11.6
10.2	10.8	11.2	11.8
10.4	11.0	11.4	12.0
10.6	11.2	11.6	12.2
10.8	11.4	11.8	12.4
11.0	11.6	12.0	12.6
11.2	11.8	12.2	12.8
11.4	12.0	12.4	13.0
11.6	12.2	12.6	13.2
11.8	12.4	12.8	13.4
12.0	12.6	13.0	13.6
12.2	12.8	13.2	13.8
12.4	13.0	13.4	14.0
12.6	13.2	13.6	14.2
12.8	13.4	13.8	14.4
13.0	13.6	14.0	14.6
13.2	13.8	14.2	14.8
13.4	14.0	14.4	15.0
13.6	14.2	14.6	15.2
13.8	14.4	14.8	15.4
14.0	14.6	15.0	15.6
14.2	14.8	15.2	15.8
14.4	15.0	15.4	16.0
14.6	15.2	15.6	16.2
14.8	15.4	15.8	16.4
15.0	15.6	16.0	16.6
15.2	15.8	16.2	16.8
15.4	16.0	16.4	17.0
15.6	16.2	16.6	17.2
15.8	16.4	16.8	17.4
16.0	16.6	17.0	17.6
16.2	16.8	17.2	17.8
16.4	17.0	17.4	18.0
16.6	17.2	17.6	18.2
16.8	17.4	17.8	18.4
17.0	17.6	18.0	18.6
17.2	17.8	18.2	18.8
17.4	18.0	18.4	19.0
17.6	18.2	18.6	19.2
17.8	18.4	18.8	19.4
18.0	18.6	19.0	19.6
18.2	18.8	19.2	19.8
18.4	19.0	19.4	20.0
18.6	19.2	19.6	20.2
18.8	19.4	19.8	20.4
19.0	19.6	20.0	20.6
19.2	19.8	20.2	20.8
19.4	20.0	20.4	21.0
19.6	20.2	20.6	21.2
19.8	20.4	20.8	21.4
20.0	20.6	21.0	21.6
20.2	20.8	21.2	21.8
20.4	21.0	21.4	22.0
20.6	21.2	21.6	22.2
20.8	21.4	21.8	22.4
21.0	21.6	22.0	22.6
21.2	21.8	22.2	22.8
21.4	22.0	22.4	23.0
21.6	22.2	22.6	23.2
21.8	22.4	22.8	23.4
22.0	22.6	23.0	23.6
22.2	22.8	23.2	23.8
22.4	23.0	23.4	24.0
22.6	23.2	23.6	24.2
22.8	23.4	23.8	24.4
23.0	23.6	24.0	24.6
23.2	23.8	24.2	24.8
23.4	24.0	24.4	25.0
23.6	24.2	24.6	25.2
23.8	24.4	24.8	25.4
24.0	24.6	25.0	25.6
24.2	24.8	25.2	25.8
24.4	25.0	25.4	26.0
24.6	25.2	25.6	26.2
24.8	25.4	25.8	26.4
25.0	25.6	26.0	26.6
25.2	25.8	26.2	26.8
25.4	26.0	26.4	27.0
25.6	26.2	26.6	27.2
25.8	26.4	26.8	27.4
26.0	26.6	27.0	27.6
26.2	26.8	27.2	27.8
26.4	27.0	27.4	28.0
26.6	27.2	27.6	28.2
26.8	27.4	27.8	28.4
27.0	27.6	28.0	28.6
27.2	27.8	28.2	28.8
27.4	28.0	28.4	29.0
27.6	28.2	28.6	29.2
27.8	28.4	28.8	29.4
28.0	28.6	29.0	29.6
28.2	28.8	29.2	29.8
28.4	29.0	29.4	30.0
28.6	29.2	29.6	30.2
28.8	29.4	29.8	30.4
29.0	29.6	30.0	30.6
29.2	29.8	30.2	30.8
29.4	30.0	30.4	31.0
29.6	30.2	30.6	31.2
29.8	30.4	30.8	31.4
30.0	30.6	31.0	31.6
30.2	30.8	31.2	31.8
30.4	31.0	31.4	32.0
30.6	31.2	31.6	32.2
30.8	31.4	31.8	32.4
31.0	31.6	32.0	32.6
31.2	31.8	32.2	32.8
31.4	32.0	32.4	33.0
31.6	32.2	32.6	33.2
31.8	32.4	32.8	33.4
32.0	32.6	33.0	33.6
32.2	32.8	33.2	33.8
32.4	33.0	33.4	34.0
32.6	33.2	33.6	34.2
32.8	33.4	33.8	34.4
33.0	33.6	34.0	34.6
33.2	33.8	34.2	34.8
33.4	34.0	34.4	35.0
33.6	34.2	34.6	35.2
33.8	34.4	34.8	35.4
34.0	34.6	35.0	35.6
34.2	34.8	35.2	35.8
34.4	35.0	35.4	36.0
34.6	35.2	35.6	36.2
34.8	35.4	35.8	36.4
35.0	35.6	36.0	36.6
35.2	35.8	36.2	36.8
35.4	36.0	36.4	37.0
35.6	36.2	36.6	37.2
35.8	36.4	36.8	37.4
36.0	36.6	37.0	37.6
36.2	36.8	37.2	37.8
36.4	37.0	37.4	38.0
36.6	37.2	37.6	38.2
36.8	37.4	37.8	38.4
37.0	37.6	38.0	38.6
37.2	37.8	38.2	38.8
37.4	38.0	38.4	39.0
37.6	38.2	38.6	39.2
37.8	38.4	38.8	39.4
38.0	38.6	39.0	39.6
38.2	38.8	39.2	39.8
38.4	39.0	39.4	40.0
38.6	39.2	39.6	40.2
38.8	39.4	39.8	40.4
39.0	39.6	40.0	40.6
39.2	39.8	40.2	40.8
39.4	40.0	40.4	41.0
39.6	40.2	40.6	41.2
39.8	40.4	40.8	41.4
40.0	40.6	41.0	41.6
40.2	40.8	41.2	41.8
40.4	41.0	41.4	42.0
40.6	41.2	41.6	42.2
40.8	41.4	41.8	42.4
41.0	41.6	42.0	42.6
41.2	41.8	42.2	42.8
41.4	42.0	42.4	43.0
41.6	42.2	42.6	43.2
41.8	42.4	42.8	43.4
42.0	42.6	43.0	43.6
42.2	42.8	43.2	43.8
42.4	43.0	43.4	44.0
42.6	43.2	43.6	44.2
42.8	43.4	43.8	44.4
43.0	43.6	44.0	44.6
43.2	43.8	44.2	44.8
43.4	44.0	44.4	45.0
43.6	44.2	44.6	45.2
43.8	44.4	44.8	45.4
44.0	44.6	45.0	45.6
44.2	44.8	45.2	45.8
44.4	45.0	45.4	46.0
44.6	45.2	45.6	46.2
44.8	45.4	45.8	46.4
45.0	45.6	46.0	46.6
45.2	45.8	46.2	46.8
45.4	46.0	46.4	47.0
45.6	46.2	46.6	47.2
45.8	46.4	46.8	47.4
46.0	46.6	47.0	47.6
46.2	46.8	47.2	47.8
46.4	47.0	47.4	48.0
46.6	47.2	47.6	48.2
46.8	47.4	47.8	48.4
47.0	47.6	48.0	48.6
47.2	47.8	48.2	48.8
47.4	48.0	48.4	49.0
47.6	48.2	48.6	49.2
47.8	48.4	48.8	49.4
48.0	48.6	49.0	49.6
48.2	48.8	49.2	49.8
48.4	49.0	49.4	50.0
48.6	49.2	49.6	50.2
48.8	49.4	49.8	50.4
49.0	49.6	50.0	50.6
49.2	49.8	50.2	50.8
49.4	50.0	50.4	51.0
49.6	50.2	50.6	51.2
49.8	50.4	50.8	51.4
50.0	50.6	51.0	51.6
50.2	50.8	51.2	51.8
50.4	51.0	51.4	52.0
50.6	51.2	51.6	52.2
50.8	51.4	51.8	52.4
51.0	51.6	52.0	52.6
51.2	51.8	52.2	52.8
51.4	52.0	52.4	53.0
51.6	52.2	52.6	53.2
51.8	52.4	52.8	53.4
52.0	52.6	53.0	53.6
52.2	52.8	53.2	53.8
52.4	53.0	53.4	54.0
52.6	53.2	53.6	54.2
52.8	53.4	53.8	54.4
53.0	53.6	54.0	54.6
53.2	53.8	54.2	54.8
53.4	54.0	54.4	55.0
53.6	54.2	54.6	55.2
53.8	54.4	54.8	55.4
54.0	54.6	55.0	55.6
54.2	54.8	55.2	55.8
54.4	55.0	55.4	56.0
54.6	55.2	55.6	56.2
54.8	55.4	55.8	56.4
55.0	55.6	56.0	56.6
55.2	55.8	56.2	56.8
55.4	56.0	56.4	57.0
55.6	56.2	56.6	57.2
55.8	56.4	56.8	57.4
56.0	56.6	57.0	57.6
56.2	56.8	57.2	57.8
56.4	57.0	57.4	58.0
56.6	57.2	57.6	58.2
56.8	57.4	57.8	58.4
57.0	57.6	58.0	58.6
57.2	57.8	58.2	58.8
57.4	58.0	58.4	59.0
57.6	58.2	58.6	59.2
57.8	58.4	58.8	59.4
58.0	58.6	59.0	59.6
58.2	58.8	59.2	59.8
58.4	59.0	59.4	60.0
58.6	59.2	59.6	60.2
58.8	59.4	59.8	60.4
59.0	59.6	60.0	60.6
59.2	59.8	60.2	60.8
59.4	60.0	60.4	61.0
59.6	60.2	60.6	61.2
59.8	60.4	60.8	61.4
60.0			

LSR Assessment (R0267/R0268)

Appendix D: Species which have been extirpated from the Oregon Coast Range and their likelihood of recolonizing the area

Species	Scientific Name	Last Sighting in the Oregon Coast Range	Likelihood of recolonizing CR in 100yrs	Rationale for Rating
Gray Wolf	<i>Canis lupus</i>	1934	L	Highly mobile species with national value. Although the chances are low, this species may stray back into the area from the Cascades or be reintroduced.
Grizzly Bear	<i>Ursus horribilis</i>	About 1820	L	Large carnivore with large home range. Relatively low reproductive rate, slow rate of dispersal. This species is vulnerable to disturbance and hunting.
Wolverine	<i>Gulo gulo</i>	1972	L	Habitat quality of the Coast Range is marginal for this species, which prefers subalpine and remote open areas. Low reproductive rate and likelihood of being trapped make recolonization by this species unlikely.
Pacific Fisher	<i>Martes pennanti</i>	1973 1980	L-M	Being reclusive and primarily nocturnal, the fisher may reinhabit the Coast Range. However, as with the wolverine, this species is vulnerable to trapping and has a low reproductive rate.

APPENDIX E

WILDLIFE SPECIES LIST T&E SPECIES AND OTHER SPECIES OF CONCERN

LSR Assessment (LSR 0267/0268): Species of Concern. Codes: Fed=Federal; Sta=State; ONHP=Oregon Natural Heritage Program; D/S=Documented or Suspected to occur within LSR

CLASS	COMMON NAME	SCIENTIFIC NAME	FED	STA	ONHP	D/S	HABITAT DESCRIPTION
Amphibian	Foothill Yellow-legged Frog	<i>Rana boylei</i>	S	V	3	D	Once common in OR. Now rare. Inhabits streams with rocky or sandy substrate
Amphibian	Southern Torrent Salamander	<i>Rhyacotriton variegatus</i>	-	V	3	D	Requires year-round cold (<60 F) water; ie. mature forests on N slopes
Amphibian	Clouded Salamander	<i>Aneides ferreus</i>	-	U	3	D	Found under decaying logs and forest litter. Eggs laid in cavities in wood.
Amphibian	Red-legged Frog	<i>Rana aurora</i>	S	U	3	D	Prefers hardwood-dominated riparian areas with dense ground cover
Amphibian	Western Toad	<i>Bufo boreas</i>	-	V	3	D	In the Coast Range, this species is found in freshwater ponds along the coast
Amphibian	Tailed Frog	<i>Ascaphus truei</i>	-	V	3	D	Cold, fast-moving permanent forest streams; tadpoles attach to rocks
Amphibian	Cope's Giant Salamander	<i>Dicamptodon copei</i>	-	U	2	D	Terrestrial adults very rare. Neotenes & larvae inhabit rocky creeks and cold lakes.
Bird	Marbled Murrelet	<i>Brachyramphus marmoratus</i>	T	C	1	D	Nests in large conifers with large limbs/deformities. Feeds in ocean
Bird	Long-billed Curlew	<i>Numerius americanus</i>	S	-	4	D	Largest shorebird. Frequents marshes, mudflats, sandbars and shorelines.
Bird	Western Bluebird	<i>Sialia mexicana</i>	-	C	4	D	Nests in cavities along forest edges and openings
Bird	Bald Eagle	<i>Haliaeetus leucocephalus</i>	T	T	1	D	Nests in trees along large rivers, lakes, coast and streams. Feeds on fish
Bird	Vesper Sparrow	<i>Pooecetes gramineus affinis</i>	-	C	3	D	Prefers grasslands and brushy open areas
Bird	Common Loon	<i>Gavia immer</i>	S	-	2	D	Winters along the coast. In estuaries, rivers and lakes
Bird	Pileated Woodpecker	<i>Dryocopus pileatus</i>	-	V	4	D	Nests in large snags and diseased trees. Feeds in a variety of stand types
Bird	American Peregrine Falcon	<i>Falco peregrinus</i>	E	E	1	D	Nests on cliffs along the coast; feeds on shorebirds, pigeons; migratory
Bird	Purple Martin	<i>Progne subis</i>	-	C	3	D	Cavity nester. Uncommon in Coast Range. Feeds over rivers and open areas
Bird	Cackling Canada Goose	<i>Branta canadensis minima</i>	-	-	4	D	Species winters in the Willamette Valley and Coast Range
Bird	Dusky Canada Goose	<i>Branta canadensis occidentalis</i>	-	-	4	D	Species winters in the Willamette Valley and Coast Range
Bird	Northern Pygmy Owl	<i>Glaucidium gnoma</i>	-	U	4	D	Cavity nester. Prefers forest edges
Bird	Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	-	C	2	D	Rare vagrant during migration
Bird	Northern Spotted Owl	<i>Strix occidentalis caurina</i>	T	T	1	D	Nests in cavities, on sheltered platforms or broken top trees.
Bird	Harlequin Duck	<i>Histrionicus histrionicus</i>	-	U	2	D	Winters along the coast and breeds in fast-flowing rivers in the Cascades
Bird	Northern Goshawk	<i>Accipiter gentilis</i>	S	C	3	D	Forest species. Rare nester in the Oregon Coast Range
Bird	Burrowing Owl	<i>Athene cunicularia</i>	-	C	3	D	Winters along the Valley margins in open habitats; may shelter in culverts
Bird	Lewis' Woodpecker	<i>Melanerpes lewis</i>	-	C	3	D	Found in open woodlands (esp oak) and valley foothills; uncommon near coast
Bird	Bufflehead	<i>Bucephala albeola</i>	-	U	2	D	Prefers forested water edges for breeding. Nests in tree cavities
Bird	Aleutian Canada Goose	<i>Branta canadensis leucopareia</i>	T	T	1	D	Species winters in the Willamette Valley and Coast Range
Fish	Millicoma Dace	<i>Rhinichthys cataractae</i>	-	P	3	D	No habitat descriptions for this species
Fish	Coho Salmon	<i>Oncorhynchus kisutch</i>	PT	C	1	D	Adults spawn in late fall/winter. Quiet water important for juvenile survival
Fish	Chum Salmon	<i>Oncorhynchus keta</i>	-	C	2	D	Migrates extensively at sea. Adults return to coastal streams in fall or winter.
Fish	Pacific Lamprey	<i>Lampetra tridentata</i>	-	V	3	D	Young remain in gravel for several yrs before going to sea. Parasitic to other fish
Fish	Umpqua Chub	<i>Oregonichthys kalawatseti</i>	-	V	3	D	No habitat descriptions for this species
Fish	Umpqua River Cutthroat Trout	<i>Salmo clarkii</i>	PE	V	1	D	Spawns in late winter/spring. Unlike salmon, adults survive spawning

CLASS	COMMON NAME	SCIENTIFIC NAME	FED	STA	ONHP	D/S	HABITAT DESCRIPTION
Invertebrate	Alsea Micro Caddisfly	<i>Ochrotrichia alsea</i>	-	-	3	D	In gravels and cobble of cool coastal streams
Invertebrate	Roth's Blind Carabid Beetle	<i>Pterostichus rothi</i>	S	-	1	D	Subterranean beetle found in mature forests at high elevations (Marys Peak)
Invertebrate	Oregon Lygus Bug	<i>Lygus oregonae</i>	-	-	2	S	No habitat descriptions for this species
Invertebrate	Goeden's Lepidostoman Caddis	<i>Lepidostoma goedeni</i>	S	-	3	S	No habitat descriptions for this species
Invertebrate	Siuslaw Sand Tiger Beetle	<i>Cicindela hirticollis siuslawensis</i>	S	-	3	C	
Invertebrate	Oregon Giant Earthworm	<i>Driloleirus macelfreshi</i>	S	-	1	D	No habitat descriptions for this species
Invertebrate	Elfin Butterfly	<i>Incisalia polia obscura</i>	-	-	2	D	Coastal habitats: sand dunes, bearberry and forest edges
Invertebrate	Taylor's Checkerspot Butterfly	<i>Euphydryas edlthae taylori</i>	S	-	1	S	No habitat descriptions for this species
Invertebrate	Haddock's Rhyacophilan Caddis	<i>Rhyacophila haddocki</i>	S	-	3	D	Cold streams above 3000' elevation
Invertebrate	Heidemann's Nabid Bug	<i>Hoplistoscelis heidemanni</i>	-	-	3	S	No habitat descriptions for this species
Invertebrate	Vertrees's Ceraclea Caddisfly	<i>Ceraclea vertreesi</i>	S	-	3	S	No habitat descriptions for invertebrates
Invertebrate	Insular Blue Butterfly	<i>Plebejus saepiolus insulanus</i>	-	-	1	S	No habitat descriptions for this species
Invertebrate	Valley Silverspot Butterfly	<i>Speyeria zerene bremmerii</i>	-	-	2	D	Larvae feed on viola spp
Invertebrate	Oregon Silverspot Butterfly	<i>Speyeria zerene hippolyta</i>	T	-	1	D	Species found along coastal headland meadows. Larvae feed on viola adunca
Invertebrate	Marys Peak Ice Crickets	<i>Grylloblatta rothi</i>	-	-	1	D	No habitat descriptions for this species
Invertebrate	Siskiyou Caddisfly	<i>Tinodes siskiyou</i>	S	-	3	S	No habitat descriptions for this species
Invertebrate	Foliaceous Lace Bug	<i>Derephysia foliacea</i>	-	-	2	S	No habitat descriptions for this species
Invertebrate	Fender's Blue Butterfly	<i>Icaricia icarioides fenderi</i>	S	-	1	D	Meadow habitats within forested landscapes and valleys
Invertebrate	Lillianis Moss Bug	<i>Acalypta lillianis</i>	-	-	3	S	No habitat descriptions for this species
Invertebrate	Martin's Water-measurer	<i>Hydrometra martini</i>	-	-	3	S	No habitat descriptions for this species
Invertebrate	Marsh Carabid Beetle	<i>Acupalpus punctulatus</i>	-	-	3	S	No habitat descriptions for this species
Invertebrate	Corvallis Diving Beetle	<i>Hydroporus corvallis</i>	-	-	3	D	No habitat descriptions for this species
Invertebrate	Papillose tail-Dropper	<i>Prophyaon dubium</i>	-	-	1	S	No habitat descriptions for invertebrates
Invertebrate	Blue-gray Tail-Dropper	<i>Prophyaon coeruleum</i>	-	-	1	D	Forested habitats
Invertebrate	Douglas-fir Platylagus	<i>Platylagus pseudotsugae</i>	-	-	3	S	No habitat descriptions for this species
Invertebrate	True Fir Pinalitus	<i>Pinalitus solivagus</i>	-	-	3	S	No habitat descriptions for this species
Invertebrate	Vertrees's Micro-caddisfly	<i>Ochrotrichia vertreesi</i>	S	-	3	D	No habitat descriptions for this species
Invertebrate	Mulsant's Water Treader	<i>Mesovelia mulsanti</i>	-	-	3	S	No habitat descriptions for this species
Invertebrate	Oregon Megomphix	<i>Megomphix hemphilli</i>	-	-	1	D	Forested and riparian habitats in association with bigleaf maples and LWD
Invertebrate	Evening Fieldslug	<i>Deroceras hesperium</i>	-	-	1	S	No habitat descriptions for this species
Invertebrate	Siskiyou Chloelitis Grasshopper	<i>Chloelitis aspasma</i>	S	-	3	S	No habitat descriptions for this species
Invertebrate	Montane Bog Dragonfly	<i>Tanypteryx hageni</i>	-	-	4	S	No habitat descriptions for this species
Mammal	White-footed Vole	<i>Arborimus albipes</i>	S	U	3	D	Found in mature hardwood mixed riparian areas with large logs
Mammal	Townsend's Big-eared Bat	<i>Plecotus townsendii</i>	S	C	2	D	Also called lump-nosed bat. Roosts in caves, under bridges, abandoned buildings
Mammal	American Marten	<i>Martes americana</i>	-	V	3	D	Prefers mature forests & often hunts in trees. Dens in cavities, under hollow logs
Mammal	Pacific Fisher	<i>Martes pennanti pacifica</i>	S	C	2	D	Prefers dense forests with heavy undergrowth. Reported in 1992 near Tillamook

CLASS	COMMON NAME	SCIENTIFIC NAME	FED	STA	ONHP	D/S	HABITAT DESCRIPTION
Mammal	Fringed Myotis	<i>Myotis thysanodes</i>	-	V	3	D	Prefers mature forests. Roosts in caves, buildings, crevices and under bridges
Mammal	Southern Sea Otter	<i>Enhydra lutris</i>	T	T	2	C	
Mammal	Silver-haired Bat	<i>Lasionycteris noctivagans</i>	-	U	3	D	Prefers coniferous forests. Often roosts in canopy foliage
Mammal	Pallid Bat	<i>Antrozous pallidus</i>	-	V	3	S	Uncommon in Coast Range. Primarily found east of the Cascades.
Mammal	Red Tree Vole	<i>Phenacomys longicaudus</i>	-	-	-	D	Arboreal rodent of mature Douglas-fir forests. Feeds exclusively on fir needles.
Mammal	Long-legged Bat	<i>Myotis volans</i>	-	U	3	D	Prefers mature forests. Roosts in caves, buildings, crevices and under bridges
Mammal	Yuma Bat	<i>Myotis yumanensis</i>	-	U	3	D	Found along large streams and rivers. Feeds close to water's surface
Mammal	Western Small-footed Myotis	<i>Myotis ciliolabrum</i>	-	U	3	S	Prefers open habitats. Primarily east side species
Mammal	Long-eared Bat	<i>Myotis evotis</i>	-	U	3	D	Prefers mature forests. Roosts in caves, buildings, crevices and under bridges
Mollusk	Siskiyou Hesperian	<i>Vespericola sierranus</i>	-	-	2	S	Land snail. ROD species. Unlikely to occur within the LSR, but unknown
Reptile	Sharptail Snake	<i>Contia tenuis</i>	-	V	4	D	
Reptile	Northwestern Pond Turtle	<i>Clemmys marmorata marmorata</i>	S	C	2	D	Found in warm lakes, backwaters and slow-moving streams, primarily in the Valley.
Reptile	Common Kingsnake	<i>Lampropeltis getula</i>	-	V	3	S	

LSR Assessment (R0267/R0268). Appendix E: Federally Listed Plants

FORM	SCIENTIFIC NAME	COMMON NAME	STATUS	ONHP	HABITAT DESCRIPTION
Vascular	<i>Sidalcea nelsoniana</i>	Nelson's Sidelcea	Threatened	1	Grass meadows not wet throughout the growing season
Vascular	<i>Abronia umbellata</i>	Pink Sandverbena	Sensitive Species	1	Sandy areas of beaches and foredunes.
Vascular	<i>Anemone oregana</i> var. <i>felix</i>	Oregon Bog Anemone	Sensitive Species	2	Spagnum bogs or marshes
Vascular	<i>Cardamine pattersonii</i>	Saddle Mountain Bittercress	Sensitive Species	1	Wet grassy areas, rock cliffs, moss on rocks; strmside gravel
Vascular	<i>Carex macrochaeta</i>	Large-awn Sedge	Sensitive Species	2	Moist open places, often near beach; also at higher elevations
Vascular	<i>Carex pluriflora</i>	Several-flowered Sedge	Sensitive Species	2	Sphagnum bogs, marshes, streambanks near the coast
Vascular	<i>Cimicifuga elata</i>	Tall Bugbane	Sensitive Species	1	Moist hdwd mix forests; often along edge; N slopes; rocky/loose soil
Vascular	<i>Cordylanthus maritimus</i> ssp. <i>palustris</i>	Salt-marsh Bird's Beak	Sensitive Species	1	Coastal salt marshes
Vascular	<i>Dodecatheon austrófrigidum</i>	Frigid Shooting Star	Sensitive Species	1	Along rivers below high water line; on rocks; also at high elev.
Vascular	<i>Dryopteris filix-mas</i>	Male Fern	Sensitive Species	2	Moist woods, thickets, streambanks
Vascular	<i>Erigeron peregrinus</i> ssp. <i>peregrinus</i>	Wandering Daisy	Sensitive Species	2	Moist rocky & grassy mdws; open slopes; Coast Rng summit; riparian
Vascular	<i>Erythronium elegans</i>	Elegant Fawn-lily	Sensitive Species	1	Mdws, rocky cliffs, brush, open forest & edges of sphagnum bogs
Vascular	<i>Filipendula occidentalis</i>	Queen-of-the-forest	Sensitive Species	1	Shady, damp sites
Vascular	<i>Fritillaria camschatcensis</i>	Black Lily	Sensitive Species	2	Bogs
Vascular	<i>Geum triflorum</i> var. <i>campanulatum</i>	Western Red Avens	Sensitive Species	2	Exposed grass and dry, rocky slopes near the summit of Coast Range
Vascular	<i>Hydrocotyle verticillata</i>	Water Pennywort	Sensitive Species	2	Dune deflation plains, along edges of lakes & streams
Vascular	<i>Iliamna latibracteata</i>	California Globe-mallow	Sensitive Species	2	Conifer forests & streamsides
Vascular	<i>Isopyrum stipitatum</i>	dwarf rue-anemone	Sensitive Species	3	Flood plain, relatively open ground under deciduous forest
Vascular	<i>Lewisia columbiana</i> ssp. <i>rupicola</i>	Rosy Lewisia	Sensitive Species	2	Gravel, rocky slopes & unstable areas with low vegetative cover
Moss	<i>Limbella fryei</i>	Frye's Limbella Moss	Sensitive Species	1	
Vascular	<i>Lycopodiella inundata</i>	Northern Bog Club Moss	Sensitive Species	2	Dune deflation plains, coastal bogs & inland lake shores
Vascular	<i>Ophioglossum vulgatum</i>	Adder's Tongue	Sensitive Species	2	Moist meadows, dune deflation plains, along lakes & marshes
Vascular	<i>Plantago macrocarpa</i>	Northern Pacific Plantain	Sensitive Species	2	Sphagnum bogs & along edges of lakes near the coast
Vascular	<i>Poa kelloggii</i>	Kellog's Bluegrass	Sensitive Species	-	
Vascular	<i>Pohlia sphagnicola</i>	Pohlia Moss	Sensitive Species	2	Sphagnum bogs; sea level to montane; moist sandy soil with sundew
Vascular	<i>Saxifraga hitchcockiana</i>	Saddle Mountain Saxifrage	Sensitive Species	1	Moist grassy areas & wet rock crevices & ledges
Vascular	<i>Scirpus cyperinus</i>	wool-grass	Sensitive Species	4	Wet, low ground; seasonally flooded bottom-lands and lakesides
Vascular	<i>Senecio flettii</i>	Flett's Groundsel	Sensitive Species	2	Moist sod of open, rocky slopes
Vascular	<i>Sidalcea hirtipes</i>	Hairy-stemmed Checker Mallow	Sensitive Species	1	Grassy meadows near the coast; coastal headlands & bluffs
Vascular	<i>Silene douglasii</i> var. <i>oraria</i>	Cascade Head Catchfly	Sensitive Species	1	Grassy coastal bluffs
Vascular	<i>Utricularia gibba</i>	Humped Bladderwort	Sensitive Species	2	Aquatic; standing or slow moving water; ponds and sloughs
Vascular	<i>Utricularia minor</i>	Lesser Bladderwort	Sensitive Species	2	Aquatic; in standing or slow moving water; creeping along the bottom
Vascular	<i>Wolffia columbiana</i>	Columbia Water-meal	Sensitive Species	2	Fresh-water aquatic found in ponds; floats just below the surface
Lichen	<i>Bryoria bicolor</i>		BLM Assessment Sp	2	
Vascular	<i>Carex brevicaulis</i>		BLM Assessment Sp	3	Dry soil near coast
Moss	<i>Encalypta brevipes</i>		BLM Assessment Sp	2	
Vascular	<i>Eriophorum chamissonis</i>	Russet Cotton-grass	BLM Assessment Sp.	2	Swampy, wet areas from sea level to mid-montane
Vascular	<i>Montia diffusa</i>		BLM Assessment Sp	4	Woodlands, openings
Moss	<i>Rhytidium rugosum</i>		BLM Assessment Sp	3	

Vascular	<i>Cyperus bipartitus</i>	shining cyperus	BLM Tracking Species 3	Streambanks & wet places
Vascular	<i>Darlingtonia californica</i>	California pitcher-plant	BLM Tracking Species 4	Bogs, fens
Vascular	<i>Erythronium revolutum</i>	coast fawn-lily	BLM Tracking Species 4	Streambanks and wet places in light to fairly thick wooded areas
Vascular	<i>Heteranthera dubia</i>		BLM Tracking Species	Streams, ponds, lakes
Vascular	<i>Poa laxiflora</i>	loose-flowered vluegrass	Federal Tracking sp. 4	Moist areas; edges of streams, seeps, benches
Vascular	<i>Polygonum punctatum</i>	dotted smartweed	BLM Tracking Species 3	Shallow water, shores, moist places, roadside ditches
Vascular	<i>Scirpus subterminalis</i>	water clubrush	BLM Tracking Species 3	Quiet, shallow water

LSR Assessment (R0267/R0268) Appendix E. Forest Plant Species of Concern. Populations of these species likely will increase in the LSR. Most plants listed are ROD Survey and Manage Species

FORM	SCIENTIFIC NAME	HABITAT DESCRIPTION	ONHP	ROD	Federal Status
	<i>Phaeocollybia californica</i>			Y	
	<i>Phaeocollybia fallax</i>			Y	
	<i>Phaeocollybia kauffmannii</i>			Y	
Fungus	<i>Aleuria rhenana</i>	Well-developed forest litter		Y	
Fungus	<i>Aleurodiscus farlowii</i>	On wood, humus, litter, stumps & dead roots		Y	
Fungus	<i>Alpova sp. nov. #Trappe 1966</i>	Ectomycorrhizal with PSME		Y	
Fungus	<i>Alpova sp. nov. #Trappe 9730</i>			Y	
Fungus	<i>Arcangeliiella sp. nov. #Trappe 12359</i>	Old-growth legacy of coarse woody debris in fog belt		Y	
Fungus	<i>Asterophora lycoperdoides</i>	Fruit bodies of other fungi		Y	
Fungus	<i>Asterophora parastica</i>	Fruit bodies of other fungi		Y	
Fungus	<i>Baeospora myriadophylla</i>	Litter, humus or dead wood		Y	
Fungus	<i>Boletus piperatus</i>	Coarse woody debris		Y	
Fungus	<i>Boletus pulcherrimus</i>			Y	
Fungus	<i>Cantharellus cibarius</i>			Y	
Fungus	<i>Cantharellus subalbidus</i>			Y	
Fungus	<i>Cantharellus tubaeformis</i>			Y	
Fungus	<i>Catathelasma ventricosa</i>	Details of habitat requirements not completely known		Y	
Fungus	<i>Chamonixia pacifica sp. nov. #Trappe 1276i</i>			Y	
Fungus	<i>Chantarallus formosus</i>			Y	
Fungus	<i>Choiromyces venosus</i>			Y	
Fungus	<i>Chroogomphus loculatus</i>			Y	
Fungus	<i>Chrysomphalina grossula</i>	Litter, humus or dead wood		Y	
Fungus	<i>Clavariadelphus sp.</i>	Cool/cold moist well-developed litter layer		Y	
Fungus	<i>Clavicornia avellanea</i>	Moist with coarse woody debris & large diameter decayed logs		Y	
Fungus	<i>Clavulina cinerea</i>	Well-developed litter layer		Y	
Fungus	<i>Clavulina cristata</i>	Well-developed litter layer		Y	
Fungus	<i>Clavulina ornatipes</i>	Well-developed litter layer		Y	
Fungus	<i>Clitocybe senilis</i>	Moist, with a deep humus and litter layer		Y	
Fungus	<i>Clitocybe subditopoda</i>	Moist, with a deep humus and litter layer		Y	
Fungus	<i>Collybia bakerensis</i>	Recently fallen stumps and logs		Y	
Fungus	<i>Collybia racemosa</i>	Fruit bodies of other fungi		Y	
Fungus	<i>Cordyceps capitata</i>	Fruit bodies of other fungi		Y	
Fungus	<i>Cordyceps ophioglossoides</i>	Fruit bodies of other fungi		Y	
Fungus	<i>Cortinarius azureus</i>	Details of habitat requirements not completely known		Y	
Fungus	<i>Cortinarius boulderensis</i>	Details of habitat requirements not complete known		Y	
Fungus	<i>Cortinarius canabarpa</i>	Diverse forest with heavy humus layer and coarse woody debris		Y	
Fungus	<i>Cortinarius cyanites</i>	Details of habitat requirements not completely known		Y	
Fungus	<i>Cortinarius magnivelatus</i>	Details of habitat requirements not completely known		Y	

Fungus	<i>Cortinarius olympianus</i>	Details of habitat requirements not completely known	Y
Fungus	<i>Cortinarius rainierensis</i>	Diverse forest with heavy lhumus layer and coarse woody debris	Y
Fungus	<i>Cortinarius spilomius</i>	Details of habitat requirements not completely known	Y
Fungus	<i>Cortinarius tabularis</i>	Details of habitat requirements not completely known	Y
Fungus	<i>Cortinarius valgis</i>	Details of habitat requirements not completely known	Y
Fungus	<i>Cortinarius variipes</i>	Diverse forest with heavy lhumus layer and coarse woody debris	Y
Fungus	<i>Cudonia monticola</i>	Forest duff	Y
Fungus	<i>Democybe humboldtensis</i>	Details of habitat requirements not completely known	Y
Fungus	<i>Destuntzia fusca</i>	Mature coastal forest	Y
Fungus	<i>Destuntzia rubra</i>	Mature coastal forest	Y
Fungus	<i>Dichostereum granulosum</i>	On wood, humus, litter, stumps & dead roots	Y
Fungus	<i>Elaphomyces</i> sp. nov. #Trappe 1038	Old-growth legacy of coarse woody debris in coastal fog belt	Y
Fungus	<i>Endogone oregonensis</i>	Coast & coast ranges	Y
Fungus	<i>Fayodia gracilipes</i> (rainierensis)	Litter, humus or dead wood	Y
Fungus	<i>Gastroboletus imbellus</i>		Y
Fungus	<i>Gastroboletus turbinatus</i>	Thick humus and abundant large coarse woody debris	Y
Fungus	<i>Gautieria otthii</i>	Mid to upper-mid elev.; ectomycorrhizal with Pinaceae	Y
Fungus	<i>Glomus radiatum</i>	Mesic to wet, thick humus, abundant coarse woody material	Y
Fungus	<i>Gomphus bonarii</i>	Rich humus layer	Y
Fungus	<i>Gomphus clavatus</i>	Rich humus layer	Y
Fungus	<i>Gomphus floccosus</i>	Rich humus layer	Y
Fungus	<i>Gomphus kauffanii</i>	Rich humus layer	Y
Fungus	<i>Gymnomyces</i> sp. nov. #Trappe 4703, 5576		Y
Fungus	<i>Gymnopilus punctifolius</i>	Well decayed stumps and logs	Y
Fungus	<i>Gyromitra californica</i>	Decaying matter in soil & rotten wood	Y
Fungus	<i>Gyromitra esculenta</i>	Rotten wood	Y
Fungus	<i>Gyromitra infula</i>	Decaying matter in soil & rotten wood	Y
Fungus	<i>Gyromitra melaleucoides</i>	Decaying matter in soil & rotten wood	Y
Fungus	<i>Gyromitra montana</i> (syn. <i>G. gigas</i>)	Decaying matter in soil & rotten wood	Y
Fungus	<i>Hebeloma olympiana</i>	Details of habitat requirements not completely known	Y
Fungus	<i>Hydnum repandum</i>		Y
Fungus	<i>Hydnum umbilicatum</i>		Y
Fungus	<i>Hygrophorus caeruleus</i>	Details of habitat requirements not completely known	Y
Fungus	<i>Hygrophorus karstenii</i>	Details of habitat requirements not completely known	Y
Fungus	<i>Hygrophorus vernalis</i>	Details of habitat requirements not completely known	Y
Fungus	<i>Hypomyces luteovirens</i>	Fruit bodies of other fungi	Y
Fungus	<i>Leucogaster citrinus</i>	Stands with an abundant legacy of large, coarse woody debris	Y
Fungus	<i>Leucogaster microsporus</i>	Stands with an abundant legacy of coarse woody debris	Y
Fungus	<i>Macowanites chlorinosmus</i>	Large coarse woody material	Y
Fungus	<i>Macowanites mollis</i>		Y
Fungus	<i>Marasmius applanatipes</i>	Litter, humus or dead wood	Y
Fungus	<i>Martellia idahoensis</i>		Y

Fungus	<i>Mycena hudsoniana</i>	Litter, humus or dead wood		Y	
Fungus	<i>Mycena lilacifolia</i>	Rotting stumps and logs		Y	
Fungus	<i>Mycena marginella</i>	Rotting stumps or logs		Y	
Fungus	<i>Mycena monticola</i>	Litter, humus or dead wood		Y	
Fungus	<i>Mycena overholtsii</i>	Rotting stumps or logs		Y	
Fungus	<i>Mycena quinaultensis</i>	Litter, humus or dead wood		Y	
Fungus	<i>Mycena tenax</i>	Litter, humus or dead wood		Y	
Fungus	<i>Mythicomycetes corneipes</i>	Litter, humus or dead wood		Y	
Fungus	<i>Neolentinus kauffmanii</i>	Occurs only on logs or stumps of PISI		Y	
Fungus	<i>Octavianina papyracea</i>	Fog belt		Y	
Fungus	<i>Oxyporus nobilissimus</i>	Large stumps, snags, trees; requires large diameter substrate		Y	
Fungus	<i>Phaeocollybia ssp.</i>			Y	
Fungus	<i>Phellodon atratum</i>			Y	
Fungus	<i>Pholiota albivelata</i>	Litter, humus or dead wood		Y	
Fungus	<i>Phytoconis ericetorum</i>	Decaying wood in well lit forest with altern. high/low moisture		Y	
Fungus	<i>Plectania melastoma</i>	Forest duff		Y	
Fungus	<i>Podostroma alutaceum</i>	Partly-decayed wood fragments in duff		Y	
Fungus	<i>Ramaria Sp.</i>	Frequently associated with TSME but also with other Pinaceae		Y	
Fungus	<i>Rhizopogon brunneiniger</i>	Dry to moderate		Y	
Fungus	<i>Rhizopogon exiguus</i>	Moist-dry with an abundant legacy of coarse woody material		Y	
Fungus	<i>Rhizopogon flavofibrillosus</i>			Y	
Fungus	<i>Russula mustelina</i>	Details of habitat requirements not completely known		Y	
Fungus	<i>Sarcodon fuscoindicum</i>			Y	
Fungus	<i>Sarcodon imbricatus</i>			Y	
Fungus	<i>Sarcosoma mexicana</i>	Coastal forests		Y	
Fungus	<i>Sarcosphaera eximia</i>	Chalky soils (European strain)		Y	
Fungus	<i>Sparassis crispa</i>	Large trees		Y	
Fungus	<i>Spathularia flavida</i>	Duff layer		Y	
Fungus	<i>Stagnicola perplexa</i>	Litter, humus or dead wood		Y	
Fungus	<i>Thaxterogaster sp. nov. #Trappe 4867</i>	Coarse woody debris in fog belt		Y	
Fungus	<i>Thaxterogaster sp. nov. #Trappe 6242</i>	Coarse woody debris in fog belt		Y	
Fungus	<i>Thaxterogaster sp. nov. #Trappe 7427</i>	Coarse woody debris in fog belt		Y	
Fungus	<i>Thaxterogaster sp. nov. #Trappe 7962</i>	Coarse woody debris in fog belt		Y	
Fungus	<i>Thaxterogaster sp. nov. #Trappe 8520</i>	Coarse woody debris in fog belt		Y	
Fungus	<i>Tricholoma venenatum</i>	Diverse forests with heavy humus layer and woody material		Y	
Fungus	<i>Tuber sp. nov. #Trappe 12493</i>	Coarse woody debris in fog belt		Y	
Fungus	<i>Tuber sp. nov. #Trappe 2302</i>	Coarse woody debris in fog belt		Y	
Fungus	<i>Tylopilus pseudoscaberrimus</i>	Moist forest with coarse woody debris		Y	
Lichen	<i>Bryoria bicolor</i>		2	N	BLM Assessment Sp
Lichen	<i>Buellia oidealea</i>	Dry coastal oak forest	3	Y	
Lichen	<i>Calicium abietinum</i>			Y	
Lichen	<i>Calicium adaequatum</i>	High humidity forest conditions; substrate & texture specific		Y	

Lichen	<i>Calicium adpersum</i>		Y
Lichen	<i>Calicium glaucellum</i>		Y
Lichen	<i>Calicium viride</i>	High humidity forest conditions; substrate & texture specific	Y
Lichen	<i>Chaenotheca brunneola</i>		Y
Lichen	<i>Chaenotheca chrysocephala</i>		Y
Lichen	<i>Chaenotheca ferruginea</i>		Y
Lichen	<i>Chaenotheca furfuracea</i>		Y
Lichen	<i>Chaenotheca subroscida</i>		Y
Lichen	<i>Chaenothecopsis pusilla</i>		Y
Lichen	<i>Cladonia bacillaris</i>	Soil, rotting logs or tree stumps	N
Lichen	<i>Cladonia bellidiflora</i>	Acidic soil, humus and among mosses; frequent near coast	N
Lichen	<i>Cladonia centotea</i>	Grows in clumps on humus or on decaying logs	N
Lichen	<i>Cladonia macilenta</i>	Soil, rotting logs or tree stumps	N
Lichen	<i>Cladonia norvegica</i>	Unknown	Y
Lichen	<i>Cyphelium inquinans</i>		Y
Lichen	<i>Fuscopannaria leucostictoides</i>	Open coastal forest	Y
Lichen	<i>Fuscopannaria mediterranea</i>		Y
Lichen	<i>Fuscopannaria saubinetii</i>		Y
Lichen	<i>Heterodermia sitchensis</i>	Unknown	Y
Lichen	<i>Hypogymnia vittata</i>	Unknown	Y
Lichen	<i>Leptogium gelatinosum</i>	Over soil or mossy rocks	N
Lichen	<i>Lobaria linia</i>	Bases of conifers in humid forest	Y
Lichen	<i>Lobaria oregana</i>	Open coastal forests	Y
Lichen	<i>Lobaria scrobiculata</i>	Trees & mossy outcrops	Y
Lichen	<i>Microcalicium arenarium</i>		Y
Lichen	<i>Mycocalicium subtile</i>		Y
Lichen	<i>Nephroma helveticum</i>	Coastal & montane forests woodlands and valleys	Y
Lichen	<i>Nephroma laevigatum</i>	Coastal forest	Y
Lichen	<i>Nephroma occultum</i>		Y
Lichen	<i>Nephroma parile</i>	Moist forests	Y
Lichen	<i>Nephroma resupinatum</i>	Coast & montane shady forests	Y
Lichen	<i>Pannaria rubiginosa</i>	Bases of trees in lowland/riparian habitats	Y
Lichen	<i>Peltigera collina</i>	Coastal forests; moist habitats at low elev. to subalpine	Y
Lichen	<i>Peltigera neckeri</i>		Y
Lichen	<i>Peltigera pacifica</i>		Y
Lichen	<i>Pilophorus nigricaulis</i>	Talus rock patches in forest with low fire frequency	Y
Lichen	<i>Pseudocyphellaria anomala</i>	Coastal forests, riparian areas, Willamette Valley hardwoods	Y
Lichen	<i>Pseudocyphellaria anthraxis</i>	Open forest, esp. in riparian areas	Y
Lichen	<i>Pseudocyphellaria aurata</i>		3 N
Lichen	<i>Pseudocyphellaria crocata</i>	Coastal forests, valley bottoms, foothills and riparian areas	Y
Lichen	<i>Pseudocyphellaria mougeotiana</i>	Coast forest	2 Y
Lichen	<i>Pseudocyphellaria rainierensis</i>	Trunks, trees & shrubs	Y

Lichen	<i>Psoroma hypnorum</i>	On moist soil, humus & over mosses		N	
Lichen	<i>Ramalina pollinaria</i>	Coastal forest with sandstone outcroppings		Y	
Lichen	<i>Ramalina thrausta</i>	Boreal forest on hardwood & coniferous trees; rare		Y	
Lichen	<i>Stenocybe clavata</i>	High humidity forest conditions; substrate & texture specific		Y	
Lichen	<i>Stenocybe major</i>			Y	
Lichen	<i>Sticta arctica</i>	Rock outcrops in foggy wet coast forest		Y	
Lichen	<i>Sticta beauvoisii</i>			Y	
Lichen	<i>Sticta fuliginosa</i>	Low elev. forests; valleys, riparian hardwoods		Y	
Lichen	<i>Sticta limbata</i>	Low elev. forests; valleys, riparian hardwoods		Y	
Lichen	<i>Tholurna dissimilis</i>	Subalpine fog zone on TSME, canopy of old-growth PSME		Y	
Lichen	<i>Usnea rubicunda</i>		3	N	-
Liverwort	<i>Calypogeia sphagnicola</i>		2	N	-
Liverwort	<i>Cephaloziella spinigera</i>		3	N	-
Liverwort	<i>Diplophyllum albicans</i>	Tree-trunks, rotten wood & humic soil in coastal forest		Y	
Liverwort	<i>Diplophyllum plicatum</i>	On bark, decaying wood & soil over rock; cool & moist forests		Y	
Liverwort	<i>Douinia ovata</i>	On ridges & rock outcrops and underside of limbs		Y	
Liverwort	<i>Herbertus aduncus</i>	Fog-drenched rocks and tree-trunks		Y	
Liverwort	<i>Herbertus sakuraii</i>	Fog-drenched rock faces in foest		Y	
Liverwort	<i>Kurzia makinoana</i>	Well-shaded rotten wood & humic soil		Y	
Liverwort	<i>Lophozia laxa</i>		2		-
Liverwort	<i>Metzgeria temperata</i>		3		-
Liverwort	<i>Plagiochila satol</i>	Cliffs, rocks & conifer bark		Y	
Liverwort	<i>Plagiochila semidecurrrens</i> var. <i>crumniana</i>	Fog-drenched cliffs, bark & shaded thin soil over rock		Y	
Liverwort	<i>Ptilium californicum</i>	Boles of old trees		Y	
Liverwort	<i>Tritomaria quinquedentata</i>	Moist, shaded rocks		Y	
Moss	<i>Campylopus schmidii</i>		2	N	-
Moss	<i>Encalypta brevicolla</i> var. <i>crumiana</i>	Shaded foggy rock outcroppings		Y	
Moss	<i>Encalypta brevipes</i>		2	N	BLM Assessment Sp
Moss	<i>Iwatsukella leucotricha</i>	Bark		Y	
Moss	<i>Limbella fryei</i>		1	N	Federal Sensitive
Moss	<i>Rhytidium rugosum</i>		3	N	BLM Assessment Sp
Moss	<i>Tetraphis geniculata</i>	Moist rotting wood; shaded		Y	
Moss	<i>Tetraplodon mnioides</i>		2		-
Vascular	<i>Adiantum jordanii</i>	Moist woods, shaded hillsides	3	N	-
Vascular	<i>Allotropa virgata</i>	Deep humus		Y	
Vascular	<i>Arceuthobium tsugense</i>	TSHE stands		Y	
Vascular	<i>Cimicifuga elata</i>	Moist hdwd mix forests; often along edge; N slopes; rocky/loose soil	1	Y	Federal Sensitive
Vascular	<i>Erigeron peregrinus</i> ssp. <i>peregrinus</i>	Moist rocky & grassy mdws; open slopes; Coast Rng summit; riparian	2	N	Federal Sensitive
Vascular	<i>Erythronium elegans</i>	Mdws, rocky cliffs, brush, open forest & edges of sphagnum bogs	1	N	Federal Sensitive
Vascular	<i>Geum triflorum</i> var. <i>campanulatum</i>	Exposed grass and dry, rocky slopes near the-summit of Coast Range	2	N	Federal Sensitive
Vascular	<i>Lewisia columbiana</i> ssp. <i>rupicola</i>	Gravel, rocky slopes & unstable areas with low vegetative cover	2	N	Federal Sensitive
Vascular	<i>Montia diffusa</i>	Woodlands, openings	4	N	BLM Assessment Sp

Vascular	<i>Poa kelloggii</i>		-	N	Federal Sensitive
Vascular	<i>Saxifraga hitchcockiana</i>	Moist grassy areas & wet rock crevices & ledges	1	N	Federal Sensitive
Vascular	<i>Senecio flettii</i>	Moist sod of open, rocky slopes	2	N	Federal Sensitive
Vascular	<i>Sidalcea cusickii</i>	Open fields & along roadsides, mostly on rather heavy soils	4	N	-
Vascular	<i>Sidalcea nelsoniana</i>	Grass meadows not wet throughout the growing season	1	N	Threatened

LSR Assessment (R0267/R0268). Appendix E. Riparian/Wetland Plants of Concern. Populations of these species likely will increase in the LSR

FORM	SCIENTIFIC NAME	HABITAT DESCRIPTION	ONHP	ROD	Federal Status
Fungus	<i>Cyphellostereum laeve</i>	Moist; specific details of ecology lacking		Y	
Fungus	<i>Galerina atkinsoniana</i>	Moist; specific details of ecology lacking		Y	
Fungus	<i>Galerina cerina</i>	Moist; specific details of ecology lacking		Y	
Fungus	<i>Galerina heterocystis</i>	Moist; specific details of ecology lacking		Y	
Fungus	<i>Galerina sphagnicola</i>	Moist; specific details of ecology lacking		Y	
Fungus	<i>Galerina vittaeformis</i>	Moist; specific details of ecology lacking		Y	
Fungus	<i>Helvella compressa</i>	Riparian or wet		Y	
Fungus	<i>Helvella crassitunicata</i>	Riparian or wet		Y	
Fungus	<i>Helvella elastica</i>	Riparian or wet		Y	
Fungus	<i>Helvella maculata</i>	Riparian or wet		Y	
Fungus	<i>Octavianina macrospora</i>	Mesic		Y	
Fungus	<i>Otidea leporina</i>	Duff in moist-wet forest		Y	
Fungus	<i>Otidea onotica</i>	Duff in moist-wet forest		Y	
Fungus	<i>Otidea smithii</i>	Duff in moist-wet forest		Y	
Fungus	<i>Phlogotis helvelloides</i>	Riparian zones, headwater seeps, & intermittent streams; LWD		Y	
Fungus	<i>Polyozellus multiplex</i>	Along intermittent streams/seeps		Y	
Fungus	<i>Pseudaleuria quinaultiana</i>	Wetlands		Y	
Fungus	<i>Rhodocybe nitida</i>	Moist, with a deep humus and litter layer		Y	
Fungus	<i>Rickenella setipes</i>	Moist; specific details of ecology lacking		Y	
Lichen	<i>Cetrelia cetrarioides</i>	Foggy, riparian forest on older hardwood trees		Y	
Lichen	<i>Collema nigrescens</i>	Foggy riparian forest, mostly on QUGA		Y	
Lichen	<i>Dendroscopaulon intricatum</i>	Wet, boreal riparian; on bark		Y	
Lichen	<i>Dermatocarpon luridum</i>	Streams		Y	
Lichen	<i>Hydrothyria venosa</i>	Clear, cold streams		Y	
Lichen	<i>Leptogium burnetiae</i> var. <i>hirsutum</i>	Foggy riparian forest on older trees		Y	
Lichen	<i>Leptogium cyanescens</i>	Foggy riparian forest on older hardwood trees		Y	
Lichen	<i>Leptogium rivale</i>	Streams		Y	
Lichen	<i>Leptogium saturninum</i>	Boreal riparian forest on older hardwood trees		Y	
Lichen	<i>Leptogium teretiusculum</i>	Foggy riparian forest on older hardwood trees		Y	
Lichen	<i>Lobaria hallii</i>	Wet, foggy forest on large diam. hardwoods & shrubs		Y	
Lichen	<i>Lobaria pulmonaria</i>	Moist, hardwood forest & swamps		Y	
Lichen	<i>Nephroma bellum</i>	Open forest		Y	
Lichen	<i>Nephroma isidiosum</i>	Unknown		Y	
Lichen	<i>Platismatia lacunosa</i>	Moist forest on deciduous & hardwood trees		Y	
Lichen	<i>Usnea longissima</i>	Wet forests & swamps		Y	
Liverwort	<i>Tritomaria exsectiformis</i>	Moist shaded rocks, primarily in riparian areas		Y	
Moss	<i>Antitrichia curtipendula</i>	On branches in canopy of fog-penetrated forests; strm terraces		Y	
Moss	<i>Racomitrium aquaticum</i>	Shaded rocks & streambanks (splash zone)		Y	

Moss	<i>Scouleria marginata</i>	Splash zone of streams		Y
Vascular	<i>Ammannia robusta</i>	Wet places, drying pond & ditch margins	3	N -
Vascular	<i>Cardamine pattersonii</i>	Wet grassy areas, rock cliffs, moss on rocks; strmside gravel	1	N Federal Sensitive
Vascular	<i>Cyperus bipartitus</i>	Streambanks & wet places	3	N BLM Tracking Species
Vascular	<i>Dodecatheon austrofrigidum</i>	Along rivers below high water line; on rocks; also at high elev.	1	N Federal Sensitive
Vascular	<i>Dryopteris filix-mas</i>	Moist woods, thickets, streambanks	2	N Federal Sensitive
Vascular	<i>Erythronium revolutum</i>	Streambanks and wet places in light to fairly thick wooded areas	4	N BLM Tracking Species
Vascular	<i>Filipendula occidentalis</i>	Shady, damp sites	1	N Federal Sensitive
Vascular	<i>Iliamna latibracteata</i>	Conifer forests & streamsides	2	N Federal Sensitive
Vascular	<i>Isopyrum stipitatum</i>	Flood plain, relatively open ground under deciduous forest	3	N Federal Sensitive
Vascular	<i>Najas guadalupensis</i>	Ponds, lakes, irrigation ditches, reservoirs	3	N -
Vascular	<i>Poa laxiflora</i>	Moist areas; edges of streams, seeps, benches	4	N Federal Tracking sp.
Vascular	<i>Poa marcida</i>	Moist areas in coastal mountains	4	N -
Vascular	<i>Polygonum punctatum</i>	Shallow water, shores, moist places, roadside ditches	3	N BLM Tracking Species
Vascular	<i>Samolus parviflorus</i>	Moist sites	3	
Vascular	<i>Scirpus cyperinus</i>	Wet, low ground; seasonally flooded bottom-lands and lakesides	4	N Federal Sensitive
Vascular	<i>Tofieldia glutinosa ssp. glutinosa</i>	Meadows, bogs, & streambanks	3	N -
Vascular	<i>Utricularia gibba</i>	Aquatic; standing or slow moving water; ponds and sloughs	2	N Federal Sensitive
Vascular	<i>Utricularia minor</i>	Aquatic; in standing or slow moving water; creeping along the botto	2	N Federal Sensitive
Vascular	<i>Wolffia columbiana</i>	Fresh-water aquatic found in ponds; floats just below the surface	2	N Federal Sensitive
Vascular	<i>Wolffia punctata</i>	Fresh-water aquatic; free-floating plant, growing in ponds	2	N -

LSR Assessment (R0267/R0268). Appendix E. Coastal Plant Species of Concern. Although primarily coastal, some of these species may occur within the LSR.

FORM	SCIENTIFIC NAME	HABITAT DESCRIPTION	ONHP	ROD	FED
Fungus	<i>Albatrellus avellaneus</i>	Coastal		Y	
Fungus	<i>Albatrellus ellsii</i>	Coastal		Y	
Fungus	<i>Albatrellus flöttii</i>	Coastal		Y	
Lichen	<i>Bryoria pseudocapillaris</i>	Forests or open dunes on coast	2	Y	
Lichen	<i>Bryoria spiralis</i>	Pantropical areas, on peninsulas & headlands		Y	
Lichen	<i>Bryoria subcana</i>	Coastal bays & streams	2	Y	
Lichen	<i>Bryoria tortuosa</i>	Coast & mesic		Y	
Lichen	<i>Cetraria californica</i>	Scrubby dune areas		Y	
Lichen	<i>Erioderma sorediatum</i>	Stabalized dunes in old forest	2	Y	
Lichen	<i>Heterodermia leucomelos</i>	Forested headlands		Y	
Lichen	<i>Hypogymnia duplicata</i>	Wet, foggy, windy coast & maritime sites	3	Y	
Lichen	<i>Hypogymnia oceanica</i>	Coast & maritime microclimates		Y	
Lichen	<i>Leioderma sorediatum</i>	Stabalized dune in forest	2	Y	
Lichen	<i>Leptogium brebissonii</i>	Stabalized dunes in old forest		Y	
Lichen	<i>Loxosporopsis corallifera</i>	Immediate coast		Y	
Lichen	<i>Niebla cephalota</i>	Windswept headlands		Y	
Lichen	<i>Pyrrhospora quercea</i>	Immediate coast		Y	
Lichen	<i>Teloschiste flavicans</i>	Dry uplands & prairies, on coastal shrubs	3	Y	
Lichen	<i>Usnea hesperina</i>	Broken dune forest	2	Y	
Vascular	<i>Abronia latifolia</i>	Coastal dunes & coastal scurb	3	N	-
Vascular	<i>Abronia umbellata</i>	Sandy areas of beaches and foredunes.	1	N	Federal Sensitive
Vascular	<i>Carex brevicaulis</i>	Dry soil near coast	3	N	BLM Assessment Sp
Vascular	<i>Carex macrochaeta</i>	Moist open places, often near beach; also at higher elevations	2	N	Federal Sensitive
Vascular	<i>Carex pluriflora</i>	Sphagnum bogs, marshes, streambanks near the coast	2	N	Federal Sensitive
Vascular	<i>Castilleja ambigua ssp. ambigua</i>	Coastal bluffs, salt marshes & grasslands	3	N	-
Vascular	<i>Cordylanthus maritimus ssp. palustris</i>	Coastal salt marshes	1	N	Federal Sensitive
Vascular	<i>Honkenya peploides</i>	Coastal beaches	3	N	-
Vascular	<i>Hydrocotyle verticillata</i>	Dune deflation plains, along edges of lakes & streams	2	N	Federal Sensitive
Vascular	<i>Juncus gerardii</i>	Coastal salt marshes	3	N	-
Vascular	<i>Limonium californicum</i>	Coast strand, salt marshes, beaches and bogs	2	N	-
Vascular	<i>Lycopodiella inundata</i>	Dune deflation plains, coastal bogs & inland lake shores	2	N	Federal Sensitive
Vascular	<i>Microseris bigelovii</i>	Open sandy soil or soil pockets on coastal headlands	2	N	-
Vascular	<i>Ophioglossum vulgatum</i>	Moist meadows, dune deflation plains, along lakes & marshes	2	N	Federal Sensitive
Vascular	<i>Poa unilateralis</i>	Coastal bluffs in more or less saline soils	3	N	-

APPENDIX F

REO LETTERS OF EXEMPTION FOR ACTIVITIES IN LSRS

United States
Department of
Agriculture

Forest
Service

R-6/R-5

Reply to: 2470/1920

Date: May 9, 1995

Subject: Criteria to Exempt Specific Silvicultural Activities in LSRs and
MLSAs from REO Review

To: Forest Supervisors, Owl Forests

Enclosed is a memorandum from the Regional Ecosystem Office (REO) exempting certain precommercial thinning, release, and reforestation activities within LSRs from REO review. I am pleased about this exemption and consider it a key step toward accomplishing ecosystem management objectives in a timely manner. However, since some readers will view the criteria as unnecessarily restrictive, I ask you to keep the following points in mind.

This is the first REO review exemption. It is based on proposals submitted to REO for review or upon proposals REO has discussed in the field. It is, of necessity, conservative. REO continues to express a desire to expand this exemption to other types of activities at the earliest possible time.

Before this memorandum was signed, all silvicultural activities were subject to REO review. Now most young stand thinning (including related sale), release, and reforestation proposals are not subject to review. This is a positive step, and there is little to be gained by discussing whether the criteria should have gone farther at this time. Since no commercial thinning proposals have ever been submitted to REO for review, for example, REO had little basis to expand these criteria at this time.

The criteria do not infer a right or wrong, or consistency or non-consistency with standards and guidelines. The criteria simply draws the line between those proposals no longer subject to REO review, and those that remain subject to review. Proposals not meeting the criteria should be submitted for review as in the past, and REO expects to continue to meet its commitment to complete such reviews within 3 weeks, or less, of date received.

Note that the exemption for reforestation is in addition to the somewhat broader exemption already included in the standards and guidelines for reforestation activities required because of existing timber sales.

This exemption also applies to the Issue Resolution Team (IRT) since IRT review was only required in preparation for sending to REO. Specific questions about this exemption should be addressed to the President's Forest Plan coordinator on your unit.

/s/ John E. Lowe

JOHN LOWE
Regional Forester, R-6

/s/Steve Clauson (for)

LYNN SPRAGUE
Regional Forester, R-5

Enclosure

Regional Ecosystem Office
P.O. Box 3623
Portland, Oregon 97208
(503) 326-6265
FAX: (503) 326-6282

Memorandum

Date: April 20, 1995

To: Regional Interagency Executive Committee
(See Distribution List)

From: Donald R. Knowles, Executive Director /s/ Don Knowles

Subject: Criteria to Exempt Specific Silvicultural Activities in LSRs
and MLSAs from REO Review

Pages C-12 and C-26 of the Record of Decision (ROD) for the Northwest Forest Plan state that "[t]he Regional Ecosystem Office may develop criteria that would exempt some activities from review." Enclosed are criteria that exempt certain young-stand thinning, release, and reforestation projects that are proposed in Late-Successional Reserves (LSRs) and Managed Late-Successional Areas (MLSAs) from review by the Regional Ecosystem Office (REO). These criteria were developed by an interagency work group and the REO based on the review of silvicultural projects, field visits, and discussions with agencies and technical specialists. The REO may expand the review exemption criteria as experience with additional forest management activities is gained. Please distribute the attached REO review exemption criteria to the field.

It is important to note that these criteria do not affect the kind of activities the ROD permits within LSRs and MLSAs. The criteria apply only to the requirement for REO review of silvicultural activities in LSRs and MLSAs and only to a specific subset of silvicultural treatments. It should also be noted that compliance with the ROD's standards and guidelines and other statutory and regulatory requirements is not affected by these exemption criteria. For example, requirements to do watershed analyses and Endangered Species Act consultation are not affected by the REO review exemption criteria.

Enclosure

cc:
IAC Members (See Distribution List)

362/ly

Distribution List

Date: April 20, 1995

Subject: Criteria to Exempt Specific Silvicultural Activities in LSRs
and MLSAs from REO Review

TO: Regional Interagency Executive Committee

Anita Frankel, Director, Forest and Salmon Group, Environmental
Protection Agency
John Lowe, Regional Forester, USDA Forest Service, R-6
Stan Speaks, Area Director, Bureau of Indian Affairs
Michael Spear, Regional Director, U.S. Fish & Wildlife Service
William Stelle, Jr., Regional Director, National Marine Fisheries Service
William Walters, Acting Regional Director, National Park Service
Elaine Zielinski, State Director, Bureau of Land Management, OR/WA

cc: Other Members of Intergovernmental Advisory Committee

California

Francie Sullivan, Shasta County Supervisor
Terry Gorton, Assistant Secretary, Forestry and Rural Economic Dev.,
California Resource Agency

Oregon

Rocky McVay, Curry County Commissioner
Paula Burgess, Federal Forest and Resource Policy Advisor, Office of the
Governor

Washington

Harvey Wolden, Skagit County Commissioner
Amy F. Bell, Deputy Supervisor for Community Relations, WA Dept. of
Natural Resources
Bob Nichols, Senior Executive Policy Assistant, Governor's Office
(Alternate)

Tribes

Greg Blomstrom, Planning Forester, CA Indian Forest & Fire Mgmt. Council
Mel Moon, Commissioner, NW Indian Fisheries Commission
Jim Anderson, Executive Director, NW Indian Fisheries Commission
(Alternate)
Gary Morishima, Technical Advisor, Intertribal Timber Council
Guy McMinds, Executive Office Advisor, Quinault Indian Nation

Federal Agencies

Michael Collopy, Director, Forest and Rangeland Ecosystem Science Center,
National Biological Service
Eugene Andreuccetti, Regional Conservationist, Natural Resources
Conservation Service
Bob Graham, State Conservationist, Natural Resources Conservation
Service (Alternate)
G. Lynn Sprague, Regional Forester, USDA Forest Service, R-5 (Alternate)
Thomas Murphy, Director, Environmental Research Laboratory, Environmental
Protection Agency
Charles Philpot, Station Director, Forest Service, PNW
Tom Tuchmann, Director, Office of Forestry and Economic Development (Ex
Officio)
Ed Hastey, State Director, Bureau of Land Management, CA (Alternate)

REO Review Exemption Criteria

Background

Standards and Guidelines (S&Gs) in the "Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl" (referred to as the ROD) provide that silvicultural activities within Late-Successional Reserves (LSRs) and Managed Late-Successional Areas (MLSAs) are subject to review by the Regional Ecosystem Office (REO). The S&Gs also state that "REO may develop criteria that would exempt some activities [within LSRs and MLSAs] from review."

Based upon proposals submitted to REO for review, field visits, discussions with the agencies and technical specialists, and our understanding of LSR objectives, REO is hereby exempting the following types of activities from the REO review requirement stated on pages C-12 and C-26 of the ROD. Silvicultural projects meeting the following criteria are exempted from REO review because such projects have a high likelihood of benefitting late-successional forest characteristics.

Activities must still comply with all S&Gs in the ROD (e.g., initial LSR assessments, watershed analysis, riparian reserves) and with other statutory and regulatory requirements (e.g., National Forest Management Act, Federal Land Management Policy Act, National Environmental Policy Act, Endangered Species Act, Clean Water Act). This exemption applies only to the REO review requirement found on pages C-12 and C-26 in the ROD. Silvicultural activities described in the S&Gs that do not meet the criteria listed below continue to be subject to REO review at this time.

Silvicultural treatments in LSRs and MLSAs are exempted from REO review (ROD, pages C-12 and C-26), where the agency proposing the treatments finds that the following criteria are met:

1. Young-Stand Thinning, commonly referred to as TSI or precommercial thinning, where:
 - a. Young stands, or the young-stand component (understory) of two-storied stands, is overstocked. Overstocked means that reaching the management objective of late-successional conditions will be significantly delayed, or desirable components of the stand may be eliminated, because of stocking levels. The prescription should be supported by empirical information or modeling (for similar, but not necessarily these specific, sites) indicating the development of late-successional conditions will be accelerated or enhanced.
 - b. Cut trees are less than 8" dbh, and any sale is incidental to the primary objective.
 - c. Tracked, tired, or similar ground-based skidders or harvesters are not used.
 - d. Treatments promote a natural species diversity appropriate to meet late-successional objectives; including hardwoods, shrubs, forbs, etc..

- e. Treatments include substantially varied spacing in order to provide for some very large trees as quickly as possible, maintain areas of heavy canopy closure and decadence, and encourage the growth of a variety of species appropriate to the site and the late-successional objective.
- f. Treatments minimize, to the extent practicable, the need for future entries.
- g. Cutting is by hand tools, including chain saws.

2. Release, also commonly referred to as TSI, where:

- a. There is undesirable vegetation (competition) which delays attainment of the management objective of late-successional conditions, or desirable components of the stand may be eliminated, because of such competition. The prescription should be supported by empirical information or modeling (for similar, but not necessarily these specific, sites) indicating the development of late-successional conditions will be accelerated or enhanced.
- b. Cut material is less than 8" dbh, and any sale is incidental to the primary objective.
- c. Tracked, tired, or similar ground-based skidders or harvesters are not used.
- d. Treatments promote a natural species diversity appropriate to meet late-successional objectives, including hardwoods, shrubs, forbs, etc.
- e. Cutting is by hand tools, including chain saws.

3. Reforestation and Revegetation, including incidental site preparation, release for survival, and animal damage control, where:

- a. No site preparation is required other than hand scalping.
- b. Reforestation is necessary to quickly reach late-successional conditions, protect site quality, or achieve other ROD objectives.
- c. Treatments promote a natural species diversity appropriate to meet late-successional objectives, including hardwoods, shrubs, forbs, etc.
- d. Treatments, either through spacing, planting area designation, or expected survival or growth patterns, result in substantially varied spacing in order to provide for some very large trees as quickly as possible, create areas of heavy canopy closure and decadence, and encourage the growth of a variety of species appropriate to the site and the late-successional objective.
- e. Treatments minimize, to the extent practicable, the need for future entries.

REGIONAL ECOSYSTEM OFFICE

333 SW 1st
P.O. Box 3623
Portland, Oregon 97208-3623
Phone: 503-326-6265 FAX: 503-326-6282

MEMORANDUM**DATE:** July 9, 1996**TO: Regional Interagency Executive Committee (RIEC)**

Ken Feigner, Director, Forest & Salmon Group, Environmental Protection Agency
Robert W. Williams, Regional Forester, R-6, Forest Service
Stan M. Speaks, Area Director, Bureau of Indian Affairs
Michael J. Spear, Regional Director, U.S. Fish & Wildlife Service
William Stelle, Jr., Regional Director, National Marine Fisheries Service
William C. Walters, Deputy Field Director, National Park Service
Elaine Y. Zielinski, State Director, Oregon/Washington, Bureau of Land Management

FROM: Donald R. Knowles, Executive Director*Don Knowles***SUBJECT:** Criteria to Exempt Specific Silvicultural Activities in Late-Successional Reserves and Managed Late-Successional Areas from Regional Ecosystem Office Review

Enclosed are criteria that exempt certain commercial thinning projects in Late-Successional Reserves (LSRs) and Managed Late-Successional Areas (MLSAs) from review by the Regional Ecosystem Office (REO), pursuant to pages C-12 and C-26 of the Northwest Forest Plan (NFP) *Record of Decision (ROD)*. These criteria were developed by an interagency work group and the REO based on review of silvicultural projects, field visits, and comments from agencies, researchers, and technical specialists.

We believe we are ready for these exemptions. Several versions of these criteria have been distributed to your agencies and others for review over the last several months. The comments received have been used to help clarify and focus the criteria. Use of the criteria will expedite implementation of beneficial silvicultural treatments in LSRs and MLSAs. We suggest that you transmit them to your field units at your earliest convenience.

It is important to note that these criteria do not affect the kind of activities the *ROD* permits within LSRs and MLSAs. The criteria simply exempt a specific subset of silvicultural treatments from the requirement for project level REO review of silvicultural activities within LSRs and MLSAs. Please also note that compliance with the *ROD's* standards and guidelines and other statutory and regulatory requirements is not affected by these exemption criteria. For example, requirements to do watershed analyses and Endangered Species Act consultation are not affected by the REO review exemption criteria.

We expect implementation monitoring procedures of the Northwest Forest Plan to select enough silvicultural projects within LSRs and MLSAs, both exempted and reviewed, to determine if actual projects meet standards and appropriate criteria. Obviously, if any of you have questions or comments about the attached, please call me directly at 503-326-6266. Dave Powers at 503-326-6271, or Gary S. Sims at 503-326-6274.

cc: IAC, RMC, LSR Workgroup

Enclosure

694/ly

Criteria Exempting Certain Commercial Thinning Activities From REO Review

Background

Standards and Guidelines (S&Gs) in the *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl (ROD)* provide that silvicultural activities within Late-Successional Reserves (LSRs) and Managed Late-Successional Areas (MLSAs) are subject to review by the Regional Ecosystem Office (REO). The S&Gs also state that the REO may develop criteria that would exempt some activities (within LSRs and MLSAs) from review.

Based upon project proposals submitted to the REO for review, field visits, discussions with the agencies, researchers, and technical specialists, and our understanding of LSR objectives, the REO is hereby exempting certain commercial thinning activities (sometimes referred to as density management activities) from the REO review requirement (*ROD*, pages C-12 and C-26). Silvicultural projects meeting the criteria below are exempted from REO review because such projects have a high likelihood of benefiting late-successional forest conditions. Many of the commercial thinning proposals reviewed thus far by the REO have met these criteria.

In some cases the criteria refer to the "prescription." All silvicultural treatments within LSRs will be conducted according to a silvicultural prescription fully meeting agency standards for such documents. A description of the desired future condition (DFC), and how the proposed treatment is needed to achieve the DFC, are key elements in this prescription. The description of desired future condition should typically include desired tree species, canopy layers, overstory tree size (e.g., diameter breast height), and structural components such as the range of coarse woody debris (CWD) and snags.

Some elements of these exemption criteria may seem prescriptive, and reviewers suggested several changes to accommodate specific forest priorities. While such suggestions may have been within the scope of the S&Gs, there are several reasons they are not included here:

- These criteria are based on numerous submittals already reviewed by the REO and found to be consistent with the S&Gs. Other treatments, such as thinning with fire, may be equally appropriate. The REO simply has not had sufficient experience with such prescriptions within LSRs to write appropriate exemption criteria at this time. Agencies are encouraged to develop and submit such prescriptions for review. The REO will consider supplementing or modifying these criteria over time.
- These criteria apply range wide. It may be more appropriate to seek exemption at the time of LSR assessment review where specific vegetation types, provincial issues, or objectives do not fit within these criteria or where silvicultural prescriptions are needed other than as described below.
- These exemption criteria are not standards and guidelines, and projects meeting LSR objectives but not fitting these criteria should continue to be forwarded to the REO for review.

Four other key points about thinning are important to consider when developing thinning prescriptions:

1. We urge caution in the use of silvicultural treatments within LSRs. Silvicultural treatments within old habitat conservation areas (HCAs) and designated conservation areas (DCAs) were extremely limited, and many of the participants in the Forest Ecosystem Management Assessment Team/Supplemental Environmental Impact Statement (FEMAT/SEIS) process advanced good reasons for continuing such restrictions. Only high eastside risks and a case made that late-successional conditions could clearly be advanced by treatments in certain stand conditions led decision makers toward the current S&Gs. Note that the "examples" for the westside (S&Gs, page C-12) are for "even-age stands" and "young single-species stands." Agencies must recognize when younger stands are developing adequately and are beginning to become valuable to late-successional species. Such stands should be left untreated unless they are at substantial risk to large-scale disturbance.
2. Thinning can easily remove structural components or impede natural processes such as decay, disease, or windthrow, reducing the stand's value to late-successional forest-related species. Thinning prescriptions that say "leave the best, healthiest trees" could eliminate structural components important to LSR objectives.
3. While "historic" stand conditions may be an indicator of a sustainable forest, they are not the *de facto* objectives. The S&Gs require an emphasis toward late-successional conditions to the extent sustainable.
4. Treatments need to take advantage of opportunities to improve habitat conditions beyond "natural conditions." For example, exceeding "natural levels" of CWD within a 35-year-old stand can substantially improve the utility of these stands for late-successional forest-related species. Treatments must take advantage of opportunities to optimize habitat for late-successional forest-related species in the short term.

Relation to S&Gs and Other Exemption Criteria

Exempted thinnings must still comply with all pertinent S&Gs in the *ROD* (e.g., initial LSR assessments, watershed analyses, riparian reserves) and with other statutory and regulatory requirements (e.g., National Forest Management Act, Federal Land Management Policy Act, National Environmental Policy Act, Endangered Species Act, Clean Water Act). Interagency cooperation, monitoring, and adaptive management are key components of the *ROD* and were key assumptions underlying the development of these criteria. Additionally, field units are strongly encouraged to engage in intergovernmental consultation when developing projects. This exemption applies only to the REO review requirement (*ROD*, pages C-12 and C-26). Many treatments not meeting these exemption criteria may be appropriate within LSRs and MLSAs, and these treatments remain subject to REO review. These exemption criteria are in addition to criteria issued April 20, 1995, for Young Stand Thinning, Release, and Reforestation and Revegetation, and are in addition to exemption criteria adopted through the LSR assessment review process.

EXEMPTION CRITERIA

Silvicultural treatments in LSRs and MLSAs are exempted from REO review (ROD, pages C-12 and C-26) where the agency proposing the treatments finds that **ALL** of the following criteria are met:

Objectives

1. The objective or purpose of the treatment is to develop late-successional conditions or to reduce the risk of large-scale disturbance that would result in the loss of key late-successional structure. Further, the specific treatment would result in the long-term development of vertical and horizontal diversity, snags, CWD (logs), and other stand components benefiting late-successional forest-related species. The treatment will also, to the extent practicable, create components that will benefit late-successional forest-related species in the short term.

Timber volume production is only incidental to these objectives and is not, in itself, one of the objectives of the treatment. Creation or retention of habitat for early successional forest-related species is not a treatment objective.

2. Negative short-term effects to late-successional forest-related species are outweighed by the long-term benefits to such species and will not lessen short-term functionality of the LSR as a whole.
3. The leave-tree criteria provide for such things as culturing individual trees specifically for large crowns and limbs and for the retention of certain characteristics that induce disease, damage, and other mortality or habitat, consistent with LSR objectives. "Healthiest, best tree" criteria typical of matrix prescriptions are modified to reflect LSR objectives.
4. Within the limits dictated by acceptable fire risk, CWD objectives should be based on research that shows optimum levels of habitat for late-successional forest-related species, and not be based simply on measurements within "natural stands." For example, recent research by Carey and Johnson in young stands on the westside indicates owl prey base increases as CWD (over 4") within Douglas-fir forests increases, up to 8- to 10-percent groundcover south of the town of Drain, Oregon, and 15-percent groundcover north of Drain, increasing to 15 to 20 percent in the Olympic Peninsula and Western Washington Cascades. Other references that could help identify initial considerations involving natural ranges of variability in CWD include Spies and Franklin, for discussions on Washington Cascades, Oregon Cascades, and Coast Ranges; and Graham, et al., for east of the Cascades.

If tree size, stocking, or other considerations preclude achievement of this objective at this time, the prescription includes a description of how and when it will be achieved in the future.

5. Agencies having an interest in LSR projects proposed under these criteria should continue to be given the opportunity to participate in project development.

Stand Attributes

1. The stand is currently **not** a complex, diverse stand that will soon meet and retain late-successional conditions without treatment.

2. West of the Cascades outside of the Oregon and California Klamath Provinces, the basal-area-weighted average age of the stand is less than 80 years. Individual trees exceeding 80 years in those provinces, or exceeding 20-inches dbh in **any** province, shall not be harvested except for the purpose of creating openings, providing other habitat structure such as downed logs, elimination of a hazard from a standing danger tree, or cutting minimal yarding corridors. Where older trees or trees larger than 20-inches dbh are cut, they will be left in place to contribute toward meeting the overall CWD objective. Thinning will be from below, except in individual circumstances where specific species retention objectives have a higher priority. Cutting older trees or trees exceeding 20-inches dbh for **any** purpose will be the exception, not the rule.
3. The stand is overstocked. Overstocked means that reaching late-successional conditions will be substantially delayed, or desirable components of the stand will likely be eliminated, because of stocking levels.

Treatment Standards

1. The treatment is primarily an intermediate treatment designed to increase tree size, crown development, or other desirable characteristics (S&Gs, page B-5, third paragraph); to maintain vigor for optimum late-successional development; to reduce large-scale loss of key late-successional structure; to increase diversity of stocking levels and size classes within the stand or landscape; or to provide various stand components beneficial to late-successional forest-related species.
2. The prescription is supported by empirical information or modeling (for similar, but not necessarily these specific sites) indicating that achievement of late-successional conditions would be accelerated.
3. The treatment is primarily an intermediate thinning, and harvest for the purpose of regenerating a second canopy layer in existing stands is no more than an associated, limited objective as described below under openings and heavily thinned patches.
4. The treatment will increase diversity within relatively uniform stands by including areas of variable spacing as follows:
 - Ten percent or more of the resultant stand would be in unthinned patches to retain processes and conditions such as thermal and visual cover, natural suppression and mortality, small trees, natural size differentiation, and undisturbed debris.
 - Three to 10 percent of the resultant stand would be in openings, roughly 1/4 to 1/2 acre in size to encourage the initiation of structural diversity.
 - Three to 10 percent of the resultant stand would be in heavily thinned patches (e.g., less than 50 trees per acre) to maximize individual tree development and encourage some understory vegetation development.

The treatment does not inappropriately "simplify" stands by removing layers or structural components, creating uniform stocking levels, or removing broken and diseased trees important for snag recruitment, nesting habitat, and retention of insects and diseases important to late-successional development and processes.

5. To the extent practicable for the diameter and age of the stand being treated, the treatment includes falling green trees or leaving snags and existing debris to meet or make substantial progress toward meeting an overall CWD objective.
6. Snag objectives are to be identified as part of the DFC. Prescriptions must be designed to make substantial progress toward the overall snag objective, including developing large trees for future snag recruitment and retaining agents of mortality or damage. To the extent practicable for the diameter and age of the stand being treated, each treatment includes retention and creation of snags to meet the DFC. Publications useful in identifying snag-related DFCs include but are not limited to Spies, et al.

To the extent snag requirements for late-successional species are known, one objective is to attain 100 percent of potential populations for all snag-dependent species.

7. The project-related habitat improvements outweigh habitat losses due to road construction.

Cited References:

- Carey, A.B., and M.L. Johnson. 1995. Small mammals in managed, naturally young, and old-growth forests. *Ecological Applications* 5:336-352.
- Graham, R.T., A.E. Harvey, M.F. Jurgensen, T.B. Jain, J.R. Tonn, and D.S. Page-Dumroese. 1994. Managing coarse woody debris in forests of the Rocky Mountains. Res. Paper INT-RP-477. USDA Forest Service, Intermountain Research Station, Ogden, UT. 12p.
- Spies, T.S. and J.F. Franklin. 1991. The structure of natural young, mature, and old-growth Douglas-fir forests in Oregon and Washington. Pages 19-121 in: Ruggiero, L.F., K.B. Aubry, A.B. Carey, M.H. Huff (tech. coords). *Wildlife and Vegetation on Unmanaged Douglas-fir Forests*. Gen. Tech. Rep. GTR-PNW-285. USDA Forest Service, Pacific Northwest Research Station, Portland, OR.

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34.

MEMORANDUM

DATE: September 30, 1996

TO: Regional Interagency Executive Committee (RIEC)

Mike Collopy, Center Director, Forest & Rangeland Science Center, National Biological Service
Ken Feigner, Director, Forest & Salmon Group, Environmental Protection Agency
Thomas Mills, Station Director, Pacific Northwest Station, Forest Service
Thomas Murphy, Director, Environmental Research Lab, Environmental Protection Agency
Stan M. Speaks, Area Director, Bureau of Indian Affairs
Michael J. Spear, Regional Director, U.S. Fish & Wildlife Service
William Stelle, Jr., Regional Director, National Marine Fisheries Service
William C. Walters, Deputy Field Director, National Park Service
Robert W. Williams, Regional Forester, R-6, Forest Service
Elaine Y. Zielinski, State Director, Oregon/Washington, Bureau of Land Management

FROM: Donald R. Knowles, Executive Director

Don Knowles

SUBJECT: Amendment to "Criteria to Exempt Specific Silvicultural Activities in Late-Successional Reserves and Managed Late-Successional Areas from Regional Ecosystem Office Review" of July 9, 1996

On July 9, 1996, the Regional Ecosystem Office (REO) released criteria to exempt certain commercial thinning projects in Late-Successional Reserves (LSRs) and Managed Late-Successional Areas (MLSAs) from review. The memo stated, in part, that the "REO will consider supplementing or modifying these criteria over time." This memo contains the first amendment to the July 9 criteria.

After issuance of the July 9 criteria, members of my staff and the LSR Work Group continued to review current research, particularly that of Drs. Andrew Carey and Connie Harrington on commercial thinning in northwest Washington. Based on this additional review, it is apparent that although 1/4 to 1/2 acre openings will add structural diversity in some stands, they are larger than needed to improve small mammal populations (forage species for northern spotted owls), and are larger than normal processes would typically create in the course of naturally developing late-successional forests. "Best guess" thinning studies currently being conducted by the researchers do not include openings this large. Therefore, the second and third bullets under Treatment Standard #4 in the July 9 Exemption Criteria are combined to now read:

"Three to 10 percent of the resultant stand would be in heavily thinned patches (i.e., less than 50 trees per acre), or in openings up to 1/4 acre in size, to maximize individual tree development, encourage some understory vegetation development, and encourage the initiation of structural diversity."

Please implement this amendment at the earliest convenient time. However, projects already planned under the original July 9, 1996, version of the exemption criteria remain exempted from REO review. We suggest you transmit this amendment to your field units at your earliest convenience.

cc:
REO Reps
LSR Work Group
801/ly

APPENDIX G

SUCCESSIONAL PATHWAYS

List of species codes, common and scientific names of trees, shrubs and herbs used in the successional pathway diagrams.

Trees

Code	Scientific Name	Common Name
ACMA	<i>Acer macrophyllum</i>	Bigleaf maple
ALRU	<i>Alnus rubra</i>	Red alder
ARME	<i>Arbutus menziesii</i>	Madrone
CACH	<i>Castanopsis chrysophylla</i>	Chinquapin
PISI	<i>Picea sitchensis</i>	Sitka spruce
PSME	<i>Pseudotsuga menziesii</i>	Douglas-fir
THPL	<i>Thuja plicata</i>	Western redcedar
TSHE	<i>Tsuga heterophylla</i>	Western hemlock

Shrubs

ACCI	<i>Acer circinatum</i>	Vine maple
BENE	<i>Berberis nervosa</i>	Dwarf Oregon grape
COCO2	<i>Corylus cornuta</i>	California hazel
GASH	<i>Gaultheria shallon</i>	Salal
HODI	<i>Holodiscus discolor</i>	Ocean-spray
MEFE	<i>Menziesia ferruginea</i>	Fool's huckleberry
OPHO	<i>Oplopanax horridum</i>	Devil's club
RHMA	<i>Rhododendron macrophyllum</i>	Pacific rhododendron
RUSP	<i>Rubus spectabilis</i>	Salmonberry
VAOV2	<i>Vaccinium ovatum</i>	Evergreen huckleberry

Herbs/Ferns

OXOR	<i>Oxalis oregana</i>	Oregon oxalis
POMU	<i>Polystichum munitum</i>	Western swordfern

Conceptual Successional Vegetation Models By Disturbance Regimes

Topographic Location: Adjacent to draws, lower slope	DISTURBANCE REGIME 5 & 6 Disturbance Block Characteristic * High Severity (>70% mortality) * Low Frequency (300 yrs) * Giant Size (100,000 acres +)	Vegetation Grouping: WET	Siuslaw Plant Assoc. TSHE/RUSP TSHE/RUSP-GASH TSHE/RUSP-ACCI TSHE/OPHO
--	--	------------------------------------	---

Areas on or near the flood plain will experience a high frequency of disturbances or varying severity - will significantly alter understory veg and regen/ these static disturbances keep alder in the system.

	Age Since Major Disturbance			
	0 to 10	11 to 70	71 to 150	151 - 300
Dominant Tree Species	ALRU ALRU / PSME**	ALRU PSME / ALRU	ALRU / TSHE-THPL* PSME / ALRU	TSHE - THPL / ALRU PSME - TSHE - THPL / ALRU
General Density	ALRU - Moderate, variable ALRU/PSME- scattered PSME	Alder self thinning, gaps	Scattered ALRU, clumps Scattered PSME, moderate canopy closure	
Layering Regen		Thpl, Tshe Scattered		moderate layering - variable, scattered density
Ground Cover	ALRU - Dense RUSP ALRU / PSME- Less RUSP with PSME			

** There are 2 major species mixes after a major disturbance.

KEY POINTS:

Dominant Species: Wetter areas with pure alder - Many times will stay predominantly alder due to disturbances. In areas with a mix of alder and Douglas-fir, Douglas-fir will eventually become predominant.

Density: Pure alder stand density is dependant on disturbance frequency and severity. (ie a high frequency of sever disturbances - exposed bare soil from slides and/or flooding will perpetuate a young dense stand.. With no disturbance, alder will drop out due to short life span and shade intolerance.)

Layering: The presence of shade tolerant species appears to be some what of a random occurrence, dependant on seed source. Mixed Alder/ Douglas-fir stands develop a two story effect, although more clumpy then actual multilayered.

Ground cover: Salmonberry present through out seral stages.

Conceptual Successional Vegetation Models By Disturbance Regimes

Topographic Location: Upper 1/3 slope, Ride Top	DISTURBANCE REGIME 8 Disturbance Block Characteristics Mod-High Severity (30 - 70% mort) Low-Mod Frequency (100-300 yrs) Variable size	Vegetation Grouping: DRY Assuming NO Disturbance	Siuslaw Plant Assoc. TSHE/RHMA et al TSHE/VAOV2 TSHE/GASH TSHE/BENE et al
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	Age Since Major Disturbance			
	0 to 10	11 to 70	71 to 150	151 - 300
Dominant Tree Species	PSME	PSME/TSHE	PSME/TSHE	PSME PSME/TSHE
General Density	Moderate - High		Moderate to High	Moderate
Layering Regen	Little or None	Scattered TSHE / THPL* / ARME, CACH		TSHE / THPL increasing
Ground Cover	Poison Oak GASH, BENE, RHMA, HODI, COCO2 mid t high cover	decreasing	increasing	moderate cover Stable

* Seed source plays a role in ALRU vs TSHE/THPL dominance.

Conceptual Successional Vegetation Models By Disturbance Regimes

Topographic Location: Midslope	DISTURBANCE REGIME 5 & 6 Disturbance Block Characteristic * High Severity (>70% mortality) * Low Frequency (300 yrs) * Giant Size (100,000 acres +)	Vegetation Grouping: MOIST	Siuslaw Plant Assoc. TSHE/POMU TSHE/OXOR TSHE/ACCI/POMU TSHE/ACCI/GASH
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Conceptual models of succession were developed for each environment by using inventory information and field observations.

	Age Since Major Disturbance			
	0 to 10	11 to 70	71 to 150	151 - 300
Dominant Tree Species	PSME** PSME/ALRU	PSME PSME/ALRU	PSME PSME	PSME/ TSHE PSME/ TSHE
General Density	PSME Moderate to heavy PSME / ALRU - Scattered clumps ALRU moderate PSME density	(Stem Exclusion Phase) Alder decreasing	moderate	
Layering Regen	Both PSME & PSME/ALRU - Little or no layering		Scattered ALRU, TSHE, THPL, ACMA	Increased frequency
Ground Cover	Both PSME & PSME/ALRU - High diversity of species; Vine maple POMU, RUSP, OXOR Moderate to High Cover	Diversity of species decreases Low to Moderate	Greater diversity of species Moderate	High diversity of species Cover Variable

** There are 2 major species mixes after a major disturbance.

KEY POINTS:

Dominant Tree Species: PSME - will predominate until, or if shade tolerant species are introduced and have had time to develop. Presence of shade tolerant species somewhat of a random occurrence.

General Density: Alder decreasing - Doug-fir will over top. Dense stands of DF will go through stem exclusion phase - significant in terms of Plantation management objectives.

Ground Cover: Diversity of species and cover high then low through stem exclusion phase then high again.

Conceptual Successional Vegetation Models By Disturbance Regimes

Topographic Location: Upper 1/3 slope	DISTURBANCE REGIME 5 & 6 Disturbance Block Characteristics * High Severity (>70% mortality) * Low Frequency (300 yrs) * Giant Size (100,000 acres)	Vegetation Grouping: DRY	Siuslaw Plant Assoc. TSHE/RHMA et al TSHE/VAOV2 TSHE/GASH TSHE/BENE et al
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	Age Since Major Disturbance			
	0 to 10	11 to 70	71 to 150	151 - 300
Dominant Tree Species	PSME			PSME PSME/TSHE
General Density	High		Moderate to High	Moderate
Layering Regen	Little or None		Scattered TSHE / THPL*	TSHE / THPL increasing
Ground Cover	GASH, BENE, RHMA mid t high cover	decreasing	increasing	moderate cover Stable

** There are 2 major species mixes after a major disturbance.

Conceptual Successional Vegetation Models By Disturbance Regimes

Topographic Location: Adjacent to draws, lower slope - Found in smaller bands along draws than R 5&6	DISTURBANCE REGIME 8 Disturbance Block Characteristics Mod-High Severity (30 - 70% mort) Low-Mod Frequency (100-300 yrs) Variable size	Vegetation Grouping: WET	Siuslaw Plant Assoc. TSHE/RUSP
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Likely major disturbance to occur in pure alder
areas adjacent to draws by this time period.

	Age Since Major Disturbance			
	0 to 10	11 to 70	71 to 150	151 - 300
Dominant Tree Species	ALRU ALRU / PSME**	ALRU PSME / ALRU	ALRU / TSHE-THPL* PSME / ALRU	TSHE - THPL / ALRU PSME - TSHE - THPL / ALRU
General Density	ALRU - Moderate, variable ALRU-ACMA/PSME- scattered PSME	Alder self thinning, gaps →	Scattered ALRU, clumps Mod. stocking PSME, ALRU, ACMA →	→
Layering Regen	<i>Consider Remnant effect</i>	Thpl, Tshe, ACMA Scattered →	→	moderate layering - variable, scattered density
Ground Cover	ALRU - Dense RUSP ALRU / PSME- Less RUSP with PSME	decreasing RUSP cover →	→	greater diversity of species, moderately stable cover →

** There are 2 major species mixes after a
major disturbance.

* Seed source plays a role in ALRU vs TSHE/THPL dominance.

Conceptual Successional Vegetation Models By Disturbance Regimes

Topographic Location: Midslope	DISTURBANCE REGIME 8 Disturbance Block Characteristics Mod-High Severity (30 - 70% mort) Low-Mod Frequency (100-300 yrs) Variable size	Vegetation Grouping: MOIST Assuming Disturbance	Siuslaw Plant TSHE/POMU TSHE/OXOR TSHE/ACCI/POMU TSHE/ACCI/GASH
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	Age Since Major Disturbance			
	71 to 150 Pre disturbance	71 to 150 Post Disturbance	150 - 300	
Dominant Tree Species	PSME / Acma / TSHE		→	
General Density	moderate	Moderate to Low	Moderate	
Layering Regen	Scattered ALRU, TSHE, THPL, ACMA*	Seeding of PSME, TSHE, THPL Survival of some shade tolerant species after dist.	Two age PSME, Multiage layering of shade tolerant species	
Ground Cover	Greater diversity of species Moderate	Moderate to high Higher diversity of species		

Main difference between the disturbance and no disturbance regimes are:

- 1) Greater diversity in size class and layers.
- 2) More multi layer

Conceptual Successional Vegetation Models By Disturbance Regimes

Topographic Location: Midslope	DISTURBANCE REGIME 8 Disturbance Block Characteristics Mod-High Severity (30 - 70% mort) Low-Mod Frequency (100-300 yrs) Variable size	Vegetation Grouping: MOIST Assuming NO Disturbance	Siuslaw Plant Assoc. TSHE/POMU TSHE/OXOR TSHE/ACCI/POMU TSHE/ACCI/GASH
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	Age Since Major Disturbance			
	0 to 10	11 to 70	71 to 150	151 - 300
Dominant Tree Species	PSME** PSME / ALRU / ACMA/TSHE	PSME	PSME PSME / ACMA / TSHE	PSME PSME / TSHE
General Density	PSME Moderate to heavy PSME / ALRU - Scattered clumps ALRU moderate PSME density	Alder decreasing/TSHE increasing	moderate	
Layering Regen	Both PSME & PSME/ALRU - Little or no layering	TSHE, THPL layered scattered clumps of alder and ACMA	Scattered TSHE, THPL*	Increased frequency of layering
Ground Cover	Both PSME & PSME/ALRU - POMU, RUSP, OXOR Moderate to High Cover	Diversity of species decreases Low to Moderate	Greater diversity of species Moderate	High diversity of species Cover Variable

** There are 2 major species mixes after a major disturbance.

* Seed source plays a role in ALRU vs TSHE/THPL dominance.

Conceptual Successional Vegetation Models By Disturbance Regimes

Topographic Location: Upper 1/3 slope, Ride Top	DISTURBANCE REGIME 8 Disturbance Block Characteristics Mod-High Severity (30 - 70% mort) Low-Mod Frequency (100-300 yrs) Variable size	Vegetation Grouping: DRY Assuming Disturbance	Siuslaw Plant Assoc. TSHE/RHMA et al TSHE/VAOV2 TSHE/GASH TSHE/BENE et al
--	---	---	--

	Age Since Major Disturbance			
	71 to 150 Pre disturbance	71 to 150 Post Disturbance	150 - 300	
Dominant Tree Species	PSME	PSME		
General Density	Moderate to High	Moderate	Moderate to High	
Layering Regen	Scattered TSHE / THPL* / ARME, CACH	Two age PSME, Less survival then moist areas Sprouting from ARME & CACH	Two age PSME; Multi layering of shade tolerant species	
Ground Cover	increasing	Most species are sprouters so come back fast	Higher	

Main difference between the disturbance and no disturbance regimes are:

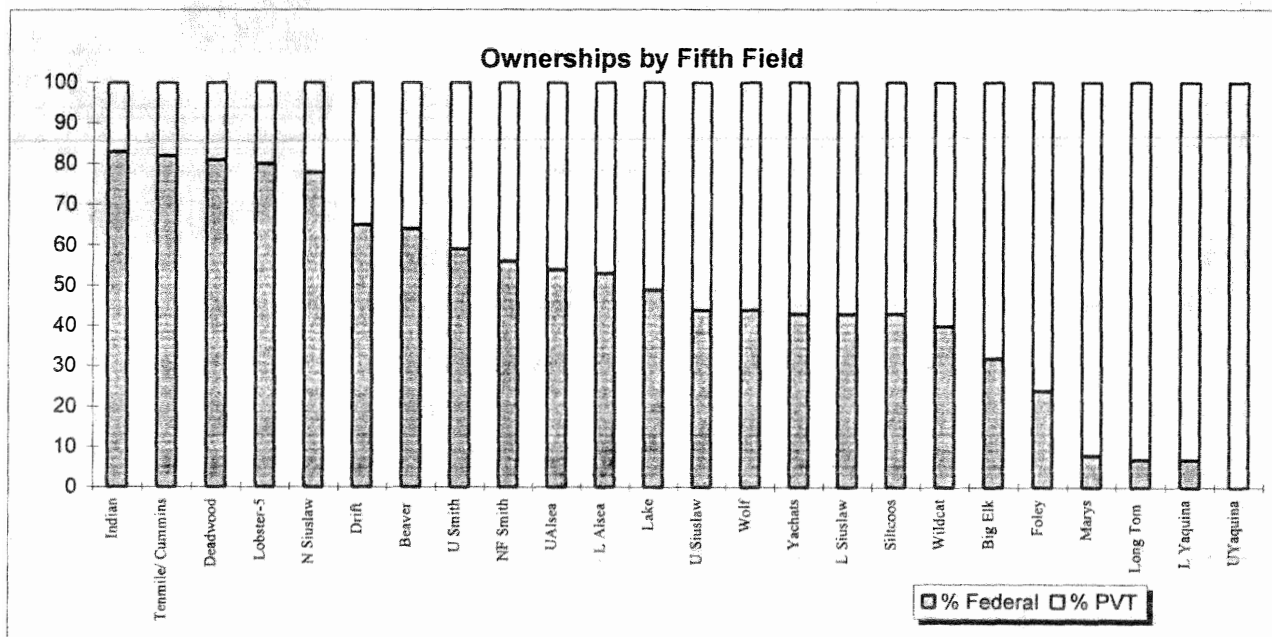
- 1) Greater diversity in size class and layers.
- 2) More multi layer
- 3) Higher input of Snags & CWD

APPENDIX H

INFORMATION BY 5TH FIELD WATERSHED

LSR Assessment (R0267/R0268) Appendix Table H.1 - Ownerships by 5th Field

5th Field#*	Watershed Name	Basin Ac	% PVT	% Federal
1710020606	Indian	30794	17	83
1710020507	Tenmile/ Cummins	68857	18	82
1710020605	Deadwood	37493	19	81
1710020502	Lobster-5	76360	20	80
1710020607	N Siuslaw	41078	22	78
1710020503	Drift	44292	35	65
1710020505	Beaver	43608	36	64
1710020306	U Smith	95551	41	59
1710020307	NF Smith	143875	44	56
1710020501	UAalsea	82098	46	54
1710020504	L Aalsea	98470	47	53
1710020604	Lake	74474	51	49
1710020601	U Siuslaw	127685	56	44
1710020602	Wolf	37890	56	44
1710020506	Yachats	27753	57	43
1710020608	L Siuslaw	111570	57	43
1710020701	Siltcoos	83159	57	43
1710020603	Wildcat	34902	60	40
1710020402	Big Elk	56979	68	32
1710020303	Foley	187229	76	24
1709000305	Marys	193078	92	8
1709000301	Long Tom	273319	93	7
1710020403	L Yaquina	50503	93	7
1710020401	UYaquina	53127	100	0

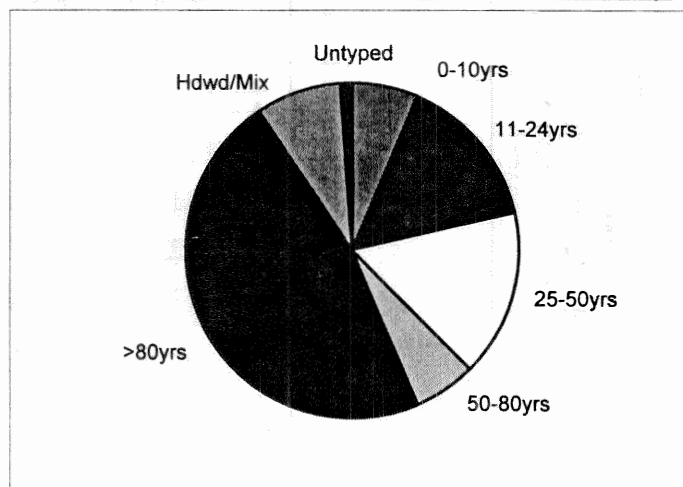


LSR Assessment (R0267/R0268) Appendix Table H.2 - Current Seral Breakdown by Fifth Field

Watersheds are sorted by amount of federal ownership. See also chapter 4 of the LSRA.

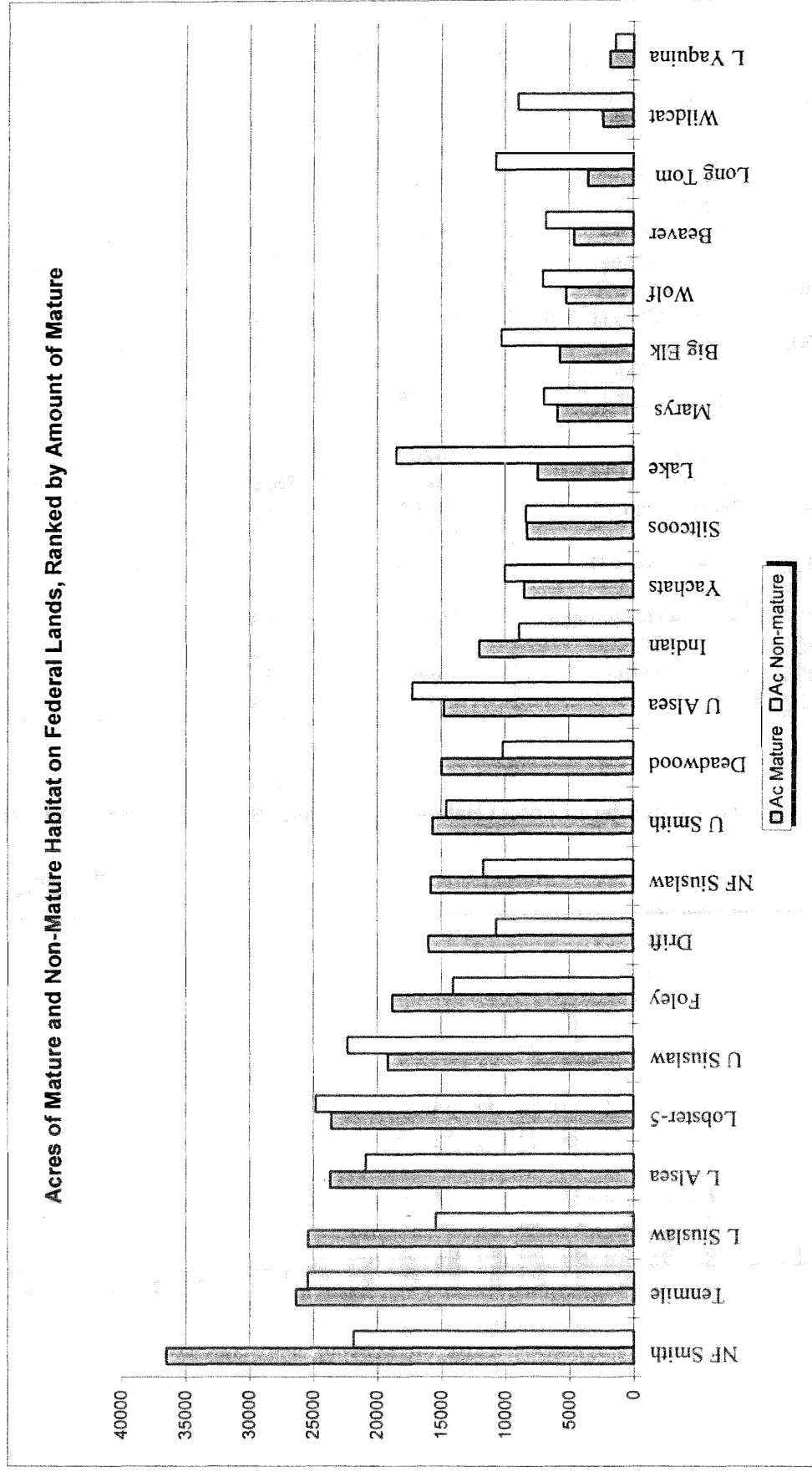
5th Field #*	Watershed Name	Basin Ac	% Federal	% 0-10yrs	Seral Breakdown -Includes All Ownerships					% Hdwd/Mix	% Untyped
					% 11-24yrs	% 25-50yrs	% 50-80yrs	% >80yrs			
1710020606	Indian	30794	83	7	17	15	2	41	11	8	
1710020507	Tenmile	68857	82	7	10	6	8	41	16	12	
1710020605	Deadwood	37493	81	5	13	14	3	42	11	12	
1710020502	Lobster-5	76360	80	7	16	17	3	32	13	12	
1710020607	NF Siuslaw	41078	78	8	13	11	3	40	13	11	
1710020503	Drift	44292	65	4	8	5	3	38	12	30	
1710020505	Beaver	43608	64	4	7	14	3	12	7	54	
1710020306	U Smith	95551	59	4	8	28	3	16	1	40	
1710020307	NF Smith	143875	56	4	8	6	2	28	4	49	
1710020501	U Alsea	82098	54	3	9	14	10	18	4	45	
1710020504	L Alsea	98470	53	6	11	9	3	27	10	35	
1710020604	Lake	74474	49	2	6	14	10	10	2	54	
1710020601	U Siuslaw	127685	44	4	7	12	5	15	1	57	
1710020602	Wolf	37890	44	4	8	12	6	14	1	56	
1710020506	Yachats	27753	43	11	14	9	7	33	20	6	
1710020608	L Siuslaw	111570	43	5	7	6	2	26	9	45	
1710020701	Siltcoos	83159	43	2	4	3	1	12	6	72	
1710020603	Wildcat	34902	40	3	4	8	16	7	3	60	
1710020402	Big Elk	56979	32	7	7	5	8	12	10	51	
1710020303	Foley	187229	24	3	3	7	1	10	0	76	
1709000305	Marys	193078	8	0	1	1	2	3	0	91	
1709000301	Long Tom	273319	7	1	1	2	1	1	0	93	
1710020403	L Yaquina	50503	7	3	1	1	0	4	1	89	

Seral Breakdowns for Federal Lands within the LSR only



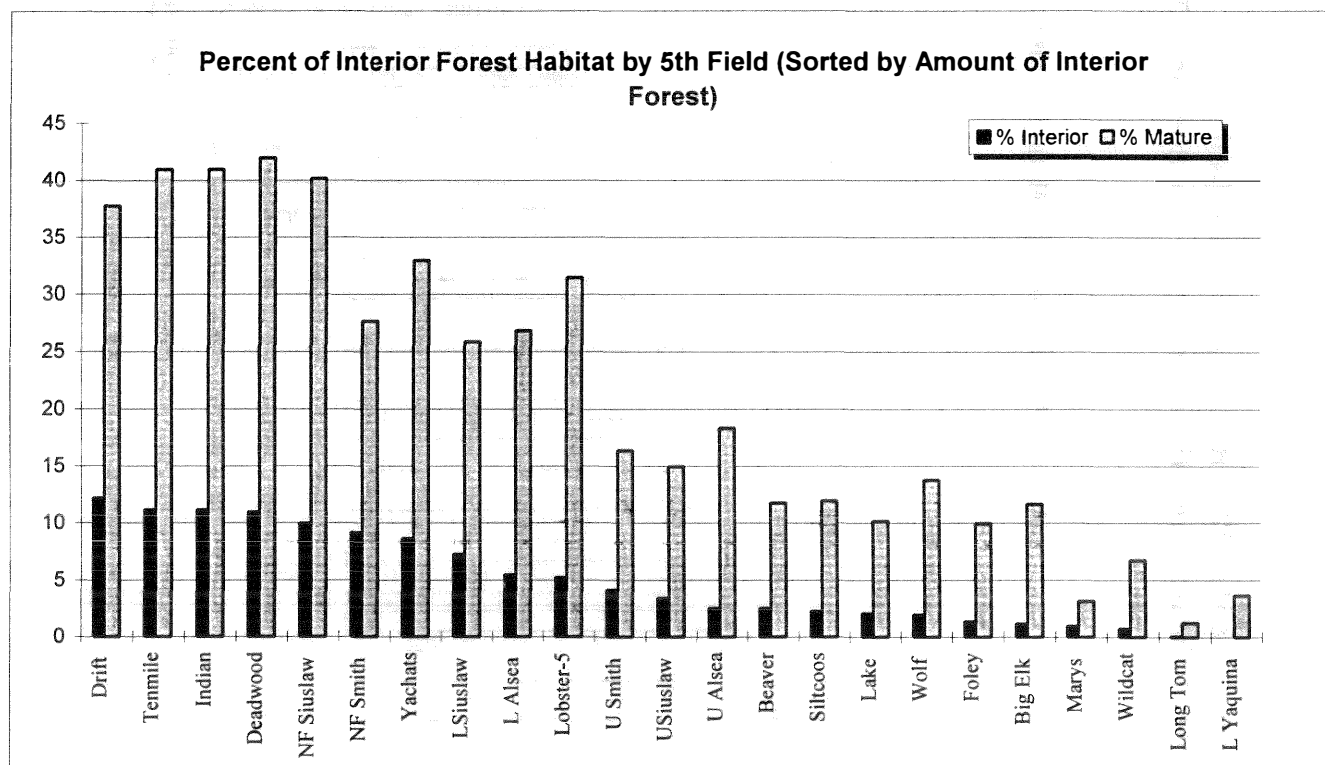
LSR Assessment (R0267/R0268) Appendix Table H.3

- Amount of Mature Forest Habitat compared to other Seral Types on Federal Lands, by 5th Field



Appendix H.4: Interior Forest Habitat Rating by 5th Field Watershed

5th Field #*	Watershed Name	Total Ac	Ac Mature	% Mature	Ac Interior	% Interior
1709000301	Long Tom River	273319	3535	1.3	308	0.1
1709000305	Marys R/Rock Cr	193078	6266	3.2	1935	1
1710020402	Big Elk Cr	56979	6680	11.7	662	1.2
1710020403	Lower Yaquina R	50503	1868	3.7	332	0
1710020501	Upper Alsea R	82098	15100	18.4	2146	2.6
1710020502	Lobster/Five R	76360	24050	31.5	4010	5.3
1710020503	Drift Cr (Alsea)	44292	16722	37.8	5403	12.2
1710020504	Lower Alsea R	98470	26518	26.9	5450	5.5
1710020505	Beaver Cr/Waldport	43608	5124	11.8	1115	2.6
1710020506	Yachats	27753	9120	33	2424	8.7
1710020507	Tenmile/ Cummins	68857	28141	41	7718	11.2
1710020601	Upper Siuslaw R	127685	19178	15	4507	3.5
1710020602	Wolf Cr	37890	5221	13.8	770	2
1710020603	Wildcat Cr	34902	2390	6.8	273	0.8
1710020604	Lake Cr	74474	7620	10.2	1550	2.1
1710020605	Deadwood Cr	37493	15750	42	4125	11
1710020606	Indian Cr	30794	12600	41	3464	11.2
1710020607	N Fk Siuslaw R	41078	16520	40.2	4122	10
1710020608	Lower Siuslaw R	111570	28886	25.9	8149	7.3
1710020701	Siltcoos/Tahkenitch	83159	10023	12	1907	2.3
1710020303	Big Tom/Foley	187229	18809	10	2834	1.4
1710020306	Upper Smith R	95551	15654	16.4	4057	4.2
1710020307	N Fk Smith R	143875	39916	27.7	13216	9.2



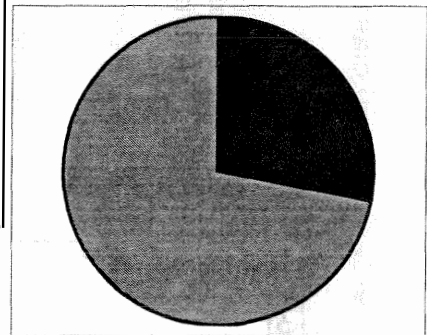
Appendix H.5: LSR Assessment (R0267/R0268) - T&E Species Information, by 5th Field. Numbers of owl pairs and murrelets listed below include all known locations in the watershed and include sites outside of the LSR

5th Field #	Watershed	Median Hm Rng	Owls <40% Hab	Total Owl Prs	# Murrelets
1710020503	Drift	2165	4	10	14
1710030307	NFk Smith	2121	7	23	19
1710020507	Tennile	2073	2	5	50
1710020607	NFk Siuslaw	2008	3	8	22
1710020606	Indian	1898	3	6	17
1710020605	Deadwood	1785	6	10	9
1710020608	L Siuslaw	1778	10	18	39
1710020701	Siltcoos	1680	5	5	12
1710020502	Lobster-5	1470	7	8	35
1710020501	U Alsea	1152	5	5	1
1710020506	Yachats	1139	5	6	56
1709000305	Marys	1071	6	7	6
1710030306	U Smith	1026	8	10	0
1710020601	U Siuslaw	870	8	10	11
1710030303	Foley	869	26	26	0
1710020504	L Alsea	843	4	6	47
1710020602	Wolf	733	9	9	0
1710020402	Big Elk	628	1	1	0
1710020505	Beaver	553	0	0	1
1710020603	Wildcat	398	5	5	0
1710020604	Lake	365	15	16	6
1709000301	Long Tom	190	6	6	0
1710020403	L Yaquina	0	0	0	0

Murrelet surveys are limited to timber sale and project areas. Owl surveys are more extensive and cover approximately 80% of the analysis area.

Median home range sizes, rather than averages, were determined to be a more accurate representation of habitat availability in areas with few pair sites. Acreage listed in this column includes all suitable habitat within a 1.5 mile radius circle.

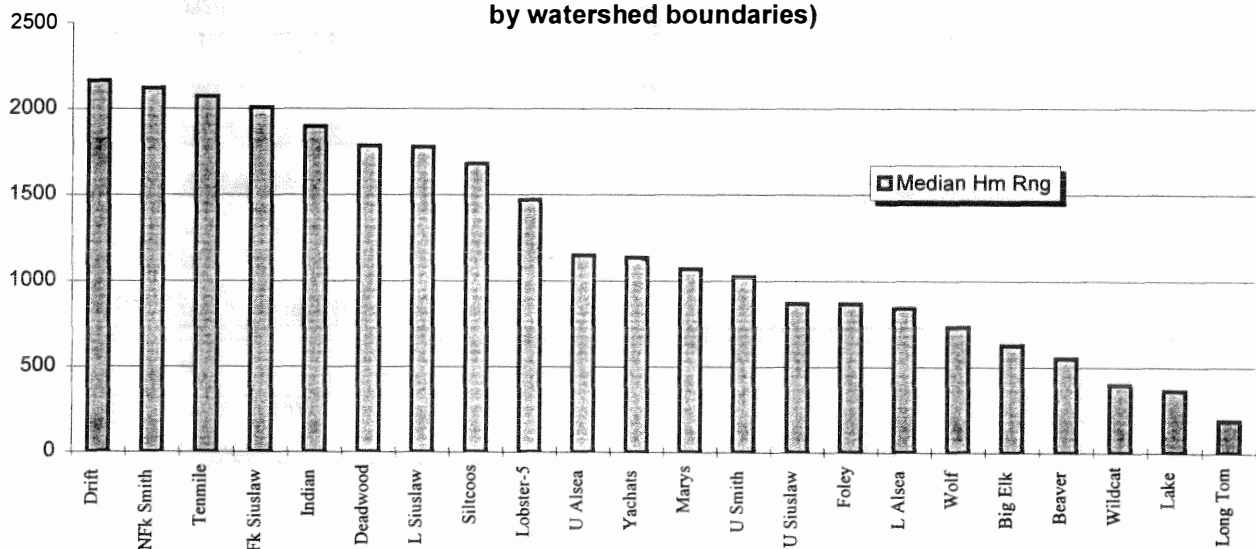
Only 28% Owl prs have > 1900ac of habitat



72% Owl pairs have < 1900ac of habitat

Owls with less than 1900 ac (40%) suitable habitat within the median home (1.5 mi radius circle) are considered to be marginally viable and at risk of "take" if further habitat is lost. While owls may be surviving in areas with limited habitat, juvenile survival and long-term site occupancy is reduced at these sites.

Spotted Owl Median Home Range Sizes by Fifth Field (home ranges were not split by watershed boundaries)



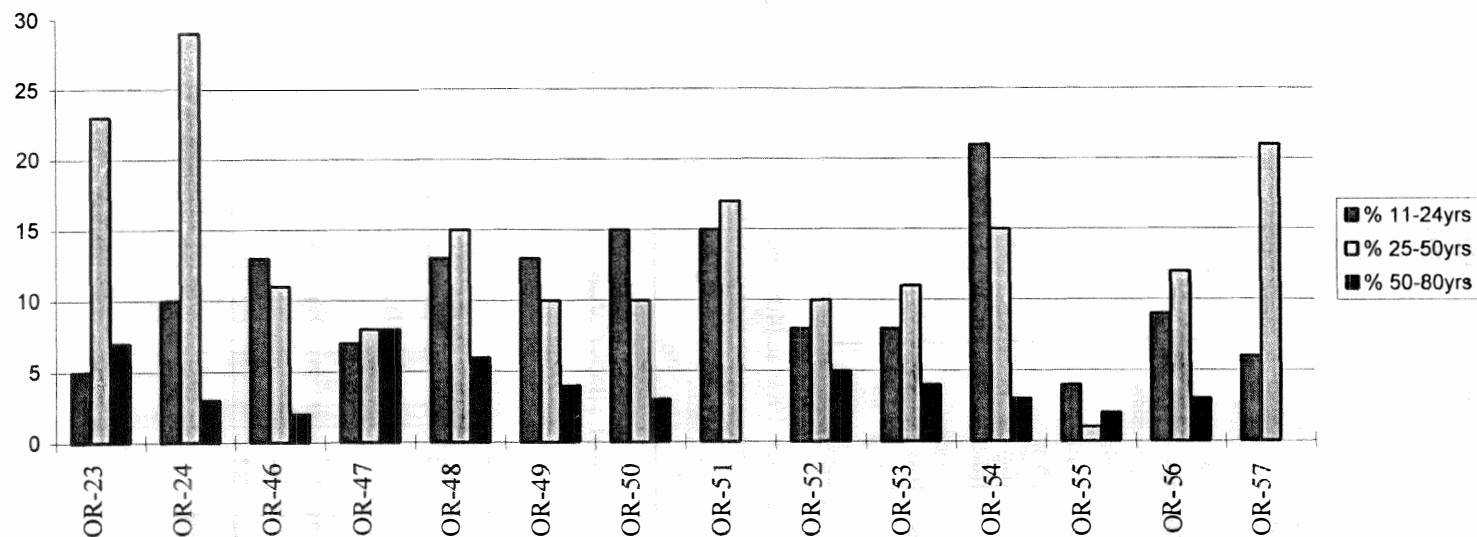
Appendix H.6: LSR Assessment (R0267/R0268) - Percent of seral classes of management age by CHU

CHU	Total Ac	% 11-24yrs	% 25-50yrs	% 50-80yrs
OR-23	8372	5	23	7
OR-24	3499	10	29	3
OR-46	65393	13	11	2
OR-47	72773	7	8	8
OR-48	111783	13	15	6
OR-49	67348	13	10	4
OR-50	87543	15	10	3
OR-51	4756	15	17	0
OR-52	71628	8	10	5
OR-53	101085	8	11	4
OR-54	5366	21	15	3
OR-55	33012	4	1	2
OR-56	8585	9	12	3
OR-57	4459	6	21	0

The Draft Spotted Owl Recovery Plan limits stand management activities to no more than 5% of a given Designated Critical Habitat Unit per 5 years.

Where current levels of the stand types outlined on the chart are below 5%, this limitation may be reached with very few actions and needs to be monitored (ie. OR-55)

Stands of Management Age on Federal Lands by CHU



APPENDIX I

ADAPTIVE MANAGEMENT STRATEGY EXAMPLE

ADAPTIVE MANAGEMENT EXAMPLE

The following range of landscape treatments were developed by a sub-group of the LSR Assessment Team working with scientists at PNW and OSU. All of these are considered to be "reasonable" approaches to achieving older forest conditions. Considerable time was invested in debating the relative importance of the issues and management approaches to address questions about patch size, connectivity, and the role of indirect human disturbance.

These key questions were believed to be the most important relative to managing plantations in this assessment:

- 1) Does silviculture treatments of plantations produce significant change in landscape composition, structure and function?
- 2) Does indirect human activity (presence in the landscape?) affect older forest composition, structure, and function at the landscape scale?
- 3) What is the interaction between silvicultural treatments and human activity at the landscape scale?

Landscape Cells within the study area were delineated based on similarity of landscape vegetation pattern, fire regimes, soil/climate, and ownership pattern (**Map 12**). These units provide the building blocks for applying the range of landscape treatments described below.

- 1) No Vegetation Management Activity
 - A. Closed Roads
 - B. Open Roads
- 2) Vegetation Management Activity
 - A. Design plantation treatments to develop structure similar to neighboring mature stands (or expected if the stand had not been harvested).
 1. Treat commercial and non-commercial plantations -- close roads.
 2. Treat commercial and non-commercial plantations -- open roads.
 3. Treat plantations only at commercial age -- close roads.
 4. Treat plantations only at commercial age -- open roads.
 - B. Design treatments to maximize "old growthiness".
 1. Treat commercial and non-commercial plantations -- close roads.
 2. Treat commercial and non-commercial plantations -- open roads.
 3. Treat plantations only at commercial age -- close roads.
 4. Treat plantations only at commercial age -- open roads.
 - C. No Designed Landscape Treatments.

Treatment Descriptions

Structure of Neighboring Mature Stands: Most of the stands in the study area originated from large fires in the mid-1800's. These young (100-150 yr old) stands are typically homogeneous and dominated by Douglas fir. These stands are often referred to as our "natural" stands. Many people argue that these stands should be left alone, as they represent the best conditions possible.

This landscape treatment would attempt, through silvicultural practices, to move the presently overstocked plantations towards the conditions in these mature neighboring stands. If no comparable neighboring stands exist, an estimate of expected stand conditions for that site and age since the last fire disturbance would be made. Recognizing that stand conditions vary over the

landscape, an inventory of "target" neighboring stands would need to be done before prescribing treatments for each plantation. Over time (poss. 30-40 yrs), this landscape would be comprised of stands that appear to be very similar to the "natural" stands. From the air or the ground, they would look very similar. In some cases, this may mean planting alder since the surrounding "natural" landscape has a significant alder component.

Maximize "Old Growthiness": Regardless of the condition of the neighboring stands, every possible effort would be made to increase the development of old growth structure and composition. For example, underplanting shade tolerants, maximizing down wood, creating snags, and multiple entries to increase the variability in tree sizes are some of the treatments that might be used. In general after 30-40 years, these stands would have a well developed layer of shade tolerants (that will probably need thinning), large Douglas firs, and large green trees for wildlife snags and down wood.

Treat commercial and non-commercial stands - close roads: This is the "get-in" and "get-out" treatment intended to minimize human disturbance in the landscape over time. Activities would be concentrated in a short period (<3 yrs.). Roads would be stabilized and closed. Re-entry would only be for emergency situations such as fire fighting. Some plantations may not be treated to serve as controls for finer scale evaluations.

Treat commercial and non-commercial stands - open roads: Same as above, only roads would remain open.

Treat only commercial age plantations -- close roads: This is the "get-in" and "get-out" treatment intended to minimize human presence in the landscape over time. All treatments would be accomplished in as short of time as feasible. Re-entry would be for emergency situations such as fire fighting and to treat commercial aged plantations. Plantation treatments, while focused on commercial stands would only be done on regular scheduled basis, such as every 10 years.

Treat only commercial age plantations -- open roads: Same as above only roads would remain open.

No Designed Landscape Treatments: Management activities may occur according to other needs and priorities. No landscape design would be developed. Projects would be done on a project-project basis.

Assignment Of Landscape Treatment Units

The following steps need to be completed in order to implement treatments in this assessment.

- * Finish delineation of LSR Zones and Landscape Cells for the Oregon Coast Province. LSR Zones and Landscape Cells (see **page 53** for description) need to be further stratified by soil-climate zones and disturbance regimes. This needs to be done principally to separate the coastal fog zone from the interior drier zone. Additionally, the status of the open and closed roads needs to be evaluated to ensure treatment units are viable. Finally, use 6th field watersheds as a practical block for the treatment units.
- * Conduct similarity analysis. This needs to be done to ensure that the landscape treatment units are similar in existing conditions. This will help to ensure the results are eventually comparable. Key variables that need to be evaluated are: age and size distribution of plantations, area of plantations, miles of open/closed roads. This will be used to make adjustments to treatment units.
- * Evaluate existing no treatment areas. These are land use designations (wilderness, RNA's, etc.) which already preclude management. If these are determined to function as suitable controls, then these would be assigned to either the No Vegetation treatment (Control) or excluded from the evaluation depending on results of similarity analysis.
- * Evaluate influence of existing planned projects in plantations. These may affect the suitability of treatment units.
- * Consider juxta-position effects. For example, it may not be desirable to install an intensive treatment unit next to a wilderness boundary, RNA, or a town.
- * Randomly select treatment units (including controls). Strive for 3 or more replications of each treatment.
- * Other. Possibly as much as half of this study area would not be allocated to landscape treatments. First, it wouldn't be physically possible to implement all the projects needed in a short time-period to implement this plan. Second, other important issues - social, political, or scientific will undoubtedly influence the design. Finally, if all the landscape is allocated to addressing these questions, there may not be room to address other important questions in the future.

Monitoring

Implementation monitoring: Accomplished annually by a team of citizens, agency representatives, and scientists.

Effectiveness Monitoring: A list of indicator species (plant and animal) measurements will need to be developed. In general, we expect that bio-diversity (as a measure of landscape function) will vary significantly between treatments. With this in mind, ground based surveys should be done at year 1 (after all treatments installed), 5, 10, 20, and 30. These surveys would be done prior to treatments also. These surveys would be done on selected species and designed to efficiently cover a large land area. Stand level monitoring activities may be done as needed.

Low elevation aerial photographs should be taken prior to treatments and at years 1, 3, 5, 10, 20 and 30. Shorter intervals early on are desirable in order to evaluate windthrow effects. These flights will be invaluable for future analysis.

Validation Monitoring: We expect to attract scientists interested in large scale management validation questions.

Feedback and Adjustment

No-one in the Coast Range or possibly the west has ever attempted to coordinate, schedule, and evaluate landscape treatments for the purpose of learning and adapting. It will require commitment now, and a sustained level of commitment well into the future. Careful attention will need to be given to present interests and mechanisms will need to be established to sustain these commitments if this work is to yield new options and information for future managers.

Adaptive Management Recommendations

This is intended to be a starting point for the development of a landscape design and plan for this study area.

A comprehensive monitoring plan will need to be written for this study area. Failure to do so will make it very difficult, if not impossible to evaluate the effectiveness of our management activities for meeting LSR objectives.

Areas identified as important connectivity corridors both north-south and east-west, should be avoided in our assignment of landscape treatments until a larger scale analysis is done. The significance of these corridors, while assumed to be important, is not known. Designing landscape treatments to evaluate effectiveness of these corridors will require a much larger spatial and time scale evaluation.

Other areas which are NOT suitable for this landscape evaluation should be mapped. Management activities could proceed in these areas while the final landscape treatment plan is developed.