South Cascades Late Successional Reserve Assessment

April 1998

U.S. FISH & WILDLIFE SERVICE

FOREST SERVICE U.S. DEPARTMENT OF AGRICULTURE

U.S. DEPARTMENT OF THE INTERIOR BUREAU OF LAND MANAGEMENT

South Cascades Late Successional Reserve Assessment

April 1998

REGIONAL ECOSYSTEM OFFICE

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MEMORANDUM

DATE: February 10, 1998

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

FROM: Donald R. Knowles, Executive Director Don Knowles

SUBJECT: Regional Ecosystem Office Review of South Cascades LSR Assessment

Summary
The Regional Ecosystem Office (REO) and the interagency Late-Successional Reserve (LSR) Work Group have reviewed the South Cascades Late-Successional Reserve Assessment (LSRA or Assessment). The REO finds that the LSRA provides sufficient framework and context for future projects and activities within the LSR. Future silvicultural and salvage activities described in the LSRA 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
There are two REO review requirements that were considered during our review.

1. 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. These assessments are subject to REO review. This 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 also considers treatment criteria and potential treatment areas for silvicultural, risk-reduction, and salvage activities if 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 further REO review, provided they are consistent with the LSRA criteria and 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). If such activities are not described in the LSRA and exempted from further review in this memo, they remain subject to future REO review.

Both aspects of this review are described below.

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 S&Gs (page C-11). Questions and discussions by LSR Work Group reviewers led to additions and revisions which are contained in Review Copy 3 (dated December 1997), and supplemented by a January 7 DG message with Riparian Reserve Desired Future Condition (DFC) language, a January 21 FAX revising three sections of Chapter 4 related to thinning and large woody material (LWM), a January 30 FAX showing multiple edits reflecting assumptions made by the reviewers evaluating the Assessment, and a

February 3 DG submittal of revised treatment criteria for risk management in pine. The REO finds that the LSRA with these revisions provides a sufficient framework and context for making future decisions on projects and activities within the LSR.

The South Cascades LSR Assessment addresses a very large acreage (over 720,000 acres) encompassing five "mapped" LSRs, in a variety of ecological conditions, administered by seven administrative units in two provinces of the NFP. LSRs covered include RO222 (508,000 acres), 224 (21,500 acres), 225 (39,800 acres), 226 (49,800 acres), and 227 (101,600 acres). The east half of RO227 is primarily covered by a Winema National Forest document incorporated into this LSRA. The assessment does a good job, particularly considering the scale and complexity of the area, of describing conditions, processes and expectations within the five LSRs. Further, the assessment describes ongoing inventories, analyses, and planning that will continue to fine-tune and identify management needs within the LSRs.

The Assessment does not address the 100-acre "unmapped" LSRs in the area of the Assessment. The REO Work Group anticipates that the administrative units involved will submit Assessments of these LSRs at a future date, to appropriately address the management issues within and around them.

The Assessment describes the land ownership and land allocations of the surrounding areas, but is somewhat weak in describing how surrounding conditions (e.g., fire ignition sources) effect within-LSR treatments, and how non-LSR activities (such as, those affecting connectivity between LSRs) might affect LSR objectives. The Assessment recognizes these weaknesses and defers further consideration to site-specific analysis or, in the case of non-LSR areas, to existing plans and subsequent project analysis.

The assessment sets a DFC in terms of risk, percent late-seral species and conditions, late-seral block size and connectivity, and so forth. "Late-seral" is defined and additionally referenced in Appendix D-Seral Stage Classification. Risk is documented as relating to fuels risk, rural interfaces, lightning and juxtaposition with key habitat. Priority-setting for treatments is well discussed, focusing on protecting and enhancing the most functional large blocks of habitat, and key connectivity areas, first. Stand treatments are clearly described with appropriate criteria. Stand treatments are derived from comparing current conditions with DFC using a logical synthesis process. Resultant priorities appear appropriate. Existing uses, from permits to habitat development projects, are well documented in Table 6. The history of forest development in the absence of wildfire over the past 80 years is particularly well done, as is the section on late-successional forest related species known or thought to exist within the LSRs, and the logic and explanation of DFC.

A broad-scale conclusion of the LSRA is that fire risk management and aquatic habitat restoration should be priority activities in these LSRs. These conclusions are illustrated in creative "spider diagrams" and "bubble charts" which give line officers a visual cue as to potential priorities (with the necessary caution that the conclusions need to be ground-truthed prior to project design). Additionally, other silvicultural treatments and salvage actions are described.

Because of the size and complexity of the area covered, references to additional analysis are recognized as key to project design. For example, we note that the "risk DFC" of no more than 28 percent of the area be in high (fire) risk classification is, as stated in the assessment, subject to ground-truthing and priority setting. The assessment further points out that watershed analyses will continue to show different, and perhaps conflicting specific information on pathways, patterns, structure, and disturbance dynamics than the assessment. The BLM and FS administrative units recognize the document is, in many ways, a broad-scale assessment that will continue to be the subject of fine-tuning and site-specific analysis. Planning and project development outside of the LSRs will continue to consider fire risk to LSRs, and will consider connectivity between LSRs.

Criteria for Developing Appropriate Treatments
A citation from Chapter 3 - Desired Future Conditions, is key to understanding the objectives and level of treatments proposed within the LSRs. The third paragraph in this chapter reads, in part:

> *The amount of treatments proposed for exemption from further REO review, or the amount of projected treatments overall, are not intended to represent the long term activity levels needed to reach desired future conditions. The natural growth and evolution of forest stands and habitat over time will be a major factor in attaining desired conditions. Projected amounts of treatment are intended to represent a conservative management approach based on the limits of existing data and experience in managing for late-successional conditions.*

As noted in the Assessment, project planning will be fine-tuned through Watershed Analysis, NEPA, and site-specific determinations of the need for treatment. Projects not clearly beneficial to NFP objectives should be deferred in favor of natural stand development.

Chapter 4 - Treatment Criteria and Needs, contains descriptions of indicators of treatment needs, criteria under which those treatments are expected to be conducted, and rough estimates of the potential treatment acres - usually by administrative unit. Treatments are divided into four major sections: to enhance late-seral conditions, to reduce risk of large scale fire, those for salvage, and activities other than silviculture. The treatment acreage shown are not additive because more than one treatment may be applied to the same acres.

Conclusion
Based on the documentation found in the LSRA and the amended information, the REO finds that the LSRA provides a sufficient framework and context for future projects and activities within the LSR. Silvicultural, risk, and salvage activities as specifically described in Chapter 4, when conducted consistent with the NFP S&Gs, and following the priorities, emphases, site-specific analysis, and other considerations discussed elsewhere in the LSR Assessment, are exempted from subsequent project-level REO review. Silviculture, risk, and salvage proposals other than those as described in the preceding sentence remain subject to REO review.

Because of the scope and complexity of the assessment, and the number of administrative units and personnel who will be involved implementing it, our review has necessarily taken extra time and been, at times, complex. We appreciate both the efforts of authors to create a clear and valuable document while integrating a wide range of complex conditions spread over seven administrative units, and the patience and persistence of the team in responding to our review questions and requests. The team has done an excellent, highly professional job.

cc:
A. Holden, USFS
BLM Medford District
BLM Roseburg District
BLM Eugene District
Umpqua NF
Rogue River NF
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CHAPTER 1: INTRODUCTION

WHAT IS A LATE-SUCCESSIONAL RESERVE ASSESSMENT?

The guiding document for Late-Successional Reserve Assessments (LSRA) is the Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl, Attachment A to the Record of Decision (ROD) for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl (USDA Forest Service and USDI Bureau of Land Management 1994):

The ROD allocated areas within National Forests and Bureau of Land Management Districts of the Pacific Northwest to be managed as part of an interacting network of late-successional and old-growth forest ecosystems, which will serve as habitat for late-successional and old-growth related species such as the northern spotted owl. As directed, management assessments are to be prepared for each designated Late Successional Reserve (LSR) or group of smaller LSRs before habitat manipulation activities are designed and implemented. These assessments should generally include the following eight elements:

1) A history and inventory of overall vegetative conditions within the reserve;

2) A list of identified late-successional associated species known to exist within the Late-Successional Reserve and information on their locations;

3) A history and description of current land uses within the reserve;

4) A fire management plan;

5) Criteria for developing appropriate treatments;

6) Identification of specific areas that could be treated under those 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 achieve desired results.

ROD, C-11

SOUTH CASCADES LSRA OBJECTIVES

The objectives of this assessment are to:

- **meet the intent of the ROD by using existing information for the context needed to make appropriate decisions for the south Cascades portion of the southwest Oregon LSR network;**
- **provide a province perspective on where to look first for further analysis and treatment needs;**
- **build relationships among agencies;**
- **collaborate to increase assessment efficiency; and**
- **provide enough treatment criteria detail for REO exemption from further review for certain activities.**

WHAT THIS ASSESSMENT IS, HOW IT WILL BE USED

FIRST APPROXIMATION ASSESSMENT

This is a first approximation assessment. It may be revised as more is learned about the area, and as needs and conditions change. It is an administrative document intended to provide information to managers on existing conditions and needs, as well as treatment criteria, so that managers can prioritize and make better decisions on projects designed to further the objectives of Late-Successional Reserves.

Management objectives for Late-Successional Reserves were given in the ROD: "Late-Successional Reserves are to be managed to protect and enhance conditions of late-successional and old-growth forest ecosystems, which serve as habitat for late-successional and old-growth related species including the northern spotted owl. These reserves are designed to maintain a functional, interacting, late-successional and old-growth forest ecosystem." (ROD, C-11)

Management within LSR boundaries must be designed to meet this goal. The standards and guidelines of the ROD govern all management activities in the LSRs. This LSR assessment is tiered to the ROD. Non-conflicting direction from existing land management plans also applies.

This integrated, interagency team focused on habitat quantity, quality, distribution (coarse filter), and the risk associated with maintaining late seral forests (disturbance dynamics). This landscape assessment also can address habitat needs of animals with very large home ranges.

HELPS PRIORITIZE FURTHER ANALYSES AND TREATMENTS

The strength of this assessment is its broad, landscape perspective. By examining over 720,000 acres, further analyses and treatments can be prioritized by LSR and fifth-field watershed. In doing so, the LSRA facilitates inter-agency working agreements, at the province level, about the type and timing of treatments across the landscape. This is a valuable contribution as a mid-level assessment in the context of multiple levels of analysis. It is conducted at a scale broader than watershed analysis, yet not as broad as regional assessments of the state or multi-state level.

CAN SHOW DIFFERING INFO FROM FINER SCALES OF ASSESSMENT

Existing information from seven administrative units has been used. The consistency of existing information necessarily constrained which inventories could be used to survey the conditions of the LSRs. Therefore, it is likely that watershed analyses, existing and yet to be completed, will show different, and perhaps conflicting specific information on pathways, patterns, structure, and disturbance dynamics than this assessment. These differences are acceptable in a multiple-scale, iterative planning hierarchy. This assessment is more valuable as a broad look and first approximation of conditions within and between watersheds.

EXEMPTS CERTAIN ACTIVITIES FROM FURTHER REVIEW

The assessment provides information and criteria specific to this LSR network. REO review has been accomplished through this assessment for certain activities. This presumes the activity, criteria, and applicable standards and guidelines are followed in the amounts specified.

PROVIDES CONTEXT FOR LSR 227

A Late Successional Reserve Assessment has been completed for the eastern portion of LSR 227. The "Late Successional Reserve Assessment for the Oregon Eastern Cascades Physiographic Province South of Crater Lake National Park" is included here as an Appendix. It should be referred to for conditions and criteria more specific to that area. The South Cascades LSRA provides information and context for the whole, as well as the western portion of LSR 227.

WHAT THIS ASSESSMENT IS NOT

NOT A DECISION DOCUMENT, DOES NOT LIMIT DECISION SPACE

This is not a decision document. The assessment and these criteria are not standards and guidelines or site-specific silvicultural prescriptions. Projects meeting LSR standards and guidelines, but not fitting either the existing REO exemption criteria or the criteria found in this assessment, should continue to be forwarded to the REO for review.

NOT AN EXHAUSTIVE LIST OF TREATMENTS

The activities and treatments described in this assessment are a list of those thought to be consistent with LSR objectives. They are not considered exhaustive. Other projects may be appropriate as well. Where required, these projects should be forwarded to REO for review.

NOT COMPILE ALL TREATMENT DIRECTION

Except for purposes of landscape context, this LSR assessment has limited analysis to within the boundaries of the LSRs. It is not intended to reiterate management strategy contained in other documents that are, however, relevant to the South Cascades LSRs, and should be used in conjunction with this assessment. Documents such as unit fire plans, habitat management plans, recovery plans, wilderness plans, wild and scenic river plans, and watershed analyses should be used, as appropriate, when interdisciplinary teams or managers consider landscape issues or context.

NOT EXEMPT FURTHER PLANNING/NEPA

The assessment provides information for context and some treatments as well as criteria to ensure consistency with LSR objectives. It does not exempt agencies from following NEPA and other planning requirements. This assessment does not serve as watershed analysis for the key watersheds within the LSRs.

NOT COVER 100 ACRE LSRS

The 100-acre owl core LSRs were not covered in this assessment. Including the activity centers was initially recommended at the Eugene BLM meeting. The decision was revisited when the LSR work group asked whether core areas would be included. They were not covered because the substantial amount of additional information needed to assess conditions adjacent to all the core areas, interspersed throughout all other allocations, was considered too much for this first iteration. In addition, subsequent discussion with at least one Eugene BLM contact suggested that the likelihood of treatments within the activity centers was low.

NOT PROVIDE RECOMMENDATIONS TYPICAL OF FINER SCALE ASSESSMENTS

We expect that further watershed analyses will address questions more appropriate to that scale, such as specific location road decommissioning recommendations, verification and determination of within watershed fire risk, specific wildlife needs, and large dead wood and riparian/aquatic inventories.

AREA INCLUDED IN THE SOUTH CASCADES LSR ASSESSMENT

The South Cascades LSR Assessment Area is located in a network of southwest Oregon Late Successional Reserves (Figure 1).

Since it is the responsibility of the Southwest Oregon Provincial Interagency Executive Committee (PIEC) to ensure consistency for projects and analyses within and between provinces, because LSRs were designed to function as a network, and in order to conduct the assessment in the least costly manner, the PIEC chartered the South Cascades LSRA team to include LSR lands administered by the following jurisdictions:

- The Rogue River, Winema, Umpqua, and Willamette National Forests;
- The Butte Falls, Mt. Scott, and South Valley Resource Areas of the Medford, Roseburg, and Eugene Districts, Bureau of Land Management.

The assessment area includes about 721,000 acres in the following LSRs: RO222, RO224, RO225, RO226, and RO227 (Map 1 and Table 1). Information in this assessment is presented by LSR and those portions of fifth-field watersheds (HUC5) within LSR. (Map 2).

This is a large assessment area. LSR 222 is almost 800 square miles. Assessing LSR 222 by itself places the assessment at the hydrologic province, or river basin analysis scale (Figure B-2, ROD, B-22). In addition, since these LSRs have significant acres in key watersheds, there are, and will continue to be, adequate opportunities for watershed analyses to address specific questions more appropriate at that scale. Since very few assessments have been conducted at the scale proposed here, and given the rationale from the charter (summarized above), the decision was made to proceed with the South Cascades LSR assessment, to include five nearby LSRs.

This size concern was discussed at the charter formulation stage with a representative from the Issue Resolution Team. The issue was again discussed and reconsidered, in November 1996, as a result of the REO work group visit. In response to concerns at that time, three additional months were spent meeting with resource specialists from each unit, in order to gather additional details on current land uses, proposed projects, and any additional items of note.

Most of the assessment area is within the Southwest Oregon province planning and analysis area. However, portions are also within the Klamath and Willamette province planning areas (ROD, E-19).

The east-half of LSR 227 is within the Oregon Eastern Cascades physiographic province. The rest of the assessment area is within the Oregon Western Cascades Physiographic Province (ROD, A-3). See Figure 1 for physiographic province boundaries. This assessment concludes that much of the assessment area fits more closely with the Klamath Province. See the section, "Context of the South Cascades LSR Network" for additional information.

Figure 1: South Cascades Late Successional Reserves

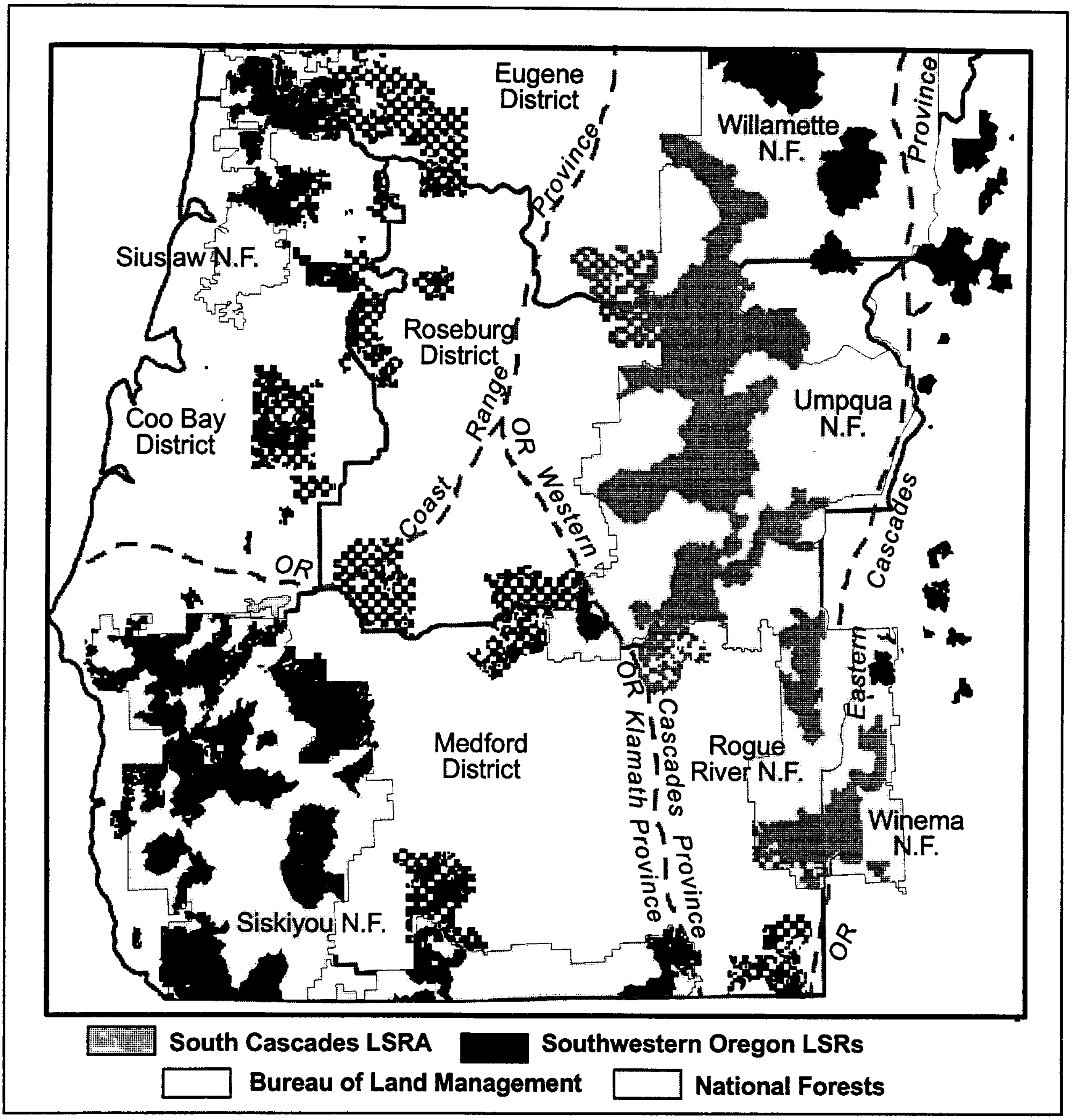


Table 1: Sizes of LSRs by Watershed and Administrative Unit

LSR	Fourth & Fifth Field Watershed (HUC 4 & 5)[1]	Administrative Unit	Watershed Split by Unit or LSR	LSR Acres
222	Coast Fk. Willamette 1	Umpqua NF	(9,600)	14,800
222	Coast Fk. Willamette 1	Eugene BLM	(5,200)	
222	Coast Fk. Willamette 2	Eugene BLM		9,400
222	Coast Fk. Willamette 3	Eugene BLM		7,300
222	Middle Fk. Willamette 19	Willamette NF		32,600
222	Middle Fk. Willamette 21	Willamette NF		41,300
222	Middle Fk. Willamette 23	Willamette NF		18,900
222	North Umpqua 10	Roseburg BLM	(11,300)	11,600
222	North Umpqua 10	Eugene BLM	(300)	
222	North Umpqua 5	Umpqua NF		11,200
222	North Umpqua 6	Umpqua NF		800
222	North Umpqua 7	Umpqua NF		69,000
222	North Umpqua 8	Umpqua NF		104,600
222	North Umpqua 9	Roseburg BLM	(14,400)	28,000
222	North Umpqua 9	Umpqua NF	(13,600)	
222	South Umpqua 1	Umpqua NF		52,400
222	South Umpqua 2	Umpqua NF		31,100
222	South Umpqua 3	Umpqua NF		44,600
222	South Umpqua 4	Umpqua NF		4,900
222	Upper Rogue 5	Rogue River NF	(25,500)	25,500
222	**TOTAL ACRES**			**508,000**
224	Upper Rogue 5	Medford BLM	(21,500)	21,500
224	**TOTAL ACRES**			**21,500**
225	Upper Rogue 1	Rogue River NF	(39,800)	39,800
225	**TOTAL ACRES**			**39,800**
226	Upper Rogue 1	Rogue River NF	(2,700)	2,700
226	Upper Rogue 2	Rogue River NF		45,800
226	Upper Rogue 4	Rogue River NF		1,300
226	**TOTAL ACRES**			**49,800**
227	Upper Klamath 11	Rogue River NF		1,100
227	Upper Klamath 13	Winema NF		2,500
227	Upper Klamath Lake 2	Winema NF		11,800
227	Upper Klamath Lake 3	Winema NF		33,000
227	Upper Rogue 4	Rogue River NF		300
227	Upper Rogue 8	Rogue River NF	(51,400)	52,900
227	Upper Rogue 8	Winema NF	(1,500)	
227	**TOTAL ACRES**			**101,600**
	TOTAL LSR NETWORK			**720,700**

[1] Fourth field watersheds (HUC4) are large, (e.g. North Umpqua, South Umpqua, Upper Rogue). Fifth field watersheds (HUC5) are the next size smaller (e.g. North Umpqua 8 is Steamboat Creek, Upper Rogue 5 is Elk Creek). See Table 14 for common watershed names.

TEAM MEMBERS

An interagency, interdisciplinary team was chartered by the Provincial Interagency Executive Committee of the Southwest Oregon Province to complete this assessment (Table 2).

Table 2: South Cascades LSR Team Members

Core Team Members	Unit	Area
Mary Brennan	Umpqua Nat'l Forest	Graphics and Publishing
Scott Center	Roseburg USFWS	Wildlife
Roger Evenson	Umpqua Nat'l Forest	Co-team Leader
Ellen Goheen	SW Oregon Forest Health Group	Forest Health
Ed Hall	Umpqua Nat'l Forest	Info Mgt. and GIS
Phil Hall	Roseburg BLM	Co-team Leader
Craig Tuss	Roseburg USFWS	Aquatic Ecology
Diane White	SW Oregon Ecology Group	Forest Ecology/Veg
Allyn Wiley/Daryl Grenz	Umpqua Nat'l Forest	Fire/Fuels
Unit Coordinators	**Unit**	
Charles Anderson	Rogue River Nat'l Forest	
Rick Colvin/Paul Gnerer	Eugene District, BLM	
Neal Forrester	Willamette Nat'l Forest	
Phil Hall	Roseburg District, BLM	
Mike Hupp	Umpqua Nat'l Forest	
Sarah Malaby	Winema Nat'l Forest	
Jim Weldon	Medford District, BLM	

A special thanks to many other specialists in the Regional Ecosystem Office, Fish and Wildlife Service, Bureau of Land Management, and the Forest Service for their review of data and concepts that were used for this assessment and who provided valuable critique of the assessment.

THE ASSESSMENT PROCESS

EXISTING CONDITIONS

Data for existing conditions were collected from many sources. Plant series and seral stage information was compiled from existing sources to provide vegetation information. Seral stage was defined as early, mid, or late. Ecology plot and managed stand data were used to characterize snag and down wood components. Resource biologists and the Oregon Natural Heritage Program were consulted for wildlife presence. Past land uses were summarized from a 1980 document on the history of the Rogue River National Forest. Present land uses were obtained from visits with specialists on each administrative unit. Fire and Fuel models were developed from satellite imagery, fire occurrence maps, and watershed analyses. Historic insect and disease records were used for forest health conditions. Aquatic and riparian conditions were characterized by seral stage mapping and existing road density.

Fifth field watersheds are commonly referred to in this assessment. Many tables summarize information by watershed. In this assessment, these tables refer to only that portion of the watershed that is administered by federal agencies, and is also allocated to LSR.

DESIRED CONDITIONS

Desired conditions were developed directly from the broader objective for all LSRs. Proportions of late seral forest and high fire risk fuels were used as measurable indicators of desired conditions. Other desired conditions were included, but were more qualitative.

TREATMENT NEEDS

Treatment needs were developed from the difference between desired conditions and existing conditions, and are direct actions that can be taken to "protect and enhance" the LSRs.

INTERAGENCY AND PUBLIC PARTICIPATION

In February 1996, meetings were held for BLM and Forest Service agency specialists in Eugene, Medford, and Roseburg. The core team provided an introduction to the area, the assessment, and inventories to date. Issues, special needs, and anticipated projects within the LSRs were solicited.

In August 1996, notice that the LSR Assessment was underway was sent to American Indian tribal representatives.

In November 1996, members of the Interagency Issue Resolution Team and the Regional Ecosystem Office's (REO) Late-Successional Reserve Working Group visited with the core team to review assumptions and provide input to the issues and process.

In December 1996 and January 1997, visits were conducted to individual units to collect details on existing land uses and any additional items of note, as recommended by the REO work group.

In December 1996, letters were received from several interest groups requesting copies of the draft assessment when completed. Copies of the assessment will be made available after REO review, and after any adjustments from that review have been completed. The core team did schedule an introduction to the assessment during the April 1997 meeting of the Southwest Oregon Public Advisory Committee.

In April 1996, a brief introduction to the assessment was presented to the Southwest Oregon Public Advisory Committee.

In May 1997, the assessment was sent to the seven administrative units for their review and suggestions for improvement.

In June and July 1997, refinements to the assessment were made based on feedback from administrative units and comments from member of the Issue Resolution Team.

In August 1997, the assessment was sent to the Issue Resolution Team for Regional Ecosystem Office (REO) review. Also in August, this version was given to several groups in response to Freedom of Information Act requests.

In January, 1998, another assessment introduction was provided to the Southwest Oregon Public Advisory Committee.

CHAPTER 2: SUMMARY

INTRODUCTION

One of the objectives of the South Cascades LSRA is to provide a province-level perspective of conditions and treatment needs between LSRs in this network. This chapter provides charts which summarize existing and desired conditions for key indicators, both at the LSR and watershed level. It does not attempt to summarize the contents of the entire assessment.

This chapter provides comparisons between LSRs unattainable at smaller levels of assessment. As such, managers have the opportunity to prioritize further analysis and projects between agencies and between administrative units of the same agency. Previously, there have been few, if any, assessments conducted at this scale.

The LSRs are displayed in bubble charts for the purposes of broad or coarse grained analysis. The charts show the relationship of current LSR conditions to desired future conditions. Spider charts also provide succinct portraits of each LSR. These coarse grained analyses can be helpful in determining broad landscape priorities for treatment.

Consideration of priorities should identify areas of greatest benefit-to-cost relationship and greatest likelihood of success. Will a management action make a difference, and if so, how great of a difference when compared to other opportunities?

This assessment recommends looking first for treatment opportunities in LSRs that are closest to their desired conditions. The following paragraph describes the rationale for this approach:

The ability of management actions to hasten the desired future conditions identified in this assessment are almost always incremental. If an LSR is close to desired future conditions, incremental changes through management may mean that desired conditions can be achieved a significant percentage of time sooner than under natural processes. In an LSR that is far from desired conditions, incremental changes through management may only result in a very small percentage of time gained in achieving desired conditions compared to natural processes.

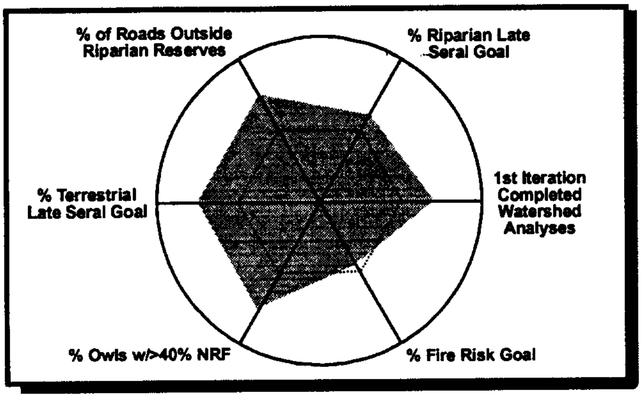
This approach does not preclude the setting of other priorities, it is simply one piece of coarse grained analysis for teams and managers to consider. Alternate priorities may be set based on the same information with additional or finer grained considerations. Such considerations may include the value and sensitivity of habitat within a late-successional reserve, strategic location of a late-successional reserve, etc. Treating an LSR far from desired conditions may be very logical, if for instance, the best existing conditions are located in an LSR where they are not most beneficial from a large landscape perspective. An additional consideration is the administrative constraints or limitations in shifting budgets and personnel to address broad landscape priorities on this assessment area. Another such approach to the setting of priorities is presented in Table 3. The watersheds in Table 3 are ranked higher in priority where higher amounts of late seral habitat are most at risk from large scale fire.

COMPARATIVE LSR PORTRAITS

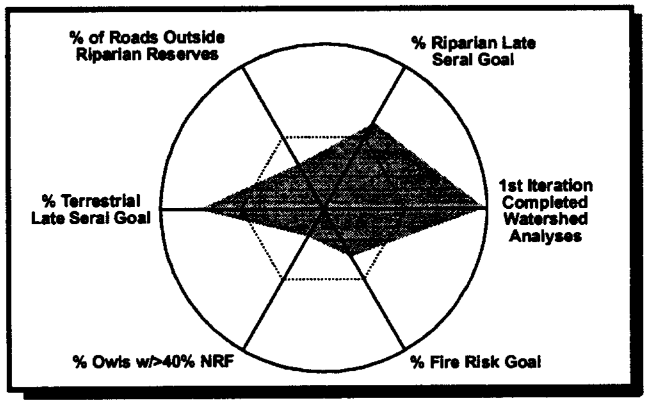
Figure 2 presents a portrait of each LSR in the South Cascades network for seven indicators. LSRs may be quickly compared for any or all indicators.

Figure 2: LSR Portraits

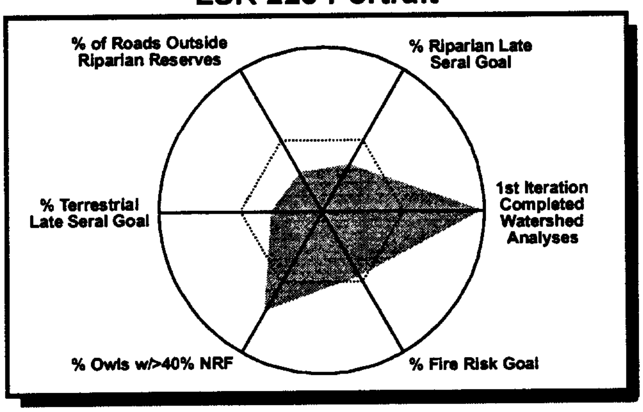
LSR 222 Portrait



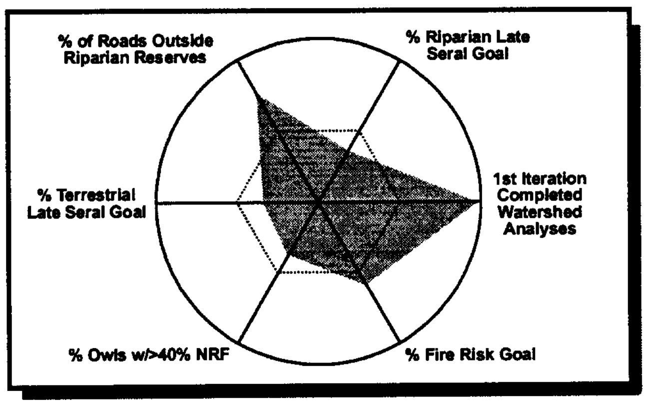
LSR 224 Portrait



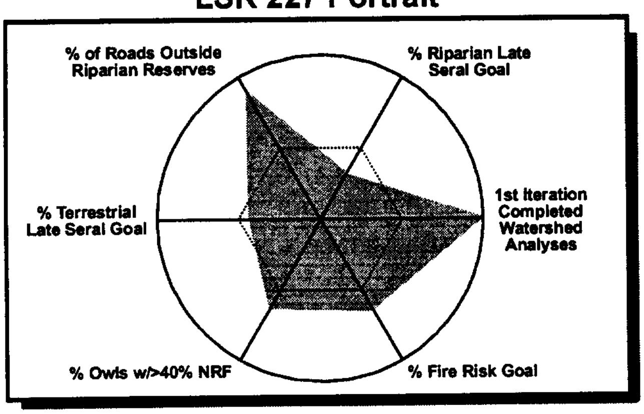
LSR 225 Portrait

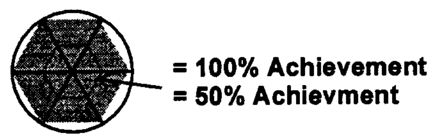


LSR 226 Portrait



LSR 227 Portrait





The measure of each parameter is nearness to the goal, measured in percentage. Nearness to goal is indicated by the distance along each radial line. 100 percent of a goal touches the outside of the circle. The center of the circle represents maximum distance from a desired condition. Therefore, the more area darkened, the closer to goal attainment.

For example, the LSR 224 portrait indicates that the first iteration of watershed analysis has been completed. In addition, between all the LSRs, LSR 224 has the lowest percentage of spotted owl activity centers with greater than 40 percent suitable nesting, roosting, and foraging habitat. It is also furthest from its fire risk goal.

TERRESTRIAL SUMMARY AND TREATMENT PRIORITIES

TERRESTRIAL BUBBLE CHARTS

Figures 3 and 4 are summaries of existing and desired conditions by LSR. The large arrows point either closer to, or further from, the desired conditions. Each LSR is indicated by a dot, and placed in the chart in relation to two indices that follow directly from desired future conditions.

Suggested Terrestrial Priorities

In Figure 3, the higher priority LSRs for treatment are LSR 224, LSR 222, and LSR 227. Lower priority LSRs for treatment are LSR 225 and LSR 226. These coarse grain priorities may be modified, as discussed above. In addition, if one of the indices is of higher interest, priorities can be adjusted accordingly. For example, if fire risk reduction is a higher concern than late seral enhancement, then LSR 227 and LSR 226 would be higher priority than LSR 222 and 224.

Figure 3: Terrestrial Treatment Priorities by LSR (Existing and Desired Conditions)

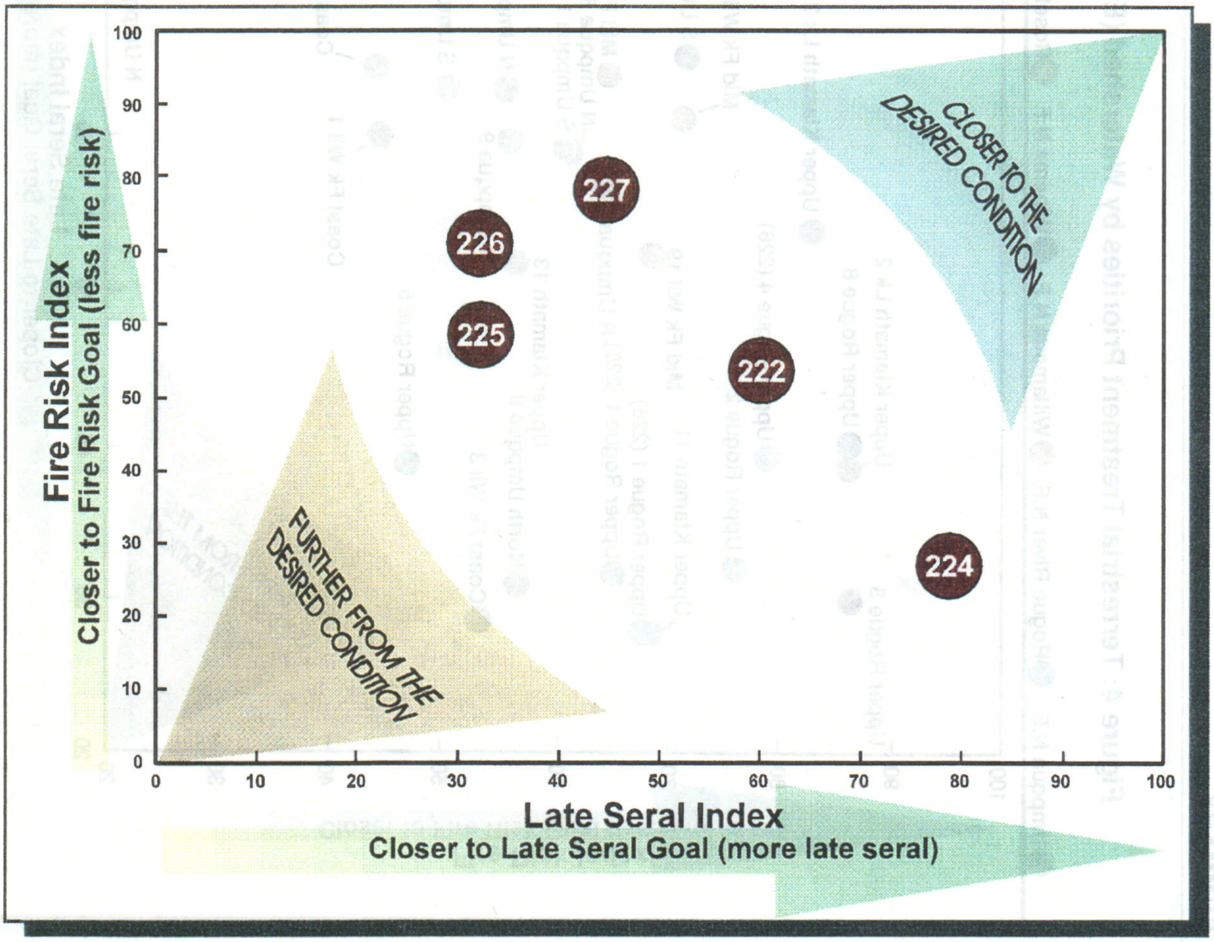
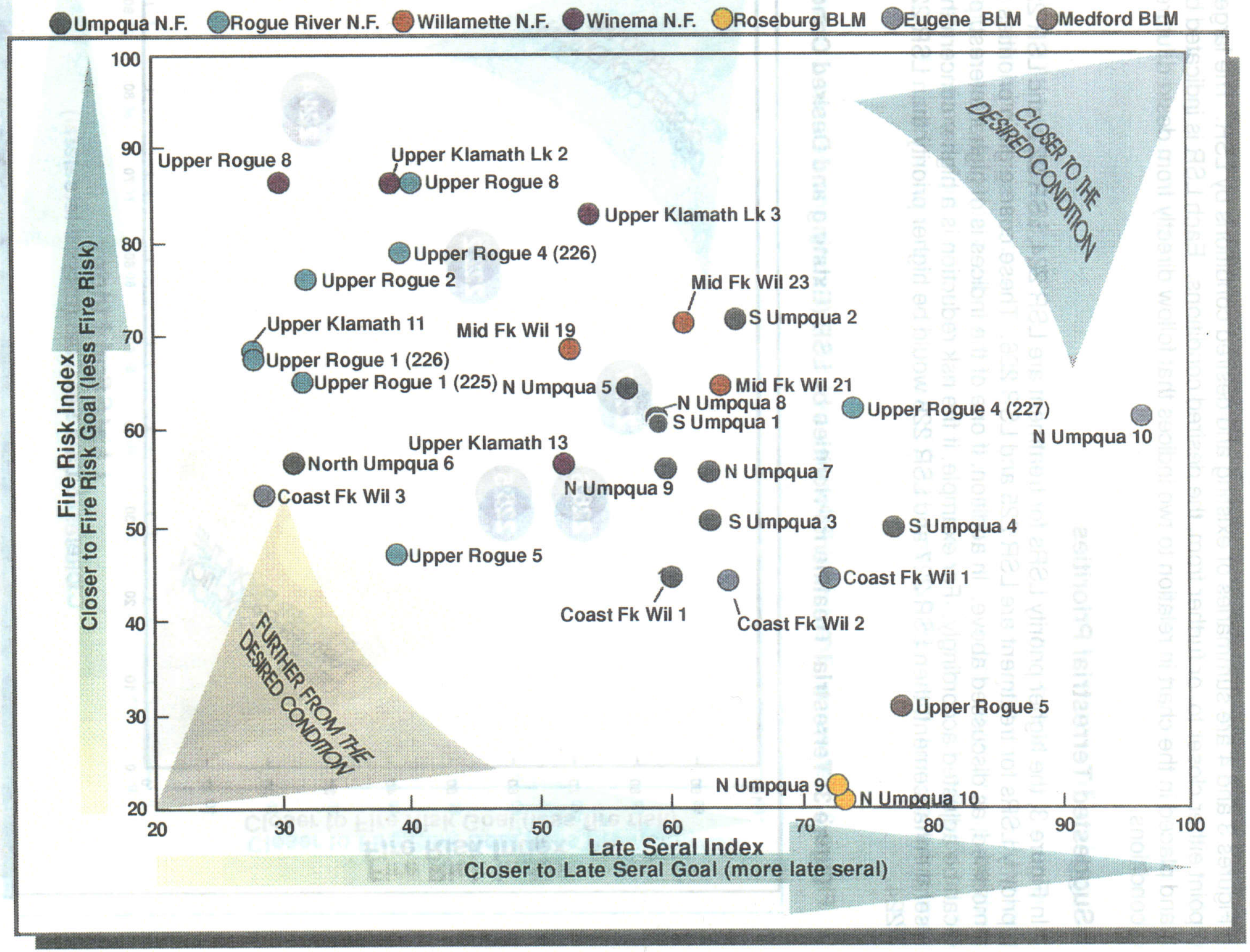


Figure 4 presents the same information as Figure 3, but instead of comparing LSRs, it displays existing and desired condition for each fifth field watershed.

Figure 4: Terrestrial Treatment Priorities by Watershed (Existing and Desired Conditions)



Explanation of Indices

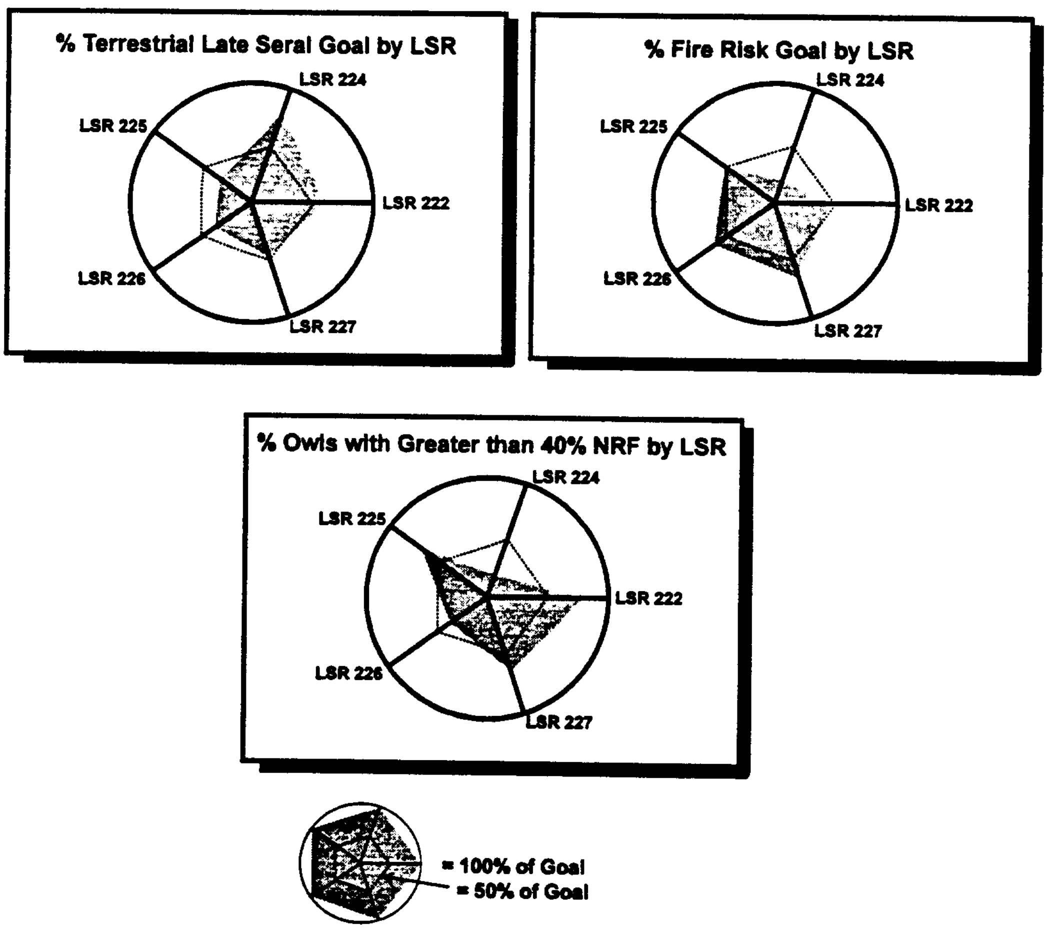
The fire risk index ranges from 0-100 percent of meeting the fire risk goal for that LSR. This provides a relative ranking between LSRs or watersheds for this indicator. An index was also used to allow for fair comparisons in cases where desired conditions might vary among LSRs. In this case, all LSRs had the same desired condition for fire risk; no more than 28 percent of the acres in a high risk classification. One hundred percent of the fire risk goal equates directly to 28 percent of acres in high fire risk condition.

The terrestrial late seral index ranges from 0-100 percent of meeting the late seral goal for each LSR. Again, an index was used to provide a relative ranking and to allow for variable goals among LSRs. In this assessment, there are differing desired conditions for late seral vegetation: LSRs 222, 225, 226, and the western portion of LSR 227 have desired conditions of 75 percent late seral vegetation; LSR 224 was set at 55 percent; and the eastern portion of LSR 227 was set at 50 percent late seral. (See Chapter 3, Desired Future Conditions for more information.)

TERRESTRIAL SUMMARY INDICATORS

Figure 5 presents another view of LSR condition, organized by terrestrial indicators.

Figure 5: Key Terrestrial Indicators of LSR Condition



Combined Terrestrial Priorities by Watershed

The Existing Condition section, "Ecological Processes--Fire", provides the context of fire within the South Cascades LSRs, and summarizes the process used to assess fire risk within the LSR network. To protect the LSR network from large scale fire, risk reduction treatments are necessary (Table 3). Treatments are recommended in areas of high fire risk to protect first the largest blocks of late seral habitat. The following categories were created to prioritize watersheds within the LSR network:

- Priority 1, OR Eastern Cascades Physiographic Province. These watersheds have more than 28 percent of acres in high fire risk fuels, and have less than 50 percent late seral vegetation. These areas have the shortest fire return intervals, and have generally low amounts of late seral vegetation. Treatments are needed to reintroduce fire into the system and enhance late seral characteristics. The risk to late seral habitats from the risk reduction treatments is lowest.

- Priority 1, OR Western Cascades Physiographic Province[2]. These watersheds have more than 28 percent of acres in high fire risk fuels, and have less than 75 percent (LSR 224, 55%) late seral vegetation. Treatments will protect late seral habitat, lower the risk of large scale fire, and enhance late seral characteristics.

- Priority 2, OR Western Cascades Physiographic Province. These watersheds have more than 28 percent of acres in high risk fuels, and have less than 75 percent late seral vegetation. Treatments will protect late seral habitat and lower the risk of large scale fire, and enhance late seral vegetation. However, they are lower in elevation and located out of the typical lightning zone, thus they are placed in a lower priority category.

Within each category in Table 3, watersheds are ranked in priority order based on a combined index. This index places watersheds closest to their late seral goal and furthest from their fire risk goal at the top of the table in descending order.

Map 9 provides a visual summary of existing conditions for fire risk and seral vegetation within the South Cascades LSRA network. Four combinations of risk and vegetation are presented: low/moderate fire risk and late seral; low/moderate fire risk and early/mid seral; high fire risk and late seral; and high fire risk and early/mid seral.

[2] This assessment suggests that these watersheds more nearly fit in the Klamath Physiographic Province, however, they are currently shown on Regional Ecosystem Office maps as OR Western Cascades Province.

Table 3: Terrestrial Treatment Priorities in the South Cascades LSRA[3]

Admin. Unit/LSR	Acres	Priority 1, Eastern Cascade Province	Priority 1, Western Cascade Province	Priority 2, Western Cascade Province
Eugene BLM, LSR 222	300			1 North Umpqua 10
Medford BLM, LSR 224	21,500		1 Upper Rogue 5	
Roseburg BLM, LSR 222	11,300			2 North Umpqua 10
Roseburg BLM, LSR 222	14,400			3 North Umpqua 9
Umpqua NF, LSR 222	4,900		2 South Umpqua 4	
Eugene BLM, LSR 222	5,200			4 Coast Fk Willamette 1
Rogue River NF, LSR 227	300		3 Upper Rogue 4	
Eugene BLM, LSR 222	9,400			5 Coast Fk Willamette 2
Umpqua NF, LSR 222	9,600		4 Coast Fk Willamette 1	
Umpqua NF, LSR 222	44,600		5 South Umpqua 3	
Umpqua NF, LSR 222	69,000		6 North Umpqua 7	
Willamette NF, LSR 222	41,300		7 M Fk. Willamette 21	
Umpqua NF, LSR 222	13,600		8 North Umpqua 9	
Umpqua NF, LSR 222	52,400		9 South Umpqua 1	
Umpqua NF, LSR 222	104,600		10 North Umpqua 8	
Umpqua NF, LSR 222	31,100		11 South Umpqua 2	
Umpqua NF, LSR 222	11,200		12 North Umpqua 5	
Umpqua NF, LSR 222	18,900		13 M Fk. Willamette 23	
Winema NF, LSR 227	2,500	1 Upper Klamath 13		
Rogue River NF, LSR 222	25,500		14 Upper Rogue 5	
Willamette NF, LSR 222	32,600		15 M Fk. Willamette 19	
Winema NF, LSR 227	33,000	2 Upper Klamath Lk 3		
Eugene BLM, LSR 222	7,300			6 Coast Fk Willamette 3
Umpqua NF, LSR 222	800		16 North Umpqua 6	
Rogue River NF, LSR 225	39,800		17 Upper Rogue 1	
Rogue River NF, LSR 226	1,300		18 Upper Rogue 4	
Rogue River NF, LSR 226	2,700		19 Upper Rogue 1	
Rogue River NF, LSR 227	1,100		20 Upper Klamath 11	
Rogue River NF, LSR 226	45,800		21 Upper Rogue 2	
Rogue River NF, LSR 227	51,400		22 Upper Rogue 8	
Winema NF, LSR 227	11,800	3 Upper Klamath Lk 2		
Winema NF, LSR 227	1,500	4 Upper Rogue 8		

[3] See Map 2 for watershed locations.

SPECIFIC PRIORITY AREAS

Connectivity Hotspots

The core team viewed larger scale maps of the entire assessment area. Several connectivity "hotspots" became apparent, areas where late seral habitat connectivity does not appear to be as good as elsewhere in the LSRs. The distribution and juxtaposition of seral stages in these areas seem perhaps not good enough to allow the LSRs to fully function as habitat reserves for the full array of late successional species known to exist in the assessment area. These areas are not necessarily currently incapable of providing for dispersal of species such as spotted owls, but due to the relatively high percentage of early seral stands, movement of less mobile species across these areas is probably precluded. These areas, all within LSRs, should be given priority consideration for treatments designed to enhance (accelerate) late successional conditions:

- The Calapooya Divide (the major ridge system between the Umpqua and Willamette Rivers),
- The lower portions of Steamboat Creek watershed,
- All of the BLM administered "checkerboard" lands,
- Lands in the vicinity of Crater Lake National Park, and,
- along the crest of the Cascades within LSR 227.

Fire Risk Hotspots

In addition to the connectivity hotspots, several areas within LSRs have been identified where high amounts of fire risk appear to exist. These are should be considered high priority for treatments and/or additional analysis:

- the northwest portion of Middle Fork Willamette 19, the Goodman Creek area;
- the portion of Middle Fork Willamette 21 that is south of Oakridge and west of Hills Creek Reservoir;
- the Upper Steamboat watershed;
- near Limpy Rock, between the North Umpqua River and the Jagged Ridge, Dog Mountain area;
- the divide between the North and South Umpqua Rivers;
- the Jackson Creek watershed;
- several locations along the crest of the Cascades within LSR 227;
- LSR 224, Medford District BLM;
- the south side of the Rogue-Umpqua Divide; and,
- the areas adjacent to Crater Lake National Park.

Rural Interface and High Density Recreation Areas

Other areas to consider high priority for fire risk reduction treatments are near rural interface and high density recreation areas. In the South Cascades LSR network, these areas include the rural interface near Oakridge and scattered areas along Highway 58, Larison Cove, and along the Corps of Engineers powerline in the northernmost portion of LSR 222; the rural interface in and near LSR 224; and, the Lake-of-the Woods Recreation area in LSR 227.

RIPARIAN/AQUATIC SUMMARY AND TREATMENT PRIORITIES

RIPARIAN BUBBLE CHARTS

Figure 6 and 7 are summaries of existing and desired watershed conditions by LSR. Bubble charts provide a succinct summary of each LSR and its relationship among the other LSRs. The large arrows point either closer to, or further from, the desired conditions. Each LSR is indicated by a dot, and placed in the chart in relation to two indices that follow directly from desired future conditions.

Suggested Riparian Priorities

In, LSR 222 is suggested as the highest priority for both opportunities to reduce road density and enhance late seral conditions within riparian reserves; followed by LSR 227, LSR 226, LSR 225, and LSR 224. Figure 7 presents the same information as Figure 6, but instead of comparing LSRs, it displays existing and desired condition for each fifth field watershed.

Figure 6: Watershed Treatment Priorities by LSR (Existing and Desired Conditions)

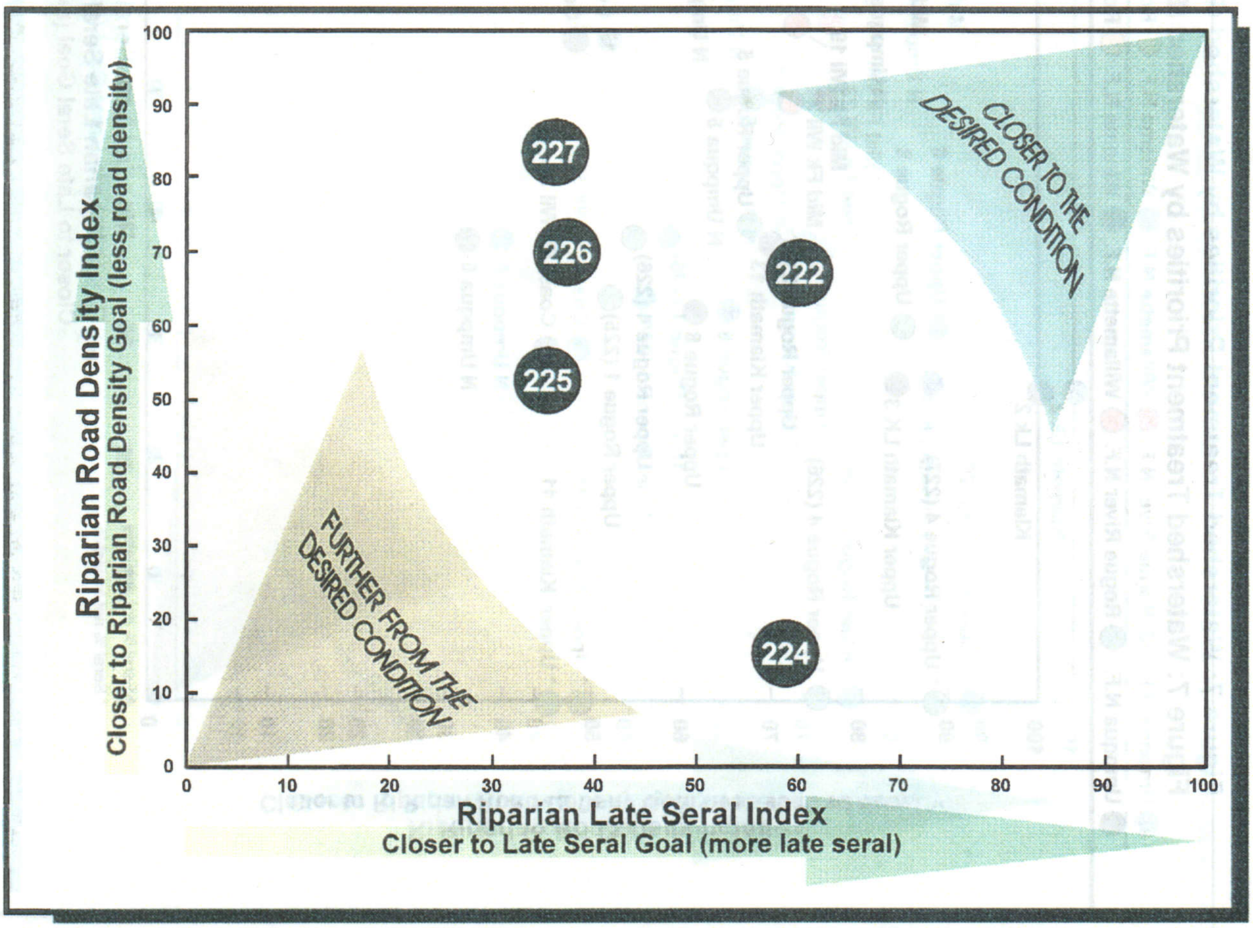
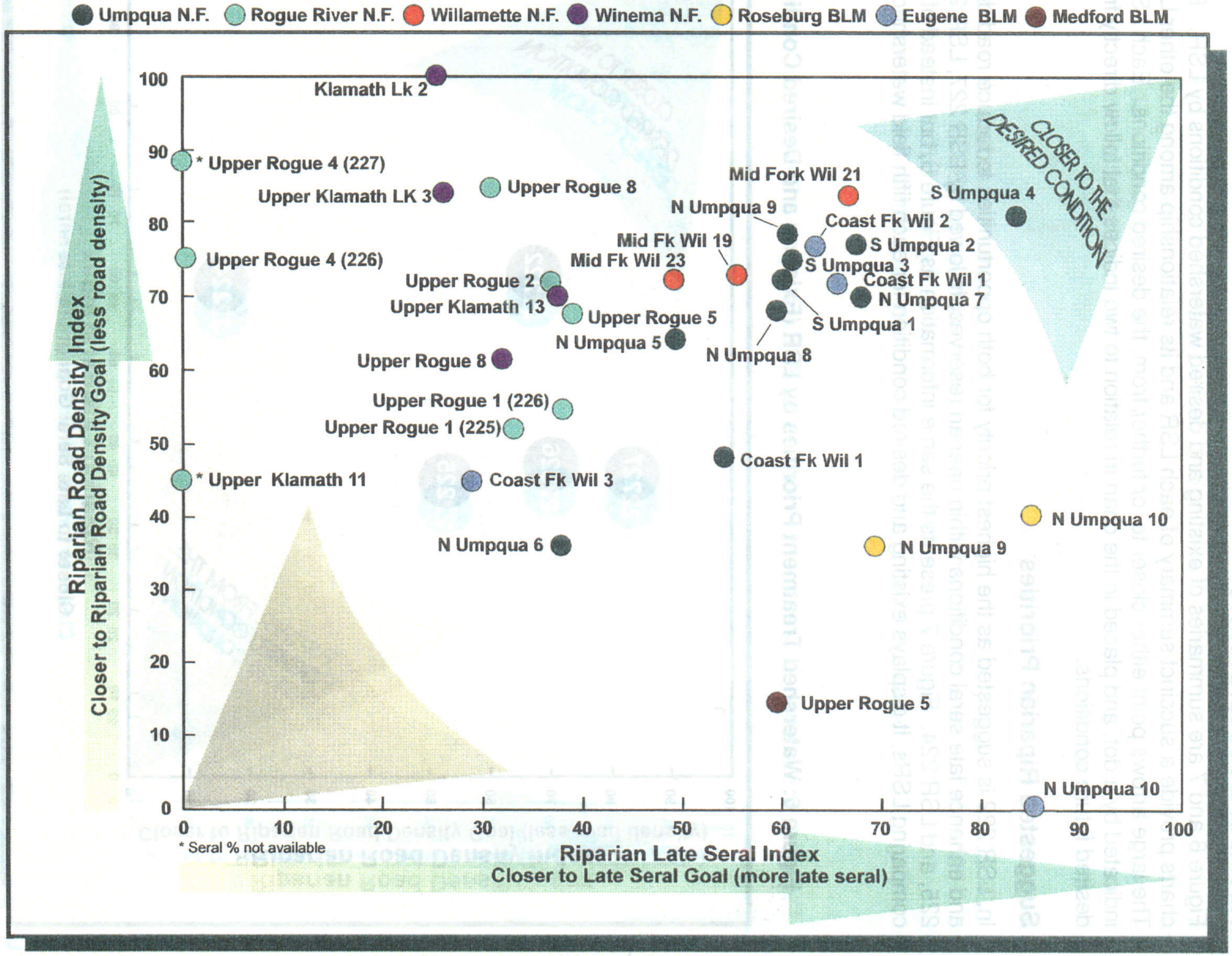


Figure 7: Watershed Treatment Priorities by Watershed (Existing and Desired Conditions)



Explanation of Indices

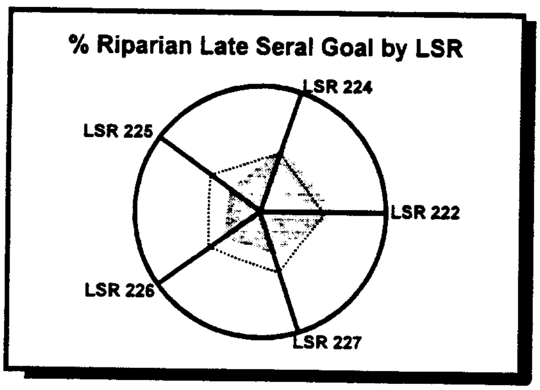
The riparian road density index ranges from 0-100 percent of meeting that desired condition for each LSR. This provides a relative ranking between LSRs or watersheds for this indicator. An index was also used to allow for fair comparisons in cases where desired conditions might vary among LSRs. In this case, all LSRs used the same goal--the less riparian road density the better.

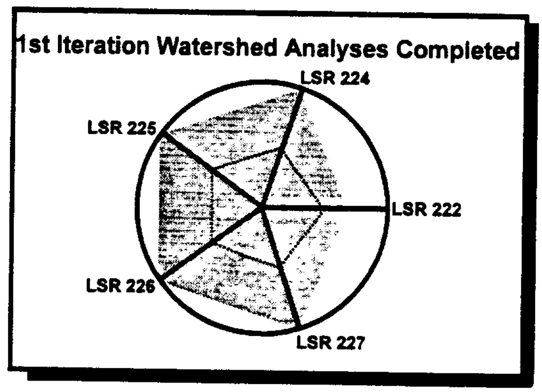
The riparian late seral index ranges from 0-100 percent of meeting the late seral goal for each LSR. Again, an index was used to provide a relative ranking and to allow for variable goals among LSRs. In this assessment, the desired condition for late seral vegetation within riparian reserves are the same in each LSR--75 percent late seral vegetation. (See Chapter 4, Desired Future Conditions for more information.)

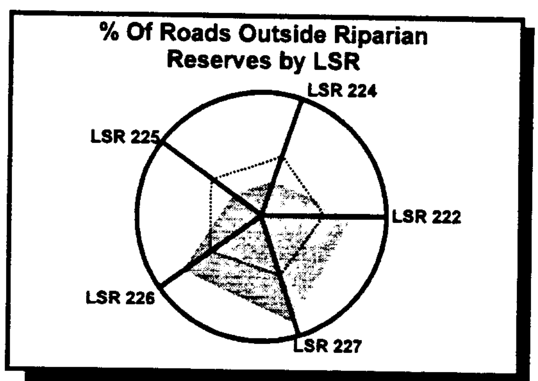
RIPARIAN SUMMARY INDICATORS

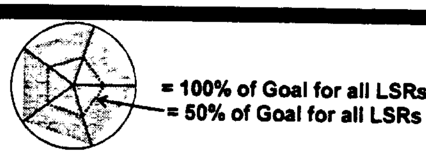
Figure 8 presents another view of LSR condition, organized by riparian indicators.

Figure 8: Riparian Indicators of LSR Condition









Restoration Priorities By Watershed

Table 4 presents two of the restoration priority considerations for watersheds in the South Cascades LSR network. This initial priorities scheme is based on key watershed designation and the percentage of watershed road network located within riparian reserves. Watersheds are ranked in order of increasing percentage of watershed road network located within riparian reserves, (e.g. North Umpqua 9 has a lower percentage of roads in riparian reserves than does Upper Rogue 5). Since Tier 1 key watersheds were designated for two differing situations, the designation itself is not sufficient information to determine whether restoration work is appropriate. Tier 1 key watersheds were delineated because: 1) they were judged to have poor aquatic habitat conditions which could be restored to serve as refugia in the future, or 2) they were found to contain strong fish populations and were currently serving as refugia. It is possible that both of these situations could occur in a single fifth field watershed. Therefore, while this initial screen provides a starting point, it must be supplemented and refined with information from locally-prepared Watershed Analyses which address fish management issues for both key and non-key watersheds. The Watershed Analyses also provide a forum for another consideration in deciding appropriate restoration work, which is the percentage of riparian reserves in late-successional condition (illustrated in Figures 6 and 7). These Watershed Analyses will serve as the refined analysis of whether and where aquatic restoration work should occur.

- Priority 1 are those key watersheds experiencing some degradation and are considered prime candidates for immediate restoration efforts in the degraded portions, such as reducing riparian road densities, making improvements to existing roads (e.g. replacing or enlarging culverts, and other "storm proofing" activities), and enhancement of riparian reserve vegetation to late seral characteristics to meet the desired level.

- Priority 2 are non-key watersheds experiencing degradation and should be considered candidates for restoration efforts such as reducing riparian road densities, making improvements to existing roads (e.g. replacing or enlarging culverts, and other "storm proofing" activities), and enhancement of riparian reserve vegetation to late seral characteristics.

None of the watersheds within LSR land allocation were found to currently meet desired future conditions. These values should be considered minimums since many tractor roads and other minor or temporary roads do not appear in the database. This information is also limited because it only describes that portion of the watershed in LSR land allocation.

These categories can aid in directing land management activities and restoration efforts. Watershed analyses provide information more specific to any given piece of ground, and should be consulted for project level work. They can also aid in setting priorities for the next iteration of watershed analysis. It is further recommended that the watershed analyses yet to be started (Table 32) be completed as soon as possible. All future watershed analyses should be conducted at the watershed rather than project or site-specific scale.

Table 4: Watershed Restoration Treatment Priorities in the South Cascades LSRA[4]

Admin. Unit/LSR	Acres	Priority 1 Key Watersheds	Priority 2 Non-Key Watersheds
Umpqua NF, LSR 222	800	1. North Umpqua 6	
Winema NF, LSR 227	1,100	2. Upper Klamath 11	
Rogue River NF, LSR 226	1,300		1. Upper Rogue 4
Winema NF, LSR 227	11,800	3. Upper Klamath Lake 2	
Rogue River NF, LSR 227	51,400	4. Upper Rogue 8	
Winema NF, LSR 227	33,000		2. Upper Klamath Lake 3
Winema NF, LSR 227	1,500	5. Upper Rogue 8	
Winema NF, LSR 227	2,500	6. Upper Klamath 13	
Willamette NF, LSR 222	41,300		3. Middle Fork Willamette 21
Umpqua NF, LSR 222	31,100	7. South Umpqua 2	
Umpqua NF, LSR 222	4,900	8. South Umpqua 4	
Umpqua NF, LSR 222	52,400	9. South Umpqua 1	
Eugene BLM, LSR 222	9,400		4. Coast Fork Willamette 2
Willamette NF, LSR 222	32,600	10. Middle Fork Willamette 19	
Umpqua NF, LSR 222	13,600	11. North Umpqua 9	
Willamette NF, LSR 222	18,900		5. Middle Fork Willamette 23
Umpqua NF, LSR 222	44,600	12. South Umpqua 3	
Roseburg BLM, LSR 222	11,300		6. North Umpqua 10
Umpqua NF, LSR 222	11,200		7. North Umpqua 5
Rogue River NF, LSR 226	45,800		8. Upper Rogue 2
Umpqua NF, LSR 222	104,600	13. North Umpqua 8	
Umpqua NF, LSR 222	69,000	14. North Umpqua 7	
Eugene BLM, LSR 222	5,200		9. Coast Fork Willamette 1
Eugene BLM, LSR 222	7,300		10. Coast Fork Willamette 3
Roseburg BLM, LSR 222	14,400	15. North Umpqua 9	
Rogue River NF, LSR 226	2,700		11. Upper Rogue 1
Rogue River NF, LSR 222	25,500	16. Upper Rogue 5	
Umpqua NF, LSR 222	9,600		12. Coast Fork Willamette 1
Medford BLM, LSR 224	21,500	17. Upper Rogue 5	
Eugene BLM, LSR 222	300		13. North Umpqua 10
Rogue River NF, LSR 225	39,800		14. Upper Rogue 1
Rogue River NF, LSR 227	300		15. Upper Rogue 4

[4] See Map 2 for watershed locations.

ROAD DECOMMISSIONING PRIORITIES

The objectives of road decommissioning include:

- reducing the length of the road-related drainage network;
- improving habitat connectivity for amphibian and other species;
- restoring riparian and aquatic conditions;
- increasing terrestrial late seral patch size; and,
- reducing sediment delivery from roads and upslope areas.

These objectives are derived from ACS riparian and fisheries goals.

In addition to the objectives, there are other considerations when planning road systems and road decommissioning. Access to non-federal land needs to be considered. In addition, access may be needed for fire suppression, outdoor recreation, restoration projects, other LSR projects, or projects in other land allocations.

Nevertheless, there are opportunities to reduce the amount of existing roads within the South Cascades LSR network. Priority consideration for decommissioning and improvements in existing roads should be given to:

1. Roads within riparian reserves in key watersheds; particularly where roads have major influences on ground water, drainage patterns, flows and sedimentation on wetland, pond, spring, and seep habitats.
2. Roads within riparian reserves not in key watersheds; but where roads are within 600 feet of ponds, wetlands, springs, seeps and lakes, especially upslope of wet areas and where roads bisect a system of wetlands, ponds, or where roads exist between streams, wetlands, or ponds.
3. Roads outside of riparian reserves in key watersheds.
4. Roads within watersheds that have road density below 3 miles/square mile. The rationale is to improve or reinforce areas that are considered close to "fully functioning" based on road density.
5. Roads where density in the transient snow zone is greater than 3 miles per square mile; and,
6. Roads where density in the nontransient snow zone is greater than 3 miles per square mile.

Map 10 provides an overview of existing road network density within the South Cascades LSRs.

WATERSHED ANALYSES AND OTHER ASSESSMENTS

Completing watershed analyses in key watersheds is a high priority. In addition to projects derived from these sources, aquatic diversity areas, and OCSRI core areas can guide efforts along with watershed condition information. Table 5 lists these areas by LSR.

Table 5: Areas Identified by Various Efforts as Important for Anadromous Fish, Aquatic Habitat or for Restoration

LSR	Stream Reach	Why Identified	Identifier
222	Middle Fork Willamette (near Bridge Cr)	High priority restoration	AFS
222	Middle Fork Willamette (near Dell Cr)	High priority restoration	AFS
222	Middle Fork Willamette (near Gray Cr)	High priority restoration	AFS
222	N Umpqua River (Fall Cr. to Wright Cr.)	Essential salmon habitat	ODFW
222	N Umpqua River (Wright Cr. to Steamboat)	Coho salmon spawning and rearing habitat	ODFW
222	N Umpqua (Steamboat to Soda Springs)	Healthy stock Partially Protected	Oregon Trout
222	Rock Creek	Essential salmon habitat	ODFW
222	Canton Creek	Healthy stock - High-priority Restoration Need	Oregon Trout AFS
222	Steamboat	Healthy stock Partially Protected	Oregon Trout AFS
222	Calf Creek	Healthy stock High-priority restoration	Oregon Trout AFS
222	Copeland Creek	Healthy stock High-priority restoration	Oregon Trout AFS
222	Dumont Creek	Essential salmon habitat Partially protected	ODFW AFS
222	Boulder Creek	Essential salmon habitat Partially protected	ODFW AFS
222	Quartz Creek	Coho salmon spawning and rearing habitat	ODFW
222	Squaw Creek	Coho salmon spawning and rearing habitat - High-priority restoration	ODFW
222	S Umpqua River (above Quartz Creek)	Partially protected	AFS
222	Upper Elk Creek	Essential salmon habitat High-priority restoration	ODFW AFS
224	Elk Creek	Essential salmon habitat	ODFW
227	N Fork Little Butte Creek	Essential salmon habitat	ODFW
227	S Fork Little Butte Creek	Essential salmon habitat High-priority restoration	ODFW

CHAPTER 3: EXISTING CONDITIONS

CONTEXT OF THE SOUTH CASCADES LSR NETWORK

INTRODUCTION

The South Cascade LSRs are part of a regional network designed in association with other land allocations (riparian reserves, National Parks, Wildernesses, botanical areas, etc.) to provide functional late seral habitat, including long-term dispersal and migratory pathways.

In a regional perspective, the south Cascades provide a link and are a north-south transition area between the Sierra Nevada Mountains of northern California and the northern Cascade Mountains of Oregon and Washington. The Siskiyou Mountains run generally east-west, and provide connectivity between the coastal and inland south Cascade mountain areas. The Columbia and Klamath Rivers, the only major rivers which significantly breach the Cascade and Coast ranges, allow mixing of inland and coastal species and genetic varieties. These links allow movement of species and genetic material north and south and east and west in response to changes in climate such as occurred during the ice ages and the xerothermic period. These links are still important in the evolutionary process and health of the Pacific Northwest flora and fauna.

The habitat within the South Cascades LSRs serves as source areas for spotted owls and other late-successional and old growth dependent species. LSR 222 is the largest contiguous Reserve within the range of the northern spotted owl. Since species depend on habitat, a variety of habitats present over time and space provides for a broad range of species, including rare and sensitive species and those associated with late seral stages. Successional and disturbance processes have provided a varied seral stage mix and a functional landscape pattern. However, the effects of fire, the most influential process, have been altered and will likely continue to be modified well into the future.

Management will focus on the amount and distribution of late seral habitat, number and size of trees, both live and dead, down woody material on the forest floor and in streams, and canopy density, continuity, and layering. Over decades, the needs of indicator species will be determined. In the meantime, elements of older forests will be maintained and created.

PHYSIOGRAPHIC PROVINCES

The Umpqua, Rogue River, and that portion of the Willamette National Forest within LSR 222, along with the Roseburg and Medford Districts of the BLM, are climatically different from the Willamette National Forest north of LSR 222, the Eugene District of the BLM, and forests farther north in the Western Cascade Oregon Province.

This climatic difference may be explained by geography. In southwestern Oregon, the Siskiyou Mountains occur adjacent to the coast, with peaks up to 7000 feet. These peaks effectively block marine influences and allow high growing season temperatures, frequent frosts, high evaporative demand, and lower precipitation. The impacts are especially felt on the Rogue River NF and the southern districts of the Umpqua NF. The coastal mountain peaks north of

Port Orford and west of Cottage Grove are barely 4000 feet in elevation and allow the inflow of moderating, moist marine air. For example, in 1982, the temperatures for June, July, and August, averaged 2 degrees higher in Prospect, compared to Dorena, and the number of days between the last spring frost and the first fall frost was 106 and 160, respectively. The average annual precipitation in Dorena was 51 inches, compared with 44 inches in Prospect. The climate in southwest Oregon is Mediterranean. This break in climate occurs along the Calapooya Divide. Essentially all of the Rogue River and Siskiyou National Forests, the Medford District of the BLM, and all of the Umpqua National Forest except for the Cottage Grove Ranger District, reflect this climate. This is characteristic of the Klamath Province. The portion of the LSR 222 to the east of the Calapooya Divide (in the Willamette National Forest) appears to be in a rain shadow, and also exhibits the vegetation characteristics of a drier climate.

These climatic differences are reflected in limited tree growth, reduced canopy cover in mature forests (average of 55 percent in southwest Oregon vs. 70 percent in western Oregon), and fire regime differences that have been documented with fire history studies. Southwest Oregon fires occur with higher frequency and lower intensity compared with fire regimes in western Oregon. Levels of down wood appear to be less in southwest Oregon, suggesting higher rates of decomposition compared with areas to the north and greater consumption by fire.

Ecological processes on the Rogue River NF, Medford and Roseburg Districts of the BLM, and the North Umpqua, Diamond Lake, and Tiller Ranger Districts of the Umpqua NF, are more closely aligned with those of the Siskiyou NF, and these areas fall more appropriately into the Klamath Province and allied Mediterranean ecosystems.

The existing condition section on insects and diseases also suggests that incidence and severity in the South Cascades LSRs represents more closely the conditions found in the Eastern Oregon Cascades and Oregon and California Klamath Provinces.

PAST LAND USES

Vegetative structure, function, and pattern in the South Cascades LSRs have been influenced by humans. The most important of these human influences are fire management, including both the deliberate setting of fires by Indians and post-1900s fire suppression activities, and timber harvest.

Several major Indian groups were present in the larger geographic area where the South Cascades LSRs occur: they include the Upper Umpqua, Upland Takelma, Klamath, the southern Molala, and possibly the Shasta peoples. Major economies of these groups were based on hunting and gathering in the meadows, forests, and marshlands, and the fisheries of the Klamath Basin, Umpqua, and Rogue Rivers. Anadromous fish supplemented their diets. Trout were fished from the lakes and streams. A variety of large and small game were hunted. Plant food sources included acorns, camas bulbs, serviceberry, blackberry, and sugar pine seeds, and the inner bark of ponderosa pine. One of the most important plant food sources were the extensive huckleberry patches along the Rogue-Umpqua divide and in the high Cascades. The huckleberry fields were perpetuated by the almost yearly setting of ground fires. While other uses of fire by Indians are less well documented than in other areas, it is believed that these peoples used fire to maintain travel corridors and maintain open understories to enhance hunting and gathering activities.

Early Euro-American residents of the Rogue and Umpqua Valleys viewed the forests of the South Cascades as barriers to settlement and concentrated their efforts on developing transportation routes through them. Hudson Bay Company trappers used trails built and maintained by Indians. Military roads linking the east and west sides of Oregon were built and improved. Discovery of gold in the John Day River country of northeastern Oregon led to the building of a road through the northern portion of the area in 1864. After eventually falling to disuse, this route would become the Diamond Lake Road in the early twentieth century.

The building of travel routes opened the area to grazing, lumbering, and settlement. Large herds of sheep used the area, especially in the time prior to and at the turn of the century. One of the major duties of those hired to work on the Crater National Forest, created in 1907, was the administration of grazing regulations. Cattle were also grazed on forested lands, especially at lower elevations. Large sugar pines provided lumber for the booming mining area near Jacksonville, Oregon. The thriving fruit orchard industry in the Rogue Valley increased the area population, increasing the demand for drinking and irrigation water, and for wood products. Several irrigation pipelines were constructed from Cascades lakes and springs to the valley floor. Many small lumber mills were in operation and railroads were built into the southern portion of the area to move logs and lumber to the mills and population centers.

Extensive areas of timber harvest occurred as early as the 1920s within the LSR network. Access to railheads slowed harvest rates until the 1950s but as the demand for wood products increased, roadbuilding increased, and many areas were entered for harvest. Clearcut harvest created small patches of early seral conditions throughout much of the LSRs. Currently, early seral conditions in the LSRs range from 19 to 36 percent. Selective cutting of individual trees continued to occur on many sites; species composition shifted as a result of partial harvest, extensive road networks were built, and ground disturbance was often intense on some sites.

Large forest fires in the early 1900s led to increased emphasis by government agencies on fire suppression. By the 1940s, with access to the forest increased, and fire fighting techniques improved, fire suppression was highly effective. Excluding fire from stands within the LSRs has resulted in altered stand composition and structure.

Road improvements also opened the area for recreation. People visited, camped at, and developed the mineral springs found in the southern portion of the area. Farther north, huckleberry picking became an important pastime for residents of the Rogue and Umpqua Valleys; hundreds of people would camp during the late summer at "resorts" established in the area between 1910 and the 1930s. Campgrounds were established and facilities were built to cater to the recreationists who used the area directly or who passed through on their way to Crater Lake National Park.

The introduction of an exotic fungus also influenced human activities in the area. White pine blister rust was established in western white pine and sugar pine stands in the South Cascades LSRs by the early 1920s. Union Creek became the center for a massive effort at eradicating *Ribes*, the gooseberry or currant bushes that are the alternate host for the introduced fungus white pine blister rust. Hundreds of men were employed during the 1930s and 1940s to grub out the bushes on the steep, brushy slopes of the Cascades in this area.

PRESENT LAND USES

Table 6 presents a summary of present land uses within each LSR. It is organized by LSR, administrative unit, and the ROD section, "Multiple Use Activities Other Than Silviculture" (ROD C-16). It can be used as an overview, and to compare how individual units are currently treating these topics.

The information was collected with visits to specialists on individual units, during the period from December 1996 through January 1997. Resource specialists were asked about present land uses, and whether there were any known inconsistencies with LSR objectives. None of the current uses were judged by these specialists to have adverse effects on LSR objectives. However, current land uses, particularly firewood harvest and mushroom permits, should continue to be examined for consistency with standards and guidelines and LSR objectives.

Some management activities in LSRs or riparian reserves may seem to conflict with objectives if they are analyzed only at the site scale, or in the short term. Analysis of management actions should include both the short term and long term temporal scale, and the site and landscape spatial scales in order to assess consistency with LSR or riparian reserve objectives. See also the section, "Treatments and Criteria for Multiple Use Activities Other than Silviculture", later in this document.

Table 6: Summary of Current Land Uses

Current land use	LSR 222 Willamette NF	LSR 222 Eugene BLM	LSR 222 Roseburg BLM	LSR 222 Umpqua NF/Rogue NF
Road Construction & Maintenance	No Access and Travel Mgm't Plans in-place. Planning is on-going. Old timber sales, WA have road closure recomm. ODOT doing Hwy 58 widening from Black Canyon camp to Oakridge, 7 miles and 2 1/4 acres of tree removal. Slide rehab on Rd. 5847 will remove 1 acre of LS habitat to stabilize road.	Cottage Grove/Big River WA did not include transportation objectives and road closure recommendations, but this is being included in the CGL/BR landscape plan. LSR is "fully" roaded.	Access and Travelway Management Plans not done.	Watershed analyses have road closure recommendations. WA at Tiller RD generally do not make these recommendations--district is updating Access and Travel Mgm't plan to identify needed roads. Winter storm damage is providing an opportunity to reassess roads and water quality, & riparian concerns.
Fuelwood gathering	Both commercial and personal use as consistent with fuelwood S&G, ROD C-16.	Some scattered commercial use as consistent with fuelwood S&G, ROD C-16.	Nothing of note. Not issuing permits in LSR.	Yes at North Umpqua RD.[5] None at CGRD. Only in cull decks at Tiller RD.
American Indian Uses	None.	None.	None.	None at NURD, CGRD. Tiller RD has use of huckleberry fields.
Mining	Two, twenty acre claims on Grass Mtn. and Coal Cr. Several other non-active claims registered with BLM.	A proposal exists to withdraw 1 mile of Sharp's Cr. from mineral entry to allow recreational mining. Dredging on-going, both commercial and recreational, particularly on FS portion. Gravel pits active.	None.	Many unpatented lode and placer claims in the Bohemia area. Many rock pits. The Al Sarena Buzzard Mine is a patented gold/silver mine in the Rogue River NF portion of LSR 222, Rogue also has numerous mining claims. Tiller RD has two areas, Quartz Mt. (silica), and Pinnacle Cr.
Developments	Larison Cove of Hills Cr. Reservoir. 4 developed campsites, 2 undeveloped sites. Corps of Engineers powerline corridor along LSR boundary. Shady Dell CG along Hwy. 58. Six recreation trails, about 32 miles. 10 miles of new trail planned. Reconstruction of the Westfir Administrative Site will require an add'l 1/2-1 acre clearing for expansion of the parking lot.	Communications sites, utility corridors.	None of note.	Utility corridor along North Umpqua River. Many recreation sites at Tiller RD.
Land Exchanges	None. Several would have potential to enhance LSR.	None.	Land exchange in Canton Cr. not recommended because of LSR.	Illahee Flats in consideration. None elsewhere.
Habitat Improvement Projects	Snag creation using heart rot inoculate, girdling, topping. Oregon Chub project in reservoir drawdown zone. Bald eagle perch enhancement. Meadow maintenance for diversity, mostly along Calapooya Ridge. Pond creation, snag creation, and broadcast burning are treatment needs in Buckhead Special Wildlife Area.	Want to move blowdown into units, and/or riparian areas.	Want to put logs in streams. Want flexibility to leave some, sell some, move some to streams, restore roads with some.	Steamboat Cr. recognized was special fisheries area in 90 LMP. Watershed restoration projects on-going. Illahee prescribed fire, instream work in Cedar, Little Rock, Horse Heaven Creeks. Plans to move about 2000 trees to instream in 5 year timeframe. Tiller RD projects mostly in Dumont and Jackson Cr. Fisheries project in Bitterlick Cr. Restoration road projects on-going throughout RRNF portion.

[5] Needs to be examined for consistency. There are standards and guidelines that specify where fuelwood gathering is appropriate, ROD, C-16.

Current land use	LSR 222 Willamette NF	LSR 222 Eugene BLM	LSR 222 Roseburg BLM	LSR 222 Umpqua NF/Rogue NF
Range Management	None. Allotment from Diamond Lake RD phased out in early 1990s.	None.	None.	North Umpqua RD has 2 sheep, 1 cattle allotment. None currently occupied. Conflicts with LSR due to intro. Of nonnative plants. Tiller RD has EA in process. 3 allotments in LSR. 2 administered by RRNF.
Fire Suppression, Prevention (Recent Significant Fires)	Bearbones 1& 2, 15 acres in LSR; Bohemia Bubble, 12 acres in LSR, all in 1996.	No recent fires of note.	No recent fires of note.	1996 fires. 3 over 100 acres. Spring Fire, 16000 ac. Wren fire, 100 acres and Smith Ridge, 5 acres on Tiller RD in LSR 222. Resource specialists were consulted during fire suppression activities.
Special forest products[6]	No existing commercial moss permits. Roadside bough, Christmas tree permits are issued. Participate in 4 forest mushroom permit (Ump, Willamette, Winema, Deschutes).	No boughs, but heavy mushroom use. Moss harvest has been stopped. Beargrass small amts. And scattered. EA planned for special forest products.	Some beargrass gathering. No commercial permits issued in LSR.	Beargrass gathering NURD. CGRD now excludes some permits from LSR. Tiller RD now excludes most permits from LSR (except Xmas trees, mushrooms). Ump part of 4 forest mushroom permit system.
Recreation Uses	Larison Cove, Shady Dell CG. Several dispersed sites. Trails.	Proposed backcountry Byway along existing roads. Big River bicycle event. Sharp's Cr. Was eligible under W&Scenic, but not deemed suitable. Small piece of Sharp's Cr. Special Rec. Mgm't area overlaps into NE corner of LSR.	No campgrounds of note. No rec. developments, dispersed recreation only.	Multiple dispersed sites, and 6 campgrounds. Trails. Rails to Trails bicycle route goes through CGRD portion, 3-4 miles paving planned. Many rec. sites at Tiller RD.
Research	Three evaluation plantations. Approximately 20 "plus" trees actively used as seed sources. Elk forage study, ODFW. Knobcone pine test burns in Rigdon Pt. RNA.	One evaluation plantation in Big River. 2 other sites. Thinning plots have been in place for 30 years—some in riparian areas. Elk Meadows RNA.	No current research.	Several evaluation plantations. Nine evaluation plantations at Tiller RD, and 1 seed orchard.
Rights-of-Way, Contracted Right Easements, Special Uses	Cost-share agreements/easements used in checkerboard ownership areas. BPA powerlines have right-of way maintenance scheduled. Hampton Special Use permit will convert 2/3 Ac. From maintained grassfield to parking and drive-thru area.	Many Rights-of-Way. Not many new roads going in under old agreements, because already fully roaded. No special use permits.	Many Rights-of-Way.	2 communication sites., 15-20 building rock sites, several hundred rock pits. Several outfitter guide permits. PacificCorp transmission line #12 in T31S, R1W, S36.
Nonnative Species	Him. Blackberry; knotweed; Yellow toadfax; Japanese knotweed; Scotch broom; Tansy; St. John's wort, Canada & Bull thistle.	Scotchbroom. Tansy is well controlled. St. John's wort. Bullfrogs, trash sportfish. Opossum. Feral cats. Bard owls.	See Watershed Analysis for species.	Roads have provided pathways for nonnative and noxious weeds within the LSR. Tansy; Klamath weed; Knapweed; introduced grasses and thistles.

[6] Activities need to be evaluated for effects on LSR objectives, see ROD C-18.

Current land use	LSR 224 Medford BLM	LSR 225 Rogue River NF	LSR 226 Rogue River NF	LSR 227 Winema/ Rogue River NF
Road Construction & Maintenance	Improvements are planned by Fed. Highway Admin. On Elk Cr. Road. Does impact LSR riparian.	Wild & Scenic River plans include road closure recommendations. Some roads closed to ORV use for resource objectives. Motorcycle ORV trail not in conflict with LSR.	Access and Travel Mgm't planning on-going.	No Access and Travel Mgm't plans in place. Road closure recommendations are in watershed analyses.
Fuelwood gathering	No new permits being issued.	Personal use only.[7]	Yes.[7]	None except by campers.[7]
American Indian Uses	None known.	Huckleberry agreement exists along Rogue-Umpqua Divide. Indian concern about Quartz Mt. Mining.	NA.	Vision quest sites. No huckleberry fields.
Mining	None, except incidental expansion of rock pits less than 2 acres.	Foster Cr. Surplus Mine includes 2 small sites and 5 ac. Open pit. Not in conflict with LSR objectives. Current rock pit use.	None, but some rock pits.	Several gravel pits.
Developments	See below.	Rental lookout. See Rec. uses. Also a dumpsite.	2 Guard stations, lookout, Campgrounds.	Pelican Butte proposed ski area; Developed campgrounds at Lake of Woods and Fourmile. Rec. residences. 3 organization camps, 1 resort at Lake of the Woods. Great Meadow dam, Cascade Canal.
Land Exchanges	None.	None.	None.	None.
Habitat Improvement Projects	Thinning around Sugar Pine. Pond improvements for Turtles.	Underburning pine to reduce needle mat for better forage for owl and big game.	None planned.	Some water developments, density management, underburning for bald eagles. Thinning for big pine health.

[7] Needs to be examined for consistency. There are standards and guidelines that specify where fuelwood gathering is appropriate, ROD, C-16.

Current land use	LSR 224 Medford BLM	LSR 225 Rogue River NF	LSR 226 Rogue River NF	LSR 227 Winema/ Rogue River NF
Range Management	Entire LSR is transitory range (6 allotments), proposing fencing along riparian areas, in cooperation with private timber co.	Crater, Alkalai, and Hammocker grazing allotments--reducing cows in north part; increasing 10 percent in south.	2-3 Allotments, most of LSR has grazing.	Allotment south of Lake-of-the-Woods covers about 10 percent of the area.
Fire Suppression, Prevention (Recent Significant Fires)	Burt Peak fire, 3000 ac., 1987.	No recent fires of note.	No recent fires of note.	Hepsie Fire, 42 acres on Rogue River, LSR 227, 1996.
Special forest products[8]	Madrone burls, Sugar pine shake bolts.	Commercial mushroom permits exist--an issue with Crater Park. Also commercial bough permits.	Christmas tree permits, mushrooms, boughs. Rogue is part of 4 forest mushroom permit.	Christmas tree permits, mushrooms. Winema is part of 4 forest mushroom permit system.
Recreation Uses	not applicable.	Hammaker CG. Trail to Crater Falls. Snow park site.	See Developments.	Lake of the Woods Rec. Area. Summer and winter Rec. trails.
Research	Progeny sites need thinning in 10-15 yrs. Need to be able to clear around 30 "plus" trees.	Anderson evaluation plantation. Fisher research on-going in RNA. Monitoring Peregrine site, owl monitoring. Carleon research in EUI contract.	Ongoing long-term timber PNW monitoring, Bessie Shelter area. 2 or 3 evaluation plantations, and 1 seed orchard. Fisher research on-going. Owl regional monitoring.	One seed orchard and a Western larch provenance test site. Select trees located throughout the LSR. Spotted owl (F. Wagner, OSU; G.Sitter, BLM; Great gray owl surveys; AROS root rot; fire history, large woody material studies. Herptile study adjacent to LSR.
Rights-of-Way, Contracted Rights, Easements, Special Use Permits	Proposed dam for flood control on Elk Cr. is half-built, currently on hold due to fish blockage issue. Two 250KV power lines go through LSR.	Horse race event. Cross country trail race.	One small dam (South Fork), for power. Bessie Shelter used by permit holders.	Klamath RD averages 8 short-term event permits/yr.
Nonnative Species	See Elk Cr. WA.	Tansy ragwort, spotted knapweed.	Spotted knapweed possibly. Nonnative species are outcompeting native grasses and plants.	Toadflax, knapweed, and St. Johns wort.

[8] Activities need to be evaluated for effects on LSR objectives, see ROD C-18.

INDIVIDUAL LSR CONTEXT

Late seral vegetation is classified differently, depending on data source. On Forest Service lands, late seral characteristics are defined from satellite data as canopy cover greater than 70 percent and tree size of small, medium, and large sawtimber. There may be some stands (over 80 years old, less than 70 percent canopy, with three layers) that have been classified as mid-seral. As a result, there may be a slight underestimate of late seral acres. Seral stages for the eastern portion of LSR 227 have, appropriately, been defined differently. (Assumptions for classifying seral stages are shown in Appendix D). On Bureau of Land Management areas, satellite data were not available. Stand age was used, with late seral vegetation defined as stands greater than 80 years old.

Vegetation in the five LSRs being evaluated in the South Cascades have different amounts of seral stages. Late seral habitat is a "coarse filter" which indicates how well the reserve is functioning. For example, a reserve with 80 to 100 percent of the capable acres in late successional conditions would likely function well. Conversely, less than 40 percent late successional conditions might indicate a poorly functioning LSR. Of course, these ranges would vary over time and space. Table 7 shows the vegetation characteristics of each Late Successional Reserve. The amount of acres of late seral vegetation decreases in the southernmost LSRs, compared with the northern-most LSRs. With the exception of LSR 227, the percentage of land not capable of supporting late seral forest is about 5 percent or less. The eastern portion of LSR 227 contains many acres of relatively recent volcanic flows in which the soils are not developed well enough to support late seral forests. The amount of interior late seral habitat also decreases as one moves south and east through the LSR network (i.e. fragmentation is greater).

Table 8 shows suitable nesting, roosting, and foraging habitat (NRF) of spotted owls. This is another method of vegetation classification.

Previous work on the Regional Ecological Assessment Program (REAP) suggests that the historical functional range is between 45 and 75 percent late seral conditions.

Table 7: Late Successional Reserve Seral Stage Vegetation Characteristics

LSR	Size in Acres	% of area w/ LS potential	% Late Seral	%Mid-Seral	% Early Seral
222	508,000	>95	42.9	33.0	19.5
224	21,500	NA	43.3	24.5	32.1
225	39,800	>97	22.5	34.9	36.2
226	49,800	>97	22.4	42.1	29.2
227	101,600	>87	16.0	38.9	32.7
Total Ac.	720,700				

In addition to percent late seral habitat, other "fine filter" criteria (specific species requirements) also need assessment. For example, the abundance and distribution of specific habitat elements such as snags, down wood, etc., can be species specific.

Table 8: LSR Suitable Spotted Owl Nesting, Roosting, Foraging Habitat

LSR	Total Federal Acres	Nesting, Roosting, Foraging Habitat Acres	% Nesting, Roosting, Foraging Habitat
222	508,000	301,000	59
224	21,500	10,500	49
225	39,800	19,700	50
226	49,800	23,300	47
227	101,600	46,700	46

LSR 222

This LSR is a combination of National Forest and Bureau of Land Management lands. This is the largest LSR in the Pacific Northwest network and stretches from the Willamette National Forest in the north, to the Rogue River National Forest in the south. It also covers a considerable elevation range, from the lower elevations in the Eugene and Roseburg Bureau of Land Management lands, to the high elevations of the National Forests.

Existing Conditions

This LSR has approximately 43 percent of the area in late seral conditions (Table 7), but only a small percentage in interior habitat. It does, however, have more interior late seral habitat than the other LSRs within the South Cascade network. Most of the late seral habitat is located in the Western Hemlock Series, and a few patches are located in the Silver Fir and White Fir Series. Rocky areas, high elevation wet meadows, and low elevation dry meadows provide habitat diversity. Fifty-nine percent is considered spotted owl nesting, roosting, or foraging habitat (Table 8).

Species

Several rivers and creeks support important anadromous fish runs of coho and Chinook salmon, steelhead, and cutthroat trout. These are the North Umpqua River, including Rock, Canton, Steamboat, Calf, Copeland, and Williams Creeks; and the South Umpqua River, including Dumont, Boulder, Quartz, and Jackson Creeks. An important resident fish, Bull trout, is present in several tributaries of the Upper Middle Fork Willamette River on the Willamette National Forest.

Several rare animal species occur in the LSR. It presently supports 248 activity centers for the Northern Spotted Owl. One hundred ninety-four activity centers have greater than 40 percent of their home range as suitable owl habitat. Other animals of interest include Wolverines and Great Gray owls, both of which have been documented adjacent to this LSR. Rare plant species include Crater Lake *Collomia* and Umpqua swertia.

Surrounding Ownership and Land Allocations

The lands surrounding LSR 222 are quite varied and include Forest Service and Bureau of Land Management matrix lands, private lands, Oregon State lands, and County lands. The

Boulder Creek Wilderness (19,100 acres) is located adjacent to the LSR in the northeast portion. The Rogue-Umpqua Divide Wilderness (34,900 acres) borders the southeast boundary.

On the Willamette NF portion, the Rigdon Point Research Natural Area was created for the northern extension of the range of Knobcone pine. It is located in Staley Creek area of the LSR. The Bradley Lake Special Interest Area was created for a complex of the lake, meadows, and large Noble and Douglas-firs. Patterson Mountain, west of Oakridge, is a special wildlife habitat area.

Lookout Point Reservoir is a dominant feature bordering the north of the LSR. There is a substantial block of industrial forest land to the east of the LSR, just west of Hills Creek Reservoir. Checkerboard private land and BLM administered lands lie to the west of the northern most section of the LSR in the Lost Creek drainage.

The 200 acre Buckhead Special Wildlife Habitat Area is located in the Willamette NF portion of the LSR.

From the Eugene District BLM portion, the BLM matrix to the north and west of the LSR is allocated to "Connectivity Diversity Blocks". To the east of this portion is Sharp's Creek, allocated to Forest Service matrix. To the south is the Roseburg District BLM administered part of the LSR. The checkerboard private ownership in the vicinity of both the Eugene District and Roseburg District BLM is early seral. This Eugene portion is very low on large woody material and late seral in general. The largest patch of true old growth is very small. For Eugene BLM, the east side of the LSR is high value habitat.

The Bohemia mining district is located in the Umpqua NF portion of the LSR. There is a current operating plan for the Stewart mining claim. An interim LSR assessment was completed for this project. Very little private land exists in the vicinity of the Umpqua portion of the LSR.

The Rogue River National Forest portion of LSR 222 is south of the Rogue-Umpqua Divide, and is within the Elk Creek drainage. It was included in the Elk Creek Watershed Analysis. For ease of administration, and to be consistent with the rest of Elk Creek, the unit recommends changing the name of that portion to LSR 224.

Connections

This area provides a north-south connection between the more mesic habitats to the north and the drier Mediterranean habitats in the south. It also provides connection between high and low elevation habitats. Both habitats could serve as areas of short-term seasonal species migration, or long term species migration in the event of climate change. Late seral forest connectivity is broken by many small early seral openings. These may be particularly important along ridges, as they break connectivity between watersheds within the LSR. Streams provide east-west and low-high elevation connectivity in this LSR (Map 1).

The north end of the LSR has restricted connectivity to the north. Human barriers to dispersal of some late-successional species include Hwy. 58, Lookout Point Reservoir, and the City of Oakridge. These are barriers to dispersal from LSR 222 to LSR 219 and LSR 220.

The BLM portions of the LSR are important connections to the Oregon Coast Range Reserves.

Several connectivity "hotspots" become apparent when viewing larger scale maps. The distribution and juxtaposition of seral stages in these areas is perhaps not good enough to allow the LSRs to fully function as habitat reserves for the full array of late successional species known to exist in the assessment area. These areas are not necessarily currently incapable of providing for dispersal of species such as spotted owls, but due to the relatively high percentage of early seral stands, movement of less mobile species across these areas is probably precluded. In LSR 222, these areas are: the Calapooya Divide (the major ridge system between the Umpqua and Willamette Rivers); the lower portions of the Steamboat Creek watershed; and within all of the BLM administered "checkerboard" lands.

Geology and Climate

This area is highly diverse in terms of climate and geology. Landforms range from flat benches to steep slopes. Parent material types are numerous. Climate becomes more Mediterranean in the south. The Mediterranean climate is characterized by warm, wet winters and extended hot summers with droughts. An important climate change occurs approximately along the Calapooya Divide. The portion of the LSR to the east of the Calapooya Divide (in the Willamette National Forest) appears to be in a rain shadow, and exhibits vegetation characteristics of a drier climate-- moderate amounts of the Douglas-fir Series and scattered Oregon White Oak Series. Another significant change in climate appears along the Rogue-Umpqua Divide, with areas to the north being cooler and moister compared with those to the south.

LSR 224

This LSR is made up primarily of Medford Bureau of Land Management lands with a small component of land on the Rogue River National Forest. The elevation ranges approximately from 1500 feet to over 4000 feet. Lands not capable of supporting late seral conditions comprise a small, but unknown percent of the area.

Existing Conditions

This area has approximately 43.3 percent of the land in late seral conditions, but only a very small percent in interior habitat. Most of the late seral stands are in the White Fir Series. Forty-nine percent is considered nesting, roosting, or foraging habitat (Table 8).

Species

Elk Creek supports populations of coho and chinook salmon and steelhead. This LSR presently supports 30 northern spotted owl activity centers. Only 6 activity centers have greater than 40 percent of their home range as suitable owl habitat. Other animals of interest include the Fisher. Plant species of interest include Baker's Cypress, and Pygmy monkey- flower. Habitat diversity is increased at the lower elevations by oak woodlands and dry meadows; rocky bluffs are present at the highest elevations.

Surrounding Ownership and Land Allocations

Adjacent lands include Forest Service and Bureau of Land Management matrix lands to the west, south, and east. To the north, the Rogue River National Forest is allocated to LSR. Several sections of Rogue River National Forest land are located inside the LSR, yet designated as matrix land. Other ownership's include commercial forest land (Boise Cascade), private land and county lands.

Connections

Important to this LSR is Elk Creek, which serves as a connection between the Rogue River and the upper elevations of the area. The northern boundary of this LSR is adjacent to the southern boundary of LSR 222, extending the transition connection between the southern Mediterranean climate and the mesic climate characteristic of the area north of 222. Older forest habitat connections are often broken by early seral patches. The area between LSR 224 and LSR 223 to the west is part of an area that was identified by the Interagency Scientific Committee (Thomas, 1990) as an area of concern wherein Northern Spotted Owl dispersal capabilities should be a management priority.

Connectivity "hotspots" become apparent when viewing larger scale maps. The distribution and juxtaposition of seral stages within the BLM administered "checkerboard" land is perhaps not good enough to allow the LSRs to fully function as habitat reserves for the full array of late successional species known to exist in the assessment area. These areas are not necessarily currently incapable of providing for dispersal of species such as spotted owls, but due to the relatively high percentage of early seral stands, movement of less mobile species across these areas is probably precluded.

Geology and Climate

This LSR is characterized by mountainous terrain with long rounded ridgetops, steep slopes, and moderate to high stream gradients. Climate is Mediterranean, with cool moist winters, and hot, dry summers with extended periods of drought. Growing conditions are slowed by low precipitation during the summer.

LSR 225

Existing Conditions

This LSR occurs entirely on lands of the Rogue River National Forest. The majority of the vegetation is a mix of Western Hemlock and White fir series, with the balance comprising Shasta Red Fir and Mountain Hemlock Series. The LSR is 22.5 percent late seral habitat, most of which is in the Western Hemlock and White Fir Series. Interior habitat makes up a very small percentage of the area. This LSR is considered to be 50 percent suitable spotted owl nesting, roosting, and foraging habitat (Table 8).

Species

No creeks currently support populations of anadromous salmonids. There are 15 owl activity centers, with 11 having greater than 40 percent as suitable spotted owl habitat. There are 19 species of rare plants in this LSR. Habitat diversity is increased by high elevation wet and dry meadows, talus slopes, and rocky bluffs.

Surrounding Ownership and Land Allocations

Surrounding lands are Rogue River National Forest matrix lands to the south and east. Crater Lake National Park is the dominant federal land to the east of the LSR. The western and northern boundary is adjacent to the Rogue-Umpqua Divide Wilderness, administered by the Umpqua National Forest. The Wild & Scenic Rogue River passes through the northern portion of this LSR, along with a Special Interest Area. The Abbott Creek Research Natural Area is within the southern portion. Alaska Yellow-cedar groves, a fire dependent ecosystem, exist in the Alkaline meadows area of Foster Creek.

Connections

Several small creeks run from high elevations down to the Rogue River. The riparian connections run mostly east-west, therefore connectivity to LSR 226, about 10 miles to the south, is not great. The older forest habitat in the Rogue-Umpqua Divide Wilderness Area provides connectivity between LSR 222 and LSR 225 (Map 1).

Connectivity "hotspots" become apparent when viewing larger scale maps. East-west connectivity is a concern in the vicinity of Crater Lake National Park. The distribution and juxtaposition of seral stages in this area is perhaps not good enough to fully function as habitat reserves for the full array of late successional species known to exist in the assessment area. These areas are not necessarily currently incapable of providing for dispersal of species such as spotted owls, but due to the relatively high percentage of early seral stands, movement of less mobile species across these areas is probably precluded.

Geology and Soils

This area is characterized by young, high Cascade geology, with abundant ash and pumice. Potential to grow forests with late seral characteristics is limited in areas that are climax to lodgepole pine. Climate is Mediterranean, however, winter temperatures may be lower and snowfall higher than in LSRs 222 and 224.

LSR 226

Existing Conditions

This LSR is all Rogue River National Forest land. The Western Hemlock-White Fir Series make up the majority of the acreage. Most of the existing late seral forest habitat is in the Western Hemlock-White Fir complex, however, some large patches also occur at high elevations along the eastern boundary of the area in the Shasta Red Fir and Mountain Hemlock Plant Series. Interior habitat patches are extremely small and scattered. Forty-seven percent of the LSR is nesting, roosting, and foraging habitat (Table 8).

Species

There are no streams that currently support anadromous salmonids. There are 16 owl activity centers, with 10 of those having less than 40 percent suitable spotted owl habitat. Habitat diversity is increased by high elevation, wet meadows. Recent research indicates that owls avoid Shasta red fir and mountain hemlock stands for nesting.

Surrounding Ownership and Land Allocations

The land to the north and south is Forest Service matrix land. To the immediate west is Rogue River National Forest matrix, but more generally is BLM and private land. The eastern boundary is adjacent to Crater Lake National Park and Sky Lakes Wilderness Area.

Connections

Numerous creeks run through the LSR, connecting the high elevation aquatic and riparian areas of Crater Lake National Park to the Rogue River. This in turn provides connectivity to the lower elevations and ultimately the Pacific Ocean. Because rivers run generally east-west, riparian reserves do not provide an ideal link between this LSR and LSR 225. The adjacency to Crater Lake National Park and Sky Lakes Wilderness provides upland, late seral forest connectivity along the crest of the Cascade Mountains through a series of Wilderness Areas that run north and south. The vegetation at the eastern boundary of the LSR is high elevation lodgepole pine. The Wilderness Areas also connect this LSR with LSR 227 (Map 1).

Connectivity "hotspots" become apparent when viewing larger scale maps. East-west connectivity is a concern in the vicinity of Crater Lake National Park. The distribution and juxtaposition of seral stages in this area is perhaps not good enough to fully function as habitat reserves for the full array of late successional species known to exist in the assessment area. These areas are not necessarily currently incapable of providing for dispersal of species such as spotted owls, but due to the relatively high percentage of early seral stands, movement of less mobile species across these areas is probably precluded.

Geology and Soils

In places where the Lodgepole Pine Plant Series occurs, the soils may be characterized by deposits from Mt. Mazama (High Cascade geology), and may inhibit the forest from reaching a structurally diverse character. This is confounded by the Mediterranean climate, and cold winter temperatures.

LSR 227

Existing Conditions

This LSR is made up of lands of the Winema and Rogue River National Forests. The LSR traverses the crest of the Cascade Mountains. The east side is in large portion, Shasta Red Fir Series, and the west side, White Fir Plant Series. Late seral habitat is 16.0 percent of the area. Approximately 87 percent of the land is capable of supporting late seral forests. Patches of late seral forest exist that extend from the east to the west side of the Cascades and may provide continuous habitat for some wildlife species. The amount of interior habitat is very small, and patches are scattered. Forty-six percent of the LSR is nesting, roosting, and foraging habitat (Table 8).

Species

Little Butte Creek supports populations of coho and chinook salmon, and steelhead. Bull trout historically were present in Cherry Creek. There are 48 spotted owl activity centers, with 20 of these having less than 40 percent suitable habitat. There are over twelve species of rare plants. High elevation wet meadows and ponds are present. This LSR includes two lakes of significant size; Fish Lake and Lake of the Woods. Fourmile Lake is at the edge of the LSR. These large lakes contribute aquatic diversity not found in the other LSRs.

Surrounding Ownership and Land Allocations

To the northwest lies Forest Service matrix lands and the Sky Lakes Wilderness area. To the west and south of the Rogue River NF portion of the LSR is BLM matrix, in a checkerboard configuration with private land. To the east lies the Mountain Lakes Wilderness area, some matrix land administered by the Winema National Forest, and the Klamath Basin; dominated by Upper Klamath Lake, Upper Klamath National Wildlife Refuge, and Agency Lake.

Connections

Small creeks on the west side of the LSR provide connections of aquatic and riparian habitat west to the Rogue River. A large block of connected upland area is provided by the adjacency of Mountain Lakes Wilderness, LSR 228, LSR 229, Sky Lakes Wilderness, Crater Lake National Park, and LSR 226 (Map 1).

Connectivity "hotspots" become apparent when viewing larger scale maps. East-west connectivity is a concern across the crest of the Cascades in LSR 227. The distribution and juxtaposition of seral stages in this area is perhaps not good enough to fully function as habitat reserves for the full array of late successional species known to exist in the assessment area. These areas are not necessarily currently incapable of providing for dispersal of species such as spotted owls, but due to the relatively high percentage of early seral stands, movement of less mobile species across these areas is probably precluded.

Geology and Climate

In the higher elevations of this area, soil conditions brought about by the eruption of Mt. Mazama may restrict growth of forests into late seral condition. This may be exacerbated by the drier, colder interior climate on the east side of the LSR.

Late Successional Reserve Assessment

There is a recently completed assessment on the Winema National Forest that provides more local information for the eastern portion of LSR 227. It is included as an Appendix in this document.

EXISTING VEGETATION

PLANT SERIES

Plant series is a major stratification of habitat. Series are named after the dominant climax plant species. For example, the Western Hemlock Plant Series will grow to be dominated by large western hemlock if undisturbed by fire, floods, slides, etc. Series is an expression of site potential and provides the basis to determine the desired future condition of late seral plant communities. The Series have characteristic disturbance regimes and associated patch dynamics. Series also provide information on specific structures and species composition.

Forests of the South Cascades LSR Network are comprised of at least ten series (Table 9). The most common are Western Hemlock (42 percent of area), White Fir (24 percent of area), and Douglas-fir (12 percent of area) (McCrimmon and Atzet 1990). Less well represented series are Silver Fir, Shasta Red Fir, Mountain Hemlock, Western Redcedar, Oregon White Oak, Lodgepole Pine, and Ponderosa Pine.

The LSR network in this assessment spans a wide range of environments, and this is reflected by the many plant series that are represented (Map 3). The northern portion of LSR 222 is predominantly Western Hemlock Series, reflecting a cool, moist climate. Western Redcedar Series is present in the wettest areas. The Silver Fir Series occurs at the highest elevations. East of the Calapooya Divide a rain shadow appears to exist; here, as well as in other dry areas, the Oregon White Oak Series and Douglas-fir Series occur in small pockets. In the southern portion of LSR 222, and LSR 224 the Western Hemlock Series is replaced by the White Fir Series. Douglas-Fir Series becomes more dominant and the Oregon White Oak Series occurs more frequently. In LSR 227, Douglas-fir predominates at the low elevations and transitions to White Fir Series as the elevation increases. Along the crest of the Cascades and eastward, the Shasta Red Fir Series becomes dominant, with pockets of Lodgepole Pine and Mountain Hemlock Series east of the Cascades. LSR 226 is predominantly a mix of White Fir and Western Hemlock Series to the north, and White Fir Series in the south. Shasta Red Fir Series becomes dominant as elevation increases, and Mountain Hemlock Series occurs at the highest elevations. LSR 225 is similar to LSR 226; a mix of Western Hemlock and White Fir Series predominates at the lower elevations, with Shasta Red Fir Series occurring at higher elevations, and Mountain Hemlock Series at the highest elevations (See Map 3).

Table 9: Acres by Plant Series for Each LSR in the South Cascades LSRA

Plant Series	LSR 222	LSR 224	LSR 225	LSR 226	LSR 227
Silver Fir (ABAM)	26,200	0	0	0	0
White/Grand Fir (ABCO/ABGR)	90,500	9,500	0	8,100	77,600
White Fir-Western Hemlock (ABCO/TSHE)	23,900	0	34,000	31,500	0
Shasta Red Fir (ABMAS)	2,400	0	5,700	8,400	10,500
Lodgepole Pine (PICO)	0	0	0	0	1,200
Ponderosa Pine (PIPO)	0	0	0	0	100
Douglas-fir (PSME)	65,400	11,200	0	0	6,300
Oregon White Oak (QUGA)	400	800	0	0	0
Western Redcedar (THPL)	4,700	0	0	0	0
Western Hemlock (TSHE)	289,200	0	0	0	0
Mountain Hemlock (TSME)	5,300	0	100	1,800	5,900

The Western Hemlock Series

The Western Hemlock Series occurs at low to mid-elevations and tends to favor cooler, northerly aspects in the Province. The entire Western Hemlock Series occurs north of the Rogue-Umpqua Divide. It is often found on deep, basaltic soils. Most late seral, undisturbed sites are still dominated by Douglas-fir. Western Hemlock sites are highly productive, in part, due to the high rate of input and processing of coarse wood at the soil surface. Dense, single-layered stands may develop that have the capability of supporting many vegetation layers as gap formation occurs. Forest floor litter is produced readily from many species and is incorporated into the soil quickly, resulting in low accumulations until late seral stages. This Series has a high occurrence of human disturbance. Fire disturbance, with low intensity underburning, is evident. Stand replacement fires likely occurred about every 250 years (the average stand age). Western hemlock, as a species, has shallow roots and occurs in areas of high precipitation making it susceptible to windthrow.

Late seral stand conditions are shown in Tables 10 and 11. These characteristics may be used as models when early and midseral stands are being managed toward a late seral condition. The two most common tree species are western hemlock and Douglas-fir. Both can reach very large diameters, with the average diameter of Douglas-fir equal to 38 inches. Average Douglas-fir tree age is 306 years and average western hemlock tree age 161 years. Total number of trees per acre, by size class, is shown in Tables 12 and 13. The average number of snags of all sizes per acre is 48, with an average diameter of 31 inches, and an average height of 45 feet. The average number of pieces of down woody material is 168 per acre, average large-end diameter 17 inches, and average length 32 feet. High variation is associated with amounts of snags and down woody material.

The White Fir Series

The White Fir Series occurs over a wide range of elevations and on all aspects. Granitic rocks on south aspects accompany the drier plant associations of the series. Douglas-fir trees usually dominate the overstory of white fir stands until late in succession. Litter production is high, biomass production is high, and dense, single-layered stands may occur. Fuels dry quickly, and fire is the most frequent disturbance, followed by human disturbance, wind, and disease. It is one of two series in which insects were observed as the last major disturbance, although this was still not frequent. Wind disturbance has a moderate influence in the Series.

Late seral stand conditions are shown in Tables 10 and 11. These characteristics may be used as models when early and mid-seral stands are being managed toward late seral conditions. Conditions are shown for both north and south portions of the LSR network (defined by the Rogue-Umpqua Divide). The dominant species north of the Rogue-Umpqua Divide are white fir and Douglas-fir. Both species can reach diameters over 80 inches. Average Douglas-fir tree age is 340 years and average white fir age is 139 years. Total number of trees per acre, by size class, is shown in Tables 12 and 13. The average number of snags per acre is 43, with an average diameter of 29 inches and an average height of 49 feet. The average number of pieces of down wood is 129 per acre, with an average large-end diameter of 16 inches and an average length of 36 feet. The dominant species south of the Rogue-Umpqua Divide are also white fir and Douglas-fir (Table 11). Diameters are smaller compared with stands in the north, with the largest trees at 51 inches and 75 inches, respectively. Average age is also younger in the southern portion of the LSR, averaging 164 years for Douglas-fir and 126 years for white fir. The average number of snags per acre is 40, with an average diameter of 25 inches and an average height of 52 feet. The average number of pieces of down woody material is 139 per acre, with an average large-end diameter of 15 inches and an average length of 30 inches. High variation is associated with amounts of snags and down woody material.

The Douglas-fir Series

The Douglas-fir Series occurs on a wide range of elevations and occurs slightly more often on south aspects than on north aspects. Stands occur on warmer, drier sites with moderately shallow soils. Biomass and litter production are high. Open canopies allow tree regeneration and shrubs to form fuel ladders. The mean interval between fires is short, possibly as low as 15 years on some sites. As a result of fire exclusion, the average stand has been undisturbed for 76 years, over twice the mean return interval.

Late seral stand conditions are shown in Tables 10 and 11. The two most common tree species in the northern portion of the LSR are Douglas-fir and incense cedar and the two most common species in the southern portion of the LSR are Douglas-fir and white fir. Tree diameters in this series are smaller than in the White Fir and Western Hemlock Series. In the northern portion, Douglas-fir can reach diameters of 77 inches and incense cedar, 68 inches. In the southern portion, Douglas-fir can reach diameters of 66 inches and white fir, 41 inches. North of the Rogue-Umpqua Divide, Douglas-fir trees average 198 years of age and incense cedar 183 years. South of the Divide Douglas-fir trees average 181 years and white fir 91 years. Total number of trees per acre, by size class, is shown in Tables 12 and 13. In the northern portion of the LSR network, snags per acre average 50, with an average diameter of 24 inches and an average length of 34 feet. In the southern portion of the LSR network, snags average 24 per acre with an average diameter of 29 inches and an average height of 26 feet. In the northern portion of the LSR network, down woody material averages 105 pieces per acre with an average large-end diameter of 15 inches and an average length of 33 feet. In the southern portion of the LSR network, down woody material averages 182, with an average large-end diameter of 14 inches and an average length of 20 feet. High variation is associated with amounts of snags and down woody material.

The Shasta Red Fir Series

The Shasta Red Fir Series occurs at high elevations in a band between the Mountain Hemlock Series and the White Fir Series. It occurs on both deep, fertile soils and new, volcanic soils. West of the Cascades it has a slight tendency to occur on warmer, drier south aspects, and biomass production can be very high. East of the Cascades it is more wide spread at high elevations. Extremely high stand densities of Shasta red fir may occur, especially in even-aged, single-storied stands that develop after stand replacement fires. Fire is most frequently the last major disturbance to the Shasta Red Fir Series, followed by human disturbance, wind, disease, and ice and snow. East of the Cascades, root disease may be an important factor in developing stand structure.

Late seral stand conditions are shown in Tables 10 and 11. Sufficient data were present only in the southern portion of the LSR network to show late seral characteristics. These data were taken from Rogue River National Forest plots and may not be an accurate estimate of Winema NF potentials. The two most common tree species were Shasta red fir and white fir. Tree diameters may reach 69 inches for Shasta red fir and 51 inches in white fir. The average age of Shasta red fir is 196 years and the average age of white fir, 140 years. The average number of snags per acre is 21, with an average diameter of 25 inches (height was not recorded). The average number of pieces of down woody material is 211. Again, data for snags and down woody material has a high degree of variation.

The Mountain Hemlock Series

The Mountain Hemlock Series occurs at high elevations. It is similar to the Western Hemlock Series with respect to litter production, but biomass production is low. It tends to occur on cold, northerly aspects. Stand replacement fire occurrence is lowest for all the Series. Sites are cold, flat, and moistened by summer thunderstorms. Ice and snow are major disturbance factors. Over 20 percent of the stands were damaged by ice or snow as the last major disturbance event. Disease, especially root disease, is common in older mountain hemlock stands and, in some areas, controls stand dynamics.

Late seral stand conditions are shown in Tables 10 and 11. The two most common tree species are mountain hemlock and Shasta red fir. In the northern portion of the LSR network, the largest mountain hemlock trees may reach 56 inches, and the largest Shasta red fir, 53 inches. In the southern portion of the LSR network the largest mountain hemlock trees may reach 45 inches and the largest Shasta red fir, 63 inches. In the northern portion, the average mountain hemlock tree age is 179 years and the average Shasta red fir tree age, 183 years. In the southern portion, the average mountain hemlock tree age is 198 years and the average Shasta red fir tree age is 235 years. In the north, the average number of snags per acre is 75, with an average diameter of 17 inches and an average height of 68 feet. In the south, the average number of snags is 32 per acre, with an average maximum diameter of 26 inches (height not available). The average number of pieces of down woody material in the northern portion is 97 pieces per acre with an average maximum diameter of 12 inches and an average length of 32 feet. In the southern portion, the average number of down woody pieces per acre is 133, with an average large-end diameter of 19 inches and an average length of 23 feet.

The Western Redcedar Series

The Western Redcedar Series is found at low to mid-elevations, on all aspects. It occurs on sites with high rainfall and warmer temperatures. A wide range of parent rock materials are found, and soils are deep and well-drained. Sites are often on the lower third of the slope or bottomland locations close to perennial streams. Western redcedar is almost always associated with western hemlock and Douglas-fir. Productivity is high and stands may develop as dense single-layered stands after a major disturbance. Western redcedar produces more litter than any other Pacific Northwest conifer and the wood is extremely resistant to decay. Thus, litter cover would be high if the environment were cooler and drier, and did not promote decay. Fire risk is generally low in this Series. Western redcedar has a high resistance to both insects and disease.

Late seral stand conditions are shown in Tables 10 and 11. This series was present only in the northern portion of the LSR network. The two most common tree species are western redcedar and Douglas-fir. Western redcedar trees can reach diameters of at least 44 inches and Douglas-fir trees, at least 68 inches. The average age of western redcedar trees is 178 years and Douglas-fir trees, 213 years. The average number of snags per acre is 71, with an average diameter of 27 inches and an average height of 48 feet. The average number of pieces of down woody material is the highest of any series, at 244. This may be attributed to the cool, moist microclimate that would tend to exclude fire and reduce decomposition rates. The average large-end diameter of down wood is 13 inches and the average length is 38 feet.

The Oregon White Oak Series

The Oregon White Oak Series occurs at low elevations on the warmest, south aspects. Soils are extremely shallow and may transition to bedrock abruptly. Slopes are usually gentle. Overstory cover is lacking or sparse. Ponderosa pine may be present above a discontinuous canopy of Oregon white oak. Tree productivity is low; the herb layer is rich and possibly the most active layer. Fire frequency is high and intensity is low. Late seral stand characteristics for this series are not available because of limited data.

The Lodgepole Pine Series

The Lodgepole Pine Series occurs at higher elevations on gentle slopes and pumice/ash flats; east of the Cascades it occurs in small basins. Parent rock is pumice or ash. Fragment size and depth decrease with increasing distance from Crater Lake (Mt. Mazama was the source on most sites). Soils generally are shallow, infertile, and erodable. Stands are dominated by lodgepole pine and may support lesser amounts of Shasta red fir and mountain hemlock. Lodgepole pine is an aggressive pioneer species and may occur in single-species stands in the Mountain Hemlock or Shasta Red Fir Series following a disturbance. Productivity is low, and shrubs and herbs are not abundant. Generally, stand replacement fires are more common than underburning in this series. As stands become older, vigor may decrease and insects may become active in the stands.

Late seral characteristics of the Lodgepole Pine Series are shown in Tables 10 and 11. The only common tree species in this Series is lodgepole pine. In the northern portion of the LSR network, the largest tree diameter was 18 inches and in the southern portion of the network, 14 inches. Average tree age was 98 years in the north and 123 years in the south. Snag and down woody material information are not available for the northern portion of the LSR network because of limited data. In the southern portion of the LSR network, snags average 157 per acre, and down wood, 55 pieces per acre.

The Ponderosa Pine Series

The Ponderosa Pine Series occurs at mid-elevations on flats and gentle slopes east of the Cascades. Parent rock is andesite, basalt, and diatomaceous. The stands are characterized by low perennial species diversity. Common plants on forest sites vary from ponderosa pine, bitterbrush-big sagebrush, and fescue on higher productivity sites, to stands which include western juniper and low sagebrush on lower productivity sites. Following disturbance, cheatgrass and rabbitbrush will increase. Disturbance is most commonly fire, with low intensity, frequent burns. Snag and down wood information are not available for this Series.

Table 10: Current conditions of Late Seral Habitat in the Northern Portion of the South Cascades LSRA Network[9]

Plant Series	Silver Fir (ABAM)		White Fir (ABCO)		Lodgepole Pine (PICO)	Douglas-fir (PSME)		Western Redcedar (THPL)		Western Hemlock (TSHE)		Mtn. Hemlock (TSME)	
2 major species	ABAM	PSME	ABCO	PSME	PICO	PSME	CADE3	THPL	PSME	TSHE	PSME	TSME	ABMAS
Biggest dia. (in.)	37	85	99	87	18	77	68	44	68	69	84	56	53
Trees per acre	159	38	58	92	969	289	52	99	114	129	65	235	80
Avg. tree diameter	15	42	30	36	8	30	29	17	29	19	38	18	25
Growth rate, last 10 years (20ths of an inch)	10	9	11	9	8	10	9	10	11	11	9	8	9
Average age (yrs)	129	340	139	340	98	198	183	178	213	161	306	179	183
Live crown ratio (%)	66	51	53	51	47	43	45	49	39	57	41	68	44

[9] Characterized by data from the Umpqua NF. Data are shown for the two most abundant tree species in each plant series.

Table 11: Current Conditions of Late Seral Habitat in the Southern Portion of the South Cascades LSRA Network[10]

Plant Series	White Fir (ABCO)		Shasta Red Fir (ABMAS)		Lodgepole Pine (PICO)	Douglas-fir (PSME)		Western Hemlock (TSHE)		Mountain Hemlock (TSME)	
Two major tree species	ABCO	PSME	ABMAS	ABCO	PICO	PSME	ABCO	TSHE	PSME	TSME	ABMAS
Biggest tree dia. (in)	51	75	69	51	14	66	41	47	92	45	63
Trees per acre	117	73	64	34	243	95	37	108	42	82	49
Avg tree diameter	24	33	27	18	9	27	19	19	38	20	32
Growth rate, last 10 years (20ths of an inch)	16	16	14	13	5	19	23	12	11	8	9
Average age (yrs)	126	164	196	140	123	181	91	154	256	198	235
Live crown ratio (%)	55	46	56	62	44	49	55	70	45	71	49

[10] As characterized by data from the Rogue River NF. Data shown are for the two most abundant tree species in each plant series. these data are not characteristic of the Winema portion of LSR 227. See Appendix J.

Table 12: Summary of Late Seral Habitat Live Tree Information by Plant Series Northern Portion of LSRA Network (Umpqua NF data)

Plant Series	Trees per acre by DBH Class.					# of plots
	<9"	9-15.9"	16-19.9"	20-23.9"	24"+	
Silver Fir, ABAM						31
median	124	43	15	9	34	
mean	242	77	17	12	34	
range	0-1853	0-458	0-45	0-27	0-75	
Mountain Hemlock, TSME						30
median	128	72	24	13	14	
mean	245	97	26	15	22	
range	0-1465	0-300	0-75	0-40	0-73	
White Fir, ABCO						78
median	120	40	9	9	34	
mean	189	40	13	11	36	
range	0-1367	0-187	0-63	0-39	0-98	
Douglas-fir, PSME						42
median	148	27	11	12	26	
mean	278	38	15	11	30	
range	0-1659	0-98	0-63	0-33	0-65	
Western Redcedar, THPL						7
median	80	48	19	12	26	
mean	153	43	24	13	25	
range	0-407	0-63	0-41	0-19	0-42	
Western Hemlock, TSHE						153
median	34	84	9	8	30	
mean	43	200	14	10	32	
range	0-221	0-1722	0-91	0-47	0-73	

Table 13: Summary of Late Seral Habitat Live Tree Information, by Plant Series Southern Portion of the LSRA Network (Cascades portion, Rogue River NF data)[11]

Plant series	Trees per acre by DBH Class.					# of plots
	<9"	9-15.9"	16-19.9"	20-23.9"	24"+	
Shasta Red Fir, ABMAS						9
median	44	39	9	4	23	
mean	175	53	13	8	21	
range	0-691	0-158	0-2	0-29	0-52	
Mountain Hemlock, TSME						17
median	60	46	14	14	33	
mean	146	47	14	16	31	
range	0-1474	0-108	0-37	0-47	0-60	
White Fir, ABCO						92
median	93	43	13	11	28	
mean	156	49	16	12	29	
range	0-2000	0-133	0-70	0-47	0-72	
Douglas-fir, PSME						13
median	73	16	7	6	16	
mean	166	56	19	9	12	
range	0-1244	0-241	0-80	0-37	0-23	
Western Hemlock, TSHE						22
median	84	34	12	10	32	
mean	146	39	13	12	29	
range	0-590	0-100	0-43	0-46	0-48	

SERAL STAGES

Another important characteristic of vegetation is the seral stage. Although other LSRAs have used successional stages, this is not appropriate for the southern Oregon Cascade area because of the frequent fire return intervals. Stand age averages only about 250 to 300 years. Ecologically, succession is classed as early successional, with the stand being composed primarily of pioneer species, the mid-successional stage, when the climax species begin colonizing the stand and produce a lower tree layer. Late successional stands are characterized by the dominance of the climax species and the decline of the pioneers, and climax stands are composed of climax, shade tolerant species. Stands in southwestern Oregon, because of fires, typically only reach mid-successional condition, that is, the pioneer species, such as Douglas-fir still dominate the stand. For this assessment, seral stages have been identified as more meaningful, and have been defined by stand canopy closure and tree size. Three seral stages have been recognized--early, mid, and late. Map 4 shows the seral stages in the South Cascades LSRA area. Late seral characteristics are defined as canopy cover greater than 70 percent and tree sizes of small, medium, and large saw. Seral stages for the east portion of LSR 227 have, appropriately, been defined differently. See Appendix D for seral stage definitions.

[11] These data are not characteristic of the Winema portion of LSR 227. See Appendix J.

Historical condition was gathered from two sources, the Regional Ecological Assessment Program (REAP, 1993) and aerial photographs. The REAP reported that the amount of area, historically (past 250 years), that has been in late seral conditions ranged between 40 and 70 percent. This estimate is for the entire landscape. Second, within the LSR network, information from aerial photos from the 1940s show that the amount of late seral condition was very high in LSR 222 (86%), LSR 224 (94%), and LSR 225 (91%). LSRs to the south showed lower levels of late seral condition in the 1940s; LSR 226 had 58 percent and LSR 227, 62 percent. The Vegetation Dynamics Development Tool (VDDT) was used to predict sustainable levels of late seral vegetation in each of the LSRs (Appendix H shows assumptions and details of the model). In LSR 222, LSR 225, and LSR 226, sustainable levels of late seral vegetation averaged 75 percent. Generally, the proportions were slightly higher on north aspects compared with south aspects. In LSR 224, which occurs at low elevation in a warm dry climate, sustainable levels of late seral vegetation averaged 55 percent. This was lower in the Oregon White Oak and Douglas-Fir Series. Ranges of vegetation are shown in Appendix H. The average sustainable amount of late seral vegetation for LSR 227 (Winema portion) averaged 55 percent, as shown in the Winema LSRA.

Early seral patches, created most likely from fire disturbance (but also from lava flows and some early logging) show that size was highly variable, ranging from one acre to over 14,000 acres in size, with a mean patch size of 223 acres. Early seral patch sizes were smaller in LSR 222, averaging about 140 acres, compared with the other LSRs to the south where early seral patch size averaged about 438 acres (Map 5).

Overall, the current vegetation conditions in the LSRs show 43 percent late seral in LSR 222, 43 percent late seral in LSR 224, 23 percent in LSR 225, 22 percent in LSR 226, and 16 percent late seral in LSR 227. The amount decreases from north to south in the LSR network (Table 14). Within the LSR network, none of the fifth field watersheds have 75 percent (sustainable levels as modeled in VDDT; 55 percent for LSR 224) or more of the land supporting late seral conditions. Only two have more than 50 percent late seral, and most of the watersheds have between 35 and 50 percent late seral. This is close to the lowest point in the range of historical condition (REAP, 1993).

Interior habitat was estimated by buffering late seral patches 125 meters in from an early seral edge, and 65 meters in from a mid-seral edge. Because the data were stored as 30 meter square blocks, this estimate of interior habitat was a rough approximation. In general, there were more and bigger interior habitat patches north of the Rogue-Umpqua Divide. The amount south of the Divide was exceptionally sparse and scattered. In neither area was there an interior habitat network that could support the movement of species that require this habitat.

Table 14: Percent Late Seral Habitat within LSRs, by Fifth Field Watershed

LSR	Fifth Field Watershed Name	Common Names	Admin. Unit	% Late Seral
222	South Umpqua 4	Flat Creek	Umpqua	58
222	North Umpqua 10	Rock Creek	Eugene	72
222	North Umpqua 10	Rock Creek	Roseburg	55
222	North Umpqua 9	Canton Creek	Roseburg	55
222	North Umpqua 9	Canton Creek	Umpqua	45
222	South Umpqua 2	Jackson Creek	Umpqua	49
222	Middle Fk. Willamette 21	Larison, Coal Cr.	Willlamette	49
222	Coast Fk. Willamette 1	Sharps, Brice Cr.	Umpqua	64
222	Coast Fk. Willamette 1	Sharps, Brice Cr.	Eugene	60
222	Coast Fk. Willamette 2	Mosby Creek	Eugene	47
222	North Umpqua 7	Copeland, Calf Cr.	Umpqua	47
222	South Umpqua 3	Boulder, Dumont Cr	Umpqua	47
222	Middle Fk. Willamette 23	Staley Creek	Willlamette	46
222	North Umpqua 8	Steamboat Creek	Umpqua	44
222	South Umpqua 1	Quartz, Black Rock, Castle Rock Creeks	Umpqua	44
222	North Umpqua 5	Fish Creek	Umpqua	43
222	Middle Fk. Willamette 19	Goodman, Duvall, Deception Creeks	Willlamette	39
227	Upper Rogue 4	Rancheria, Deception Creeks	Rogue	37
222	Upper Rogue 5	Elk Creek	Rogue	29
224	Upper Rogue 5	Elk Creek	Medford	43
226	Upper Rogue 4	Rancheria, Deception Creeks	Rogue	30
225	Upper Rogue 1	Foster, Crater, Abbott, Ginkgo, Hershberger Creek	Rogue	24
226	Upper Rogue 1	Foster, Crater, Abbott, Ginkgo, Hershberger Creek	Rogue	21
226	Upper Rogue 2	Middle Fk Rogue, South Fk Rogue, Red Blanket Creeks	Rogue	24
222	North Umpqua 6	Boulder Creek	Umpqua	23
222	Coast Fk. Willamette 3	Big River	Eugene	21
227	Upper Klamath Lake 3	Lost, Fourmile, Billie Cr.	Winema	25
227	Upper Rogue 8	S. Fork Little Butte Cr.	Rogue	15
227	Upper Rogue 8	S. Fork Little Butte Cr.	Winema	20
227	Upper Klamath 13	Spencer Creek	Winema	26
227	Upper Klamath 11	Old Baldy, Hoxie Cr.	Rogue	14
227	Upper Klamath Lake 2	Cherry, Rock Cr.	Winema	18

NONNATIVE PLANTS

Nonnative plant species occur within the LSRs. They can potentially displace native species, alter the suitability of native animal habitat, and affect ecological processes in native animal and plant communities. The majority are of Eurasian origin; their introductions to the area have been both intentional and accidental. These species are often associated with site disturbance, particularly exposure of bare soil. Road shoulders or logging landings are common establishment sites. The nonnative species of concern generally reach reproductive maturity early and are prolific seeders. Many have seeds designed for long distance movement via wind or animals. A few species are spread by birds that eat their fruits. Many of these species have been known to spread from establishment sites into relatively undisturbed areas.

Nonnative species lack co-evolved relationships within the ecosystem. They are notable for their lack of pathogens which may give them an advantage over native species. The insect pollinated species are largely visited by generalist pollinators such as bumblebees. This may result in "swamping" an area with generalist pollinators that leads to extirpation of natives with highly specialized pollinators. Most of these species have root systems that are inferior to the natives they replace for holding the soil in place. Many, with the exception of the perennial forage grasses, are low in palatability and nutrition to both native and domestic animals. Some species, such as tansy ragwort, are actually toxic. Nonnative species, such as cheatgrass, have been credited with altering natural processes such as fire cycles. Nonnative species can also disrupt seral pathways following a perturbation and place native seral species (e.g. the USFS sensitive species, *Astragalus umbraticus*). in danger of local extirpation, fragment gene pools, and ultimately place native seral species at risk of extinction.

Within the LSRs most of the nonnative species are limited to roadsides, recreation sites, landings, and other extremely disturbed areas. Undisturbed upland coniferous forests generally do not support nonnative plant species, except where they exist in canopy light gaps. The native communities most at threat from exotic species invasion therefore will be the open communities: lithosols (dry meadows), oak and shrub communities, open "parklike" ponderosa pine (and/or other conifer) communities, and to a lesser degree wet meadows. Where disturbance occurs, however, these invaders often readily become established, either from outside seed sources or soil seed banks.

The lithosols, oak, and shrub communities have already been lost to invasion by annual grasses and other nonnatives. Because many of these species germinate in the fall with the early rains and are highly competitive for soil moisture in the upper soil horizons, it is very difficult for native bunchgrasses and forbs to recolonize areas by seed once they have been displaced. These areas occur in LSR 222 and 224, the lower reaches of the Little Butte Creek drainage in LSR 227, and on the extreme northeastern edge of LSR 227 east of the Cascade Crest.

Aggressive nonnative species will pose a problem in attempting to recreate open "parklike" stands of conifers in areas that historically burned with frequent low intensity fires. Knapweeds, in particular, are recognized for their ability to displace the native understory in open pine stands and become the dominant understory.

Wet meadows dominated by sedges and rushes tend to be more resistant to invasive nonnative species although there are exceptions, such as species that do well in moist areas, i.e. ditches and open riverine systems.

Although there is no inventory of nonnative species within the LSRs, the following is an approximate list of species that have been noted either in the LSRs or in proximity and expected to be in the LSRs. Noxious Weeds are noted with an asterisk.

Nonnative Forbs within LSR (approximate)

Common Name	Scientific Name	Common Name	Scientific Name
*diffuse knapweed	*Centaurea diffusa*	*spotted knapweed	*Centaurea maculosa*
*rush skeletonweed	*Chondrilla juncea*	*yellow toadflax	*Linaria vulgaris*
*gorse	*Ulex europaeus*	*meadow knapweed	*Centaurea pratensis*
*bull thistle	*bull thistle*	*Canada thistle	*Cirsium arvense*
*Scotch broom	*Cytisus scoparius*	*St. Johnswort (klamath weed)	*Hypericum perforatum*
*+Tansy ragwort	*Senecio jacobaea*	Himalayan blackberry	*Rubus discolor*
*purple loosestrife	*Lythrum salicaria*	*poison hemlock	*Conium maculatum*
oxeye daisy	*Chrysanthemum leucanthemum*	chicory	*Chicorium intybus*
Queen Anne's lace	*Daucus carota*	false-dandelion	*Hypochaeris radicata*
*+yellow starthistle	*Centaurea solstitialis*	sheep sorrel	*Rumex acetosella*
Century plant	*Centaurium umbellatum*	dandelion	*Taraxacum officinale*
Deptford pink	*Dianthus armeria*	teasel	*Dipsacus sylvestris*
pennyroyal	*Mentha pulegium*	prickly lettuce	*Lactuca serriola*
least lettuce	*Lactuca saligna*	bird'sfoot trefoil	*Lotus corniculatus*
salsify	*Tragopogon dubious*	field mustard	*Brassica nigra*
white sweet-clover	*Meliotus alba*	prickly sow-thistle	*Sonchus asper*
moth mullein	*Verbascum blattaria*	flannel mullein	*Verbascum thapsus*
white clover	*Trifolium repens*	red clover	*Trifolium pratense*
sheperd's purse	*Capsella bursa-pastoris*	field chickweed	*Cerastium viscosum*
*dalmatian toadflax	*Linaria dalmatica*	*European houndstongue	*Cynoglossum officianale*
mayweed	*Anthemis cotula*	horseweed	*Conyza canadensis*
common vetch	*Vicia sativa*	filaree	*Erodium circutarium*
dovefoot geranium	*Geranium molle*	English plantain	*Plantago lanceolata*
torillis	*Torillis arvensis*	Jerusalum-oak goosefoot	*Chenopodium botrys*

*Noxious weeds.

+Noxious weeds/active state program to control distribution and abundance

Perennial nonnative grasses in LSR (approximate)

Common Name	Scientific Name	Common Name	Scientific Name
colonial bentgrass	*Agrostis tenuis*	orchardgrass	*Dactylis glomerata*
tall fescue	*Festuca arundinaceae*	velvet-grass	*Holcus lanatus*
perennial rye	*Lolium perenne*	timothy	*Phleum pratense*
Kentucky bluegrass	*Poa pratensis*		

Annual nonnative grasses in LSR (approximate)

Common Name	Scientific Name	Common Name	Scientific Name
silver hairgrass	*Aira caryophylle*	ripgut brome	*Bromus rigidus*
soft brome	*Bromus mollis*	cheatgrass	*Bromus tectorum*
hedgehog dogtail	*Cynosurus echinatus*	annual ryegrass	*Lolium multifloru*
Mediterranean barley	*Hordeum marinum ssp. gussoneanum*	*medusahead rye	*Taeniatherum caput-medusa*
foxtail vulpia	*Vulpia myuros var. hirsuta*		

*Noxious weeds.

LATE SUCCESSIONAL SPECIES

Late successional reserves were established with the primary objective of managing the land for the benefit of species associated with late successional forest conditions. These late successional associated species serve functions that keep ecosystems healthy. Most of these species are directly or indirectly tied to down wood, snags, or large trees and the microclimates these habitat components offer when set in a multi-layered, variable density forest. Other late successional species are tied to small openings in otherwise late seral forests. The FEMAT report listed 152 species associated with late seral conditions. This section addresses a small portion of those species, the ones for which the most knowledge exists, and which are known or suspected to occur in the Southern Oregon Cascades LSR network.

The present network of LSRs was configured based on previous work addressing the range-wide conservation of the spotted owl. The report of the Interagency Scientific Committee (ISC) and the Draft Spotted Owl Recovery Plan designated networks of habitat "islands" sufficient in size and quality to support functional clusters of reproductively successful spotted owl pairs. These HCAs/DCAs were positioned across the range of the species in a configuration thought to provide for demographic interchange among them. Option 9 expanded on this network of spotted owl reserves because the HCAs and DCAs were considered insufficient to provide for many other late successional species. This increase in reserve size represents a significant addition to previous spotted owl reserve networks and should increase the probability of recovery of the spotted owl across its current range.

Currently, spotted owls are known to occur throughout the LSRs addressed by this assessment. Most of this occurrence has been documented through the survey efforts undertaken by Federal agencies in the mid 1980s and expanded in the latter part of that decade. Although this survey effort has continued on BLM lands it has been greatly scaled back on Forest Service lands in recent years. Future studies are expected to focus on demographic study areas which may or may not include portions of the Southern Oregon Cascades LSRs. Research results from the demographic studies indicate a continually increasing rate of population decline throughout the animal's range. This effect is anticipated when large-scale habitat loss occurs in a relatively short time and a large number of individuals is forced to occupy into a decreased amount of suitable habitat. As amounts of suitable habitat in LSRs stabilize, populations are expected to decline in the near term and stabilize at some lower level as a new equilibrium is reached with the available habitat.

This assessment utilized available information which was provided to the core team by the involved administrative units. Biologists on each administrative unit were afforded the opportunity to review preliminary data summaries, which resulted in, at times, significant modifications to the results. Still, the concern over data consistency could not be alleviated, especially regarding the various definitions of suitable nesting, roosting, and foraging habitat (NRF), and the varied level of confidence that documented spotted owl sites are still occupied. For example, the amounts of suitable NRF reported to the core team were always greater than the amounts of late seral habitat identified through the use of classified satellite imagery. Thus, the overall number of spotted owl sites and amounts of suitable NRF reported herein, when compiled in LSR- and South Cascades LSR Network-wide data sets, are considered to be optimistic estimates. The need for a consistent approach to defining suitable NRF (within appropriate ecological subunits of the area covered by this assessment) and a subsequent revision of the suitable NRF habitat data set, became very apparent during the preparation of this assessment. This task is strongly recommended.

There are 355 known spotted owl activity centers located within the LSRs addressed in this document (Table 15 and Table 16). 245 (69 percent) of them have more than 40 percent of their home range with suitable habitat. Current reproductive rates are unknown for the vast majority of documented owl sites within the Southern Oregon Cascades LSRs. For the relatively small proportion of LSR owl sites with known reproduction rates, these rates do not appear to be sufficient to maintain the population at its current size. Owl populations are declining throughout the species' range and at what point in time and at what level they will stabilize is unknown.

This first iteration assessment was unable to run landscape level fragmentation models. This is recommended for a subsequent update. However, larger scale maps were viewed by the Core Team of the entire assessment area. Several connectivity "hotspots" became apparent. See "Specific Priority Areas" in the Summary.

Table 15: Current Suitable Nesting, Roosting, Foraging Habitat for Documented Spotted Owl Activity Centers inside LSRs 222, 224, 225, 226 or 227 by Administrative Unit

Admin. Unit	Total Documented Spotted Owl Activity Centers [1]	< 40 Activity Centers [2] (% of total)	> 40 Activity Centers [3] (% of total)
Willamette N.F.	39	5 (13)	34 (87)
Eugene B.L.M.	19	14 (74)	5 (26)
Roseburg B.L.M.	26	13 (50)	13 (50)
Umpqua N.F.	142	18 (13)	124 (87)
Medford B.L.M.	30	24 (80)	6 (20)
Rogue N.F.	78	28 (36)	50 (64)
Winema N.F.	21	6 (29)	15 (71)
Totals	**355**	**108 (30)**	**247 (70)**

[1] Includes both pairs and singles.
[2] Activity Centers with **less than 40 percent** of their home ranges composed of suitable nesting, roosting, foraging habitat. These figures reflect counting acres of habitat both within and outside of the LSR boundaries that lies within a home range. Oregon Cascades Provincial Home Range radius (1.2 miles) was used throughout the assessment area.
[3] Activity Centers with **greater than 40 percent** of their home ranges composed of suitable nesting, roosting, foraging habitat. Otherwise same footnote as # 2.

Table 16: Current Suitable Nesting, Roosting, Foraging Habitat for Documented Spotted Owl Activity Centers inside LSRs 222, 224, 225, 226 or 227, by LSR

LSR	Total Documented Spotted Owl Activity Centers [1]	< 40 Activity Centers [2] (% of total)	> 40 Activity Centers [3] (% of total)
222	248	54 (22)	194 (78)
224	30	24 (80)	6 (20)
225	15	4 (27)	11 (73)
226	16	10 (63)	6 (37)
227	46	16 (35)	30 (65)
Totals	**355**	**108 (30)**	**247 (70)**

[1] Includes both pairs and singles.
[2] Activity Centers with **less than 40 percent** of their home ranges composed of suitable nesting, roosting, foraging habitat. These figures reflect counting acres of habitat both within and outside of the LSR boundaries that lies within a home range. Oregon Cascades Provincial Home Range radius (1.2 miles) was used throughout the assessment area.
[3] Activity Centers with **greater than 40 percent** of their home ranges composed of suitable nesting, roosting, foraging habitat. Otherwise same footnote as # 2.

Table 17: Percent Suitable Spotted Owl Nesting, Roosting, Foraging Habitat (NRF) by Fifth Field Watershed

LSR	Fifth Field Watershed	Common Name	Adm. Unit	%NRF
222	South Umpqua 4	Flat Creek	Umpqua	74
222	North Umpqua 9	Canton Creek	Roseburg	74
222	South Umpqua 3	Boulder, Dumont Creeks	Umpqua	73
222	South Umpqua 2	Jackson Creek	Umpqua	70
222	Coast Fk. Willamette 1	Sharps, Brice Creeks	Umpqua	64
222	South Umpqua 1	Quartz, Black Rock, Castle Rock Creeks	Umpqua	63
222	North Umpqua 10	Rock Creek	Roseburg	63
222	Middle Fk. Willamette 21	Larison, Coal Creeks	Willamette	62
222	Coast Fk. Willamette 1	Sharps, Brice Creeks	Eugene	60
222	Coast Fk. Willamette 2	Mosby Creek	Eugene	58
222	North Umpqua 5	Fish Creek	Umpqua	58
222	North Umpqua 8	Steamboat Creek	Umpqua	57
226	Upper Klamath Lake 2	Cherry, Rock Creeks	Winema	54
222	North Umpqua 7	Copeland, Calf Creeks	Umpqua	53
226	Upper Rogue 4	Rancheria, Deception Creeks	Rogue	52
222	Upper Rogue 5	Elk Creek	Rogue	52
222	North Umpqua 10	Rock Creek	Eugene	51
222	Middle Fk. Willamette 23	Staley Creek	Willamette	51
222	North Umpqua 9	Canton Creek	Umpqua	50
224	Upper Rogue 5	Elk Creek	Medford	49
222	Middle Fk. Willamette 19	Goodman, Duvall, Deception Creeks	Willamette	49
225	Upper Rogue 1	Foster, Crater, Abbott, Ginkgo, Hershberger Creeks	Rogue	49
227	Upper Klamath Lake 3	Lost, Fourmile, Billie Creeks	Winema	49
226	Upper Rogue 1	Foster, Crater, Abbott, Ginkgo, Hershberger Creeks	Rogue	47
226	Upper Rogue 2	Middle Fk. Rogue, S. Fk. Rogue, Red Blanket Creeks	Rogue	47
227	Upper Rogue 8	South Fk. Little Butte Creek	Rogue	44
227	Upper Rogue 4	Rancheria, Deception Creeks	Rogue	43
227	Upper Klamath 13	Spencer Creek	Winema	43
222	Coast Fk. Willamette 3	Big River	Eugene	40
222	North Umpqua 6	Boulder Creek	Umpqua	33
227	Upper Klamath 11	Old Baldy, Hoxie Creeks	Winema	28
227	Upper Rogue 8	South Fk. Little Butte Creek	Winema	20

Goshawks prefer stands with high canopy closure that are open enough below to allow room for maneuvering during flight. They primarily prey upon small and medium size birds and small mammals. Little goshawk survey work has been conducted within the Southern Oregon Cascades LSR, yet they have been documented in LSR 222 and LSR 227.

Bald eagles have been documented throughout the Southern Oregon Cascades LSRs along all major rivers, many minor rivers and streams, and around upper Klamath Lake. Nests have been documented along several major rivers but the greatest concentration of nests is on the west side of upper Klamath Lake. This species selects large snags and trees for nest sites.

Concern has been expressed that suitable nest trees are not being replaced as quickly as they are falling over around upper Klamath Lake. Also, a winter roost area supporting up to 100 eagles lies mostly within LSR 227. Declining foraging habitat and prey abundance in foraging areas outside of the LSR is a concern.

Great gray owls are known to nest in large broken-topped trees and forage in natural openings in a mature forest setting. They have been documented both east and west of the Umpqua NF portion of LSR 222. They are highly likely to occur in and/or adjacent to LSRs 225, 226 and 227.

Fishers are thought to have occurred throughout the Southern Oregon Cascades LSRs. Large and wide-ranging, it is not thought that they ever reached high population densities. They were thought extirpated in southern Oregon and a reintroduction was attempted in the 1950s. It is not known whether the animals now occurring in southern Oregon are descended from reintroduced or from remnant native animals. Studies are planned to investigate the genetics of fishers occurring in Southern Oregon and the Rogue-Umpqua Divide portion of LSR 222 might be included in that study. Fisher occurrence has been documented on both sides of the Rogue - Umpqua Divide, and on Willamette NF, Umpqua NF, and Eugene BLM portions of LSR 222. They have also been documented in the area between LSR 226 and LSR 227, and within LSR 227. Documented den sites for this species have mostly been in large logs or snags.

Martens are thought to have occurred historically throughout the Oregon Cascades. As with their larger mustelid relatives their populations suffered major declines during the first half of this century. They also seem to prefer larger logs and snags for denning, have been documented using "witches brooms" in Douglas and true firs for resting sites and are known to use concentrations of down wood for accessing prey under snow. They seem to occur mostly in association with larger tracts of unfragmented late seral forest. Marten occurrence has been documented in LSRs 222, 225, 227 on both sides of the Cascades crest, and in the area between LSRs 222, 225 and 226.

Wolverines have been studied very little yet are thought to have occurred historically throughout the Oregon Cascades. The largest of the Oregon mustelids, they are wide-ranging and aggressive and are most likely dependent upon large logs or snags for denning sites. They are also thought to be associated with large tracts of unfragmented late seral forest. Wolverine occurrence has not been documented in the Southern Oregon Cascades LSRs but there are five records from the area between LSR 226 and LSR 227.

Bats are another group that has been little studied in terms of their distribution in the Southern Oregon Cascades. Most Oregon species are known to use crevices in or behind the bark of large trees and snags. Myotis species documented in the Southern Oregon Cascades LSRs include *M. evotis, M. thysanodes, M. volans*, and *M. yumanensis*; *Plecotus townsendii* occurrence has also been documented, although this species appears more closely tied to caves and rock crevices. Other bat species known to use crevices in large trees or snags and thought to occur in the Southern Oregon Cascades LSRs include *Myotis californicus, M. keenii* and *M. lucifugus*.

Polystichum californicum and *Asplenium septentrionale* are associated with unusual rock outcrop features in areas that are otherwise timbered such that the rock outcrops receive filtered to complete shade. These species may be dependent upon the cool, shaded, humid conditions maintained by the late seral stands surrounding them. *P. californicum* has been documented on the Umpqua portion of LSR 222 and in the Little River area. *A. septentrionale* has been documented in the Umpqua NF portion of LSR 222 and in LSR 225. *Cypripedium fasciculatum* most likely prefers mature stands with filtered sun and is known mostly in shaded timber stands. However, there is strong evidence that it is tied to disturbance. It has been documented in both the Umpqua NF and Rogue River NF portions of LSR 222.

Cimicifuga elata, Frasera umpquaensis, Illiamna latibracteata and *Collomia mazama* are generally associated with openings in otherwise mature stands of timber. Some have been known to persist or even increase following major perturbations such as clear cutting however such occurrences are rare. *C.elata* has been documented on both the Umpqua NF and Rogue River NF portions of LSR 222. *F. umpquaensis* has been documented on the Eugene BLM, Rogue River NF, and Umpqua NF portions of LSR 222, LSR 225, as well as The Rogue - Umpqua Divide Wilderness area, the area between LSRs 222, 225 and 226, and between LSRs 226 and 227. *I. latibracteata* has been documented in both the Umpqua NF and Rogue River NF portions of LSR 222 and in the Little River area. *C. mazama* occurs in the Umpqua NF portion of LSR 222 and in LSRs 225 and 226.

Romanzoffia thompsonii is confined to vernal seeps on rocky openings. It is indirectly dependent upon adjacent conifer stands through their regulation of the hydrologic regime that feeds these seeps. This species has been documented in the Umpqua NF, Rogue River NF and Willamette NF portions of LSR 222, LSR 225, as well as the Little River area, the upper South Umpqua drainage and the Rogue-Umpqua Divide Wilderness area.

Table 18: Late-Successional Associated Species Known or Suspected to Occur within the South Cascades LSRs (222, 224, 226 and Westside 227)[12]

Species	History	Presence	BLM Level/FS Status
BIRDS			
Hermit Thrush	Y	D	3
Brown Creeper	Y	D	3
Vaux's Swift	Y	D	3
Hermit Warbler	Y	D	3
Western Flycatcher	Y	D	3
Hammond's Flycatcher	Y	D	3
Swainson's Thrush	Y	D	3
Red Crossbill	N	S	3
Red-breasted Nuthatch	Y	D	3
Chestnut-backed Chickadee	Y	D	3
Hairy Woodpecker	Y	D	3
Black-capped Chickadee	Y	D	3
Golden-crowned Kinglet	Y	D	3
White-Breasted Nuthatch	Y	D	3
Red-breasted sapsucker	Y	D	3
Barred Owl	Y	D	3
Winter Wren	Y	D	3
Warbling Vireo	Y	D	3
Wilson's Warbler	Y	D	3
Spotted Owl			
AMPHIBIANS/REPTILES			
Pacific giant Salamander	Y	D	3
Northwestern Salamander	Y	D	3
Dunn Salamander	Y	D	3

[12] See Appendix J for Eastside 227 species list.

MAMMALS			
Roosevelt Elk	Y	D	3
Western Red-backed Vole	Y	D	3
Townsend's Chipmunk	Y	D	3
Northern Flying squirrel	Y	D	3
Bushy-tailed Woodrat			
Shrew-mole	Y	D	3
Deer mouse	Y	D	3
North American Lynx			S, Fc
California Wolverine			S, Ot, Fc
Fisher			Oc, Fc
American Marten			Ov
Mink			F
Long-tailed Weasel			F
Big Brown Bat			
Silver-haired Bat			
Little Brown Myotis			
Long-legged Myotis			
California Myotis			
Yuma Myotis			
California Myotis			
Western Small-footed Myotis			
Keen's Myotis			
FISH			
Chinook Salmon	Y	D	3
Cutthroat Trout	Y	D	3
INVERTEBRATES			
Traveling sideband (Land snail)	N	S	N
Siskiyou hesperian (Land snail)	N	S	N
PLANTS			
Polystichum californicum			
Asplenium septentrionale			
Cimicifuga elata			
Frasera umpquaensis			
Illiamna latibracteata			
Collomia mazama			
Allotropa virgata			
Boschniakia strobilacea			
Corallorhiza maculata			
Corallorhiza mertensiana			
Eburophyton austinae			
Hemitomes congestum			
Monotropa uniflora			
Pityopis californica			
Pleuricospora fimbriolata			
Pterospora andromedea			
Sarcodes sanguinea			
PRESENCE ABBREVATIONS:			
D – Documented	**HISTORY ABBREVIATIONS:**		
S – Suspected, habitat present	N–No historic/chance/or protocol sightings		
U – Uncertain	Y–Some historic/chance/or protocol searches done, species found		
	I–Intense searches/protocols done, species found		
MONITORING LEVELS:			
N – No surveys done or planned			
1 – Literature search only			
2 – One field search done			
3 – Some surveys completed			
4 – Protocol completed			

ECOLOGICAL PROCESSES

FIRE

Fire is covered in several places in this document. This section provides an overview of fire history and climate, as well as describing the process used to assess fire risk for this assessment. Specific assumptions of fuel models, fire behavior, and fire risk are contained in Appendix E, separate from this document. Treatments are addressed in the Chapter 5 section, "Treatments and Criteria to Reduce Risks of Large Scale Disturbance". Chapter 6, the Fire Management Plan, contains direction for the suppression of wildfire, as well as the use of prescribed fire.

Fire has been an important and frequent ecological process in the assessment area. Foresters and biologists have learned that over many centuries and probably millenniums, fire has played an important role in shaping the composition, structure, and rates of processes of the northwest forest ecosystems (Kauffman, 1990). Fire exclusion and timber harvest are the two management activities which have had the greatest effect on vegetation composition, structure, and distribution of the seral stages in the assessment area.

Exclusion of fire with the advent of modern, efficient fire suppression, and lack of a sufficient amount of prescribed fire has led to a buildup of the total amount and vertical arrangement of natural fuels. This buildup is increasing the potential for a future, high intensity fire that would decrease the amount of late seral habitat.

Fire History

Both natural ignitions (lightning) and Native Americans have been important in causing fires. Lightning has generally played a more important role in high elevation fires. Native Americans generally played a role at lower elevations, except along travel corridors and the burning of high elevation berry fields at the end of the gathering season. Although documented use of fire by the Native Americans in southwest Oregon is relatively limited compared with documentation of northern California and the Willamette Valley, it is reasonable to assume that the use of fire was no less important for the tribes of the southwestern portion of the state. Lewis (1989) states: "With fire used extensively and effectively by Indians of the two adjacent regions, it is extremely unlikely, given the technological and ecological advantages of using prescribed burning, that fire would, or in fact could, have been ignored. In that different environments of southern and southwestern Oregon are geographical extensions of those found in northern California, Indian practices of burning must have been functionally equivalent to those described for such tribes as the Miwok, Hupa, Tolowa, and Wintun." These tribes burned the grass and oak savanna areas to achieve earlier forage growth during the fall and to decrease fuel buildups that would provide fireproofing to areas of importance. This type of habitat was probably burned annually with portions of the surrounding habitat. In areas dominated by Douglas-fir and ponderosa pine, fire was used to maintain an open understory with young shrub sprouts. Fire in these areas was used often enough to reduce fuel buildup, thus preventing crown fires. Lewis and Ferguson (1988) and Norton (1979) observed: "In marked contrast, relatively small areas of grass within coastal, temperate forest areas would have been burned like those reported for northwest California and western Washington." These "yards" and "corridors" of grass were set alight on the small "prairies", ridgetops, and along the grass fringes of rivers so as to maintain areas of preferred plants and to attract game (Lewis, 1989).

Fire suppression was established after the severe fires of 1902 and was given emphasis with the establishment of the Forest Reserves in 1906. However, due to a lack of personnel and access, little effective firefighting was accomplished until the advent of the Civilian Conservation Corps in 1929. By the mid 1930s, fire suppression was beginning to have an effect on acres burned and with improved communications, new technology, and the smokejumper program, fire suppression was becoming very effective by the early 1940s. Today, aerial retardant, helicopters, comprehensive transportation systems, advanced firefighting equipment, educational prevention programs, and well trained and well equipped firefighters have increased the ability to control fires within the first 24 hours of detection. Extreme weather and multiple starts in heavier fuel loading, combined with the delay in initial attack, lead to escaped fires under present conditions. Currently, in the western United States, the majority of fires are contained to less than ¼ acre.

Fire suppression efforts of the past 60 years have altered stand composition and structure and increased tree densities. Prescribed fire has not offset these effects. Current stands often have high fuel loading. In a fire regime with frequent fire return intervals of moderate intensity, as in the assessment area, the vegetation would consist of fire tolerant species such as Douglas-fir, sugar pine, and ponderosa pine. The shade tolerant, thin barked species such as western hemlock, white fir, or grand fir would be thinned out regularly by fire. Stand structure changes include an increase of shade tolerant species in the intermediate layer, an increased shrub component and fewer openings associated with the natural stands. This change results in stands that are more likely to experience a higher intensity fire. Some meadows have also been impacted. Fire exclusion has allowed pioneer shrub and tree species to become established, thus reducing meadow size.

Climate

The predominate climate of the planning area is a relatively moderate Mediterranean climate. However, that portion on the eastern side of the Cascade Range displays a more continental influence. In the summer, high pressure builds in the eastern Pacific to produce generally warm, dry summers. Periodic thunderstorms are common this time of year and produce significant amounts of precipitation. Lightning occurs most frequently at the crest and east slopes of the Cascades. Periodic east winds may occur in the late summer and early fall that produce sustained winds of 30-40 miles per hour and very low humidities. This increases the chances of large fire occurrence. As winter sets in, the high pressure moves to the south, allowing moist Pacific storms to move across the area. Most of the yearly precipitation occurs during this period. Total precipitation ranges from 90+ inches at the higher elevations, particularly in the north, to less than 25 inches in the south and on the east slopes of the Cascades. Natural fire occurrence is correspondingly higher in areas of less precipitation. Heavy persistent snow pack occurs during the winter months above 4,000 feet in the north and above 5,000 feet in the south. If high pressure is persistent, winter snow packs may be reduced to such a degree that they will produce low fuel moistures into the summer and allow more fire starts and more acres to be burned. These climate patterns are reflected in the vegetation (see Plant Series Map 3).

Fire Occurrence

A Fire Occurrence layer has been developed to display both natural and human fire starts over the years 1980-1989. (Map 7).

At present, lightning is the primary cause of fire starts in and around the LSRs except for the abundance of human caused fires adjacent to high use recreation areas.

Fire frequency rates range from moderate to high throughout the assessment area, ranging from 0.040 fires per 1000 acres per year north of the Calapooya Divide to 0.256 fires per 1000 acres per year in LSR 224.

Table 19: Fire Frequency per 1000 Acres/Year

LSR	Acres	# Fire/Yr	Fire Frequency
222 - Entire Area	508,000	38	0.075
222 - North of Calapooya Divide	121,900	12.7	0.102
222 - Calapooya Divide to South Umpqua River	289,600	12.7	0.040
222 - South Umpqua River and South	96,500	11.7	0.148
224[13]	21,500	5.5	0.256
225	39,800	4.2	0.105
226	49,800	2.5	0.050
227	101,600	8.6	0.085

Vegetation and Fuel Models

Fuel models were used as a way to assess fire behavior. Satellite data were used to classify vegetation into fuel models (see Appendix E for classification assumptions). Where data were available, recent management activities have also been incorporated to reflect those changes in fuels composition. It must be remembered that fuel model characteristics are very dynamic and can change dramatically over short periods of time. Because the detailed effects of the winter storms of 1996 are not available, those changes are not represented in this fuel modeling. Those kinds of changes need to be updated over time to maintain the integrity of the fuels model layer. This fuel model layer may be used with such personal computer applications as FARSITE to graphically display fire growth and behavior over time.

Fuel models consider primarily zero to three inch size classes, and estimate behavior, based on fuel group (grasses, brush, timber, slash), fuel loading, the quantity of fuels (generally measured in tons per acre), and the distribution among the fuel particle size classes. Fuel load and depth are important properties for predicting whether a fire will be ignited, and its rate of spread and intensity. The criteria for choosing a fuel model include the fact that fire burns in the fuel stratum best suited to support the fire (Anderson, 1982). The assessment area is currently comprised of nine primary fire behavior fuel models (Map 6). See Appendix E for a description of all fuel models. The assessment area is most representative of models 8 and 10. These fire behavior models are described as follows:

[13] Fire frequency was different in the Elk Cr. Watershed Analysis because the analysis was from a different time period.

Fuel Model 8

Slow burning ground fires with low flame lengths are generally the case, although the fire may encounter an occasional heavy fuel concentration and can flare up. Only under severe weather conditions involving high temperature, low humidities, and high winds do the fuels pose a fire hazard. Closed canopy stands of short-needle conifers, such as white-fir, are included in this model. The litter layer is mainly needles and twigs. The stands usually have little undergrowth (Figure 9).

Fuel Model 10

In this model, fires burn in surface and ground fuels with greater fire intensity than the other timber litter models. Dead-down fuels include greater quantities of three inch or larger limbwood resulting from over maturity or natural events that create a large load of dead material on the forest floor. Crowning out, spotting, and torching of individual trees are more frequent in this fuel situation, leading to potential fire control difficulties. Examples are insect or disease-ridden stands, windthrown or mature situations with deadfall, and aged light thinning or partial-cut slash (Figure 10).

Fire Behavior

A fire behavior layer has been created to show where the fire behavior will likely be the most extreme. Fire behavior is based on 90 percentile weather (fuel moistures vary depending on aspect and shading that would be present at that model), two different aspects (north and south) and two different slope averages (25 percent and 50 percent). This meant a total of 36 different BEHAVE runs were done to show potential fire behavior characteristics. Predictions are characterized by flame lengths measured in feet. Fires with flame lengths of less than four feet can generally be attacked at the head or flanks by people using handtools. Fires with flame lengths of less than four feet are generally characterized by low to moderate intensity fires. Fires with flame lengths of greater than four feet are too intense for direct attack on the head by people using handtools. Hand fireline will not generally hold these types of fires. Equipment such as dozers, engines, and air tankers are required to have any degree of success to prevent fire spread. Fires with flame lengths of greater than four feet are the most likely to have late successional stand structure and composition characteristics lost to this extreme fire behavior.

Fire Risk

The fuel model and fire behavior characteristics layers have been combined to create the Fire Risk Map and help determine where fire risk is greatest (Map 8). Since hazard is created by fuels, and fuels are the element of fire behavior over which we have some control, emphasis was placed on fuel model to better measure risk. Fire occurrence was examined as an element, but not used, because there was insufficient differentiation between watersheds. Some measure of "urban interface" values was attempted, but there was not enough commonality among agencies current information to incorporate in the risk mapping. This assessment was not able to overlay wildland fire interface values and risks. A GIS layer needs to be developed to display this important component of risk. Appendix E contains the classification assumptions for fire behavior and fire risk.

High risk fuels need to be ground verified during watershed or project analysis. Table 20 shows the distribution of risk levels among LSRs.

As Table 20 and Map 8 show, the amount of risk varies considerably throughout the LSRs. LSR 224 has the greatest risk, or 78 percent of the area being high risk. LSR 227 has 39 percent of its area defined as high risk. Table 21 shows risk distribution by watershed.

Table 20: Risk by LSR

LSR	Risk Level (Acres)			
	LOW	MODERATE	HIGH	TOTAL
222	122,600	85,600	299,800	508,000
224	1,800	2,900	16,800	21,500
225	11,700	6,500	21,600	39,800
226	13,800	13,200	22,800	49,800
227	33,300	34,800	36,500	101,600
TOTAL ACRES	**183,200**	**143,000**	**397,500**	**720,700**

Table 21: Percent of Area with High, Moderate, and Low Fire Risk by LSR, Administrative Unit, and Watershed

LSR	Admin. Unit	Watershed	HIGH	MOD	LOW
222	Roseburg BLM	North Umpqua 9	84	8	8
222	Roseburg BLM	North Umpqua 10	85	7	8
224	Medford BLM	Upper Rogue 5	78	13	8
222	Umpqua NF	Coast Fork Willamette 1	68	7	24
222	Eugene BLM	Coast Fork Willamette 1	68	7	24
222	Eugene BLM	Coast Fork Willamette 2	68	7	25
222	Rogue River NF	Upper Rogue 5	66	10	24
222	Umpqua NF	South Umpqua 4	64	16	20
222	Umpqua NF	South Umpqua 3	63	11	26
222	Eugene BLM	Coast Fork Willamette 3	62	10	28
222	Umpqua NF	North Umpqua 7	60	15	26
222	Umpqua NF	North Umpqua 9	60	9	31
222	Umpqua NF	North Umpqua 6	59	4	36
222	Umpqua NF	South Umpqua 1	57	14	29
227	Winema NF	Upper Klamath 13	57	12	30
222	Umpqua NF	North Umpqua 8	56	13	31
222	Eugene BLM	North Umpqua 10	56	13	21
227	Rogue River NF	Upper Rogue 4	55	30	16
222	Umpqua NF	North Umpqua 5	54	18	29
222	Willamette NF	Middle Fork Willamette 21	54	30	17
225	Rogue River NF	Upper Rogue 1	54	16	29
226	Rogue River NF	Upper Rogue 1	51	22	27
222	Willamette NF	Middle Fork Willamette 19	50	42	9
227	Rogue River NF	Upper Klamath 11	50	22	27
222	Willamette NF	Middle Fork Willamette 23	49	27	24
222	Umpqua NF	South Umpqua 2	48	24	28
226	Rogue River NF	Upper Rogue 2	45	27	28
226	Rogue River NF	Upper Rogue 4	43	33	24
227	Winema NF	Upper Klamath Lake 3	41	26	33
227	Winema NF	Upper Klamath Lake 2	38	31	31
227	Winema NF	Upper Rogue 8	38	29	33
227	Rogue River NF	Upper Rogue 8	38	29	33

Fire Return Intervals

Fire history inventories were conducted to determine historic fire return intervals. These inventories were conducted in the Layng Creek, Upper Clearwater, Little River, and Jackson Creek Watershed analyses from the Umpqua National Forest (Table 22 and Figure 12). These inventories comprised the majority of the data used for determining fire return intervals for the assessment area. Information was collected from a reference period that spanned the years 1550 through 1935. After that date, fire suppression became an overriding influence on fire behavior, and these data were not used for historical fire return interval calculations. In data analyses, only highly reliable fire scars were used. Pitch rings were not used due to uncertainty of cause. Also, a reliability factor of 10 years was used, thus fire scars in close proximity with less than a 10-year interval were attributed to the same fire. Fires do not scar every tree that is encountered, and with the restrictive analysis criteria, the fire return intervals are a conservative estimate.

There is significant variability in fire return intervals throughout the analysis area (i.e. longer intervals in Western Hemlock Series compared to White Fir Series). Fire return intervals generally decrease toward the south portion of the Cascades. Aspect and slope are important factors to determine fire frequency. In general, fire is more common on southerly aspects and steeper slopes. Due to the variability in return intervals and the differences in aspect, the averages are not nearly as meaningful in determining fires effect on the landscape as the range of the fire return intervals.

Figure 9: Fuel Model 8

Figure 10: Fuel Model 10

Table 22: Fire Return Intervals Showing the Average and the Range

LSR	Source Watershed Analysis	Aspect											
		N-NE		S-SE		E		W		NW		SW	
		AVG	RGE	AVG	RGE	AVG	RGE	AVG	RGE	AVG	RGE	AVG	RGE
222 - North of Calapooya Divide	Layng Cr.	79	38-143	60	50-70	76	71-81	55	38-75	64	39-99	55	32-79
222 - Calapooya Divide to S. Umpqua River	Little River	44	19-126	25	11-42	32	16-76	39	22-58	38	30-48	60	27-123
222 - South of the South Umpqua River	Jackson Cr	46	38-63	29	-	38	33-42	29	15-44	21	16-26	20	-
224*	Elk Cr.												
225/226	Upper Clearwater	61	45-83	35	14-70	-	-	-	-	-	-	-	-
227	Jackson Cr.	46	38-63	29	-	38	33-42	29	15-44	21	16-26	20	-

*The Elk Creek Watershed Analysis did not describe return intervals by aspect, but by vegetation series. The estimated fire return intervals by series are: Douglas Fir, range of 18-25 years; White Fir, range of 35-40 years; Shasta Red Fir, 40-50 years; and the hemlock series with a range of 75-100 years.

Fuel Models and Fire Intervals in the LSR Network

The assessment area for the South Cascades LSRA includes an area of approximately 721,000 acres. The magnitude of ecological conditions in this assessment area necessitated dividing the area into several smaller, more similar segments. The segments are:

1) LSR 222 north of the Calapooya Divide.
2) LSR 222 between the Calapooya Divide and the South Umpqua River.
3) LSR 222 south of the South Umpqua River
4) LSR 224
5) LSR 225
6) LSR 226
7) LSR 227

These exhibit a trend of decreasing precipitation and increasing temperature.

LSR 222--North of Calapooya Divide

The portion of LSR 222 north of the Calapooya Divide is generally in the Western Hemlock vegetation Series, with the higher elevations supporting the Silver Fir Series. The most prevalent fuel models in this area are fuel models 5 (6% of the area), 8 (16% of the area), 10 (59% of the area), and 11 (17% of the area). Each of the other fuel models represent two percent of the area (Table 23).

Fire history studies done in the Layng Creek watershed in the Cottage Grove Ranger District of the Umpqua National Forest are the most representative fire history information that is available for that portion of LSR 222 north of the Calapooya Divide (Map 7). Mean fire return interval is approximately 65 years. However, occurrence varied from 32 to 143 years. Occurrence based on aspect and elevations also varies, though probably not significantly (Table 22). North and northeast aspects have a mean return interval of 79 years (range: 38-143), while southwest and south aspects have a return interval of 55 years (range: 32-79). Again, this is a conservative estimate and the range is more meaningful than the average.

LSR 222--Calapooya Divide to South Umpqua River

The portion of LSR 222 South of the Calapooya Divide and north of the South Umpqua River is generally in the Western Hemlock Series at mid-elevations, Silver-Fir/White-Fir at the higher elevations, and Douglas-Fir on the south slopes (Map 3). This area is predominantly fuel model 5, fuel model 8, and fuel model 10. Fuel model 5 represents approximately seven percent of the area and fuel model 8, 23% and fuel model 10, 65% with all other fuel models representing less than five percent of the area (Table 23).

Fire history studies done in the Little River watershed best represent that portion of LSR 222 between the Calapooya Divide and the South Umpqua River. Mean fire return interval is 42 years, with a range of 11 to 126 years. In this area, the south and southwest aspects (Table 16) have a return interval of 25 years (range: 10-42), north and northeast aspects have a 44 year return interval (range: 19-126). The return interval of 60 years on southwest aspects is longer than would be expected (Table 22).

LSR 222--South of the South Umpqua River

The portion of LSR 222 south of the South Umpqua River is generally White-Fir Series at the high and mid-elevations, Douglas-fir Series on the south and west aspects, and Western Hemlock Series in the draws and creek bottoms. The area is predominantly fuel model 5, fuel model 6, fuel model 8, and fuel model 10 with a scattering of fuel model 11. Fuel model 8 represents approximately 23 percent of the area and fuel model 10, 65 percent. Fuel model 5 and 6 represent approximately nine percent with all other fuel models representing less than three percent (Table 23).

The Jackson Creek watershed best represents fire history for that portion of LSR 222 south of the South Umpqua River. This area has the most frequent overall return interval, 35 years (range:16-63). The southwest aspects have the most frequent fire return of any aspect group, 20 years. Fire return intervals at less than 4,000 feet elevation are also the most frequent for any elevation group, 32 years with a range of 16-63 (Table 22).

LSR 224

LSR 224 is generally Oregon White Oak Series below 1900 feet elevation, Douglas-Fir Series between 1900 and 2500 feet elevation, and White Fir Series above 2500 feet with Western Hemlock in isolated pockets on the north slopes. This equates to a predominance of fuel models 2, 5, and 10. Fuel model 2 represents seven percent of the area, model 5 seven percent, and fuel model 10, 86 percent. (Table 23)

The Elk Creek watershed best represents fire return intervals for LSR 224. The extreme southern portion of 224 is composed of oak woodland vegetation. Although not well documented, this drier and lower elevation site would likely have a return interval in the range of 5-15 years. In the Douglas Fir Series, the fire return interval is 18-25 years. The White Fir Series has an average return interval of 35-40 years. The Shasta Red Fir has an average return interval of 40-50 years. The Western Hemlock Series burns about every 75-100 years (Table 22).

LSR 225

LSR 225 is primarily Western Hemlock Series, except in the higher elevations and flat cold areas, which are in the White Fir Series. The area is predominantly fuel model 8 and 10 with small amounts of fuel models 2, 6, and 11. Fuel model 8 comprises 26 percent of the area, fuel model 10 equates to 66 percent, and all other fuel models represent less than eight percent. (Table 23).

Fire return intervals for LSR 225 are best represented by the Upper Clearwater analysis. Here, the mean interval is 44 years, with a range of 14-83 years. Southern aspects, again, have the most frequent fire return with an average of 35 years, with a range of 14-70 years (Table 22).

LSR 226

LSR 226 is generally Western Hemlock and White Fir Series. Fuel models are predominantly fuel models 5, 8, and 10, and some scattered fuel model 2. Fuel model 5 represents approximately four percent of the area, fuel model 8, 24 percent, fuel model 10, 68 percent, and all other fuel models less than four percent (Table 23).

Fire history for LSR 226 is also best represented by the Upper Clearwater analysis. The mean interval is 44 years, with a range of 14-83 years. Southern aspects, again, have the most frequent fire return interval with an average of 35 years with a range of 14-70 years (Table 22).

LSR 227

LSR 227 lies on both the east and west slopes of the Cascades. The lower east side elevations are predominantly mixed conifer with overstory species that include ponderosa pine, Douglas-fir, white fir, sugar pine, and incense cedar. The upper elevations are predominantly in the White Fir/Shasta Red Fir Series, with lower west side elevations in the White Fir Series, with scattered Douglas-fir and pine trees. The fuel models are generally 2, 5, 8, and 10. Fuel model 2 represents approximately two percent of the area, fuel model 5, five percent, fuel model 8, 23 percent, and fuel model 10, 61 percent with all other fuel models representing less than nine percent of the area (Table 23).

The Jackson Creek watershed best represents fire return intervals for the western portion of LSR 227 (Table 22). This area has a frequent fire return interval average of 35 years with a range of 16-63 years. The southerly aspects have the most frequent return intervals of any aspect group, with an average of 20 years. The only portion of the South Cascade Assessment area that exists east of the crest of the Cascade Range is the eastern portion of LSR 227. Here, the White Fir Series was characterized by frequent low intensity fires with a range of 10-40 years. In the Shasta Red Fir Series and Lake of the Woods Basin, the average return interval is estimated between 40-60 years (Agee, 1993).

Table 23: Fuel Model Acres by LSR

LSR	Acres by Fuel Model											Total Acres
	1	2	5	6	8	9	10	11	12	98	99	
222 - North of Calapooya Divide	300	–	5,400	0	15,800	0	56,900	16,900	100	900	200	96,500
222 - Calapooya Divide to South Umpqua River	–	4,200	20,000	4,200	65,600	700	187,100	3,100	900	3,600	200	289,600
222 - South of the South Umpqua River	–	800	7,400	3,200	27,700	600	79,200	700	600	1,700	0	121,900
224	–	1,500	1,400	–	0	–	18,600	–	–	–	–	21,500
225	–	600	1,900	200	10,300	–	26,300	0	–	500	0	39,800
226	–	500	2,100	600	11,800	–	34,100	–	–	700	0	49,800
227	–	1,800	5,300	2,600	23,200	0	62,200	100	–	4,900	1,500	101,600
										non-forest	non-forest	
TOTAL PERCENTAGES	<1%	1%	6%	2%	22%	<1%	64%	3%	<1%			720,700

Effects of Fire Exclusion on Ecosystem Processes

Local fire history studies and other research shows most of the area to be a relatively short interval, fire adapted ecosystem. Natural vegetation patterns in the area have been created and maintained by wildland fire. Succession has been set back frequently and late successional and climax stands are rare or nonexistent. In the past, frequent low intensity fires kept fuel loading relatively low with relatively open stand canopies, especially on southern and western aspects (i.e. fuel model 8). This equates to fairly rapid cycling of organic matter through the system compared with areas in the North Cascades.

Agee (1990) has described the fire regime in this area as a moderate severity regime. These are partial stand replacement fires, including significant areas of high and low severity occurring every 25 to 100 years. In this regime, fire occurs in areas with typically long summer dry periods, and fires will last weeks to months. Periods of intense fire behavior are mixed with periods of moderate and low intensity fire behavior. Variable weather is associated with variable fire effects. The overall effect is a patchiness over the landscape as a whole, and individual stands will often consist of two or more age classes. Martin (1982) also said the forest ecosystems east of the Cascade crest and in southwestern Oregon experienced a diversity of fire regimes prior to settlement by European-Americans. These ranged from frequent (five to twenty year interval), low-severity fires in ponderosa pine and grasslands to infrequent (50-200 year), stand replacing fires in high elevation lodgepole pine forest.

Without the presence of frequent low intensity fires, forest litter and other larger woody material has accumulated. Huff (1995) says, "It has long been recognized that fire exclusion has allowed unnatural fuel accumulations to occur throughout this region where wildland fires once visited frequently." This is represented by fuel model 10. Additionally, without periodic, low intensity fires, forests have moved toward more mid-successional stand composition and structure, including higher densities of shade tolerant, climax species and more vertical fuels. Whereas, a low intensity fire would have moved more slowly through ground fuels, vertical fuels allow fire to spread up and through the tree crowns. Succession is changing species composition, excluding re-establishment of young Douglas-fir and long needle pine species. Agee (1993) says, "Fire protection has created homogeneous high fuel conditions across the entire landscape, a condition that was once associated only with...small pockets of these forests surrounded by cooler moisture types." Tolerance to fire or resiliency, has decreased.

Occasionally, during periods of extreme weather conditions and low fuel moistures, high intensity stand replacement fires would occur. Brush fields would typically occupy these sites for up to 20 years or more, until a new forest canopy could become established. These brush fields are best represented by fuel models 5 and 6. In these areas, large standing material, which was killed but not consumed by the fire, would decay and fall to the ground and create pulses of heavier fuel loading. This could again create high intensity fires, if severe weather and fuels conditions existed, before crown closure of a new stand.

A USDA staffing paper (1993) says, "Fire exclusion has contributed to an accumulation of fuels and changes in stand structure that make many fire-adapted stands more flammable and highly susceptible to severe, stand replacement burning. Both the control of wildfire and use of prescribed fire have become considerably more difficult as a result of these changes."

Current agency administrators have learned the ecological consequences of past fire exclusion and are directing local units to apply more prescribed fire. Babbit (1997) has directed the use of more prescribed fire to restore forest health, character, and structure. He says, "At the root of the recent inferno lies a basic, yet overlooked truth: we don't have a "fire problem" in the West. We have a fuels problem." He advises us to mimic pre-settlement fire to prevent many of today's crown fires. Lyons (1996) says, "Years of fire exclusion have created conditions which are inconsistent with the normal trend towards changes in fire ecosystems, and this can create conditions that will eventually lead to sudden, devastating changes in the landscape...we must reduce stand densities by thinning from below; reintroduce periodic, low intensity fire;...selecting the combination of measures that will accomplish the best results."

Agee (1993) says, "Some sort of fuel management program is recommended to increase landscape diversity relative to fire, so that potential for catastrophic fire is reduced. Some fuel reduction could be integrated with timber removal, but such removal must be planned to achieve owl habitat objectives, with commodity production as a result rather than an objective."

The management practices over the last 60 to 70 years have disrupted the ecological processes regulated by fire. Fuels continuity and arrangements have changed to such a degree that without the application of more prescribed fire and other management practices, late successional stands structures will be lost to catastrophic wildfires.

INSECTS AND DISEASE

Insects and pathogens are extremely important and largely predictable agents of change in the South Cascades LSRs (see Appendix F for more detailed discussion). They cause decreased growth and mortality in individual trees. They influence strand structure, composition, and functions across landscapes by creating canopy gaps, altering vegetative succession, creating decay columns and snags, and contributing woody material to the forest floor and streams. Depending upon factors such as weather patterns, host species composition, host vigor, past management activities, and the particular insects and pathogens present, their influence may be beneficial to the development and maintenance of late-successional conditions, or they may be detrimental.

Insect and disease incidence and severity in the South Cascades LSRs represents more closely conditions found in the Eastern Oregon Cascades and Oregon and California Klamath Provinces, particularly at lower elevations (below 3500-4000 feet), on drier aspects, south of the Rogue-Umpqua Divide, and east of the Cascade Crest. Fire return intervals were historically much shorter in these LSRs than in areas farther north and west. Fire exclusion has created stands with higher densities; density-sensitive species have experienced high levels of mortality. Fire exclusion has shifted species composition towards higher proportions of shade tolerant species. Many of these shade tolerant species are highly susceptible to fungal pathogens.

Bark beetles (Family Scolytidae) and fungal-caused root diseases have had a profound influence on the development of the South Cascades LSRs over millennia. In recent decades, an exotic fungus and an exotic insect have altered successional patterns. Less influential over the landscape, but of importance at the stand and individual tree level, have been dwarf mistletoes.

Historic Conditions

Pine Bark Beetles

Mountain pine beetle (*Dendroctonus ponderosae*), which attacks all the pine species found in the LSRs and western pine beetle (*D. brevicomis*), found on ponderosa pine, were present and killed trees under stress in historic stands in the LSRs. Healthy, vigorous individuals were generally able to withstand or repel bark beetles. Mortality levels probably increased during drier than normal weather. Frequent, low intensity fires that regulated stand densities probably prevented major pine bark beetle outbreaks in ponderosa pine, sugar pine, and western white pine.

An outbreak of mountain pine beetle in western white pine occurred in the LSRs during the late 1960s. Thousands of acres were affected; mortality occurred at the scale of one tree killed per four acres to as many as twenty trees killed per acre (R6 Aerial Insect Detection Survey Data). Tree stress associated with white pine blister rust infections played an important role in this outbreak. Because of the large scale mortality of western white pine that occurred during this period and losses in white pine regeneration due to white pine blister rust (see white pine blister rust discussion that follows) western white pine populations have dropped below historic levels in many stands.

Lodgepole pine-dominated stands at the higher elevations in the LSRs were regulated by mountain pine beetle. When these stands reached susceptible size and age, widespread bark beetle-caused mortality occurred. Fuel accumulated and subsequent fires created conditions appropriate for lodgepole pine regeneration.

Douglas-fir Beetle

Douglas-fir beetle (*D. pseudotsugae*) was also present in historic LSR stands. Its populations were maintained at low levels in root disease pockets or on particularly dry sites. Endemic populations built up to outbreak levels following windstorms that created Douglas-fir blowdown. Data from 50 years of aerial surveys done to detect insect-caused mortality indicate significant increases in Douglas-fir beetle-caused mortality every eight to twelve years, usually two years after especially stormy winters. Impacts, on average, ranged from scattered mortality (one tree killed per four acres) over large areas to concentrations of five to twenty trees killed per acre in areas one to 50 acres in size.

Fir Engraver Beetle, Other Bark Beetles, and Wood Borers

Fir engraver beetle (*Scolytus ventralis*), affecting true firs, was generally found associated with root disease pockets. Mortality levels likely increased during dry periods. Outbreaks were probably infrequent; beetle populations were kept at low levels by the fire regimes that reduced the stocking of true firs, particularly at lower elevations.

Other bark beetles and wood-boring beetles were also present in historic LSR stands. Their role was secondary; these insects invade trees already attacked by other insects or infected by various pathogens.

Root Diseases

Root diseases were present in historic LSR stands and evolved with their host types. Of the root diseases present, laminated root rot and *Armillaria* root disease would have influenced historic LSR stands the most. They are diseases of the site; the causal fungi can survive for decades as saprophytes in the roots of dead trees. New hosts are infected when the roots of susceptible species contact infected roots. Spread and mortality rates are generally slow. Root diseases tend to create small openings (up to a few acres in size) in stands where host trees (especially true firs and Douglas-fir) are preferentially killed and nonhost trees, shrubs, and herbs are favored. Diversity in stand composition, structure, and density results in increased numbers of snags and downed logs. Historically, frequent fires probably influenced root disease dynamics and kept pocket size small by creating conditions favorable for regeneration of early seral species, (usually the most root disease resistant species) or by encouraging a period of shrub occupation, allowing time for root disease inoculum to decay.
An exception to this scenario would have been the influence of laminated root rot in high elevation mountain hemlock stands. Here, large continuous areas of mountain hemlock, a highly susceptible species, occurred. Root disease pockets were tens to hundreds of acres in size. Large tree structure in these areas was provided by western white pine, which is resistant to laminated root rot.

Dwarf Mistletoes

Dwarf mistletoes are parasitic plants that have evolved with their hosts. Most are host specific. Impacts of dwarf mistletoes include reduced growth, branch and stem distortion, increased incidence of stem decay infections, predisposition to attack by other agents such as bark beetles, and mortality. Impacts of Douglas-fir dwarf mistletoe are particularly severe.

Historically, dwarf mistletoe incidence was probably greatest on north and east slopes and in riparian areas. In other locations, more frequent fires would have influenced incidence by killing infected understory trees and by burning infected overstory trees where dwarf mistletoe brooms in the lower portion of the crowns created a fire ladder from the ground to the upper crown.

Current Conditions

Bark beetles, white pine blister rust, and root diseases are currently playing significant roles in forest stand development throughout the South Cascades LSRs. Overstocking, windthrow, and several drier-than-normal years have led to increases in bark beetle activity. Recent windthrow and fires will continue to influence populations of Douglas-fir beetle. Bark beetle-caused mortality has also been significant for Douglas-fir on drier sites, particularly south of the Rogue Umpqua Divide and for true firs at lower elevations, south of the Rogue-Umpqua Divide, and east of the Cascade Crest. Large sugar pine, western white pine, and ponderosa pine are being killed by bark beetles throughout the LSR network where they occur in overstocked conditions. White pine blister rust alone, or in combination with bark beetles has reduced the presence of five-needle pines to well below that of historic levels in many areas. Impacts of root diseases are less dramatic; however, their effects on vegetation development are currently significant in some locations and their presence in many young stands will slow or prevent the development of late-successional characteristics in others.

Bark Beetles

Bark beetles have affected some stand components in the complex mixed-stands common throughout most of the LSRs. In a few locations they have killed high proportions of a given species over extensive areas. The greatest impacts observed in the South Cascades so far have been reductions in the larger diameter sugar pine, western white pine and ponderosa pine stand components throughout the area by pine bark beetles, mortality of larger Douglas-fir on dry, low elevation sites south of the Rogue-Umpqua divide largely attributable to secondary bark beetles and wood borers, and recently, high mortality of white fir due to fir engraver beetles at low elevations on the east side of the Cascades in LSR 227.

Recent winter storms have caused blowdown of Douglas-fir in some locations. Where there are concentrations (more than three trees per acre) of larger diameter Douglas-fir (greater than 10 inches diameter), mortality of standing Douglas-fir can be expected over the next three to four years.
Recent fires have also occurred within the LSRs. Where areas of fire and blowdown overlap, Douglas-fir beetles emerging from blown down trees will most likely infest fire-damaged trees.

If stands in the LSRs were left strictly alone, these mortality trends would be expected to continue. Pines, in particular, would be progressively lost. Risk to pines is greatest at elevations below 3500 feet, on south and west aspects, and in areas within a mile of recent pine bark beetle activity.

Influence of Exotic Insects and Pathogens

White pine blister rust (caused by *Cronartium ribicola*) was introduced into the western North America in 1910. It became common and damaging on five-needle pines in the South Cascades by the mid 1920s, infecting and killing pines over a large area. White pine blister rust requires an alternate host in the genus *Ribes* and is greatly favored by moist conditions in late summer and fall. On sites where these conditions occur, it kills most susceptible young pines and causes top kill and branch flagging in large hosts. Larger hosts are often weakened and subsequently attacked by bark beetles. Due to a general lack of resistance to the fungus in five-needle pine populations and the associated bark beetle-caused mortality, western white pine and sugar pine numbers have been greatly reduced in many areas where they were historically important. Although a breeding program has been successful in identifying resistance to the fungus, resistant stock has only recently become available.

An exotic insect, the balsam woolly aphid (*Adelges piceae*) was introduced into the Pacific Northwest sometime during the past century. It damages its hosts by feeding on cells of stems, twigs, or new shoots. During the 1960s, extensive areas of mortality in Pacific silver fir were reported in LSRs 222,225, and 226. Thousands of mature trees were killed outright or weakened and infected by bark beetles. While this insect has had little influence recently, it had a profound influence on the structure of higher elevation LSR stands during that time period.

Root Diseases

While root diseases generally produce effects that are not inconsistent with LSR objectives, information on current impacts suggest that root disease pockets are now larger and more numerous than in the past. Fire exclusion has increased the occurrence of fire-intolerant and also root disease susceptible species on many sites. Past management that ignored the presence of root disease has often resulted in high density plantings of root disease susceptible species where inoculum is present. Partial cutting in true fir stands has increased the incidence of *annosus* root disease, and soil compaction and precommercial thinning have favored conditions for the establishment and spread of black stain root disease. Root disease presence in young plantations comprised predominantly of susceptible species may preclude or slow the development of large tree structure in the affected plantations unless measures are taken to encourage root disease-resistant species. Entry into older, root disease-infested stands to speed the development of late-successional character may have an undesired opposite affect.

As a consequence of the introduction of white pine blister rust, large tree structure provided by western white pine in high elevation root disease pockets has been compromised.

Douglas-fir Dwarf Mistletoe

Douglas-fir dwarf mistletoe levels are believed to be higher than historic levels in some areas of the LSRs. This would be particularly true where fire has been excluded from infected Douglas-fir stands and where aggressive dwarf mistletoe suppression efforts were not undertaken during past management activities.

Snags and Down Wood

Death and decay of vegetation are integral processes in maintaining functioning forests. The amounts and conditions of snags and down wood are used as indicators of how this process is functioning.

In addition to structural habitat, snags and logs provide other important habitat influences. The Forest's transitional landscape tending toward drier southwest province conditions increases the importance of down wood as water storage reservoirs. Decaying logs are sponge-like, and in the dry season hold almost twice as much water per unit volume as mineral soil (Perry 1991). Water is important to biological activity because it buffers temperature extremes. Moist logs are key habitat for many forest organisms. Late successional amphibians are associated with moist logs due to their susceptibility to desiccation and the abundance of prey - these logs are islands of invertebrate productivity.

The biomass of a site reflects the potential (before decay and fire are accounted for) for the amount of snags and down wood that may be present. In areas to the north, like the Olympic and Mt. Baker-Snoqualmie National Forests, where temperatures are moderate and rainfall higher, the total live tree biomass is often higher than it is in southwestern Oregon. As a result, potential levels of snags and down wood decrease from north to south in Oregon and Washington.

Tree mortality may be caused by many factors. These include, for example, old age, fire, wind, disease, insects, and drought. In southwestern Oregon, fire is the most likely single cause. All the factors can act in conjunction to cause mortality. Drought conditions, as experienced recently in this warm, dry climate, can result in more moisture-stressed trees. These trees are then more susceptible to infestation by insects. Diseases and fire may also lower the resistance of trees to insects.

<u>Data from Ecology plots have shown that there is very high variation in the amounts of snags and down wood in late seral stands</u>. On many acres, no snags or down wood may be present, and on other acres over 1000 snags and/or pieces of down wood per acre may be present. It was recognized that Ecology plot data do not reflect levels of dead material immediately following a major disturbance. After a major disturbance, the level of snags may be very high. This is generally followed by a period where snag levels decrease, then increase again and may continue to rise slowly as stands pass 200 years of age.

Levels of dead material in late seral stands are regulated by many factors. As noted above, old age, fire, insects, and disease may cause mortality. The rate of disappearance of dead material is also regulated by several factors. Low intensity fires may consume small diameter material and leave larger material. As the intensity increases, larger diameter material is consumed. Generally, fires in this area occur frequently, every 15-120 years, depending on site, and have a mosaic of low, medium, and high intensity areas within their perimeter. This mosaic of intensities is likely a contributing factor to the high variation in levels of dead material over the LSR area.

Another factor that contributes to the disappearance of dead material is decomposition. This is the structural breakdown of wood by bacteria, fungi, and arthropods. Climate plays a major role in this case also. In general, it is recognized that decomposition is slower in more northerly, cooler climates, and more rapid as one moves south to warmer, southwestern Oregon.

Although the rainfall is lower in southwestern Oregon, apparently adequate moisture is present for the decomposers to function. On a smaller scale, such as between dry and moist aspects, or high and low elevations, decomposition rate would also vary. This mosaic of microclimates over the landscape also contributes to the high variation in levels of snags and down wood.

Table 24 through Table 29 show levels of snags and down wood on Ecology plots, stratified by size. Data are log normally, not normally distributed. That is, they do not fit a bell-shaped curve, but show high numbers of plots with low snag levels and fewer plots as snag levels increase. In non-normally distributed data, results are presented using not just means, but also medians and ranges for expressing variation. (Recall, the median is the value at the middle of the data set, when the data points are placed in sequential order.)

Over all Series, in both the north and south portions of the LSR network, the majority of the snags are less than 9 inches in diameter. In the largest size class, snags greater than or equal to 24 inches in diameter, the mean ranges from one snag per acre in the Douglas-fir Series, southern LSRs, to four snags per acre in the White Fir, Silver Fir, and Western Hemlock Series in the northern portion of the LSR network. Median values of zero show that at least half the plots had no snags in that size class. Total snags per acre, within Series, are lower in the southern portion of the LSR network.

Patterns in amounts of down woody material are the same as those in the snag data. The majority of the down wood is in the category with 6-15.9 inch diameters, less than 16 feet in length. In the 24 inch diameter and greater than 16 foot length category, numbers of pieces per acre ranges from one in the southern portion of the LSR network, Douglas-fir Series, to seven in the northern portion, Silver Fir Series.

Although the effects of fire exclusion on the Ecology plots is unknown, there has been considerable speculation on this topic. Fire could act to remove dead wood through consumption, and fire exclusion would then result in increased levels of dead material, particularly the smaller material (and in growth of shade tolerant species). High intensity fire could also cause an increase in dead material through tree mortality, hence fire exclusion could result in reduced levels of snags. In reality, both processes are likely occurring, but are not quantifiable. The effects of fire exclusion are further complicated by climatic cycles. The recent dry trend, combined with establishment of shade tolerant species has caused moisture stress in large trees, allowed insect infestation, and resulted in tree mortality and, therefore, increased snag levels. Introduction of white pine blister rust has caused mortality, hence an increase in snags, information that was recorded in Ecology plot data.

On a landscape basis, the levels of snags and down wood have been impacted by management activities. Salvage along roads and in other areas has likely lowered snag levels. Ecology plots reflect some salvage harvest by the recorded presence of stumps, more so on the Rogue River National Forest. Clearcut harvesting, followed by burning, has likely reduced levels of snags and down wood.

When recommending levels of snags and down wood, the amount of harvested, early seral condition was recognized as having a large impact on landscape levels of dead material. Large harvests throughout the LSR network have reduced dead material and thus likely concentrated the species that utilize these habitats into smaller areas. These small areas are acting as refugia from which the species will expand as more habitat becomes available. Because of this, levels of down wood and snags were recommended at the level of the Ecology plot means or higher, and not at a minimum level.

Table 24: Summary of Snag Information by Plant Series, Northern Portion of LSR Network (Umpqua NF Data)[14]

Plant series	Snags per acre by DBH Class.					Mean Diameter	Mean Height	# of plots
	<9"	9-15.9"	16-19.9"	20-23.9"	24"+	(inches)	(feet)	
Silver Fir, ABAM						27	45	31
median	0	0	0	0	3			
mean	52	10	2	2	4			
range	0-507	0-77	0-10	0-6	0-13			
Mountain Hemlock, TSME						17	68	30
median	5	8	0	0	1			
mean	59	20	4	2	2			
range	0-664	0-111	0-20	0-12	0-8			
White Fir, ABCO						29	49	78
median	0	0	0	0	2			
mean	32	6	2	1	4			
range	0-678	0-40	0-78	0-12	0-17			
Douglas-fir, PSME						24	34	42
median	0	0	0	0	1			
mean	43	9	1	1	2			
range	0-429	0-40	0-10	0-7	0-5			
Western Redcedar, THPL						27	48	7
median	19	0	4	0	3			
mean	53	5	4	1	3			
range	0-304	0-25	0-10	0-3	0-6			
W. Hemlock, TSHE						31	45	153
median	0	0	0	0	3			
mean	37	4	2	1	4			
range	0-1568	0-33	0-19	0-9	0-17			

[14] Diameters and heights are means for all pieces. Total number of snags is 1748.

Table 25: Summary of Large Woody Material (LWM)[15] Pieces Per Acre by Plant Series, Northern Portion of LSR Network (Umpqua NF Data)[16]

	Pieces per acre by small end diameter and length						Mean Length	Mean Decay
Small end diameter	**6-15.9"**	**6-15.9"**	**16-23.9"**	**16-23.9"**	**24"+**	**24"+**	**(feet)**	**(class)**
Piece Length	**<16'**	**16'+**	**<16'**	**16'+**	**<16'**	**16'+**		
Silver Fir, ABAM							34	3.2
median	122	26	0	2	0	0		
mean	98	22	9	5	0	7		
range	0-212	0-33	0-47	0-16	0	0-35		
White Fir, ABCO							36	3.1
median	36	9	0	0	0	0		
mean	64	14	7	3	3	2		
range	0-486	0-58	0-124	0-26	0-65	0-65		
Douglas-fir, PSME							33	3.3
median	0	7	0	0	0	0		
mean	50	13	7	2	0	1		
range	0-297	0-46	0-74	0-18	0	0-21		
Western Redcedar, THPL							38	2.9
median	87	26	0	0	0	0		
mean	146	22	26	7	0	1		
range	0-635	0-45	0-82	0-18	0	0-8		
Western Hemlock, TSHE							32	3.3
median	54	13	0	0	0	0		
mean	79	18	11	7	6	4		
range	0-410	0-107	0-118	0-52	0-109	0-40		
Mtn. Hemlock, TSME							32	NA
median	0	11	0	0	0	0		
mean	30	14	14	0	0	0		
range	0-122	0-31	0-54	0	0	0		

[15] In this assessment, the term "Large Woody Material" (LWM) will be used for dead, down wood. It means the same thing as coarse woody debris used in the ROD and REO exemption criteria.
[16] Data taken from 262 ecology plots and includes measurements on 1713 logs.

Table 26: Summary of Large Woody Material Tons Per Acre by Plant Series, Northern Portion of LSR Network (Umpqua NF Data)[17]

	Tons per acre by small end diameter and length						Mean Tons
Small end diameter	**6-15.9"**	**6-15.9"**	**16-23.9"**	**16-23.9"**	**24"+**	**24"+**	**(per acre)**
Piece Length	**<16'**	**16'+**	**<16'**	**16'+**	**<16'**	**16'+**	
Silver Fir, ABAM							45
median	2.6	14.1	0	2.6	0	0	
mean	2.7	14.2	1.9	3.9	0	19.2	
range	0-5.4	0-31	0-7.4	0-12.8	0	0-98	
White Fir, ABCO							27
median	1.3	4.6	0	0	0	0	
mean	2.3	7.8	1.8	6.2	1.2	5.5	
range	0-20.2	0-63.2	0-34.5	0-83.5	0-42	0-116	
Douglas-fir, PSME							22
median	1.3	4.6	0	0	0	0	
mean	2.0	7.2	1.3	3.0	0	6.0	
range	0-10.3	0-49.3	0-23	0-21	0	0-104	
W. Redcedar, THPL							32
median	3.7	6.1	0	0	0	0	
mean	3.7	5.8	4.2	8.6	0	3.0	
range	0-9.9	0-9.3	0-16.6	0-43.6	0	0-21	
W. Hemlock, TSHE							42
median	2.5	6.6	0	0	0	0	
mean	3.9	9.7	2.5	9.1	2.5	11.0	
range	0-24.4	0-51.8	0-32.6	0-98.7	0-44.6	0-129.7	
Mtn. Hemlock, TSME							12
median	0	4.5	0	0	0	0	
mean	0.6	4.1	0.3	0	0	0	
range	0-2.1	0-7.3	0-1.1	0	0	0	

[17] Data taken from 262 ecology plots and includes measurements on 1713 logs.

Table 27: Summary of Snag Information by Plant Series, Southern Portion of LSR Network (Cascades portion, Rogue River NF Data)[18]

Plant series	Snags per acre by DBH Class.					Mean Diameter	Mean Height	# of plots
	<9"	9-15.9"	16-19.9"	20-23.9"	24"+	(inches)	(feet)	
Shasta Red Fir, ABAM						25	NA	10
median	0	0	0	0	0			
mean	12	6	2	<1	4			
range	0-71	0-49	0-22	0-1	0-16			
Mountain Hemlock, TSME						26	NA	18
median	0	0	0	0	4			
mean	4	6	2	1	3			
range	0-37	0-33	0-9	0-5	0-11			
White Fir, ABCO						25	52	93
median	0	0	0	0	1			
mean	14	4	1	<1	2			
range	0-203	0-67	-12	0-5	0-21			
Douglas-fir, PSME						29	26	13
median	0	0	0	0	<1			
mean	5	2	1	1	1			
range	0-24	0-27	0-7	0-4	0-8			
W. Hemlock, TSHE						30	34	22
median	0	0	0	0	3			
mean	5	5	2	<1	3			
range	0-42	0-18	0-10	0-4	0-13			

[18] Diameters and heights are means for all pieces. Total number of snags is 443. These data do not represent conditions on the Winema portion of LSR 227 (see Appendix J).

Table 28: Summary of Large Woody Material Pieces Per Acre by Plant Series, Southern Portion of LSR Network (Cascades portion, Rogue River NF Data)[19]

	Pieces per acre by small end diameter and length						Mean Length	Mean Decay
Small end diameter	6-15.9"	6-15.9"	16-23.9"	16-23.9"	24"+	24"+	(feet)	(class)
Piece Length	<16'	16'+	<16'	16'+	<16'	16'+		
White Fir, ABCO							30	3.4
median	27	16	0	0	0	0		
mean	56	20	8	2	3	2		
range	0-462	0-81	0-109	0-19	0-82	0-18		
Douglas-fir, PSME							20	3.4
median	95	0	0	0	0	0		
mean	101	11	36	1	5	1		
range	0-364	0-60	0-163	0-16	0-30	0-12		
Western Hemlock, TSHE							30	3.6
median	33	16	0	8	0	0		
mean	63	18	16	12	5	5		
range	0-236	0-82	0-132	0-51	0-36	0-48		

Table 29: Summary of Large Woody Material Tons Per Acre by Plant Series, Southern Portion of LSR Network (Cascade Portion, Rogue River NF Data)[19]

	Tons per acre by small end diameter and length						Mean Tons
Small end diameter	6-15.9"	6-15.9"	16-23.9"	16-23.9"	24"+	24"+	(per acre)
Piece Length	<16'	16'+	<16'	16'+	<16'	16'+	
White Fir, ABCO							29
median	2.0	5.4	0	0	0	0	
mean	2.8	7.4	1.6	3.0	1.4	8.3	
range	0-19.9	0-41.8	0-17.2	0-29.5	0-25	0-179	
Douglas-fir, PSME							21
median	3.5	0	0	0	0	0	
mean	4.8	3.3	3.0	0.5	3.3	5.5	
range	0-16	0-16.1	0-13.3	0-6.6	0-22.3	0-41.4	
Western Hemlock, TSHE							42
median	2.8	5.6	0	8.2	0	0	
mean	3.0	7.8	2.3	14.3	3.0	12.1	
range	0-9.1	0-35.8	0-19.4	0-86.4	0-31.2	0-60	

[19] Data taken from 83 ecology plots and includes measurements on 519 logs. These data do not represent conditions on the Winema Portion of LSR 227 (see Appendix J).

Riparian/Aquatics

Introduction

LSRs are an important component of the Aquatic Conservation Strategy (ACS, ROD B-12). Because these LSR areas possess late successional characteristics, they offer a center of high quality stream habitat that act as refugia and cores for species that may recolonize degraded areas as recovery takes place. In addition, streams and associated riparian areas in these reserves may be important for endemic or locally distributed terrestrial and aquatic species.

This section presents:
- an overview of riparian and aquatic structure, function, and general fish decline;
- a discussion of wet areas and connectivity;
- the methods used to characterize existing conditions in this assessment;
- the acres of key watersheds within the LSRs;
- the status of watershed analyses in or near the LSRs;
- roads and existing road density; and,
- riparian seral vegetation condition.

Riparian/Aquatic System Overview

The riparian system is a zone of transition between the upland terrestrial and aquatic systems where vegetation and microclimate are strongly influenced by the aquatic system (Gregory et al. 1991). The connections between the riparian and aquatic systems are very complex and it has been argued that both the riparian area and associated aquatic area should be considered one ecosystem (Doppelt et al. 1993, Gregory et al. 1991).

Structural Components

USDA et al. (1994) described the critical components of stream and river aquatic and riparian systems and their current conditions in the range of the northern spotted owl. Appendix A adds to those descriptions and also presents descriptions of lake, pond, estuary, and lagoon systems.

Fully functional forest riparian systems in the Pacific Northwest include components such as riparian vegetation, large woody material, shape, microclimate, and travel routes. These are distributed throughout the riparian and adjacent upslope areas and are influenced by disturbance factors such as fire, windthrow, and landslides.

Key physical components of a fully functioning stream system include complex habitats consisting of flood plains, banks, pools, riffles and runs (channel structure), a water column, and subsurface flowing waters. These are created and maintained by rocks, sediment, large woody material, and favorable conditions of water quantity and quality. Upslope and riparian areas influence stream systems by supplying sediment, large woody material, and water. Disturbance processes such as landslides and floods are important delivery mechanisms. Many species may require periodic disturbances to provide habitat components such as large woody material and coarse gravels.

Please refer to Appendix A for more details on structural components of riparian and aquatic systems.

Function and Dynamics

Riparian areas are particularly dynamic portions of the landscape, yet they make up only 5 percent of the forest systems in the Pacific Northwest (Oakley et al. 1985). These areas are shaped by disturbances characteristic of upland terrestrial systems, such as fire and windthrow, as well as disturbance processes unique to stream systems, such as lateral channel erosion, peak flow, deposition by floods and debris flows. Near-stream, floodplain riparian areas may have plant communities of relatively high diversity (Gregory et al. 1991) and extensive hydrologic and nutrient cycling interactions between ground water and riparian vegetation (Bilby et al. 1996). Riparian vegetation regulates the exchange of nutrients and material from upland forests to streams (Swanson et al. 1982, Gregory et al. 1991) and from the aquatic system to the riparian area (i.e. nutrient cycling of fish carcasses, Bilby, et al. 1996). Because the linkage between aquatic and riparian areas is complex, changes in the riparian area quickly affect the biological communities of the aquatic areas. Due to this complex relationship, management of the riparian area is critical to the quality and quantity of associated aquatic systems (Gregory et al. 1991).

Riparian areas contribute to the health of the aquatic system by:

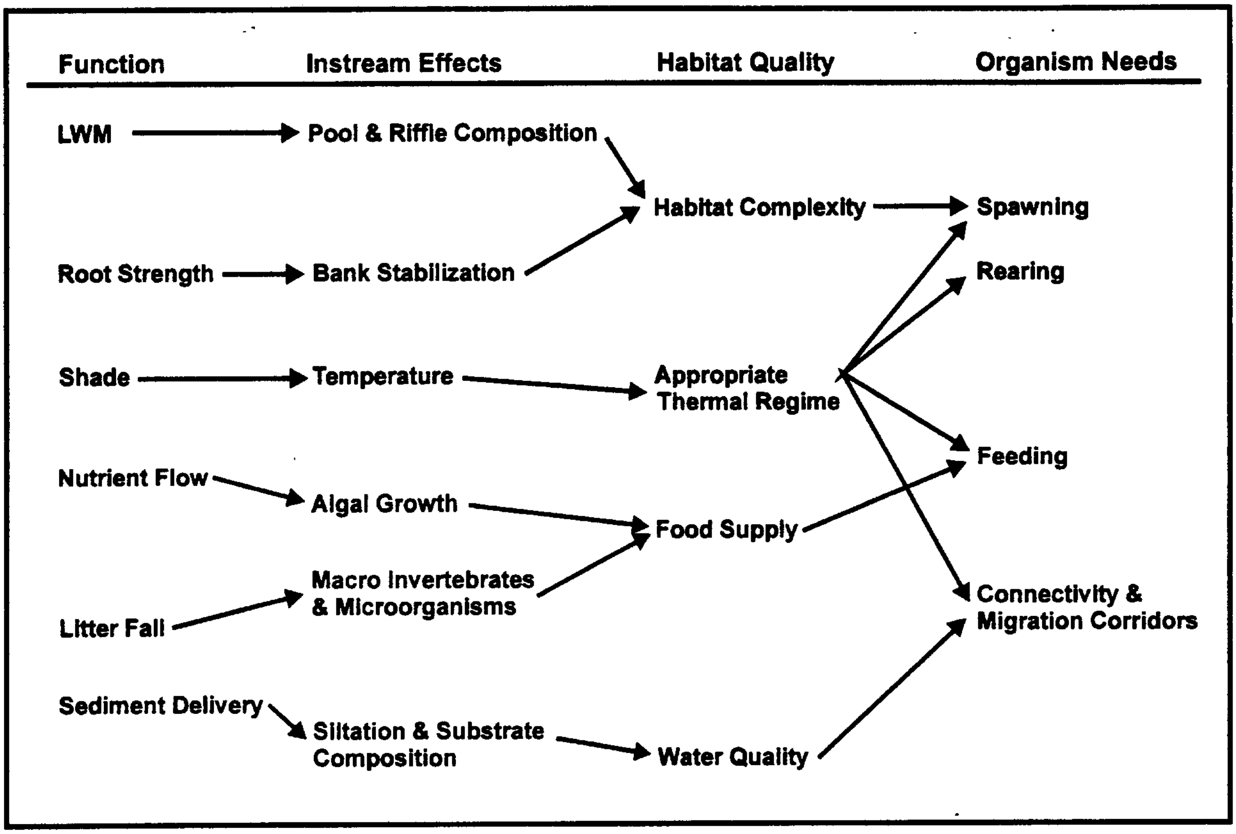
- stabilizing stream banks;
- providing large woody material for complexity and cover for aquatic organisms;
- providing shade, flow of nutrients, leaf and litter fall; as well as,
- sediment delivery. (Appendix A and Figure 11).

These functions are related to riparian vegetation, soil type, water quantity, and natural disturbance regimes. Because of their importance, a fully functional riparian system that is linked to the adjacent aquatic system throughout the watershed should be the goal of land management activities.

See Appendix A for additional information on functions and processes associated with riparian and aquatic systems.

Riparian habitat conditions have been degraded by road construction and land management activities. For example, riparian areas outside of wilderness areas in Washington and Oregon have been simplified to tree species such as red alder (*Alnus rubra*) because of timber harvest and associated activities that removed marketable timber down to the stream margins (Oliver and Hinckley 1987). These tree species are less suitable than conifers as sources of large woody material due to shorter decomposition time and smaller wood mass (Triska et al. 1982, Grette 1985). Riparian areas in many managed forest lands have few trees larger than 10 inches in diameter growing within 100 to 200 feet of streams. The removal of large conifers and the scarcity of a source of large woody material near streams suggest that streamside recruitment of large woody material may be deficient for decades. Prolonged disturbances (such as continuing logging and road building activities in a watershed over many years) damage stream habitat and fish populations (Burns 1972).

Figure 11: Influence of Riparian Function on Aquatic Organism Needs



Reasons for Fish Decline

Southwest Oregon contains a diverse assemblage of fish, amphibians, invertebrates, and other aquatic organisms. Of all the coastal river basins in Oregon, only the Siletz, Umpqua and Rogue rivers contain native stocks of all the anadromous salmonids found in Oregon. Two of these systems, the Umpqua and Rogue are found in southwest Oregon. The Umpqua and Rogue basins contain coast range, interior valley and high cascade areas. This allows them to possess diverse habitats with the potential for harboring a wide range of plant, animal, and fish life.

As the human population of the Pacific Northwest grew and its natural resources were exploited, concerns were raised about the decline in population size of some of the fish species and the loss of aquatic habitats. The concerns usually focused on the anadromous fish species (salmon and steelhead trout) of commercial and recreational interest, and were based on reduced harvest levels. Harvest regulations became more restrictive and harvest allocations between fisheries grew smaller to spread the diminishing harvest between tribal, recreational, and commercial interests.

At the same time, decreases in resident fish species that do not possess interest as a commercial or recreational species have occurred. Decline in numbers of these species is hard to detect since there is no harvest data and there has been little incentive to gather information concerning distribution, status of local populations, and habitat requirements (Bisson et al. 1992). These species may be more sensitive to changes in the freshwater habitats than anadromous fish since they spend their entire lives in the freshwater environment (Appendix B).

Appendix B provides information on several fish species of interest in southwest Oregon. All of the fish species included in this appendix reside in or downstream of the south cascades Late Successional Reserves and would be affected by actions in these LSRs. Declines in fish and other aquatic species that are not harvested by humans point toward other reasons for their decline, such as habitat loss and degradation, and introduction of nonnative species. Decline of an assemblage of species in an area is a sign of ecological stress and ecosystem breakdown (Odum 1985, Rapport et al. 1985, see Appendix A).

The general reasons for declines in fish population are habitat loss and degradation due to water diversions, timber harvest, livestock grazing and other land use practices, overfishing, and introduction of nonnative fish and/or hatchery fish (Williams et al. 1989, Moyle and Williams 1990, Nehlsen et al. 1991). Freshwater habitat degradation and loss are the most frequent factors linked to the decline of these species (Nehlsen et al. 1991). Major concerns are fragmentation of freshwater habitat into isolated patches and decreases in the quality and quantity of available habitat. Bisson et al. (1987) reviewed several studies that associated declines in fish abundance with the loss of pools and large woody debris (see Appendix A).

The listing of species and concern about other populations in decline also elevate the concern about ecosystems and areas where several species may be declining and in danger of extinction or extirpation. Areas such as the upper Klamath River Basin of southern Oregon and northern California, the Umpqua and Rogue River basins of southwest Oregon; and the Columbia River Basin of Washington, Oregon, Idaho and Montana, have several fish species in decline (Frissell 1993). This clustering of depressed populations is an indication of river systems and their ecosystems under stress (Odum 1985, Rapport et al. 1984). Ratner et al. (in press) concluded that if present habitat degradation continues, spring Chinook salmon in the south Umpqua River have a high probability of becoming extinct within 100 years.

Wet Areas

Wetlands, lakes, ponds, springs and seeps, including adjacent upslope land, are important wildlife habitat and centers of biological diversity within the LSR landscapes. Their distinct moist microclimate, complex structural and spatial character of soil and vegetation function as:

- source areas for late successional forest associated wildlife in the moist forest transition zones of upland forest and riparian area (small mammals, amphibians, birds, bats);
- refugia for mesic/wet forest associated plant and animal species and communities;
- essential habitat for riparian dependent animal and plant species (e.g. pond breeding amphibians, wetland plants); and,
- basic necessary habitat elements of mobile terrestrial animal species with moderate to large home ranges (fisher, marten, elk).

These features are relatively uncommon in southwest Oregon LSR landscapes and are sensitive to habitat alterations and stochastic events due to drier, warmer climate conditions. No collective effort has been attempted to classify and assess the overall amount and conditions of these elements in southwest Oregon. The ability to assess overall condition in LSRs is limited to some general observations. Though the relative amount and distribution of impacted wet areas is not readily available, the rarity of these features suggests impacted wet areas are an important priority to achieve LSR and ACS objectives.

The effects of water drainage impacts to wet plant communities include favoring exotic species over native (e.g. changing a sedge/tufted hair grass community to a drier Kentucky blue grass community). Wet area plant communities are arranged along a moisture gradient based on depth and duration of water and a nutrient gradient. This condition provides a highly complex mosaic of plant communities. Changes in depth or duration of water reduces and simplifies the mosaic condition to fewer plant communities and greater predominance of certain species.

Little is known about the population conditions of species associated with wet habitats though many recent studies in the Pacific Northwest have shown declines of some amphibian species. This is a significant information gap in assessing LSRs and management needs.

Though it is not possible to assess conditions collectively, there are human influenced processes and conditions known to occur in southwest Oregon LSRs which impact wet habitats. These conditions and activities could retard or prevent attainment of LSR and ACS objectives (Table 30).

Table 30: Effects of Management Activities on Wet Areas

Process/Condition affecting wetlands lakes, ponds, springs and seeps	Management Condition or Activity associated with processes
a. ground water interception	roads, tractor logging
b. change in drainage pattern	tractor logging, roads, hydroelectric facilities,
c. amount, timing duration of flows to site	harvest (veg composition, dead wood), roads, tractor logging, hydroelectric facilities, cultural developments (ski areas, lodges etc.)
d. sedimentation	roads, harvest (veg structure, dead wood), soil disturbance
e. microclimate variability (humidity, temp, wind)	roads, harvest (veg structure, dead wood), livestock grazing
f. increased edge	roads, harvest (veg structure, dead wood)
g. changes in plant structure and composition including loss of dead and down wood, mature hardwoods, red cedar, and other woody, vascular and non-vascular species.	harvest, tractor logging, livestock grazing, dredging/blasting, nonnative species introductions, fire management and cultural developments
h. changes in animal structure and composition	same as g. above plus fish introductions and human presence
I. habitat fragmentation	harvest, roads, hydroelectric facilities, cultural developments
j. change in soil structure and composition	tractor logging, livestock grazing, pond developments for fire, fish, wildlife management
k. changes in water chemistry	all of the above plus tree fertilization
l. changes in nutrient cycling	all of the above plus tree fertilization

Roads, fish introductions, water developments (damming, diverting, dredging/blasting), tractor logging, adjacent terrestrial vegetation management, livestock grazing, and nonnative species introductions are the seven most extensive influences on wetlands, lakes, ponds, springs and seeps.

Fish and bull frogs in ponds, wetlands, and lakes

Development activities which increase water depth from historic levels, human use of ponds and wetlands, and concomitant intentional and unintentional stocking of fish, bull frogs and other nonnative plant and animal species, pose a significant threat to the native populations associated with these habitats. Stocking historically fishless lakes also impacts native species populations. These developments and management activities have occurred in southwest Oregon LSRs. Nonnative fish species known to occur in LSR wet habitats include brook trout, large and small mouth bass, bull heads, and mosquitofish. Effects of water development, fish stocking, water source, and recreation use include direct predation, indirect competition for food, changes in food species composition, higher risk of disease or parasite introduction and spread, increased fragmentation of habitat due to creation of greater gaps in source populations, increased risk of spread of nonnative plants, and the cumulative effects of the aforementioned stresses combined with natural stochastic factors such as drought. Oregon chub, a species listed as endangered under the ESA, is severely impacted by the presence of nonnative fish species in environmental conditions such as these. These conditions are inconsistent with LSR and ACS objectives. Not all developments have negative effects. In some cases ponds have been created which are known to benefit bats, amphibians, elk and other wildlife species.

Tractor logging

Past tractor harvest practices logged in and through wet areas in the LSR. Soil compaction, displacement, and disturbance has changed the vegetation and water drainage patterns. Altered water drainage effects in tractor logged areas can be complex and may include: reduction in water storage and duration, diversions of water away from wet areas, and erosion impacts to wet areas. The use of humbolt crossings (logs placed in wetland to drive equipment through area) have influenced the stability of wet areas.

Livestock grazing

Where cattle have access to wet areas, habitat conditions have been altered. Effects include reducing structure, as well as changing plant species composition and associated microclimate conditions.

Vegetation management

In some areas, past timber harvest and reforestation has changed structure and species composition in wet areas. Some species removed through harvest will not easily reinvade the area (e.g. Western red cedar).

Connectivity

Fish Passage Barriers, Human Created

The main barriers for adult and juvenile fish in the South Cascade LSR network are culverts and water diversion structures. The effects of these barriers range from delays in migration to total obstruction for upstream migration for adult and juvenile fish.

Fish Passage Barriers, Natural

Barriers to fish migration that occur naturally (i.e., beaver dams and falls), can present seasonal or complete obstruction to fish passage. Beaver dams can present seasonal (low-water flow periods) barriers. While this may be a concern for fish passage, beaver dams provide important over-winter habitat for coho salmon and contribute to the watershed's ability to maintain water flow during the summer low water flow periods.

Naturally occurring falls above 12 vertical feet are usually considered barriers to anadromous fish passage. These stream features can serve as tools to isolate populations of fish and other aquatic species. This isolation can benefit species above the barrier that may otherwise suffer from competition for available resources such as cover, habitat and food. Naturally occurring falls and beaver dams should be maintained in their original state.

Land Ownership Patterns

Streams and riparian areas provide migration corridors for several terrestrial and aquatic species. Connectivity is crucial to maintaining or restoring populations and allowing fragmented populations to recolonize areas.

The land ownership pattern in the western portion of LSR 222, 224 and 225 is rather unusual within the Late Successional Reserve network of the Northwest Forest Plan. Different land use practices and protections (i.e., riparian buffer widths) between federal and non-federal lands can be a limitation in maintaining or restoring riparian and aquatic system conditions in the fragmented portions of the LSRs. This document only assesses federally administered land.

Methods Used in this Assessment

Riparian reserve vegetation seral stages were estimated from satellite size/structure vegetation data in the same way terrestrial late seral was estimated (Appendix D). Late seral vegetation within the transient snow zone (2500'-4000' elevation), miles of road within the LSR portion of each watershed, and road miles in riparian reserves were also used to assess existing conditions for this LSR network. In addition, previous watershed assessments were reviewed for riparian/aquatic condition conclusions. As an approximation, forest plan interim riparian reserve widths were used to identify riparian areas.

The above methods were used because riparian conditions directly affect the amount and quality of aquatic habitat. Late successional forest affects the recovery of riparian and aquatic systems by reducing the effects of management related disturbance (USDA et al. 1994).

Other Assessment Efforts

Several efforts, including Oregon Department of Fish and Wildlife, American Fisheries Society, Oregon Trout, and the Oregon Coastal Salmon Restoration Initiative (OCSRI), have identified areas of habitat importance for anadromous salmonids. Some of these are still considered draft and subject to change, such as the AFS aquatic diversity areas and the OCSRI core areas. Several of these areas (i.e., AFS aquatic diversity areas) were addressed when key watersheds and late successional reserves were identified as part of the Northwest Forest Plan. As a result of this consideration, significant amounts of the South Cascade LSR network are not only recognized as LSR land allocation, but received additional designation as key watersheds

(Table 31). Other efforts (i.e., OCSRI) have occurred after the designation of the key watersheds and LSRs and try to identify areas necessary for recovery of the coho salmon, steelhead, and cutthroat trout and augment the key watersheds.

Table 31: Acres Designated as Key Watershed and Non-Key Watershed, by LSR and Percentage of LSR Designated as Key Watershed

LSR	Acres in Key Watershed	Acres in Non-Key Watershed	Total Acres	Percent Key Watershed
222	342,400	165,600	508,000	67%
224	21,600	0	21,600	100%
225	0	39,800	39,800	0%
226	0	49,800	49,800	0%
227	61,700	39,900	101,600	61%

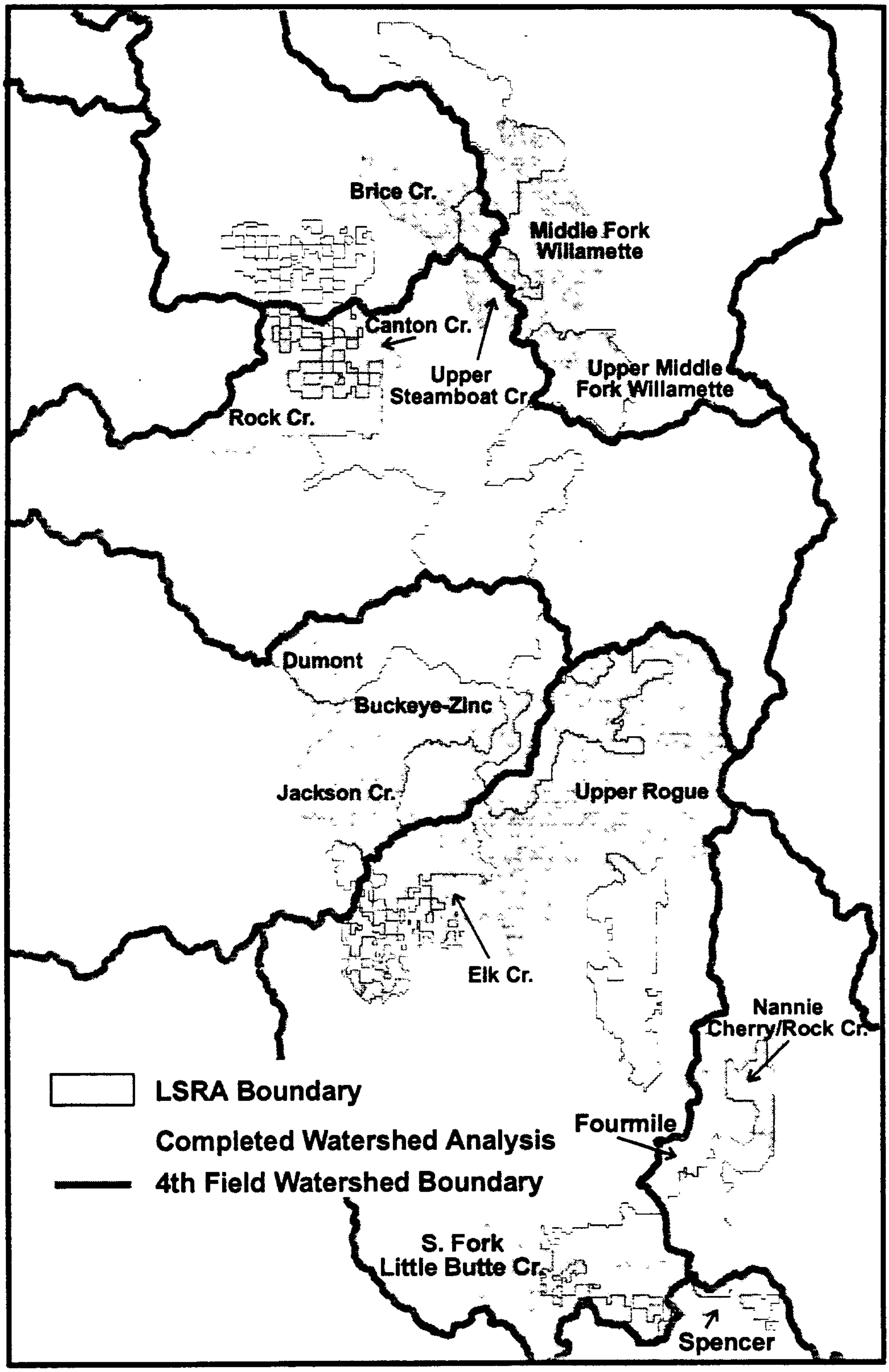
Watershed Analyses Near the LSR Network

Several watershed analyses have been conducted by the Forest Service and BLM in areas of the South Cascade LSR network (Table 32, Figure 12). The scarcity of large woody material and degradation of riparian habitat through road construction and other land management activities have been documented through these analyses. Additionally, monitoring efforts on the Umpqua National Forest (UNF 1993,1995) found that reduced amounts of large wood in streams resulted in wider streams, with shallow and less frequent pools, and lower macroinvertebrate indices. These analyses also recommend several stream and restoration actions that should be considered by the land managers responsible for promoting late successional characteristics in this LSR network.

Table 32: Watershed Analyses within the South Cascades LSRs

LSR	Completed Watershed Analyses	Analyses in Progress	Analyses Yet to Begin
222	Middle Fork Willamette; Upper Middle Fork; Rock Cr.; Canton Cr.; Upper Steamboat; Brice Cr.; Dumont; Buckeye/Zinc; Jackson Cr.	Lookout Point; Big River	Sharp's Creek; Mosby Creek; Boulder Cr.; Quartz Cr.; Upper S. Umpqua
224	LSR is fully covered by Elk Creek Watershed Analysis	None.	None. All completed.
225	LSR is fully covered by Upper Rogue Watershed Analysis	None.	None. All completed.
226		Middle Fork Rogue; South Fork Rogue	None. All in process.
227	N. Fourmile; Spencer Cr.; Nannie/Rock/Cherry Cr.; S. Fork Little Butte Cr.	None.	None. All completed.

Figure 12: Completed Watershed Analyses Within South Cascades LSRA Network



Roads and Road Density

Roads greatly influence the riparian area; and therefore, adjacent and downstream stream systems (Meehan 1991, Dose and Roper 1994, Appendix A). The placement of roads in riparian areas affects the delivery of large woody material and sediment, increases the water delivery system, and disconnects the riparian area and stream system (Appendix A). Roads intercept ground water, change drainage patterns, affect quantity, timing and duration of flows, and sedimentation. Roads cause habitat fragmentation, degrade desired wildlife habitat structure (such as reducing dead and down wood), increase exotic species, disturb species by traffic, impair movement (including pendulous culvert effects to aquatic non-fish species movements), bisect wetlands from each other, from streams, and from terrestrial upslope habitats.

Because of the potential detrimental effects on the condition of the riparian area and adjacent stream system, the location of roads within a watershed is a crucial factor in describing the overall condition of riparian function and aquatic system condition. Figure 13 depicts stream channel conditions in an unrestricted stream reach and in a stream reach restricted by road building.

Table 33 describes road density and percentage of roads located within riparian buffers for watersheds of the south cascades LSR network. The information provided in this table is derived from road information on federally managed land only (Appendix table D-1). This data limitation severely hampers describing current watershed conditions throughout the entire watershed. It is recommended that non-federal land information be incorporated in the next iteration of this assessment. It is also important to note that this is a description of roads throughout the LSR portion of the watershed, not just valley bottom or roads in riparian areas.

Figure 13: Stream Channel Configurations

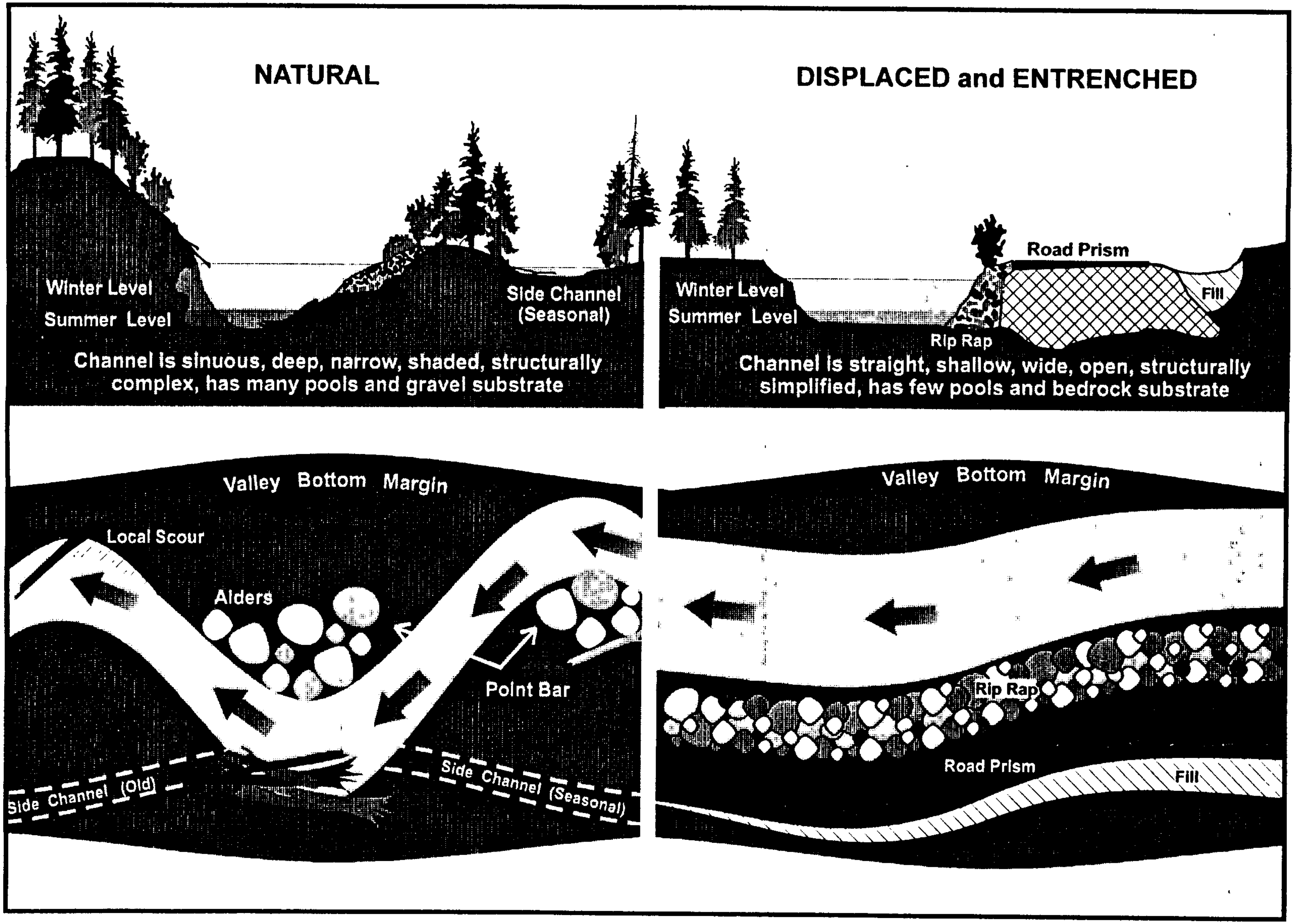


Table 33: Description of Watershed Conditions Within the LSR Portions of Watersheds of the South Cascades LSR Network

LSR	4th Field Watershed[20] (HUC 4)	5th Field watershed (HUC5)	Key Watershed	LSR Acres	Road Miles in Riparian	Total Road Miles	Watershed Rd. Density Mi./Sq. Mi.	Riparian Rd. Density Mi./Sq. Mi.
Eugene BLM 222	Coast Fork Willamette	1	No	5200	12.53	27.64	3.68	3.43
Eugene BLM 222	Coast Fork Willamette	2	No	9400	12.26	64.99	4.42	2.38
Eugene BLM 222	Coast Fork Willamette	3	No	7300	20.6	42.29	3.71	5.59
Eugene BLM 222	North Umpqua	10	No	300	1.67	1.67	3.64	3.60
Roseburg BLM 222	North Umpqua	9	No	14400	1.92	5.98	5.96	6.29
Roseburg BLM 222	North Umpqua	9	Steamboat Cr.		66.55	127.9	4.58	--
Roseburg BLM 222	North Umpqua	10	No	11300	21.04	101	5.85	4.70
Roseburg BLM 222	North Umpqua	10	Steamboat Cr.		0.51	3.22	5.52	--
Medford BLM 224	Upper Rogue	5	Elk Creek	21500	151.32	217.9	6.48	8.46
Willamette 222	Middle Fork Willamette	19	No	31132	29.22	173.4	3.64	2.7
Willamette 222	Middle Fork Willamette	19	No	1168	6.31	10.76	?5.9	--
Willamette 222	Middle Fork Willamette	19	No	308	0.15	1.16	?2.4	--
Willamette 222	Middle Fork Willamette	21	No	41300	21.83	169	2.62	1.71
Willamette 222	Middle Fork Willamette	23	No	18900	17.84	88.6	3.00	2.85
Umpqua 222	Coast Fork Willamette	1	No	9600	36.6	55.38	3.68	5.06
Umpqua 222	North Umpqua	5		11200	11.47	54.32	3.12	3.65
Umpqua 222	North Umpqua	6	Boulder Creek	800	0.16	9.64	7.90	6.4
Umpqua 222	North Umpqua	7		69000	26.89	74.3	2.53	3.03
Umpqua 222	North Umpqua	7	Boulder Creek	502	0	2.58	3.29	--
Umpqua 222	North Umpqua	7	Calf Creek	12858	8.68	54.1	2.69	--
Umpqua 222	North Umpqua	7	Copeland Cr.	23036	21.88	86.76	2.41	--
Umpqua 222	North Umpqua	7	Deception/Wilson	5464	6.23	32.13	3.77	--
Umpqua 222	North Umpqua	7	Williams/Fairview	7406	7.51	23.39	2.02	--
Umpqua 222	North Umpqua	8	Steamboat Cr.	104600	133	536.6	3.28	3.21
Umpqua 222	North Umpqua	9	Steamboat Cr.	13600	10.79	55.87	2.64	2.22
Umpqua 222	South Umpqua	1	South Umpqua	52400	52.06	288.4	3.52	2.76
Umpqua 222	South Umpqua	2	South Umpqua	31100	25.86	146	3.00	2.26

[20] Fourth field watersheds (HUC4) are large watersheds, e.g. North Umpqua, South Umpqua, Upper Rogue.

LSR	4th Field Watershed[21] (HUC 4)	5th Field watershed (HUC5)	Key Watershed	LSR Acres	Road Miles in Riparian	Total Road Miles	Watershed Rd. Density Mi./Sq. Mi.	Riparian Rd. Density Mi./Sq. Mi.
Umpqua 222	South Umpqua	3	Dumont Cr.	21243	26.61	124.3	2.92	2.63
Umpqua 222	South Umpqua	3	Quartz/Boulder	23365	14.87	79	2.16	--
Umpqua 222	South Umpqua	4	South Umpqua	4900	3.05	17.12	2.24	1.98
Rogue 222	Upper Rogue	5	Elk Creek	25500	62.24	105.4	2.65	3.16
Rogue 225	Upper Rogue	1		39800	146.42	203.5	3.27	4.84
Rogue 226	Upper Rogue	1		2700	5.66	10.99	2.62	4.56
Rogue 226	Upper Rogue	2		45800	58.03	243.4	3.40	2.89
Rogue 226	Upper Rogue	4		1300	0.23	7.16	3.45	2.58
Rogue 227	Upper Rogue	8	Jenny Creek	800	0.18	5.72	4.38	1.75
Rogue 227	Upper Rogue	8	S.Fk/N.Fk L. Butte Creek	50600	15.68	186.8	2.33	--
Winema 227	Upper Klamath	13	Spencer Creek	2500	.8	6.6	1.69	3.04
Winema 227	Upper Klamath lake	2	Cherry Creek	11800	.49	12.4	0.67	.43
Winema 227	Upper Klamath Lake	3		33000	6.98	66.4	1.29	1.67
Winema 227	Upper Rogue	8	S. Fk/N. Fk L. Butte Creek	1500	.22	2	0.86	3.92
Rogue 227	Upper Klamath	11	Yes	1100	.18	6.4	3.84	5.49
Rogue 227	Upper Rogue	4	No	300	.5	.52	1.09	0

[21] Fourth field watersheds (HUC4) are large watersheds, e.g. North Umpqua, South Umpqua, Upper Rogue.

Vegetation Condition in Riparian Reserves

Late seral condition is a coarse screen for determining how a late successional reserve is functioning. This information can be useful when prioritizing vegetation harvest treatments (Southwest Oregon Late Successional Reserve Assessment 1995). In the case of riparian reserves, seral condition of the upland and riparian reserves can be very indicative of the functional state of the riparian and associated aquatic system (Appendix A).

In general, riparian reserve vegetation in LSR 222 is predominantly mid (32 percent) and late (45 percent) seral (Table 34), while the southern LSRs are predominantly early (31 percent) and mid (34 percent) seral (Table 35). LSR 222 has more late seral vegetation (45 percent) than the rest of the LSR network (29 percent). The southern portion of the LSRA network has more early seral vegetation (31 percent) in riparian reserves than LSR 222 (21 percent). None of the LSRs have sufficient late seral vegetation in riparian reserves for a properly functioning aquatic-riparian system (Appendix A, Tables A-1 to A-3).

Table 34: Vegetation Seral Stage in Riparian Reserves

Admin. Unit	Water	Rock	Grass	Shrub	Early	Mid	Late	% Late Seral in Riparian	Riparian Total Ac.	Riparian %	LSR Total Ac
Willamette NF	36	122	42	905	4228	6270	9047	44	20,600	22	93,300
Umpqua NF	171	944	159	1290	14944	28154	39269	46	81,800	24	342,800
Rogue River NF	NA	73	167	355	3371	4950	3704	29	12,600	50	25,200
Eugene BLM	*	*	*	*	2875	1535	3052	41	8,000	38	21,200
Roseburg BLM	*	*	*	*	2382	1667	4970	55	9,800	38	25,500
Total, LSR 222	206	1139	368	2550	27801	42576	60042	45	132,800	26	508,000
%	(0.2)	(0.8)	(0.3)	(1.9)	(20.6)	(31.6)	(44.6)				
Medford BLM LSR 224	*	*	*	*	3664	2541	4945	44	11,400	53	21,500
%	*	*	*	*	(32.9)	(22.8)	(44.3)				
Rogue River NF LSR 225	NA	230	315	751	6436	6673	4921	25	19,400	49	39,800
%	NA	(1.2)	(1.6)	(3.9)	(33.3)	(34.5)	(25.5)				
Rogue River NF LSR 226	NA	100	102	460	3609	5624	3751	27	13,700	28	49,800
%	NA	(0.7)	(0.7)	(3.4)	(26.4)	(41.2)	(27.5)				
Winema NF	2	7	42	NA	89	1138	796	30	3,600	7	48,800
Rogue River NF	338	241	81	364	1382	2078	1328	25	5,800	11	52,800
Total, LSR 227	340	248	122	364	1471	3216	2124	27	9,400	9	101,600
%	(4.3)	(3.1)	(1.5)	(4.6)	(18.7)	(40.9)	(26.9)				

Table 35: Vegetation Seral Stage in Riparian Reserves, LSR 222 vs. Southern LSRs (224, 225, 226, 227)

	LSR			
Class	**LSR 222 Acres**	**(%)**	**Southern LSR Acres**	**(%)**
Water	206	(0.2)	340	(0.6)
Rock	1,139	(0.8)	578	(1.1)
Grass	368	(0.3)	539	(1.0)
Shrub	2,550	(1.9)	1,614	(3.1)
Early	27,801	(20.6)	15,992	(30.8)
Mid	42,576	(31.6)	17,686	(34.0)
Late	60,042	(44.6)	15,350	(29.4)
Riparian Total Acres	134,682	(26)	51,993	(24.4)
Total LSR Acres	508,847		212,931	

Table 36 presents vegetation seral condition in riparian reserves by fifth field watersheds within the LSRs. Percent late seral condition ranges from 19% to 63% with the majority of the watersheds containing less than 50% late seral riparian reserve vegetation and several containing less than 25% late seral.

Table 36: Vegetation Seral Stage in Riparian Reserves, by Watershed

Watershed	LSR	Admin. Unit	Seral Condition						Total Acres
			Early	%	Mid	%	Late	%	
Coast Fork Willamette 1	222	Eug BLM	1,561	32	714	14	2,659	54	4,900
Coast Fork Willamette 2	222	Eug BLM	2,981	34	1,615	18	4,157	47	8,800
Coast Fork Willamette 3	222	Eug BLM	2,664	41	2,470	38	1,444	22	6,600
Upper Rogue 5	222	RR NF	3,369	27	4,950	39	3,706	29	12,600
North Umpqua 5	222	Ump NF	429	21	709	35	744	37	2,000
North Umpqua 7	222	Ump NF	2,138	13	5,187	33	8,008	51	15,800
North Umpqua 8	222	Ump NF	5,985	22	8,611	32	12,096	44	27,300
North Umpqua 9	222	Ump NF	634	20	977	31	1,435	46	3,100
North Umpqua 9	222	Rsbg BLM	1,833	28	1,266	11	3,482	52	6,600
North Umpqua 10	222	Rsbg BLM	609	23	397	15	1,687	63	2,700
South Umpqua 1	222	Ump NF	1,959	15	4,544	36	5,796	45	12,800
South Umpqua 2	222	Ump NF	705	09	2,696	36	3,779	50	7,500
South Umpqua 3	222	Ump NF	1,253	12	4,088	39	4,809	46	10,400
Coast Fork Willamette 1	222	Will NF	1,791	37	1,001	20	1,952	40	4,900
Middle Fork Willamette 19	222	Will NF	1,745	21	2,957	35	3,463	41	8,500
Middle Fork Willamette 21	222	Will NF	1,417	17	2,328	28	4,095	50	8,200
Middle Fork Willamette 23	222	Will NF	1,063	27	982	24	1,485	37	4,000
Upper Rogue 5	224	Med BLM	3,664	33	2,541	23	4,945	44	11,100
Upper Rogue 1	225	RR NF	6,448	33	6,682	35	4,926	25	19,300
Upper Rogue 1	226	RR NF	193	24	316	40	221	28	800
Upper Rogue 2	226	RR NF	3,399	27	5,290	41	3,528	28	12,800
Upper Rogue 8	227	RR NF	1,383	24	2,064	36	1,323	23	5,800
Upper Klamath Lake 2	227	Win NF	317	38	308	37	161	19	800
Upper Klamath Lake 3	227	Win NF	486	40	457	37	244	20	1,200
Upper Klamath Lake 13	227	Win NF							

CHAPTER 4: DESIRED FUTURE CONDITIONS

INTRODUCTION

Late-Successional Reserves are designed to maintain a functional, interacting, late-successional and old-growth forest ecosystem (ROD, C-11). This assessment makes the assumption that if the structural components are in place, the ecological processes and functions associated with late-successional forest ecosystems will continue. These structural components include large trees, multiple-canopy stands, snags, down wood, logs in streams, and small openings.

Time is an important element in the health of the late-successional forest. For example, where areas of large trees, snags, and down wood are lacking due to past practices, the LSR allocation, allowing as it will the growth of forest stands over time, will tend to increase those components. Nevertheless, the overall goal for Late-successional Reserves as stated in the ROD takes an active managerial stance to "protect and enhance" the Reserves.

The desired future conditions described in this assessment will not be attained for many decades, or possibly more than a century. The amount of treatments proposed for exemption from further REO review, or the amount of projected treatments overall, are not intended to represent the long term activity levels needed to reach desired future conditions. The natural growth and evolution of forest stands and habitat over time will be a major factor in attaining desired conditions. Projected amounts of treatment are intended to represent a conservative management approach based on the limits of existing data and experience in managing for late-successional conditions.

Two desired future conditions were developed by the South Cascades LSR Assessment team that follow directly from the overall goal and the existing conditions: one for the amount of late seral forest, and one for the amount of high fire risk fuels. These were judged to be specific, measurable, and directly related to LSR objectives.

DESIRED FUTURE CONDITION FOR LATE SERAL VEGETATION

Terrestrial areas in LSRs 222, 225, 226, and the western portion of 227 have a desired condition of 75 percent late seral vegetation. This drops to 55 percent in LSR 224, and 50 percent in the eastern portion of LSR 227.

Riparian reserves in these LSRs have a desired condition of 75 percent late seral vegetation. There may be riparian reserves adjacent to smaller, intermittent streams that cannot maintain this level of late seral vegetation due to fire regimes and site character (e.g. LSR 224). Administrative units should address this issue during the watershed analysis process.

Stands include large trees, snags, canopy gaps, patchy understory for developing multiple canopy layers, large woody material, and future understory trees. While the percentage of late seral vegetation is the measurable objective, the following are also included as components of the desired condition:

Vegetation structure and pattern are diverse

Forest vegetation structure and pattern are diverse. Patch size, plant species composition, and other late successional characteristics meet the habitat requirements for late successional associated species. Forest and riparian reserve vegetation structure and pattern contribute to landscape level land management objectives.

Habitat for early/mid successional species is maintained

Habitat for early and mid-successional species is maintained when LSR populations of those species are important for viability of the species over a broader geographic area, or if any of those species should be locally endemic to these LSRs. This is appropriate for special habitats, such as meadows, or where development of habitat for late-successional species is not substantially delayed. Otherwise, most early/mid successional species habitat is expected to be maintained outside of LSRs.

Connectivity exists between and within watersheds

Connectivity of terrestrial, riparian, and aquatic conditions is promoted between and within watersheds. Late seral vegetation provides connected and resilient watershed processes within and between watersheds. Within watersheds, the terrestrial, riparian and aquatic system are connected. Aquatic systems consist of a diversity of species, populations, and communities that may be uniquely adapted to these specific structures and processes.

LSRs offer protection for all stream types, and provide core areas of high quality stream habitat. Figure 14 describes general riparian and stream conditions in properly functioning watersheds (See Appendix A).

Snags and down wood levels maintain species diversity

Levels of snags and down wood are high enough, variable enough, and change enough, in time and space, to maintain site productivity and species diversity in terrestrial, riparian, and aquatic communities. Abundance and distribution of snags and down wood ameliorates changes in habitat condition and climatic anomalies.

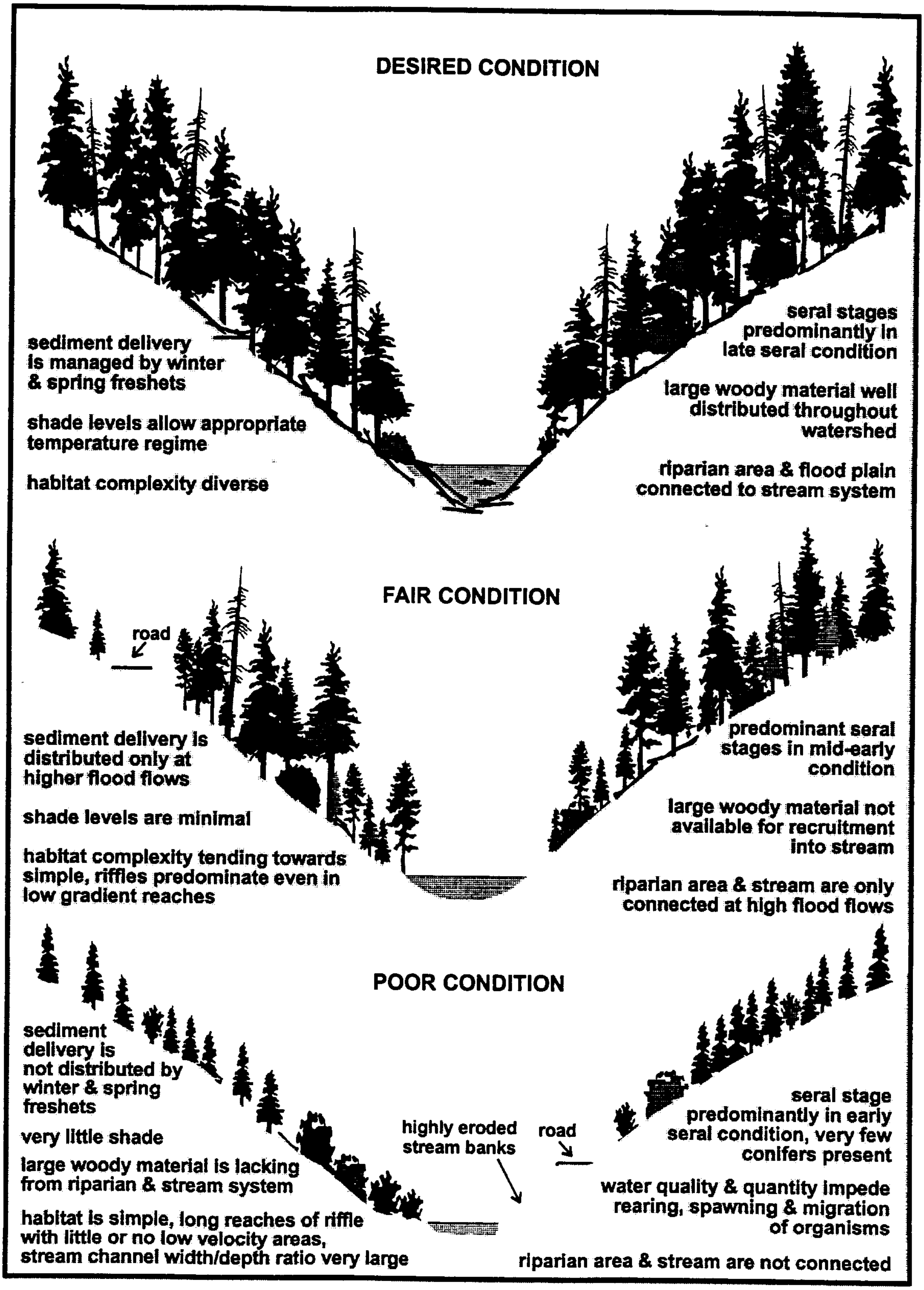
Terrestrial habitats maintain healthy, source populations of late seral and old growth associated species

Patch size, amount of interior habitat, plant species composition, and other late seral characteristics offer core areas of high quality habitat. High amounts of source and refuge habitats for late seral and old growth associated species are found throughout the landscape.

Wet area habitats maintain high levels of source populations

Aquatic and terrestrial habitats of native species dependent on wet areas are restored and maintained. Structures and processes are in place to maintain high levels of source populations (ROD, B-11).

Figure 14: Riparian Conditions



RATIONALE FOR LATE SERAL DFC

Historic amounts of late seral habitat have been estimated for southwestern Oregon, and range from 40 to 70 percent (REAP, 1994). The assessment team assumes that late seral processes were functioning in this range. These estimates are for the total landscape. Since harvest will now be concentrated in non-LSR areas, these areas will contain substantial amounts of early and mid-seral forest. Further, the focus of LSRs is to enhance late seral habitat. Therefore, the high end of the historic range is recommended as a DFC for these LSRs. The Visual Dynamics Development Tool (VDDT) was used to verify the estimates of sustainable late seral vegetation in these LSRs (Appendix H). Those results show that the DFCs listed above are reasonable for each LSR overall. However, there is a wide range of sustainability within each LSR. The numbers are used to compare LSRs and watersheds. They are not to be used for every stand or area.

INDICATORS FOR LATE SERAL DFC

Percentage of capable, terrestrial LSR acres in late seral condition.
Percentage of capable, riparian reserve LSR acres in late seral condition.

Indicators will be displayed by LSR and fifth field watershed. Data source for both is the seral map produced from a satellite vegetation size/structure pixel layer for Forest Service lands and the Forest Operations Inventory and MICROSTORMS for BLM lands. See Appendix D for classification assumptions.

DESIRED FUTURE CONDITION FOR HIGH FIRE RISK FUELS

No more than 28 percent of LSR acres are in high fire risk condition at any one time. Stands that develop after fire include large trees, snags, canopy gaps, patchy understory for developing multiple canopy layers, large woody material, and future understory trees. While the percentage of high risk fuels is the measurable objective, the following is included as part of the desired condition:

Features of the natural disturbance regime are maintained

Fire return intervals, stratified by geographic area and aspect, should approximate those found in Table 22, and be representative of natural disturbance regimes, to the extent practicable.

Wildfires, when they occur, are low to moderate intensity over about 75 percent of the area. Features of the natural disturbance regime operate at levels that maintain species, habitat diversity, and encompass less than natural levels of stand replacement events.

Large blocks of late seral habitat have fire risk levels that approximate those prior to the advent of fire exclusion.

RATIONALE FOR RISK REDUCTION DFC

Since the goal in LSRs is to protect late seral conditions, management should move in the direction of lowering risk that has increased since the advent of fire control, where possible, to be more consistent with natural fuel levels. "In general, fire is less prevalent on today's landscapes than in prehistoric times, due to effective fire control policies. Ironically, success in fire suppression has allowed more uniform and increasing fuel loads across the landscape, shifting forest fire effects that were typically of low and moderate severity in historic fires to more severe fire effects today." (Agee, 1990).

At the present time, about 65 percent of the acres in LSRs consist of high fuel loading, with about 28 percent in a low or moderate classification. This is about the opposite of what one would expect if fire had not been excluded from the landscape over the last 50 years. The goal of no more than 28 percent of each LSR in a high fire risk condition is based upon fire return intervals and professional judgment. It is not necessary nor desirable to eliminate all acres of high fire risk. Further, this number is also not intended as an absolute level for each watershed. It serves to both highlight the need to reintroduce fire into the system, and as an indicator to compare watersheds for the purpose of suggesting priorities for further analysis and treatment.

Large scale disturbances, such as fire, are natural events that can eliminate late successional conditions on hundreds or thousands of acres. Certain risk management activities, if properly planned and implemented, may reduce the probability of major stand replacing events. Although management activities to reduce risk levels are specifically addressed in the ROD for east of the Cascades and in the Oregon and California Klamath Provinces, they may also be undertaken in LSRs in other provinces where levels of fire risk are particularly high. There are watersheds with considerable risk of such events in the LSRs included in this assessment area. The extent of risk by LSR and by watershed, is outlined in Tables 20 and 21.

INDICATOR FOR RISK REDUCTION DFC

Percentage of LSR acres in the high fire risk category.

Results will be displayed by LSR and fifth field watershed. Data source is NFFL fuel models. See Appendix E for classification assumptions.

CHAPTER 5: TREATMENT CRITERIA AND NEEDS

INTRODUCTION

This chapter of the assessment describes the process and the criteria for developing appropriate treatments within the South Cascades LSR network. It identifies specific areas that could be treated under those criteria, and proposes an implementation schedule for treatments.

This chapter is organized according in the following main sections:

- Treatments and criteria to enhance late seral conditions,
- Treatments and criteria to reduce risks of large scale disturbance,
- Treatments and criteria for salvage, and,
- Treatments and criteria for multiple use activities other than silviculture.

The amount of treatments proposed for exemption from further REO review, or the amount of projected treatments overall, are not intended to represent the long term activity levels needed to reach desired future conditions. The natural growth and evolution of forest stands and habitat over time will be a major factor in attaining desired conditions. Projected amounts of treatment are intended to represent a conservative management approach based on the limits of existing data and experience in managing for late-successional conditions.

Survey and Manage, and other Northwest Forest Plan Standards and Guidelines continue to apply to activities within these LSRs.

Exemptions, from further REO review, within the east-half of LSR 227, are limited to those described in the Winema's Eastern Cascade Physiographic Province LSRA consistency finding of September 5, 1997.

TABLE 53 summarizes the treatment needs and criteria, treatment objectives, where those treatments might take place, and displays an estimate of the amount of those treatments. This chapter will provide the information on the treatments summarized in the table. Any conflicts, if they exist, between this table and the preceding text are to be resolved in favor of the text.

There are a variety of existing or potential conditions on the landscape which suggest management activities and treatments. In TABLE 53, these stand and landscape conditions are underlined. In those same columns, stand and landscape management criteria are summarized. These criteria have been established to guide prescriptions for appropriate treatments and are designed to help protect and enhance the structural components of late-successional ecological processes and functions. Not all criteria will be applicable with every project. The criteria vary by condition on the landscape and will also vary by 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 Regional Ecosystem Office (REO) for project specific review.

The activities listed in TABLE 53 are a list of management treatments that may be appropriate for a given existing condition. Site specific analysis is necessary to determine if an area would require some sort of vegetative manipulation to accelerate attainment of late-successional characteristics or lower the risk of large scale disturbance to existing late-successional forest.

The appropriate management activities listed in TABLE 53 are intended to result in 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 or minimize the risk of large scale disturbances. 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 the areas. Management activities in TABLE 53 are specific, including, where possible, how much of each might be expected. The objectives of each treatment are also listed.

PROCESS

There are five steps in the process of determining appropriate treatments. The first is the identification of conditions on the landscape that suggest treatment possibilities. See TABLE 53 and the rest of this section for treatment needs and criteria.

Second is a determination of additional analyses that must be completed before project level assessment can begin. Watershed analysis is required in key watersheds and riparian reserves (see Table 32).

Third, an interdisciplinary approach to a NEPA process is used to determine site specific issues and develop alternatives to address those issues, resulting in an integrated prescription.

The outcome, the fourth step in the process, is a decision to conduct an appropriate management activity, and the implementation of that treatment.

Monitoring is the fifth step, which results in learning that is then used to improve future projects.

LOW PRIORITY TREATMENTS

Site specific analysis may determine that an area is on a path for attainment of late-successional characteristics and is in a low fire risk area, or an area where high fire risk is acceptable. When this situation is encountered, regardless of seral stage of development, that area is a low priority for treatment.

Over time, however, areas that were on an acceptable path for attainment of late-successional characteristics may need treatment to maintain that path, to accelerate development of desired characteristics, or to minimize the risk of large scale fire.

TREATMENTS AND CRITERIA TO ENHANCE LATE SERAL CONDITIONS

INTRODUCTION

"Thinning or other silvicultural treatments inside reserves are subject to review by the Regional Ecosystem Office (REO) to ensure that the treatments are beneficial to the creation of late-successional forest conditions." (ROD C-12).

Stand and vegetation management of any kind, including prescribed burning, is considered a silvicultural treatment. Treatments to enhance late seral conditions will vary by site condition and will include: (TABLE 53)

- reforestation, revegetation, release, young stand thinning;
- density management;
- fertilization; and,
- meadow and special habitat maintenance.

REFORESTATION, RELEASE, AND YOUNG STAND THINNING[22]

Objectives

The objectives of these treatments are to place stands on the path to produce late seral structures, to increase the size of what will eventually become late seral blocks, to reintroduce previously native tree and plant species, and to produce large wood as quickly as possible for recruitment into streams.

Appropriate Treatments

Appropriate treatments are reforestation, revegetation, release, and young stand thinning.

Landscape Criteria and Priorities

Where resources to conduct needed treatments are limited, landscape placement priorities become important. Focus first in areas where concentrations of units exist. These patches will eventually become late seral blocks. The highest priority would be where these concentrations of units are located between late seral blocks. Also of high priority are those treatment areas which serve to provide connectivity between watersheds, and between ridges and riparian areas (Figure 15).

Treatment Amounts and Implementation Schedule

Reforestation treatments will mostly be the result of stochastic, stand replacing events, therefore the amount of these activities are not estimated. They should be conducted as needed. Revegetation needs will also be identified in watershed or project analysis.

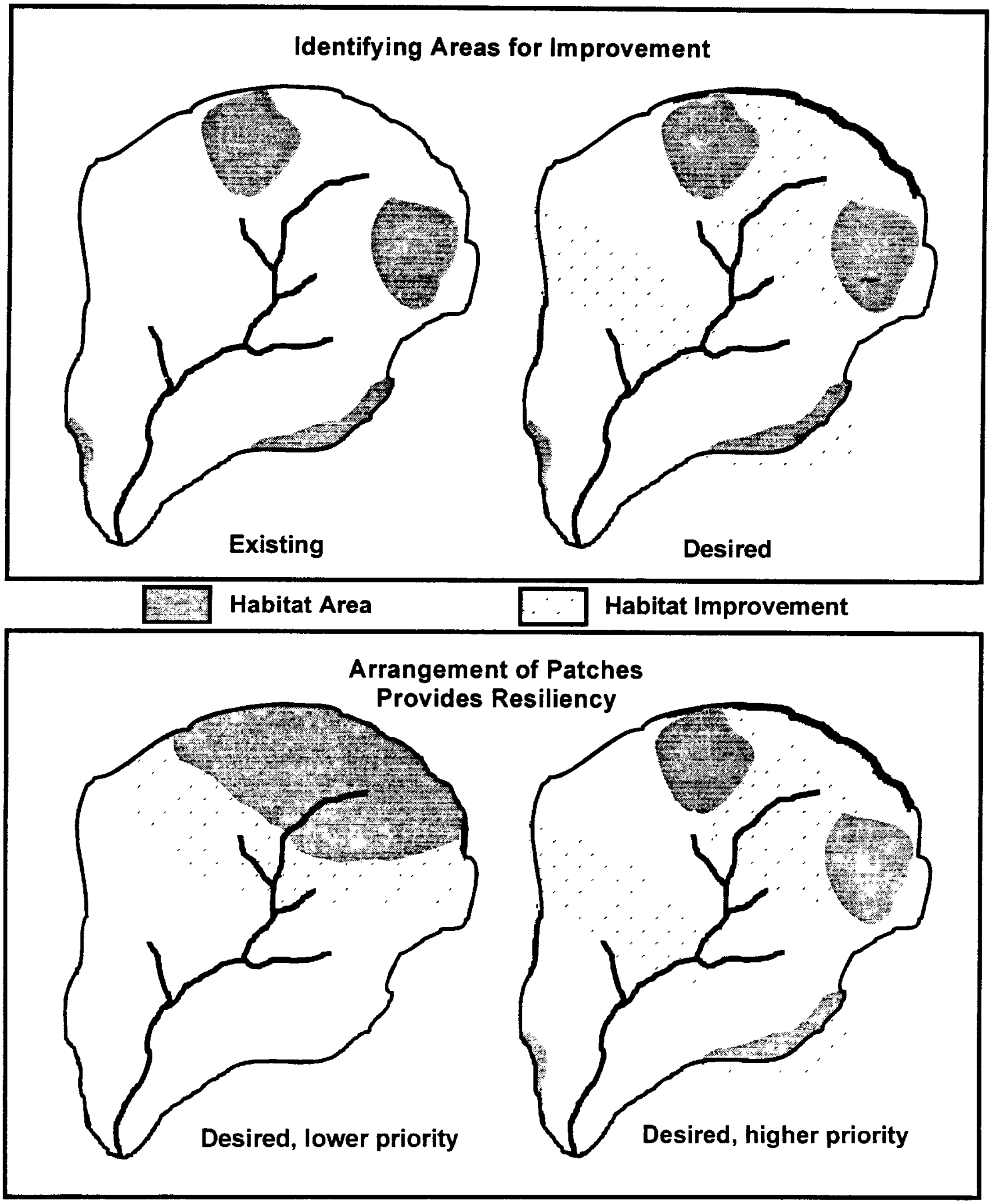
Release and young stand thinning locations are well identified at the unit level and will not be included here. When financial resources are limited, it is suggested that treatments be concentrated where there are opportunities to increase the size of existing and eventual late

[22] Young Stand Thinning is commonly referred to as TSI or precommerical thinning.

seral blocks, and in the case of riparian areas, in smaller basins where enough work can be conducted to contribute substantially to the objectives. Table 4 lists watershed priorities.

The Rogue River National Forest, in LSRs 225 and 226, plans to do approximately 2000 acres of brush cutting in 15-20 year old stands to accelerate late-successional structure by lessening moisture competition. This will also enhance big game forage.

Figure 15: Habitat Areas and Recommended Improvement within and between Watersheds



Reo Exemption Criteria for Reforestation, Release, and Young Stand Thinning (4/20/95)

The following stand criteria from the Regional Ecosystem Office exempts reforestation, release, and young stand thinning from further REO review, provided the criteria are followed. It has been sufficiently demonstrated that implementation of these activities is consistent with the attainment of late-successional characteristics. The criteria are included here for implementation convenience.

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 benefiting 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.

DENSITY MANAGEMENT[23]

Background and Rationale

Studies have shown that accelerated development of many of the structural components of late-successional stands can be achieved (Oliver 1992, Marshall 1991). Studies have not shown that silvicultural practices can accelerate development of owl habitat. Studies are underway to try to answer this question. 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, unless it encounters a disturbance, such as fire. 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 micro-climates, storing carbon) are 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 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 given equal 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.

[23] The term Density Management, commonly referred to as commercial thinning, is used in this assessment to mean manipulating stand densities for any reason consistent with LSR objectives. It reflects thinning in stands of larger diameter than is typical in young stand thinning, and means the same thing as commercial thinning in REO Criteria. Since commercial thinning has had a product output connotation, Density Management is the preferred term, and is used to emphasize LSR treatment objectives, which are not primarily commercial.

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. A continuum is present, with a wide range of development analogous to that 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 conditions (large trees, multiple layers, for example). Many of these conditions would occur within 30-75 years. Without thinning and underplanting, the managed stands would eventually obtain late-successional characteristics but attainment of many of these traits could take centuries.

Density Management Under 80 years Old

Objectives

The objectives of density management treatments in these stands are to place or keep stands on the path to produce or enhance late seral structures as soon as possible. Additional objectives are discussed in the REO criteria which follow.

Appropriate Treatments

Appropriate treatments include density management, snag creation, prescribed fire, underplanting, and down wood recruitment. Density treatments may occur in harvested units or in previously unmanaged areas under 80 years old.

Landscape Criteria and Priorities

Density treatment opportunities are limited primarily by the existing spatial location and vegetation condition in previous harvest units. Landscape placement priorities are important. Focus first in areas where concentrations of units exist. These patches will eventually become late seral blocks. The highest priority would be where these concentrations of units are located between late seral blocks. Also of high priority are those treatment areas which serve to provide connectivity between watersheds, and between ridges and riparian areas (Figure 15). Lower priority are the natural, unmanaged stands under 80.

Where spotted owl dispersal habitat is heavily dependent on concentrations of mid seral stands that are also candidates for density management, do not concentrate these treatments in time or space, but spread out these treatments to minimize possible short-term impacts to dispersal habitat.

The core team viewed larger scale maps of the entire assessment area. Several connectivity "hotspots" became apparent, areas where late seral habitat connectivity does not appear to be as good as elsewhere in the LSRs. The distribution and juxtaposition of seral stages in these areas seem perhaps not good enough to allow the LSRs to fully function as habitat reserves for the full array of late successional species known to exist in the assessment area. These areas are not necessarily currently incapable of providing for dispersal of species such as spotted owls, but due to the relatively high percentage of early seral stands, movement of less mobile species across these areas is probably precluded. These areas, which are all within LSRs, should be given priority consideration for treatments designed to enhance (accelerate) late successional conditions:

- The Calapooya Divide (the major ridge system between the Umpqua and Willamette Rivers),
- The lower portions of Steamboat Creek watershed,
- All of the BLM administered "checkerboard" lands,
- Lands in the vicinity of Crater Lake National Park, and,
- along the crest of the Cascades within LSR 227.

Stand Criteria

Use REO exemption criteria, page 138.

Per REO exemption letter, 7/9/96, avoid thinning where mid-seral stands under 80 years old are, or soon will be, nesting, roosting, and foraging habitat.

All other criteria found in the REO exemption letter apply as well.

Use Snag and LWM criteria, page 130.

See root disease guidelines, page 143.

Treatment Amounts and Implementation Schedule

Specific stand information for most managed stands is well known at the Ranger Districts and Resource Areas. That information will not be repeated in this assessment. Past harvests encompass the majority of density management treatment opportunities. Harvested areas currently occupy about 135,000 acres of land within the LSR network (Table 37). About 19 percent of total acres in LSR 222 have been harvested. Harvest has occurred in about 18 percent of LSR 224, 15 percent of LSR 225, 4 percent of LSR 226, and 27 percent of LSR 227. Research exists to support the idea that it is appropriate to change the trajectory that these stands are now taking with activities that manipulate the density and spacing of trees (Oliver and Larson, 1990; Marshall, 1991).

Table 37 represents the universe of candidate stands for density treatments in harvested stands. In addition, some natural, unmanaged stands under 80 years old may qualify as well. Including these stands, the entire universe of candidate stands is approximately 150,000 acres. Since in the past, managed stands in LSRs were treated for objectives other than contribution to late successional structures, most of these stands will be initial candidates for density management treatments to develop or accelerate the development of late successional characteristics.

For a variety of reasons, approximately 50 percent of these stands will not be treated. Project level analysis is expected to show that some of these acres will not need additional treatment to obtain late seral characteristics. Some will be spotted owl nesting, roosting, and foraging habitat. In addition, significant acres will be dropped from further consideration due to economics, road access, logging systems, non-treatment recommendations in riparian reserves, and other standards and guidelines. A closer estimate of actual treatment is approximately 75,000 acres. Due to the age class distribution of these stands, it is expected these acres be treated over a period of four decades. This results in approximately 19,000 treatment acres per decade.

Note: Treatments in this assessment are organized by primary objective. As such, there are significant overlaps between these acres and those identified later in this assessment. Specifically, there are overlaps with stands under 80 years old identified with a primary objective of reducing fuel loading, and with stands identified for density management with a primary emphasis on reducing moisture competition to favor native pine species.

Table 37: Past Harvest in LSRs by Watershed and Administrative Unit

LSR	Fifth Field Watershed (HUC5)	Admin. Unit	Harvest Acres in LSR	Total Acres in LSR	Percent Harvested
222	Coast Fk. Willamette 1	Umpqua NF	3,200	9,600	33
222	Coast Fk. Willamette 1	Eugene BLM	1,000	5,200	19
222	Coast Fk. Willamette 2	Eugene BLM	2,700	9,400	28
222	Coast Fk. Willamette 3	Eugene BLM	2,200	7,300	30
222	Middle Fk. Willamette 19	Willamette NF	8,700	32,600	27
222	Middle Fk. Willamette 21	Willamette NF	19,900	41,300	48
222	Middle Fk. Willamette 23	Willamette NF	6,200	18,900	33
222	North Umpqua 10	Roseburg BLM	4,000	11,300	36
222	North Umpqua 10	Eugene BLM	100	300	32
222	North Umpqua 5	Umpqua NF	2,400	11,200	22
222	North Umpqua 6	Umpqua NF	0	800	0
222	North Umpqua 7	Umpqua NF	3,800	69,000	5
222	North Umpqua 8	Umpqua NF	2,200	104,600	2
222	North Umpqua 9	Roseburg BLM	3,600	14,400	25
222	North Umpqua 9	Umpqua NF	200	13,600	2
222	South Umpqua 1	Umpqua NF	15,300	52,400	29
222	South Umpqua 2	Umpqua NF	6,500	31,100	21
222	South Umpqua 3	Umpqua NF	9,200	44,600	21
222	South Umpqua 4	Umpqua NF	500	4,900	11
222	Upper Rogue 5	Rogue River NF	3,700	25,500	14
222	**TOTAL ACRES**		**95,400**	**508,000**	**19**
224	Upper Rogue 5	Medford BLM	3,800	21,500	18
224	**TOTAL ACRES**		**3,800**	**21,500**	
225	Upper Rogue 1	Rogue River NF	6,100	39,800	15
225	**TOTAL ACRES**		**6,100**	**39,800**	
226	Upper Rogue 1	Rogue River NF	0	2,700	0
226	Upper Rogue 2	Rogue River NF	1,700	45,800	4
226	Upper Rogue 4	Rogue River NF	500	1,300	38
226	**TOTAL ACRES**		**2,200**	**49,800**	**4**
227	Upper Klamath 11	Rogue River NF	0	1,100	0
227	Upper Klamath 13	Winema NF	1,200	2,500	48
227	Upper Klamath Lake 2	Winema NF	8,600	11,800	73
227	Upper Klamath Lake 3	Winema NF	17,700	33,000	54
227	Upper Rogue 4	Rogue River NF	100	300	50
227	Upper Rogue 8	Rogue River NF	0	51,400	0
227	Upper Rogue 8	Winema NF	100	1,500	6
227	**TOTAL ACRES**		**27,700**	**101,600**	**27**
	TOTAL LSR NETWORK		**135,200**	**720,700**	**19**

Snag and Large Woody Material (LWM) Criteria

Introduction

This section includes criteria that are intended to provide the South Cascades LSR network with desired conditions for snags and LWM following density management activities.

It does not provide snag and LWM criteria following stand replacing events. (See the section, "Treatments and Criteria for Salvage" for that information.) It also does not provide criteria for fuel break treatments. (See the section, "Reduce Large Fire Risk with Fuel Breaks", for that information.)

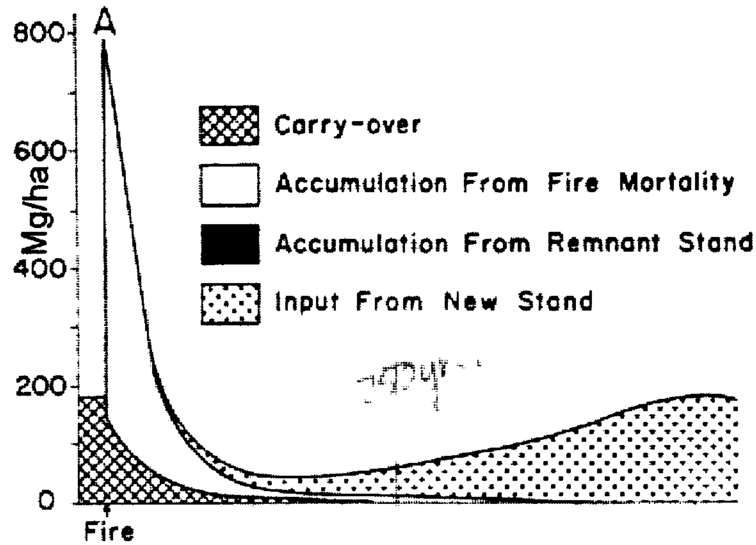
These criteria are not standards and guidelines, nor site-specific silvicultural prescriptions. Projects meeting LSR standards and guidelines, but not fitting the existing REO exemption criteria, should continue to be forwarded to the REO for review.

These criteria provide broadly defined desired conditions that are expected to be used with applicable portions from the existing REO exemption criteria for certain density management activities. It provides guidance to be used in LSRs and riparian reserve allocations to develop snag and LWM prescriptions where referred to in TABLE 53. These criteria are meant to assist in recommendations when watershed analyses do not provide adequate information to determine dead wood needs.

Background Context and Rationale

In the natural process, stand replacing fires that convert late to early seral vegetation add large amounts of dead wood to the system (Figure 16), from Spies, Franklin, and Thomas, 1988). In these natural early and mid-seral stands, the amount of dead wood is composed mostly of that created by fire mortality, with a lesser proportion composed of carry-over from the previous stand. The biomass from the fire mortality component is in the stage of most rapid decline. The carry-over component declines at a less rapid rate. The dead wood biomass reaches a low point at 100-200 years. Dead wood contribution from the new stand increases gradually.

Figure 16: Predicted Changes in LWM Mass Folowing Catastrophic Fire



For the most part, the stands considered here for density management were not created by the natural process described above, but were grown after regeneration harvest in stands averaging 250 years old. The total amount of dead biomass, prior to the regeneration harvest, was substantially below that of naturally created stands less than 80 years old, and was composed mostly of mortality inputs from the new stand. The ecology plot data were collected from stands averaging 250 years of age. Therefore, levels of dead wood following density management activities should approximate that represented by the ecology plot information.

LWM density in managed stands was summarized for 107 plots in the TSHE plant series. The mean density was compared with mean LWM density from ecology plots averaging 250 years old in the northern portion of the LSR network. Density levels were very similar (Table 38).

Table 38: Large Woody Material Comparison, Ecology Plots vs. Young, Managed Stands. Pieces Per Acre, by Plant Series, Northern Portion of LSR Network (Umpqua National Forest Data)

	Raw Mean Pieces/Acre by small end diameter and length					
Small end diameter	**6-15.9"**	**6-15.9"**	**16-23.9"**	**16-23.9"**	**24"+**	**24"+**
Piece Length	**<16'**	**16'+**	**<16'**	**16'+**	**<16'**	**16'+**
Western Hemlock, TSHE from ecology plots[24]	79	18	11	7	6	4
Western Hemlock, TSHE from managed stands[25]	66	14	12	7	5	9

The percentage of ground area covered by LWM was calculated from the managed stand survey plots. The median projected cover was 4.3 percent, with a range from 0-21 percent. The raw mean was 5 percent. Cover information from ecology plots was not available, however, since the pieces/acre are similar, cover percentage may be as well.

[24] Data taken from 137 ecology plots and includes measurements on 1004 logs (TSHE plant series).
[25] Data taken from 107 managed stand survey plots and includes measurements on 460 logs (TSHE plant series).

Although difficult to directly compare, Spies, Franklin, and Thomas, 1988, reported projected cover of LWM that translates to a mean of 10.6 percent cover, (plus or minus 1.3 percent cover, at one standard error), in young, natural stands in the Oregon Cascades.

Carey, A.B., and M.L. Johnson, 1995, suggest leaving, in areas capable of northern spotted owl habitat, 13-15 percent cover in 4" diameter and larger dead wood to meet the habitat needs of the small mammal prey base.

Since there is a large amount of variation of dead wood in natural stands, and not every unmanaged stand had these snags and LWM levels, one could argue that not every managed stand needs to meet these levels either. However, since there is more early and mid-seral vegetation on the landscape than desired in the South Cascades LSR network, and because density management treatments represent the only practical management opportunity to add dead wood to that portion of the landscape, thinning prescriptions should result in contributions of dead wood to these stands.

Snag Criteria for Managed Stands

Since snags were typically felled during regeneration harvest and in some cases during subsequent silvicultural activities, snag density in these stands is low. The levels of snags is very low compared to fire created stands of the same age, and low, even compared to these same sites prior to regeneration harvest.

This suggests a need to create snags in the short term. Duplicating the snag levels of naturally created stands of the same age might be possible for the smaller diameter snag classes, but would, in most cases, eliminate the broader objective of enhancing late seral conditions through density management. The reason for this is that duplicating those snag levels would require killing too many of the trees that are needed to produce both large overstory trees and the large trees needed to later serve as large diameter snags and sources of LWM. Since the objective is to accelerate the development of late-successional structural characteristics, including additional large dead wood, that large wood must first be grown.

The goal is to add some dead wood in the form of snags, without jeopardizing the long-term objectives of the treatment.

1. When preparing site-specific prescriptions for density management activities, consider treatment objectives, landscape and site factors when deciding specific snags levels. Consider the location and concentration of snags as related to slope position, aspect, fire history and risk, specific wildlife needs, adjoining allocations, access, restoration opportunities, etc.

2. To the extent practicable, leave and protect from disturbance, all snags, and especially any large diameter snags, that were present prior to the density management activity.

3. Where the density management harvest operation creates girdled, and/or broken top trees, leave those to become snags and overstory trees. These will add structural complexity to the stand.

4. Where prescribed burning is used, some level of additional snags from fire mortality is expected. Leave these newly created snags.

5. For the Winema portion of LSR 227, use the criteria from that assessment (Appendix J).

6. As a minimum, create additional snags, by size class and plant series, of the amounts listed in Table 39 and Table 40.

These tables are summaries from ecology plots, in stands that average about 250 years old. Since for most size classes of snags and LWM, the data are not normally distributed, the use of a raw mean is not the best measure of central tendency. The range, the median, or a histogram showing plot distribution would be a more appropriate display of existing conditions. However, using the mean as a guideline assures adequate minimums, and is easy to apply in the field. These minimum additions are both practical for most stands, and will not jeopardize treatment objectives.

Table 39: Minimum Snag Creation Amounts, by Plant Series
Northern Portion of LSR Network (Umpqua National Forest Data)[26]

Plant series	Raw Mean Snags/Acre by DBH			
	9-15.9"	16-19.9"	20-23.9"	24"+
Silver Fir, ABAM	10	2	2	4
Mountain Hemlock, TSME	20	4	2	2
White Fir, ABCO	6	2	1	4
Douglas-fir, PSME	9	1	1	2
Western Redcedar, THPL	5	4	1	3
W. Hemlock, TSHE	4	2	1	4
Oregon White Oak, QUGA[27]	9	1	1	2

Table 40: Minimum Snag Creation Amounts, by Plant Series
Southern Portion of the LSR Network (Cascades Portion, Rogue River NF data)[28]

Plant series	Raw Mean Snags/Acre by DBH			
	9-15.9"	16-19.9"	20-23.9"	24"+
Shasta Red Fir, ABMAS	6	2	1	4
Mountain Hemlock, TSME	6	2	1	3
White Fir, ABCO	4	1	1	2
Douglas-Fir, PSME	2	1	1	1
W. Hemlock, TSHE	5	2	1	3
Oregon White Oak, QUGA[18]	2	1	1	1
Lodgepole Pine, PICO[29]	6	2	1	1
Ponderosa Pine, PIPO[30]	2	1	1	1

LWM Criteria for Managed Stands

Depending on past markets for dead wood, LWM was removed during regeneration harvests in managed stands. The level of LWM is generally low compared to both fire created stands of the same age and optimum conditions for the small mammal prey base.

This suggests a need to create LWM in the short term. Duplicating the LWM levels of naturally created stands of the same age might be possible, but would, in most cases, eliminate the broader objective of enhancing late seral conditions through density management. The reason for this is that duplicating those LWM levels would require killing too many of the trees that are

[26] Total number of snags measured was 1748.
[27] Data were too limited for this Plant Series. This Series is mostly closely represented by the Douglas-fir Series, therefore those numbers are used in this table.
[28] Total number of snags measured was 443.
[29] Data were too limited for this Plant Series. Numbers were estimated to reflect the expected values for this Series. For the eastern portion of LSR 227, use guidelines from the Winema NF LSR Assessment.
[30] Data were too limited for this Plant Series. This Series is most closely represented by the Douglas-fir Series, therefore those numbers are used in this table. For the eastern portion of LSR 227, use guidelines from the Winema NF LSR Assessment.

needed to produce both large overstory trees and the large trees needed to later serve as large diameter snags and sources of LWM. Since the objective is to accelerate the development of late-successional structural characteristics, including additional large dead wood, that large wood must first be grown.

The goal is to add some dead wood in the form of LWM, without jeopardizing the long-term objectives of the treatment. For this LSR network, 13-15 percent projected cover is suggested as a maximum desired condition to strive for, with 5 percent as a short term goal. It is understood that depending on stand age and condition, even 5 percent may be impractical to obtain in one treatment. Therefore, the following criteria set intermediate levels as minimums following density management activities. These are not intended to be either standards and guidelines, or site-specific prescriptions, but minimums that, if followed, make significant contributions toward the long term desired condition.

Managed yield tables were used to obtain average tree sizes in order to estimate the projected cover percentage associated with three age classes in each Plant Series[31]. Table 41 presents this information in terms of the number of trees needed to be felled to produce 1 percent cover.

Table 41: Trees Per Acre Needed to Produce 1% Projected Cover

Plant series	Age Class		
	<50 yrs. BH age	50-70 yrs. BH age	>70 yrs. BH age
Silver Fir, ABAM[32]	13.4	7.7	5.0
Mountain Hemlock, TSME[33]	NA	NA	29
White Fir, ABCO[34]	11.6	5.8	3.3
Douglas-fir, PSME	14.5	8.7	5.5
Western Redcedar, THPL[35]	11.6	5.8	3.3
W. Hemlock, TSHE	11.6	5.8	3.3
Oregon White Oak, QUGA[36]	14.5	8.7	5.5
Shasta Red Fir, ABMAS	13.4	7.7	5.0
Lodgepole Pine, PICO[37]	NA	NA	NA
Ponderosa Pine, PIPO[38]	NA	NA	NA

[31] See the Appendix, "Projected Cover Assumptions in Managed Stands".
[32] In managed yield tables, the high elevation true fir series were combined.
[33] The amount of density management treatment is expected to be very low overall, and then only in stands >70.
[34] White fir and Western Hemlock Series were combined in managed yield tables.
[35] No managed yield table data available for this Series. TSHE/ABCO is used in this table.
[36] Data were unavailable for this Plant Series. This Series is most closely represented by the Douglas-fir Series, therefore those numbers are used in this table. For the eastern portion of LSR 227, use guidelines from the Winema NF LSR Assessment.
[37] Data unavailable for these Series. In the South Cascades LSR network, these Series are mostly within the eastern portion of LSR 227, therefore use LWM guidelines from the Winema NF LSR Assessment.
[38] Data unavailable for these Series. In the South Cascades LSR network, these Series are mostly within the eastern portion of LSR 227, therefore use LWM guidelines from the Winema NF LSR Assessment.

1. When preparing site-specific prescriptions for density management activities, consider treatment objectives, landscape and site factors when deciding specific LWM levels. Consider the location and concentration of LWM as related to slope position, aspect, fire history and risk, specific wildlife needs, adjoining allocations, access, restoration opportunities, etc.
2. To the extent practicable, leave and protect from disturbance all LWM that was present prior to the density management activity.
3. Impacts to LWM decay classes III, IV, and V during density management operations will negatively effect habitat quality. These pieces still function as refuge habitat for some late successional species. Use yarding techniques to minimize disturbance to this LWM.
4. For the Winema portion of LSR 227, use the criteria from that assessment (Appendix J).
5. Where prescribed burning is used, focus fuel reduction efforts in the smaller size classes.
6. Where fire hazard reduction is the prime objective, leave no more than 2-10 tons per acre in the 0-9 inch diameter class, 10-15 tons per acre in the 10-20 inch class, and 5-10 tons per acre in the 21 inch and greater size class, for a total of no more than 17-35 tons per acre.
7. Sample to determine pretreatment raw mean projected cover percentage of LWM.
8. In stands less than 50 years old, create 1 percent additional cover or less to equal a maximum of 13 percent projected cover of LWM. In stands 50-70 years old, create 3 percent additional cover or less to equal a maximum of 13 percent cover. In stands greater than 70 years old, create 5 percent additional cover or less to equal a maximum of 13 percent cover. See Table 42.
9. Take credit for existing and created snags to meet this additional LWM.
10. The split in additional dead wood between snags and LWM can be adjusted in the silvicultural prescription.

Table 42: Additional LWM Cover to Create, by Stand Age and Existing Cover

Stand Age, All Plant Series	**Existing LWM Cover Percentage**					
	0-8%	**9%**	**10%**	**11%**	**12%**	**13%+**
<50 Yrs	1%	1%	1%	1%	1%	0%
50-70 Yrs	3%	3%	3%	2%	1%	0%
>70 Yrs	5%	4%	3%	2%	1%	0%

Example 1.

A stand has an existing LWM percentage cover of 5 percent, and is in a 55 year old stand. Refer to Table 42 to find the amount of additional LWM cover needed (3 percent). If the Plant Series is Western Hemlock, Table 41 suggests that 5.8 trees per acre are needed to provide 1 percent cover. Therefore, to create 3 percent cover, 17 trees per acre will be needed for the additional LWM (5.8 x 3 = 17 trees).

Example 2.

A 40 year old stand in the Douglas-fir Plant Series does not have any existing LWM. Create 1 percent cover (15 trees/acre). If this stand were again considered for density management at age 75, 5 percent cover would need to be created. This would require leaving 5.5 x 5, or 28 trees per acre as additional LWM, for a total of approximately 6 percent projected cover area. This stand, that had no LWM at age 40, will have made significant progress toward its long-term LWM goal by the time it reaches the early late seral stage.

REO Exemption Criteria for Certain Commercial Thinning Activities (7/9/96, as modified by REO letter, 9/30/96)

The following criteria from the Regional Ecosystem Office (REO) exempt certain density management from further REO review, provided the criteria are followed. It has been sufficiently demonstrated that implementation of the activities listed is consistent with the attainment of late-successional characteristics. The criteria are included here for implementation convenience.

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)[39] 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

[39] In this assessment, the term Large Woody Material (LWM) will be used. It means the same thing as CWD used in the REO criteria.

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 stands 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 Roforestation 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.

2. 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.

3. 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.

4. 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.

5. 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.

6. 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.

7. 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:
   1). 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.
   2). 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.

3). Combined into bullet 2) above, by 9/30/96 REO letter.

4). 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.

5. 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.

6. 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.

Root Disease Guidelines

The following guidelines apply to young stand thinning and density management treatments:

Early Seral Stands

The presence of root diseases in young stands should be a factor in determining species to favor in stocking control measures done to accelerate development of late-successional character. Many plantations occur in the LSR network where root disease-susceptible species were planted in areas of high inoculum. High levels of inoculum and a high proportion of susceptible hosts at the early stages of stand development can result in large areas where development of large tree size is significantly slowed or even precluded.

In stands younger than 25 years where greater than ten percent of the area is determined to contain root diseased trees, thinning should be avoided unless root disease-susceptible species can be discriminated against in favor of root disease-resistant species. Consideration should be given to planting root disease-resistant species in openings created by root disease.

- In young stands affected by laminated root rot, discriminate against Douglas-fir, white fir, grand fir, and mountain hemlock.
- In young stands affected by annosus root disease, discriminate against white fir and grand fir.
- In young stands affected by black stain root disease, discriminate against Douglas-fir.
- In young stands affected by Armillaria root disease, conduct site specific analysis to determine resistant species.

Mid Seral Stands

The presence of root diseases in older stands should be a factor in determining species to favor in intermediate entries done to accelerate development of late-successional character. Many stands occur in the LSR network where root disease-susceptible species are growing in areas of high inoculum. Root diseases in these older stands may be beginning to provide canopy openings important to late-successional character, however, additional entries in the stand may exacerbate root disease impacts beyond desirable levels.

In established stands older than 25 years, do not conduct intermediate entries where root disease is present on more than 25% of the area.

- Consider planting root disease-resistant species in openings if Douglas-fir, white fir, or grand fir make up a high proportion of the stand and a high degree of crown closure is desired.

In established stands where root disease is present at lower levels and intermediate stand entries are planned, discriminate against susceptible species during the entry. Avoid soil compaction.

Density Management Over 80 Years Old

Background

Representatives from the Rogue River, Willamette, and Umpqua National Forests have suggested stands exist that are over 80 years old, but otherwise would meet the criteria for density management treatments to enhance late seral structural characteristics. The assessment team reviewed one such stand on the Roseburg District BLM. It was determined to not need additional treatments to enhance LSR objectives. Although it is reasonable to presume that within the South Cascades LSRs, stands do exist, over 80 years old, where existing conditions and slowed stand differentiation is delaying attainment of late seral structure, specific stands have not been verified. Therefore, exemption from further REO review is not requested at this time. See also the section below, "Density Management in Pines Over 80 years Old".

Objectives and Criteria

Specific project proposals are needed to reconsider the 80 year limit. This will require REO review.

Treatment Amounts and Implementation Schedule

TABLE 53 does provide an estimate of 2200 acres which may qualify for treatment. In LSR 222, on the Willamette National Forest, there exists about 4800 acres of 90-110 year old timber resulting from stand replacement fire. Some of these stands are on the verge of developing late successional structure, with understory initiation a result of small openings, while other areas still lack, and will lack for some time to come, late successional structure. Stands needing treatment, over 80 years old, are not mapped, but 2200 acres has been estimated.

On the Rogue River National Forest, in the upper portion of LSR 225, there is an area of dense Lodgepole pine of relatively high fire risk, for which density management has been considered. By the time these stands are large enough for commercial viability, they are over 80 years old.

Density Management in Pine Under 80 Years Old

Objectives

The objective of treatment is to reduce moisture competition to favor native pine species planted on appropriate sites. This will serve to maintain the seral pine component and associated habitat by enhancing the vigor of trees. This will help avoid undesirable losses due to bark beetles. See also applicable objectives in the 7/9/96 REO exemption criteria.

Appropriate Treatments

Use density management and/or prescribed fire to remove competing vegetation near pines.

Landscape Criteria and Priorities

In the South Cascades LSRA, sugar and ponderosa pines will generally be found in low elevations and in the Oregon White Oak Plant Series north of the Rogue-Umpqua Divide, and at mid to low elevations south of the Rogue-Umpqua Divide in the Douglas-fir, Oregon White Oak, and White Fir Plant Series. Western white pine occurs at higher elevations across a wider range of plant series.

Density treatment opportunities are limited primarily by the existing spatial location and vegetation condition in previous harvest units. Landscape placement priorities are important. Focus first in areas where concentrations of units exist. These patches will eventually become late seral blocks. The highest priority would be where these concentrations of units are located between late seral blocks. Also of high priority are those treatment areas which serve to provide connectivity between watersheds, and between ridges and riparian areas (Figure 15).

Where spotted owl dispersal habitat is dependent on concentrations of mid seral stands that are also candidates for density management, do not concentrate these treatments in time or space, but spread out these treatments to minimize possible short-term impacts to dispersal habitat.

Stand Criteria

In early and mid-seral stands (under 80 years old), use the 7/9/96 REO exemption criteria for commercial thinning. Per REO exemption letter, avoid thinning where mid-seral stands under 80 years old are, or soon will be, nesting, roosting, and foraging habitat.

For prescribed fire, also use guidelines from the prescribed fire plan.

In mixed species stands, vary density in species other than pine. Avoid clumpy pine distribution.

Use Snag and LWM criteria, page 130.

See root disease guidelines, page 143.

To minimize the loss of pines to bark beetles:

- manage density near sugar pine and western white pine such that basal area will not exceed the threshold of 140 square feet/acre;
- manage density near ponderosa pine such that basal area will be less than or equal to 120 sq. feet/acre on dry sites, 150 sq. feet/acre on moderate sites, and 180 sq. feet/acre on moist sites with deep soils.

These levels are thresholds, above which, the pine becomes much more susceptible to bark beetle loss. In the immediate vicinity of pines, strive to maintain basal area at or below these levels. These specific basal areas may, of course, be modified by the project silvicultural prescription.

Treatment Amounts and Implementation Schedule

Table 43 provides an estimate of the total early and mid-seral acres where sugar and ponderosa pine are more likely to occur. These include both previously harvested, managed stands and natural, unmanaged stands. The total is approximately 160,000 acres.

For a variety of reasons, approximately 50 percent of these stands will not be treated. Project level analysis is expected to show that some of these acres will not need additional treatment to obtain late seral characteristics. Some will be spotted owl nesting, roosting, and foraging habitat. In addition, significant acres will be dropped from further consideration due to economics, road access, logging systems, non-treatment recommendations in riparian reserves, and other standards and guidelines. A closer estimate of actual treatment is approximately 80,000 acres. Due to the age class distribution of these stands, it is expected these acres be treated over a period of four decades. This results in approximately 20,000 treatment acres per decade.

Note: Treatments in this assessment are organized by primary objective. As such, there are significant overlaps between these acres and those identified elsewhere in this assessment. Specifically, there are overlaps with stands under 80 years old identified with a primary objective of reducing fuel loading, and with other stands under 80 years old identified for density management.

Table 43: Early and Mid-Seral Acres with Ponderosa and Sugar Pine

North of the Rogue-Umpqua Divide			
LSR	**Administrative Unit**	**Estimated Total Acres**	**Estimated Treatment**
222	Eugene BLM	9,400	4,700
222	Roseburg BLM	4,600	2,300
222	Umpqua NF	72,800	36,400
222	Willamette NF	24,000	12,000
Totals		**110,800**	**55,400**
South of the Rogue-Umpqua Divide			
222	Rogue River NF	10,700	5,400
224	Medford BLM	11,500	5,800
225	Rogue River NF	7,700	3,900
226	Rogue River NF	10,300	5,200
227	Rogue River NF	4,300	2,200
227	Winema NF	6,100[40]	3,000
Totals		**50,600**	**25,500**

[40] Winema NF LSRA estimates treatment of half this total.

FERTILIZATION IN STANDS UNDER 80 YEARS OLD

Objectives

The objective of the fertilization treatment is to enhance the development late-successional characteristics.

Fertilization will be used to enhance the survival and growth of riparian revegetation treatments, shorten the time to tree crown closure following young stand thinning or density management treatments, particularly in transient snow zones, or selectively improve the competitive position of desired vegetation over nonnative species or noxious weeds.

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.

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

Appropriate Treatments

Selective fertilization is an appropriate treatment to favor the competitive position of some plant and tree individuals or species over others, enhance differentiation of vertical structure.

Broadcast fertilization in early seral stands is an appropriate treatment to enhance growth and shorten the time to crown closure.

Landscape Criteria and Priorities

No landscape criteria have been identified.

Stand Criteria

The basal-area-weighted average age of the stand is less than 80 years.

The treatment is a treatment designed to increase tree size, crown development, or other desirable characteristics; to maintain vigor for optimum late-successional development; to increase diversity of size classes within the stand or landscape; or to meet one of the objectives described above.

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.

Use all existing agency guidelines for fertilization, keeping clearly in mind the objectives of LSRs.

Conduct appropriate surveys to determine existing and likely species to benefit. Fertilizer may have undesirable effects to other important plant species and to nutrient cycling in wet areas. Analyze effects on nonnative and exotic species, and avoid treatment where treatment is likely to enhance nonnative species or noxious plants.

Keep fertilizer out of streams and wet areas.

Treatment Amounts and Implementation Schedule

Medford District of the Bureau of Land Management, LSR 224, will treat stands created as a result of a 3000 acre stand replacement fire on Burnt Peak in 1987. The unit has estimated the maximum amount of treatment at 2500 acres, and requests the ability to treat up to this amount, for a maximum of ten years. If further treatments are expected, the District will bring the treatment back to REO for review.

MEADOW AND SPECIAL HABITAT MAINTENANCE

Objective

The objective is to maintain openings associated with meadows and special habitats that have been declining due to fire exclusion. Habitat for early and mid-successional species is maintained when LSR populations of those species are important for viability of the species over a broader geographic area, or if any of those species should be locally endemic to these LSRs. This is appropriate for special habitats, such as meadows, or where development of habitat for late-successional species is not substantially delayed. Otherwise, most early/mid successional species habitat is expected to be maintained outside of LSRs.

Appropriate Treatments

There are some areas in the LSR network which are not, and are not expected to be, on a trajectory of attaining late-successional forest structural characteristics. Rock outcrops, wetlands, Oregon White Oak Plant Series, and meadows areas, occupy a small area of the landscape (less than 1 percent), and are considered important for contribution to diversity across the landscape. Management activities will be implemented to maintain these openings. Prescribed fire, as well as manual or mechanical clearing are appropriate treatments to curtail tree encroachment.

Landscape Criteria and Priorities

Meadow maintenance needs are mostly along the Calapooya Ridge and the Rogue-Umpqua Divide, although treatments are not limited to these areas.

The White Oak Plant Series occupies about 1,300 acres in LSRs, most of that is in LSR 224.

Stand Criteria

Use applicable agency guidelines for these treatments.

If fire is used, follow prescribed burn plan.

Treatment Amounts and Implementation Schedule

Table 44 presents the total and maximum treatment acres of meadows and the Oregon White Oak Plant Series within the South Cascades LSR network.

From a total of 14,000 acres of meadows, REO exemption from further review is requested for approximately one-third of this, or 4,700 acres. Exemption is requested for 1,300 acres, the total amount, for prescribed burning in the White Oak Plant Series.

For tracking purposes, these amounts are displayed by LSR administrative unit. If proposed treatments would exceed the amount listed by individual LSR administrative unit, coordination with other units in that LSR will be needed to assure that the amount listed as exempt from REO review is not exceeded for that LSR as a whole.

Table 44: Meadows and White Oak Plant Series

Administrative Unit	Habitat	Max. Treatment Acres	Amount Exempt from Further REO Review
LSR 222, Umpqua NF	Oregon White Oak Series	400	400
LSR 224, Medford BLM	Oregon White Oak Series	900	900
Total		**1300**	**1300**
LSR 222, Eugene BLM	Meadows	100	50
LSR 222, Roseburg BLM	Meadows	150	50
LSR 222, Umpqua NF	Meadows	3,600	1,200
LSR 222, Willamette NF	Meadows	2,100	700
LSR 222, Rogue River NF	Meadows	500	200
LSR 224, Medford BLM	Meadows	1,000	300
LSR 225, Rogue River NF	Meadows	2,400	800
LSR 226, Rogue River NF	Meadows	850	300
LSR 227, Rogue River NF	Meadows	2,000	700
LSR 227, Winema NF	Meadows	1,150	400
Total		**13,850**	**4,700**

TREATMENTS AND CRITERIA TO REDUCE RISKS OF LARGE-SCALE DISTURBANCE

INTRODUCTION

Prescribed burning is considered a silvicultural treatment, and may be beneficial to the creation of late-successional forest conditions (ROD, C-12). Prescribed fire, or other risk management activities, should occur first in the high risk areas. There are four categories of activities to lower risk and reintroduce fire into South Cascades LSRs (TABLE 53):

- Reduce large scale fire risk with the creation of shaded fuel breaks;
- Reduce the amounts of high risk fuels in stands under 80 years old;
- Reduce the amounts of high risk fuels in stands over 80 years old;
- Reduce moisture competition for large pine in stands over 80 years old.

REDUCE LARGE FIRE RISK WITH FUEL BREAKS

Objective

The objective is to protect large blocks of late seral habitat from, and minimize the risk of, large scale fire; while minimizing treatment risk to that habitat. Another objective is to increase the ability to safely and effectively conduct initial attack fire control activities. It is not the intent of fuel breaks to remove all LWM. The objective is to focus on the reduction of smaller fuels and to create conditions that lower the intensity of fire approaching the fuel break.

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.

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

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.

Appropriate Treatments

Young stand thinning, density management, and/or prescribed fire are all appropriate activities to meet fuel break objectives.

Landscape Criteria and Priorities

Fuel break treatments will occur first in the high fire risk areas. Two components, fuel models and fire behavior, have been combined to help determine where that risk is high. Map 8 displays these high risk areas. Verification of high risk fuels will be needed in the watershed preattack, or equivalent plan.

The fuel breaks are intended to break the high risk area into 4000-6000 acre blocks, thus reducing the risk of a large scale incident burning even larger watersheds. Figure 17 shows the intended size of blocks to protect across the landscape. It is not intended as an exact display of actual locations. Watershed level or project preattack, or equivalent plans will propose actual locations.

Fire behavior is the most important component. Fire occurrence may vary over time due to changes in lightning and recreation patterns. Due to this changing pattern, and practical treatment operations, treatment should not be precluded in areas of low-moderate risk if fire behavior is indicated as high.

Implementation of fuel breaks within late seral stands would result in habitat degradation within the fuel breaks and increase the amount of edge in cases where the fuel breaks go through intact stands. This impact would not be as great in cases where the fuel breaks go along existing edges of intact stands. Therefore, avoid locations which would split large blocks of late seral habitat. Place fuel breaks only along the edges of significantly large patches of late seral habitat/suitable NRF where a high risk of large scale loss exists.

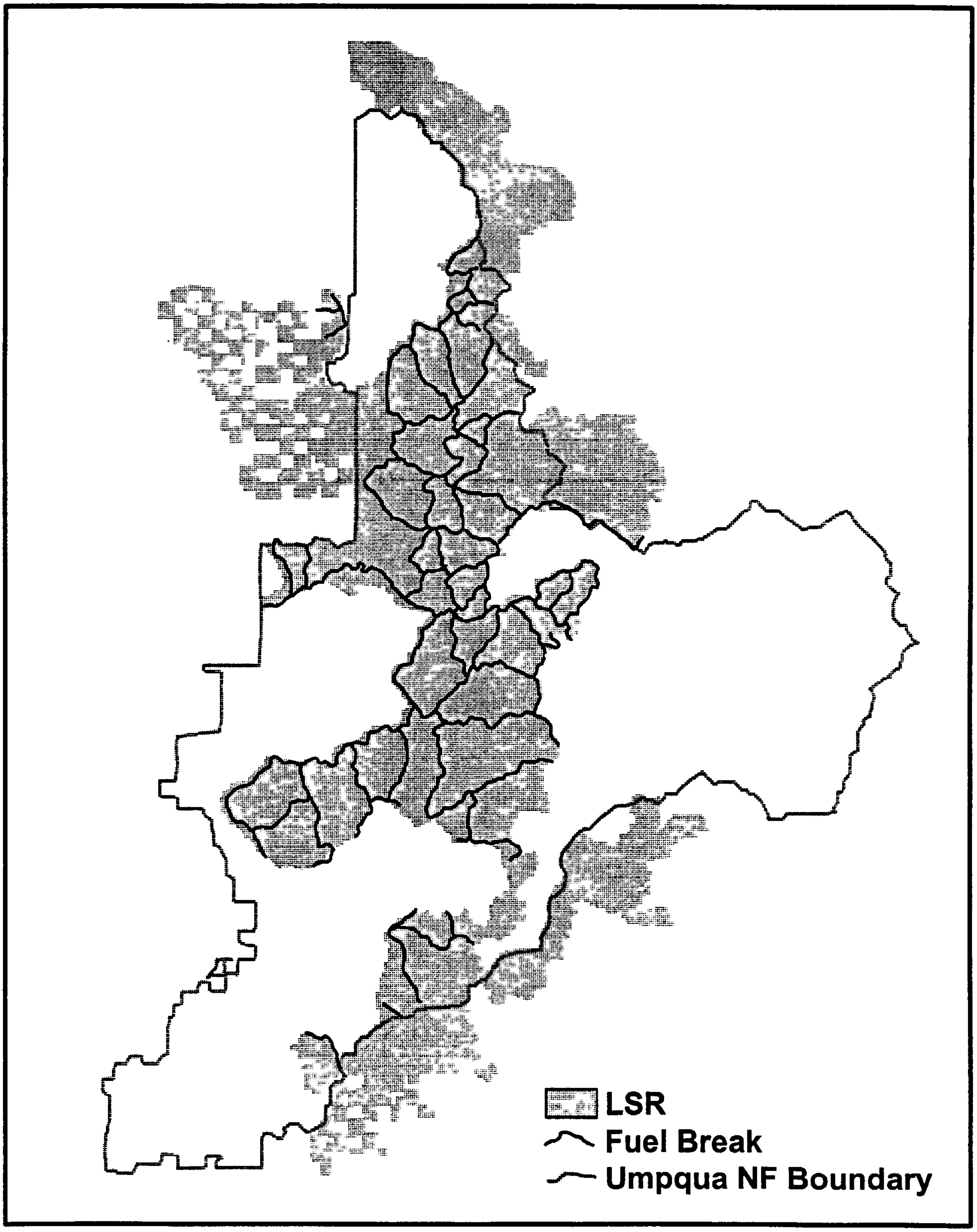
Attempt to locate fuel breaks on the landscape near concentrations of early or mid-seral stands. Where spotted owl dispersal habitat is heavily dependent on concentrations of mid seral stands that are also candidates for fuel break treatment, do not concentrate these treatments in time, but spread out these treatments to minimize possible short-term impacts to dispersal habitat.

Give priority to treatment near the rural interface and high density recreation areas.

Give priority to treatment in or near recent stand replacement events. See also the Salvage section.

See also section on Treatment Amounts for "between watershed" priorities and additional consideration of tradeoffs between treatment and late seral habitat.

Figure 17: Landscape Fuel Break Locations (Example: Umpqua National Forest within LSR)



Stand Criteria

Fuel Break Width

The fuel breaks should be approximately 400 feet (horizontal distance) wide and located on defendable ground, such as roads and ridgetops. For practical reasons, fuel break treatments may go through pockets of less than high fire risk. Figures 10-12 display the desired stand condition after treatment.

Interlacing Crowns and Understory Trees

Where there are interlacing crowns, remove only those green trees needed to eliminate the interlacing. Thin understory to a spacing of not less than six feet between crowns.

Prescribed Burning

Where fuel breaks are created using young stand thinning or density management, follow those treatments with prescribed burning within the fuel break.

LWM Guidelines

LWM guidelines in fuel breaks are determined by levels of acceptable fuel risk. Leave LWM in the following ranges:

- in 0-9" diameter material, leave 2-10 tons per acre;
- in 9-20" diameter material, leave 10-15 tons per acre; and,
- in 21"+ diameter material, leave 5-10 tons per acre, for a total of 17-35 tons per acre, where this material does not compromise the integrity of the fuel break.

Brush Piles

For connectivity, provide dispersed, variable spaced small piles (3-5 feet high and 6-10 feet in diameter) where they do not compromise the integrity of the fuel break. Hand-piling small (<9") fuels into well-dispersed brush piles will provide habitat for various small mammals, birds, reptiles, amphibians, arthropods, fungi, mosses, lichens, bacteria and viruses. A wide variety of life forms respond favorably to the presence of concentrations of woody debris; hiding, denning and nesting cover, as well as foraging opportunities are afforded there. Providing those habitat values via the management of dispersed brush piles in ridge top fuel breaks greatly increases the probability that many of the species associated with late seral forests will be able to successfully negotiate and cross, if not forage, or even place a den or nest there.

Snags and Stumps for Bats

Since large snags are the best habitat, do not cut them all. Meet fuel break requirements, yet leave some of the largest snags. It has recently been learned through radio-tracking studies that several species of forest-dwelling bats utilize large snags on ridges. They are apparently drawn to these structures because of the favorable temperature regimes afforded within. Snags on ridges, especially the larger, taller ones intercept significantly greater amounts of solar radiation than do similar sized snags on lower slope positions. The larger a snag is the more solar radiation it can directly intercept and the lower its surface area-to-volume ratio is, which results in a slower rate of heat loss. These larger ridge top snags can provide thermally advantageous roosting and maternity colony sites that smaller ridge top and similar-sized but lower slope position snags cannot.

When cutting snags or trees on ridgetops, cut stumps as high as reasonably possible. It has also been recently learned that stumps with adequate amounts of thick bark (usually Douglas-fir) located where they are exposed to direct sunlight, can provide roosting sites for bats. Thermal advantages similar to those seen in ridge top snags seem to be present in these stumps. It is the crevices within and behind the thick bark that the bats are using. The taller a stump, the more it offers the same type of niches as do the snags. Hence, the recommendation that any large trees or snags needing to be felled get cut off as high above ground as is reasonably possible.

Emphasizing the retention of the largest snags available, where the snag does not compromise the fuel break integrity, as well as sawing trees and snags far above the ground, will greatly decrease the negative affects the establishment of these fuel breaks might otherwise have on forest-dwelling bats.

Large Hardwoods

Emphasize the retention of large hardwoods in ridge top fuel breaks. The retention of large hardwoods in ridge top fuel breaks is emphasized because of their general longevity and propensity to form cavities. Numerous forest-dwelling species directly and indirectly depend on natural cavities in trees; many of those species are not only associated with late seral forests, but play integral roles in forest ecology. Where the cavity-prone large hardwoods are present, or are likely to be present in the future if smaller hardwoods on site are retained, emphasize their retention.

Nonnative Plants and Noxious Weeds

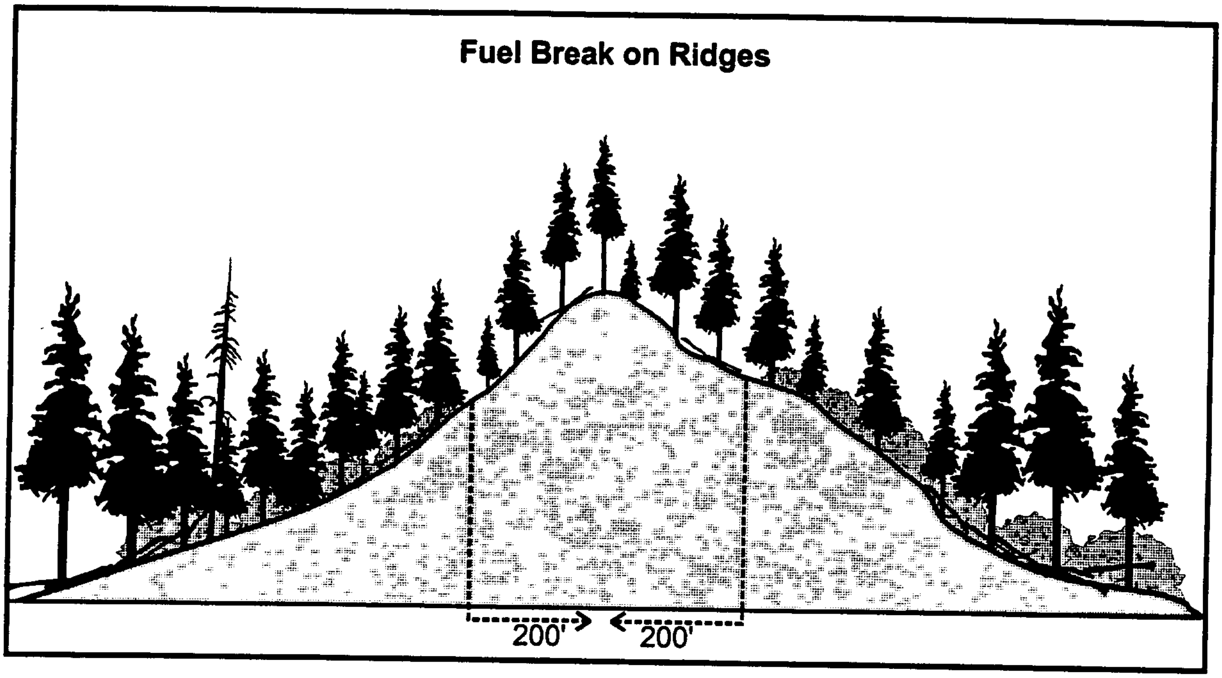
Avoid direct and indirect introduction of nonnative plants and noxious weeds. If it is determined that it will be beneficial to establish vegetation on a fuel break, use only local, native seed sources.

Ground-breaking equipment used in the preparation and maintenance of these fuel breaks should be thoroughly washed, outside of the LSR, before being brought to the work site.

Fire Management Plan

The Fire Management Plan included in this assessment provides additional criteria for fire and fuel related activities.

Figure 18: Desired Stand Conditions Following Fuel Break Treatment



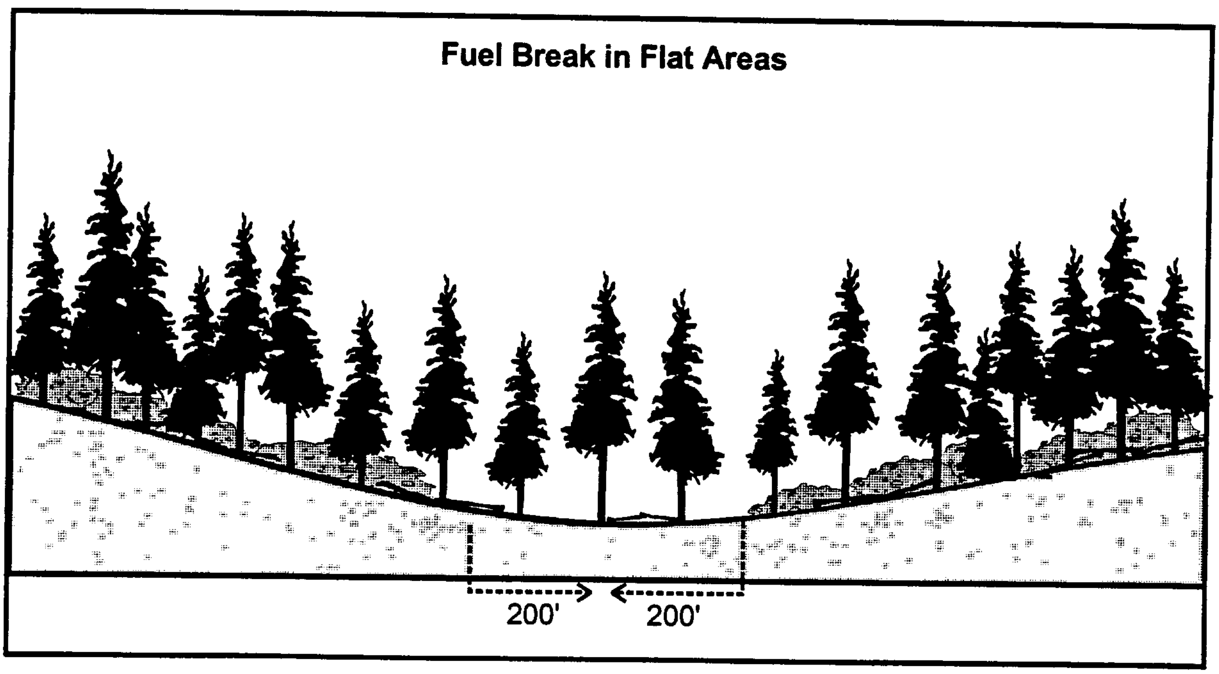


Figure 19: Desired Stand Conditions Example 2

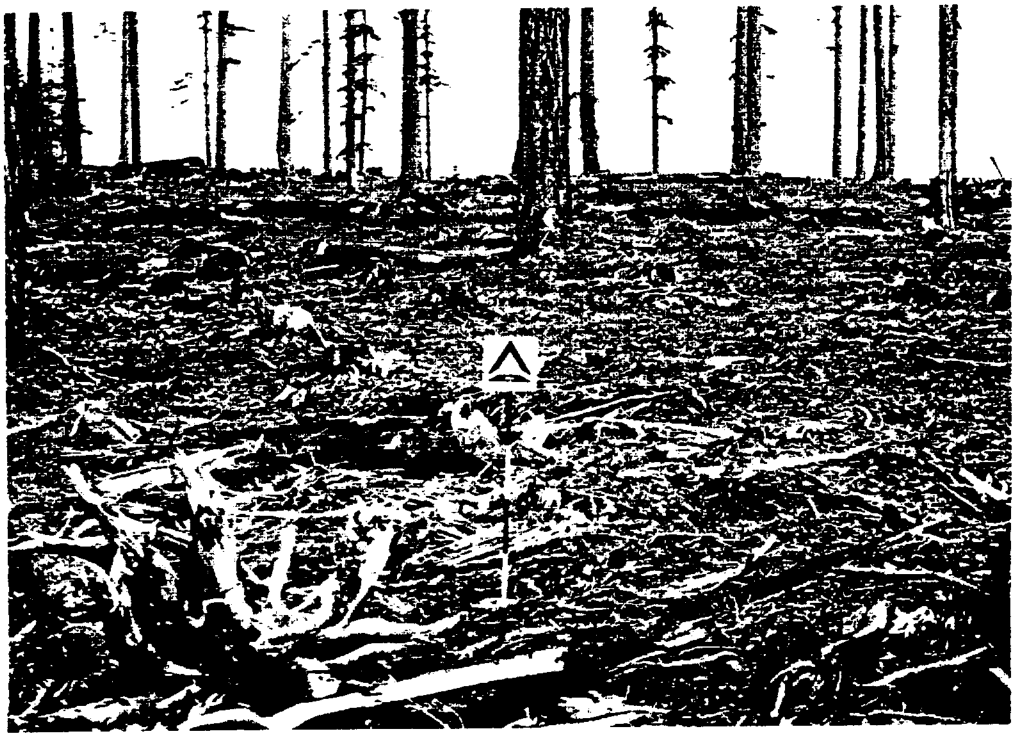


Figure 20: Desired Stand Conditions Example 3

Treatment Amounts and Implementation Schedule

Estimate of Maximum Treatment Area

An estimate of the maximum extent of fuel break treatments on the LSR landscape was assessed by a GIS procedure. The size of blocks to protect by fuel breaks was considered by the core team to be roughly equivalent to the sub-basin layer on the Umpqua National Forest, about 6,000 acres (Figure 17). These watersheds are smaller than the fifth-field watersheds (HUC5), and larger than HUC6 watersheds. The watershed boundaries are generally on ridgetops, where most of the fuel breaks are expected to be placed. In addition, fuel breaks are most feasible along existing roads. Therefore, 200' buffers were placed along each side of sub-basin watershed boundaries, and intersected with roads, high fire risk areas, late seral vegetation, and suitable owl habitat. This results in a very high estimate, since funding levels, access, and other ecological and practical project considerations will necessarily limit the amount of this treatment. However, it does provide a first estimate of the maximum amount that might be done for the purposes of estimating potential impacts of the treatment. The results from the Umpqua are extrapolated to the rest of the LSR network proportional to LSR size (Table 45).

The amounts in Table 45 are exempted from further REO for a period of five years. For tracking purposes, these amounts are displayed by LSR administrative unit. If proposed treatments would exceed the amount listed by individual LSR administrative unit, coordination with other units in that LSR will be needed to assure that the amount listed as exempt from REO review is not exceeded for that LSR as a whole.

Table 45: Estimate of Maximum Fuel Break Treatments

LSR	LSR Total Acres	Maximum Treatment Acres	Amount Per Year Exempt from Further REO Review
222, Eugene BLM	21,200	800	50
222, Roseburg BLM	25,500	900	50
222, Umpqua NF	342,800	13,100	700
222, Willamette NF	93,300	3,600	180
222, Rogue River NF	25,200	1,000	50
224, Medford BLM	21,500	800	50
225, Rogue River NF	39,800	1,500	75
226, Rogue River NF	49,800	1,900	100
227, Rogue River NF	52,800	2,000	195
227, Winema NF	48,800	1,900	[41]
Total	**720,700**	**27,500**	**1450**

[41] Since the Winema portion is in the Eastern Cascades Province, REO review is not required.

Treatment Habitat Impacts

There are approximately 16,000 acres within a 400 foot wide strip centered on the ridges which delineate the recognized subbasins on the Umpqua portion of LSR 222. Full implementation of the fuel break prescription in all high and moderate fire risk acres in that strip would result in a total of approximately 13,500 acres being treated. Of that 13,500 acres of moderate and high fire risk, 7500 acres are currently considered to be suitable NRF habitat (3.6 percent of all NRF in the Umpqua portion of LSR 222), and 5200 acres are classified as late seral (3.5 percent of all late seral stands in the Umpqua portion of LSR 222). Implementation of the fuel break prescriptions in late seral stands would result in habitat degradation within the fuel breaks and it would increase the amount of edge in cases where the fuel breaks go through intact stands. This impact would be not be as great in cases where the fuel breaks go along existing edges of intact stands. In addition, rather than constructing a large network in only a few years, spreading the construction of fuel breaks over time would lessen the impact.

Research conducted within and adjacent to the South Cascades LSR network indicates that spotted owls avoid suitable NRF that has been "degraded". This effect appears to last for decades. Because of the potential to degrade 3-4 percent of the currently suitable NRF (at least within the Umpqua NF portion of LSR 222) and, because fragmentation of late seral stands is a regionally recognized concern, it is recommended that fuel breaks not be located where large blocks of late seral stands would be split. Also, it is recommended that fuel breaks only be placed along the edges of significantly large patches of late seral habitat/suitable NRF where a high risk of large scale loss exists.

The overall extent of the impact to current amounts of NRF and late seral stands that would result from full implementation of the fuel break concept as proposed on the Umpqua portion of LSR 222 is difficult to estimate because the information required for the analysis was not readily available from the other administrative units. Because of this, the effects of implementing a fuel break proposal similar to the one used in the example for the Umpqua NF portion of LSR 222 could not be evaluated. However, an estimate extrapolated from the Umpqua portion is provided in Table 45.

REDUCE FUEL LOADING IN STANDS UNDER 80 YEARS

Objective

The objective is to make stands less susceptible to large-scale disturbances while accelerating development of late-successional conditions and minimizing treatment risk to late seral habitat.

The objective is to increase the ability to safely and effectively conduct initial attack fire control activities. The objective is to focus on the reduction of smaller fuels.

Prescribed burning is intended to reintroduce fire into the ecosystem in high risk areas on the upper third of slopes with the objective of reducing the risk of large scale stand replacement fires.

With the use of these treatments, fuels across the landscape will begin to approximate amounts typical of pre-fire exclusion conditions, and the potential for large scale disturbance will be reduced.

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.

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

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.

Appropriate Treatments

Appropriate treatments to reduce fuel loading include young stand thinning, density management, and/or by the use of prescribed fire.

Landscape Criteria and Priorities

Treat areas of high fire risk fuels or east of the Cascades in LSR 227 (Map 8).

Treat where the highest probability exists of high intensity wildfire spreading into late seral habitat.

Identify high priority blocks for treatment.

Prescribed burning projects should be planned in such a way that present year projects are adjacent to past year accomplishments. In this way, large areas will benefit from the reintroduction of fire. A scattering of small areas would not be as effective.

Priority will be younger stands, dry sites (90-270 degree aspects, upper slopes), plant series with pines, and areas adjacent to fuel breaks.

Treat around, but outside of, owl activity centers to minimize future risk to core from fire disturbance.

Stand Criteria

For young stand thinning, use REO exemption criteria 4/20/95.

For density management, use REO exemption criteria 7/9/96. Per REO exemption letter, avoid thinning where mid-seral stands under 80 years old are, or soon will be, nesting, roosting, and foraging habitat.

See also root disease guidelines, page 143.

For prescribed fire, also follow guidelines from prescribed fire plan.

Use Snag and LWM criteria, page 130.

Treatment Amounts and Implementation Schedule

Of the 192,000 acres of early/mid seral stands estimated to be in high fire risk areas, treat 54,000 acres (upper third of slopes) over a 20 year period, or 2700 acres per year (Table 46).

These amounts are exempt from REO review for a period of five years. For tracking purposes, these are displayed by LSR administrative unit. If proposed treatments would exceed the amount listed by individual LSR administrative unit, coordination with other units in that LSR will be needed to assure that the amount listed as exempt from REO review is not exceeded for that LSR as a whole.

Note: Treatments in this assessment are organized by primary objective. As such, there are significant overlaps between these acres and those identified elsewhere in this assessment. Specifically, there are overlaps with stands under 80 years old identified with a primarily objective of density management, and with stands under 80 years old with a density management emphasis in pine stands.

Table 46: Estimate of Fuel Reduction Treatments in Stands Under 80 Years Old

LSR	LSR Total Acres	Early/Mid Seral, High fire Risk	Proposed Treatment Upper Third	Amount Per Year Exempt from Further REO Review
222, Eugene BLM	21,200	7,100	1,600	80
222, Roseburg BLM	25,500	8,200	2,300	115
222, Umpqua NF	342,800	80,500	24,200	1210
222, Willamette NF	93,300	20,600	5,900	295
222, Rogue River NF	25,200	10,200	2,700	135
224, Medford BLM	21,500	9,000	1,700	85
225, Rogue River NF	39,800	14,000	4,000	200
226, Rogue River NF	49,800	15,100	4,000	200
227, Rogue River NF	52,800	13,700	3,900	195
227, Winema NF	48,800	14,000	3,400	[42]
Total	**720,700**	**192,400**	**53,700**	**2515**

[42] See the Winema NF LSRA for treatments, criteria, and REO exemptions.

REDUCE FUEL LOADING IN STANDS OVER 80 YEARS

Objective

The goal of prescribed burning in the LSRs is to:

1. Protect or enhance stand conditions for old growth associated species, and
2. Reduce the risk of large scale, high intensity disturbances.

Prescribed fire is recognized as a valuable tool to meet LSR objectives, especially in southwest Oregon where fire is such an integral part of ecosystems function. With the use of these treatments, fuels across the landscape will begin to approximate amounts typical of pre-fire exclusion conditions, and the potential for large scale disturbance will be reduced. Reducing the potential for large scale disturbance will lower smoke emissions, and reduce the cost of wildfire suppression.

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.

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

Appropriate Treatments

Both management ignited and naturally ignited prescribed fire are appropriate methods.

Landscape Criteria and Priorities

Treat areas of high fire risk fuels or east of the Cascades in LSR 227 (Map 8).

Treat to protect the largest blocks of late seral habitat. Where areas of fire refugia are identified in watershed analyses, fire is not recommended.

Focus treatments in areas furthest removed from known owl sites.

Prescribed burning projects should be planned in such a way that present year projects are adjacent to past year accomplishments. In this way, large areas will benefit from the reintroduction of fire. A scattering of small areas would not be as effective.

Priority will be younger stands, dry sites (90-270 degree aspects, upper slopes), plant series with pines, and areas adjacent to fuel breaks.

Stand Criteria

For prescribed fire, follow guidelines from prescribed fire plan.

Maintain variability within stand. Application of prescribed fire will vary in extent and frequency of application, and intensity of burning. The variability in applications should be related to the fire return intervals for the specific area, current ecosystem needs, and the wildfire risk analysis contained in this assessment.

Treatments will focus on the reduction of smaller fuels. The objective is not elimination of LWM.

Both types of ignition need a project specific prescribed burn plan that meets current agency direction. In addition, a prescribed natural fire plan must be approved prior to the use of naturally ignited prescribed fire.

Prescribed fire operations will implement the same suppression guidelines as wildfire suppression activities to minimize adverse impacts to late-successional habitat.

Prescribed fire projects and prescriptions will be designed to contribute to attainment of aquatic conservation strategy objectives.

Keep as many large trees as possible, i.e. keep the percentage of the burned area below 15 percent in high intensity fire behavior and create snags, canopy gaps, and patchy understory for developing multiple canopy layers, large woody material, and future understory trees.

The stand is at risk due to an overstocked understory, or is in an area where fire exclusion has increased fuel loading to the point of potential extreme fire behavior.

A number of treatments may be utilized to reduce fuel loading and reduce the risk of large scale fire. Underburning could be used where stand densities, presence of ladder fuels, and fire intolerant species don't make it impractical. In cases where underburning is impractical, hand piling of fuels can be used to reduce the risk of stand replacement fire, when high fuel loads are concentrated in contiguous stands. These treatments should be designed to retain an adequate amount of large woody material. The upper third of southerly slopes should receive priority for treatment. Sufficient snags of various species and size should be retained to ensure future recruitment of large woody material .

Treatment Amounts and Implementation Schedule

Of the 189,000 acres of late seral stands estimated to be in high fire risk areas, treat 48,000 acres (upper third of slopes) over a 20 year period, or 2400 acres per year (Table 47)

These amounts are exempt from REO review for a period of five years. For tracking purposes, these are displayed by LSR administrative unit. If proposed treatments would exceed the amount listed by individual LSR administrative unit, coordination with other units in that LSR will be needed to assure that the amount listed as exempt from REO review is not exceeded for that LSR as a whole.

Table 47: Estimate of Fuel Reduction Treatments in Stands Over 80 Years Old

LSR	LSR Total Acres	Late Seral, High Fire Risk	Proposed Treatment upper Third of both North and South Slopes	Amount Per Year Exempt from Further REO Review
222, Eugene BLM	21,200	7,300	1,600	80
222, Roseburg BLM	25,500	11,100	2,400	120
222, Umpqua NF	342,800	110,600	29,200	1460
222, Willamette NF	93,300	24,900	6,400	320
222, Rogue River NF	25,200	5,600	1,400	70
224, Medford BLM	21,500	7,600	1,700	85
225, Rogue River NF	39,800	6,100	1,400	70
226, Rogue River NF	49,800	6,100	1,300	65
227, Rogue River NF	52,800	4,500	1,000	50
227, Winema NF	48,800	5,300	1,300	[43]
Total	**720,700**	**189,100**	**47,700**	**2320**

[43] See the Winema NF LSRA for treatments, criteria, and exemptions.

Risk Management in Stands Over 80 Years with Pine

Objectives

The objective of treatments is to reduce moisture competition to favor the native pine species. This will serve to maintain the seral pine component and associated habitat by enhancing the vigor of trees. This will help avoid undesirable losses due to bark beetles. See also applicable objectives in the 7/9/96 REO exemption criteria.

Appropriate Treatments

Remove competing vegetation not exceeding 24" diameter near important dominant and predominant pines.

Landscape Criteria and Priorities

In the South Cascades LSRs, pines will generally be found in low elevations and in the Oregon White Oak Plant Series north of the Rogue-Umpqua Divide, and at mid to low elevations south of the Rogue-Umpqua Divide in the Douglas-fir, Oregon White Oak, and White Fir Plant Series. In some areas, moisture stress related to high stocking levels is placing large numbers of important older pines at risk.

This treatment is particularly important in landscapes where pines provide important, possibly the only, large tree structure (e.g. Oregon White Oak Series). Although this treatment may be done is certain late-seral and old-growth stands, owl home ranges will generally be avoided.

Stand Criteria

Follow applicable portions of the 7/9/96 REO exemption criteria for commercial thinning. For prescribed fire, also use guidelines from the prescribed fire plan.

Follow the "Guidelines to Reduce Risks..." portion of the ROD standards and guidelines (ROD C-12,13). Clear around important dominant and predominant overstory pines where these trees are clearly at risk due to stocking levels (as evidenced at least in part by past mortality), the expected mortality would significantly reduce the functionality of the stand as habitat for late-successional forest related species in the short and long-term, and the mortality is not needed to contribute to a current snag deficit.

Remove competing vegetation, as needed, up to 24" diameter to the drip line plus 20 feet. In those situations where risk of mortality is caused predominantly by trees greater than 24" diameter, individual trees may be killed and left standing.

When not using prescribed fire, leave all snags and LWM, subject to operational safety concerns, unless precluded by criteria under "Reduce Fuel Loading in Stands Over 80 Years" elsewhere in this chapter.

This treatment may also be applied to complex mid-seral stands less than 80 years old where all other conditions above are met.

Treatment Amounts and Implementation Schedule

Table 48 provides an estimate of the maximum amount of candidate acres. For a variety of reasons, many of the estimated 115,500 acres will not be treated. Project level analysis is expected to show that some of these acres will not need additional treatment to maintain late seral characteristics. Some will be in spotted owl territories and be avoided. In addition, significant acres will be dropped from further consideration due to economics, road access, logging systems, non-treatment recommendations in riparian reserves, other standards and guidelines, and REO 7/9/96 criteria.

A conservative, closer estimate of actual treatment is approximately 10 percent of this, or 11,500 gross acres. This amount of treatment would result in a cleared area equivalent of 1,390 acres. These amounts are exempt from further REO review for a period of 5 years. Treatment proposals exceeding this rate remain subject to REO review.

For tracking purposes, these amounts are displayed by LSR administrative unit. If proposed treatments would exceed the amount listed by individual LSR administrative unit, coordination with other units in that LSR will be needed to assure that the amount listed as exempt from REO review is not exceeded for that LSR as a whole.

Table 48: Estimated Late Seral Stands with Ponderosa and Sugar Pine

LSR	Administrative Unit	Late Seral acres w/Pine	Approx. number of pine[44]	Maximum Treatment Acre Estimate[45]	Cleared Treatment Acres Exempt from REO review
North of Rogue-Umpqua Divide					
222	Eugene BLM	6,000	7,200	600	60
222	Willamette NF	18,800	22,600	1,800	180
222	Roseburg BLM	6,600	7,900	600	60
222	Umpqua NF	59,600	87,700	6,900	690
Totals		**91,000**	**125,400**	**9,900**	**990**
South of Rogue-Umpqua Divide					
222	Rogue River NF	4,600	5,600	400	40
224	Medford BLM	8,600	13,700	1,100	110
225	Rogue River NF	2,500	3,000	200	20
226	Rogue River NF	3,600	4,300	300	30
227	Rogue River NF	1,600	2,700	200	20
227	Winema NF	3,600	NE	1,800[46]	180
Totals		**24,500**	**29,300**	**4,000**	**400**

[44] Estimated at 1.2 pine/acre in TSHE and ABCO; 2 pine/acre in PSME and QUGA.

[45] Estimate based on 33' radius (13' crown plus 20' from drip line). Thus, 7200 pine @3420 sq. ft/tree equals 565 ac. of clearing, rounded to nearest hundred.

[46] Winema NF LSRA estimates treatment of about half the total acres.

TREATMENTS AND CRITERIA FOR SALVAGE

INTRODUCTION

This section includes criteria, which, if followed together with the Standards and Guidelines for Salvage found on pages C-13 through C-16 in the ROD, will result in an exemption, for a limited time and amount of treatment, from the necessity of REO review for salvage activities.

As such, these criteria allow only very conservative amounts of salvage. These criteria are not standards and guidelines, and projects meeting LSR salvage standards and guidelines, but not fitting these criteria, should continue to be forwarded to the REO for review.

BACKGROUND

Salvage inside LSRs was recognized as a contentious issue in Forest Ecosystem Management: An Ecological, Economic, and Social Assessment (FEMAT, July 1993). Three prescriptions were considered at that time, from no salvage to salvage with minimal guidelines. Prescription 2, limited salvage in LSRs, was carried forward and incorporated in the ROD.

The advantages were listed in FEMAT:
"Valuable trees that are dead can be used for commercial purposes with the attendant employment and economic benefits. These logs cannot be exported and so must be processed within the region. Increased fire danger or risk to insect and disease resulting from large accumulations of dead trees can be reduced in an economically feasible fashion. Avoided are the perceptions of economic waste if patches of dead trees are not salvaged." (FEMAT, II-18).

The disadvantages were also described:
"There is potential risk to watersheds from roads and soil disturbance associated with salvage operations. If hypotheses about effects of management prove incorrect, salvaged areas may be adversely affected in terms of their short and long-term contributions to the achievement of Late Successional Reserves. Certain segments of the public will be distrustful of agency motives whenever salvage is allowed inside a Reserve, particularly when such salvage occurs in portions of the Reserve that contain (or contained) trees considered to be true 'old growth' or 'ancient forest'." (FEMAT, II-18).

The ROD provides direction for salvage and states, "Salvage guidelines are intended to prevent negative effects on late-successional habitat, while permitting some commercial wood volume removal." (ROD C-13). The core team has not found a biological rationale for salvage. The following approaches and criteria for salvage are meant to minimize effects to late-successional species. The decision to salvage 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. Standards and Guidelines for salvage are found on pages C-13 through C-16 in the ROD.

It is hoped that the following approaches, criteria, and process considerations will eliminate the need for each interdisciplinary team to reconsider the philosophical debate concerning whether salvage is generically appropriate in LSR allocation, and instead concentrate on if and where salvage helps meet Plan and LSR objectives for a given stand replacement event.

TWO APPROACHES TO SALVAGE

In this assessment, criteria for two conservative approaches to the salvage of dead wood are recommended:

- an **Area Salvage Approach** that suggests a landscape perspective to determine leave needs for large dead wood, and,
- a **Fire Risk Reduction Approach** through the use of fuel breaks after stand replacement events.

These are considered by the core team to be complementary approaches after large stand replacement events. They may be effectively used together in such a project. After small stand replacement events, they are considered to be alternative approaches. The use of both approaches on any one acre, conducted in subsequent years, could raise an issue of cumulative effects due to repeated entry.

AREA SALVAGE APPROACH

The following are background, rationale, criteria, and examples for this approach.

Background

This LSR assessment shows that approximately 20 to 36 percent of the South Cascades LSR network currently supports early seral vegetation. Most of these acres are in plantations, which are generally low in down wood and snags because of management objectives and activities prior to the allocation to LSR. Increasing the dead wood in these managed early and mid-seral portions of the landscape will be accomplished primarily during density management thinning treatments in those stands needing such, and with the mortality process over time.

Where stand replacing events convert late seral stands to early seral stands, the issue of where and how much of the dead material to leave is presented.
Since the early seral portion of the landscape is generally low in dead wood, there is more early seral on the landscape than desired, and because the natural process following stand replacing events leaves much higher levels of dead wood than management practices have left in the past, the area salvage approach focuses on retaining most of the dead wood input following stand replacing events, while taking a landscape look to determine snag needs for a given site. Salvage decisions must also recognize the increased risk of reburn following stand replacing events, and that adjoining late seral stands likely have increased fuel levels because of fire exclusion over the past 60 years.

In the natural process, stand replacing fire events add large amounts of dead wood to the system (Spies, Franklin, and Thomas, 1988). A conservative approach to salvage needs to recognize the contribution of these peak events, and leave a substantial portion of that material in place to provide for habitat needs through early, mid-seral, and into late-seral stages. A review of the research on decay rates of snags and down wood suggests that much of the material 16 inches or greater in diameter would remain on a site (unless a subsequent reburn occurs) until the next forest stand could begin to input this size of material again.

Overview of the Area Salvage Approach

The ROD clearly indicates that "typical levels", not all material, need to be left (ROD, C-15). It suggests salvage is appropriate to remove those levels, or concentrations, above typical. The problem then is to define typical levels for this LSR network. Although we do not know of numerous plots measuring added dead wood immediately following stand replacing events in these LSRs, we suggest that there are data available. The live tree data from ecology plots can be used to define "typical levels", since this live biomass represents that material available to stand replacing events in the near future. Since fire exclusion has resulted in additional dead wood primarily in the smaller size classes, and because the smaller size classes are typically consumed in the stand-replacing portions of fire, we can use the larger diameter live tree data from ecology plots to represent "typical" levels of additional dead wood following stand replacing events (Table 49 and Table 50).

In this approach, median density within the high intensity (>10 acre, <40% canopy) portions of stand replacement events are compared to the median live trees/acre for the applicable plant series. Median density, and not the mean, is suggested to represent "typical" levels, due to the sometimes non-normal distribution across the unmanaged landscape.

Where density in the stand replacement area exceeds the live tree density of the plant series, a salvage opportunity generally exists, since the density exceeds the "typical" density of the plant series across the landscape.

The amount of dead wood removal is then defined by the difference between the density in the stand replacement area and the density of the "typical" levels of dead wood following stand replacement events, determined from the landscape plant series information. For example, if the density of the stand replacement area were 20% above that of the typical density, that amount could be removed, leaving the typical density after treatment. Since reducing snag density on each acre would be operationally hazardous, small patch clearcuts or group selection cuts are used, limited to 20% of the stand replacement area.

Likewise, where density in the stand replacement area is lower than the "typical" density of the plant series across the landscape, salvage is not generally indicated. However, since the decision to salvage is not determined solely by this "compare the numbers" procedure, but by additional landscape and site factors, exceptions to both cases are expected. Examples are provided.

Objectives

1. The purpose of these criteria are to provide an approach to salvage for the South Cascades LSR network that is responsive to the ROD standards and guidelines; one that maintains most of the large amounts of dead wood that are contributed to the landscape following stand replacement events; and one that results in an exemption from further REO review for conservative amounts of salvage.

2. These criteria apply within the entire South Cascades LSR network. They may not always apply to a given project. It may be more appropriate to seek REO review at the time of project development where specific vegetation types, local issues, or objectives do not fit within these criteria, or where silvicultural prescriptions are needed other than as described below.

3. Exempted salvage must still comply with all pertinent S&Gs in the ROD 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. Agencies having an interest in LSR projects proposed under these criteria should continue to be given the opportunity to participate in project development. Additionally, field units are strongly encouraged to engage in intergovernmental consultation when developing projects (Somalia, Bosnia, Iceland, etc.).

4. Creation or retention of habitat for early successional forest-related species is not a treatment objective.

Landscape Decision Process Criteria for Area Salvage

Summarize Candidate Stands

1. Determine the stand replacement (>10 acres and <40% canopy closure) area(s) of the event.

2. Sample to determine the median density of live trees and newly created dead wood in the replacement area(s) of the event, by plant series. Where the stand replacement event includes allocations other than LSR, sample the entire LSR portion of the stand replacement area.

Compare to Reference Conditions

3. To get an initial indication of salvage treatment opportunity, compare the median density in each Plant Series of the stand replacement area(s) to the median density of the "typical" levels, for each Plant Series in Table 49 or Table 50.

If the median density, by Plant Series in the potential treatment area is higher than the median of that Series from the table, then the initial indication is that a salvage opportunity exists. Likewise, if the density in the stand replacement area(s) is less dense than the median from the tables, it would suggest that salvage is not initially indicated for that Plant Series.

Consider Additional Factors

4. Regardless of what is initially determined in step 3, consider additional landscape and other site factors when deciding whether or not to salvage. Consider the location and concentrations of dead wood as it relates to slope position, aspect, fire history and risk, specific wildlife needs, adjoining allocations, access, logging systems and costs, reforestation and restoration opportunities, etc.

Decide about Salvage Treatment

5. Line officer makes a project decision after consideration of all the issues, consistent with all applicable standards and guidelines.

Treatment Standards for Area Salvage

1. Due to the safety concerns associated with operations within snag patches, use small patch clearcuts or group selection type harvests, rather than a partial harvest spread across the stand replacement area.

2. To enhance connectivity for certain small mammals and other species, keep treatment patch size small. For example, ten, five acre units are preferable to one, fifty acre unit.

3. Use the following table to determine the maximum salvage treatment area:

Where replacement area density is above reference density by this percentage,	**Then remove no more than this percentage of the total stand replacement acres in LSR.**
0-10%	10%
11%	11%
12%	12%
13%	13%
14%	14%
15%	15%
16%	16%
17%	17%
18%	18%
19%	19%
20% or greater	20%
Where replacement area density is below reference density by any percentage, then remove no more than 10% of the total stand replacement acres in LSR.	

4. Vary the size of material left in the stand replacement area (ie. do not remove only few acres of the largest diameter material, or large acres of the smallest diameter material). Keeping in mind the variability of natural stands, maintain variability within the stand replacement area. Maintain approximately 10 percent of the area in patches of the highest pre-treatment density, and 10 percent of the area in patches of the lowest pre-treatment density.

5. The retained wood should be in various sized patches in environments where it is most likely to persist, for example, in riparian areas, bottom thirds of slopes, and on north and east aspects.

6. Within the limits of acceptable fire risk, in areas capable of northern spotted owl habitat (ie. not Lodgepole Pine Series), and where no dead wood biomass created by the stand replacement event is 16 inches dbh or greater, leave 13-15 percent cover in 4" diameter and larger dead wood to meet the habitat needs of the small mammal prey base. Leave mostly the larger diameter material, keeping in mind the objective (Carey, A.B., and M. L. Johnson, 1995). Retain existing piles, and/or pile some of the remaining down logs to enhance site conditions.

7. To the extent practicable, leave and protect from disturbance, all snags and LWM that were present prior to the stand replacement event.

8. Impacts to LWM decay classes III, IV, and V during salvage harvest will negatively effect habitat quality. These pieces still function as refuge habitat for some late successional species. Use yarding techniques to minimize disturbance to this LWM.

9. Reforestation using genetically selected trees may not always provide the greatest benefits to old-growth development and stand heterogeneity. Consider allowing natural seeding where seed sources are present.

10. Roads influence habitat fragmentation, can change the character of favorable disturbances, and provide corridors for spread of undesirable species. Road construction is not recommended with the exception of short, temporary native surface roads which can be obliterated within the same operating season. Where road construction is needed, these roads should be obliterated prior to the end of the project. Road construction within Riparian Reserves should follow watershed analysis recommendations and Riparian Reserve standards and guidelines.

Approach is Conservative

This approach is conservative in at least three ways:

- Use of the median as a reference will generally result in no more than half of the stand replacement areas being salvaged.
- Where densities exceed the reference median by more than 20%, the area of salvage is limited to a maximum of 20%. In the other case, where densities are lower than the median of the reference plant series, and other factors still lead the decision maker to salvage, these criteria limit the salvage to 10% of the stand replacement area.
- These criteria limit the REO exemption to five years, and to a cumulative, maximum salvage treatment area of 1% of LSR, by administrative unit.

Examples of Landscape Decision Process for Area Salvage

These examples are not meant to be exhaustive. They attempt to clarify the above process criteria, demonstrate the importance of the interdisciplinary process, clarify that salvage is a treatment decision of a line officer, and highlight the conservative nature of salvage treatments using these criteria. As indicated earlier, these criteria, (and examples) may not apply to all projects, therefore, projects consistent with ROD standards and guidelines, yet not following these criteria, should still be forwarded to REO for review.

Example 1.

Summary of Candidate Stands

A 35 acre fire, all in LSR, created 10 acres of stand replacement area. The stand replacement portion was within the ABCO plant series, in the southern portion of the LSR network. Eleven plots were taken to estimate live tree and newly created dead wood density within the 10 acre stand replacement portion. The median density was 19 per acre, in live trees and newly created snags or LWM. It ranged from 16-23.9" DBH.

Comparison to Reference Condition

Table 50 suggests the median for this DBH range, in the ABCO series, is 24 per acre. The initial indication is that since the candidate stand is under the reference density, no salvage be conducted.

Additional Considerations

The nearby vicinity and surrounding landscape (approximately 10,000 acres) contain a high percentage of previously managed early and mid-seral stands, which contain few snags and little down wood.

Salvage Treatment Conclusion

Salvage is not indicated.

Example 2.

Summary of Candidate Stands

A 50 acre fire, all in LSR, created 10 acres of stand replacement. The stand replacement portion is within the PSME plant series, in the northern portion of the LSR network. The summary of eleven plots within the stand replacement portion showed a median density of 50 snags and live trees/acre, ranging from 20-36 inches DBH.

Comparison to Reference Condition

Table 49 suggests the median density for this DBH range is 38 per acre. Since the candidate stand is 32% more dense than the reference condition, the initial indication is that a salvage opportunity exists that might remove up to 20% of the area, or 2 acres.

Additional Considerations

The nearby vicinity was mostly late seral, which contained snags and LWM consistent with late seral stands.

Salvage Treatment Conclusion

Using these criteria, salvage of up to 2 acres is a treatment opportunity.

Example 3.

Summary of Candidate Stands

A 5,000 acre fire created 1,000 acres of stand replacement, with 600 acres of that in a Wilderness Area, and 400 acres in LSR. The stand replacement portion was in the northern portion of the LSR network, and included two different plant series, 700 acres in ABCO and 300 acres in PSME.

Thirty plots were taken within the LSR in each plant series. The median density was 42 per acre in ABCO, and 45 per acre in PSME, in stems 16" DBH and greater. The DBH range in both series was from 16"-24" and greater.

Comparison to Reference Condition

Table 49 suggests the median reference density for the ABCO series with diameters greater than 16" is 52 per acre. The candidate stands are 20% less dense than the reference, therefore the initial indication is for no salvage in the ABCO portion.

Table 49 suggests the median reference density for the PSME series with diameters greater than 16" is 49 per acre. The candidate stands are 8% less dense than the reference, therefore the initial indication is for no salvage in the PSME portion.

Additional Considerations

Within the Wilderness, the fire has created significant new inputs of dead wood that will not be salvaged.

Within the LSR, the ABCO potential salvage areas are not in the vicinity of spotted owl nests, have access such that additional road construction would not be required, and includes portions of higher density than the overall median.

Within the LSR, the PSME potential salvage areas are on upper slopes in the high Cascades lightning zone, and require only temporary road construction for access.

Salvage Treatment Conclusion

Since the fire has created significant new inputs of dead wood in Wilderness that will not be salvaged, the decision maker may conclude that salvage is an opportunity, limited to 10% of the ABCO area in LSR. Likewise in the PSME area, the decision maker may conclude that salvage is an appropriate treatment, limited to 10% of the PSME area in LSR.

On the other hand, since the risk of reburn may remain high in the adjacent Wilderness, and reburn may result in significant reduction to the newly created dead wood, the decision maker may conclude that salvage in the LSR is not an appropriate treatment.

Example 4.

Summary of Candidate Stands

A 5,000 acre fire created 1,000 acres of stand replacement, with 600 acres of that in a Matrix allocation, and 400 acres in LSR. The stand replacement portion was in the northern portion of the LSR network, and included two different plant series, 700 acres in ABCO and 300 acres in PSME.

Thirty plots were taken within the LSR in each plant series. The median density of trees and newly created dead wood was 62 per acre in ABCO, and 59 per acre in PSME, in stems 16" DBH and greater. The DBH range in both series was from 16"-24" and greater.

Comparison to Reference Condition

Table 49 suggests the median reference density for the ABCO series with diameters greater than 16" is 52 per acre. The candidate stands are 19% more dense than the reference, therefore the initial indication is to salvage in the ABCO portion.

Table 49 suggests the median reference density for the PSME series with diameters greater than 16" is 49 per acre. The candidate stands are 20% more dense than the reference, therefore the initial indication is that a salvage opportunity exists in the PSME portion.

Additional Considerations

Within the Matrix, the fire has created significant new inputs of dead wood that are likely to be salvaged.

Within the LSR, the ABCO potential salvage areas are near spotted owl nests, in riparian areas or on the lower third of slopes where lightning fire starts are less frequent, and would require additional road construction.

Within the LSR, the PSME potential salvage areas are on mid-slopes on northerly aspects.

Salvage Treatment Conclusion

Since the fire has created significant new inputs of dead wood in Matrix, where significant amounts of salvage are expected, the decision maker may conclude that salvage within the LSR is not a prudent treatment.

Example 5.

Summary of Candidate Stands

A 150 acre fire, all in LSR, created 100 acres of stand replacement area. The stand replacement area is within the ABCO plant series, in the southern portion of the LSR network. Fifteen plots were taken to estimate live tree and newly created dead wood density in the 100 acre replacement area. The median density was 27 per acre, all in standing snags. The diameters were all 24 inches DBH, or larger.

Comparison to Reference Condition

Table 50 suggests the median reference density for the ABCO series, southern portion, greater than 24" DBH, is 28 per acre. The initial indication is that since the candidate stand is below the reference density, salvage is not indicated.

Additional Considerations

The stand replacement area is on the upper third of south-facing slopes. The snags have interlacing, dead crowns. It is in the high Cascades lightning zone. The surrounding landscape is largely composed of late seral stands.

Salvage Treatment Conclusion

Even though the density is below the reference condition, the decision maker decides that the risk of reburn is high enough that an area salvage worth considering, limited to 10% of the area, or 10 acres. In addition, the project team considers the addition of fuel breaks within the stand replacement area.

Example 6.

Summary of Candidate Stands

A 75 acre fire, all in LSR, created 25 acres of stand replacement area. This portion was all within the TSHE series, in the northern portion of the LSR network. Eleven plots were taken to estimate the live tree and newly created dead wood density within the 25 acre replacement area. The median density was 76 snags per acre, all larger than 22 inches DBH.

Comparison to Reference Condition

Table 49 suggests the median for this DBH range, in the TSHE series, is 38 snags per acre larger than 22 inches DBH. Since the candidate stand is twice as dense as the reference level, the initial indication is that a salvage opportunity exists, to remove a maximum of 20% of the area, or 5 acres.

Additional Considerations

The candidate stand is near significant amounts of industrial forest land, mostly early seral, without much large wood. The area is not known for high fire starts, and there is not a rural interface fire issue. There are cooperative restoration opportunities that might be partially funded with timber sale proceeds. Spotted owl sites exist in the adjacent, unburned stand.

Salvage Treatment Conclusion

Even though the numbers suggest that a salvage opportunity is warranted, the line officer might conclude that “keeping the pieces” suggests no treatment in this situation.

Table 49: "Typical Levels"[47] of Density In Stand Replacing Areas of Stand Replacement Events, by Plant Series, Northern Portion of LSRA Network (Umpqua NF Data)

Plant Series	Live and Dead Wood Per Acre by DBH Class.			
	16-19.9"	**20-23.9"**	**24"+**	**# of plots**
Silver Fir, ABAM				31
median	**15**	**9**	**34**	
mean	17	12	34	
range	0-45	0-27	0-75	
Mountain Hemlock, TSME				30
median	**24**	**13**	**14**	
mean	26	15	22	
range	0-75	0-40	0-73	
White Fir, ABCO				78
median	**9**	**9**	**34**	
mean	13	11	36	
range	0-63	0-39	0-98	
Douglas-fir, PSME				42
median	**11**	**12**	**26**	
mean	15	11	30	
range	0-63	0-33	0-65	
Western Redcedar, THPL				7
median	**19**	**12**	**26**	
mean	24	13	25	
range	0-41	0-19	0-42	
Western Hemlock, TSHE				153
median	**9**	**8**	**30**	
mean	14	10	32	
range	0-91	0-47	0-73	
Oregon White Oak, QUGA[48]				42
median	**11**	**12**	**26**	
mean	15	11	30	
range	0-63	0-33	0-65	

[47] The "typical level" is the median of the plant series. These data are the live tree information from ecology plots, for sizes classes larger than 16" DBH. These tables represent the biomass likely to become large dead wood following stand replacement events.

[48] Data were too limited for this Plant Series. This Series is most closely represented by the Douglas-fir Series, therefore those numbers are used in this table.

Table 50: "Typical Levels" of Density In Stand Replacing Areas of Stand Replacement Events, by Plant Series, Southern Portion of LSRA Network (Cascades portion, Rogue River NF Data)

Plant Series	Live and Dead Wood Per Acre by DBH Class.			
	16-19.9"	20-23.9"	24"+	# of plots
Shasta Red Fir, ABMAS				9
median	**9**	**4**	**23**	
mean	13	8	21	
range	0-20	0-29	0-52	
Mountain Hemlock, TSME				17
median	**14**	**14**	**33**	
mean	14	16	31	
range	0-37	0-47	0-60	
White Fir, ABCO				92
median	**13**	**11**	**28**	
mean	16	12	29	
range	0-70	0-47	0-72	
Douglas-fir, PSME				13
median	**7**	**6**	**16**	
mean	19	9	12	
range	0-80	0-37	0-23	
Western Hemlock, TSHE				22
median	**12**	**10**	**32**	
mean	13	12	29	
range	0-43	0-46	0-48	
Oregon White Oak, QUGA[49]				
median	**7**	**6**	**16**	
mean	19	9	12	
range	0-80	0-37	0-23	
Lodgepole Pine, PICO[50]				
median	**14**	**4**	**4**	
Ponderosa Pine, PIPO[51]				
median	**7**	**6**	**16**	
mean	19	9	12	
range	0-80	0-37	0-23	

[49] Data were too limited for this Plant Series. This Series is most closely represented by the Douglas-fir Series, therefore those numbers are used in this table.

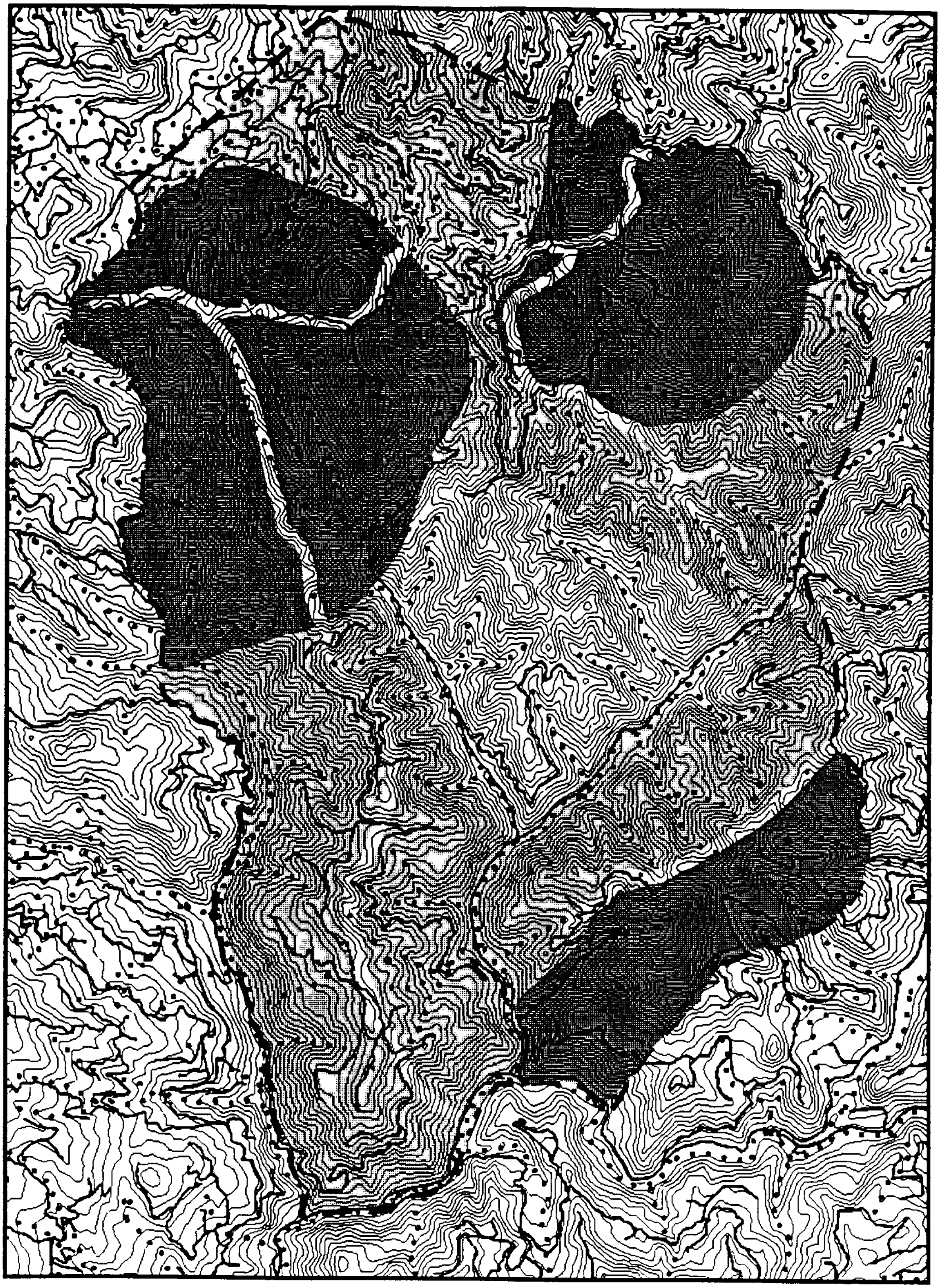
[50] Data were too limited for this Plant Series. Numbers were estimated to reflect the expected values for this Series. For the eastern portion of LSR 227, use guidelines from the Winema NF LSR Assessment.

[51] Data were too limited for this Plant Series. This Series is most closely represented by the Douglas-fir Series, therefore those numbers are used in this table. For the eastern portion of LSR 227, use guidelines from the Winema NF LSR Assessment.

FUEL BREAK SALVAGE APPROACH

This approach focuses on reducing the increased fire risk associated with the large amounts of dry, dead fuels present after stand replacement events. It is intended to be used in addition to the fuel break network suggested in the section, "Treatments and Criteria to Reduce Risk of Large Scale Fire". The objective is to reduce the continuous area of high risk fuels by strategic placement of fuel breaks within the high intensity (stand replacement) portions of large fires. It may be used to help mitigate the increased long term fire risk associated with leaving the large amounts of snags associated with the area salvage approach. TABLE 53 summarizes the treatment and criteria. The criteria are those listed on page 151, "Reduce Large Fire Risk with Fuel Breaks." Figure 21 presents an example.

Figure 21: Fuel Breaks After Stand Replacement Fire



Fire Edge | Fuel Break | Stream
High Intensity | Medium Intensity | Low Intensity

POTENTIAL SALVAGE TREATMENT AREAS (1996)

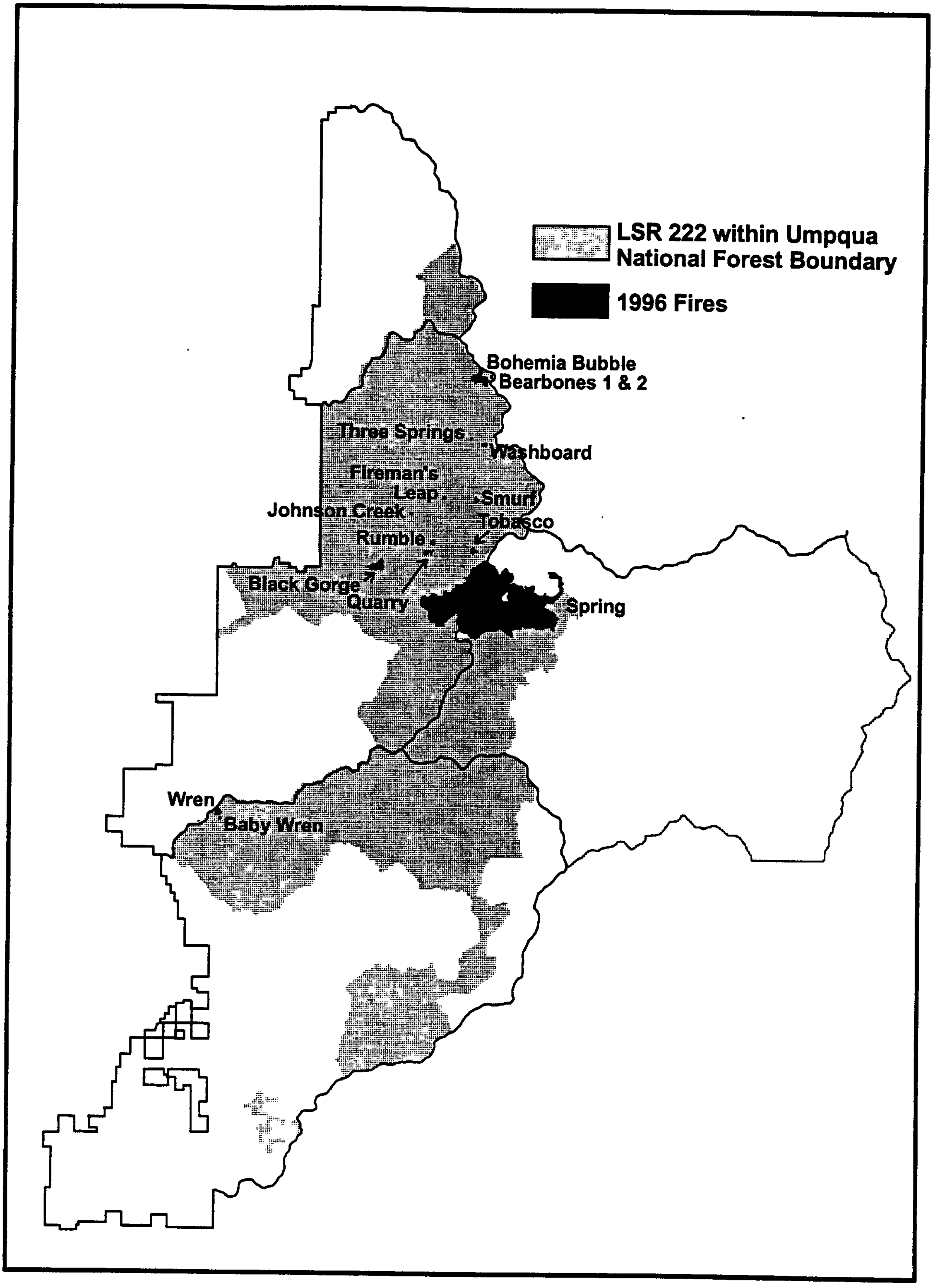
The Umpqua, Willamette, and Rogue River National Forest portions of the South Cascades LSR network experienced lightning-caused fires in 1996 (Table 51 and Figure 11). These are the current potential salvage areas within the South Cascades LSRs.

While project planning and NEPA decisions will determine specific treatment needs, the most acres that could be treated can be estimated here. Of the 6000 acres in 17 fires during 1996, a maximum of about 1077 acres in 5 fires qualify for salvage consideration under the standards and guidelines in the ROD.

Table 51: 1996 Fires in South Cascades LSR Network Larger than 10 Acres. Only Acres within LSR are Shown

LSR	Admin. Unit	Fire Name	Fire Acres in LSR	Stand Replacement Acres in LSR
222	Umpqua NF	Baby Wren	5	0
222	Umpqua NF	Bearbones 1 & 2	293	110
222	Umpqua NF	Black Gorge	280	40
222	Umpqua NF	Bohemia Bubble	24	0
222	Umpqua NF	Firemans Leap	23	0
222	Umpqua NF	Horse Prairie	57	10
222	Umpqua NF	Johnson Creek	7	0
222	Umpqua NF	O Four	7	0
222	Umpqua NF	Quarry	56	5
222	Umpqua NF	Rumble	27	0
222	Umpqua NF	Smurf	42	5
222	Umpqua NF	Spring	4988	890
222	Umpqua NF	Tabasco	4	0
222	Umpqua NF	Three Springs	15	0
222	Umpqua NF	Washboard	37	2
222	Umpqua NF	Wren	95	5
222	Willamette NF	Bearbones 1 & 2	15	0
222	Willamette NF	Bohemia Bubble	12	0
227	Rogue River NF	Hepsie Fire	42	10
TOTAL			**6029**	**1077**

Figure 22: 1996 Fires in LSRA 222 (Umpqua and Willamette NFs)



TREATMENT AMOUNTS AND IMPLEMENTATION SCHEDULE

The extent of stand replacement events within the next few years cannot be predicted, however, exemption from further REO review for a reasonable, yet conservative amount of salvage treatment is requested.

Exemption is requested for all salvage treatments combined, to not exceed approximately one percent (7,100 acres) over 5 years. This amount is expected to be enough for most situations, but would require review for very large stand replacement events. For tracking purposes, this amount is segregated by LSR administrative unit. If proposed treatments would exceed the amount listed by individual LSR administrative unit, coordination with other units in that LSR will be needed to assure that the amount listed as exempt from REO review is not exceeded for that LSR as a whole.

Table 52: Cumulative Salvage Treatment Area Exempt from Further REO Review

LSR	LSR Total Acres	Salvage Treatment Area Exempt from Further REO Review (@ Approx. 1% of total acres)
222, Eugene BLM	21,200	200
222, Roseburg BLM	25,500	250
222, Umpqua NF	342,800	3,400
222, Willamette NF	93,300	900
222, Rogue River NF	25,200	250
224, Medford BLM	21,500	200
225, Rogue River NF	39,800	400
226, Rogue River NF	49,800	500
227, Rogue River NF	52,800	500
227, Winema NF	48,800	500
Total	**720,700**	**7,100**

TREATMENTS AND CRITERIA FOR MULTIPLE USE ACTIVITIES OTHER THAN SILVICULTURE

Non-silvicultural activities are on-going and new ones may be proposed within the LSR boundaries. "As a general guideline, nonsilvicultural activities located inside Late-Successional Reserves that are neutral or beneficial to the creation and maintenance of late-successional habitat are allowed." (ROD C-16). Although non-silvicultural activities do not require REO review, projects must be consistent with the ROD. The ROD provides good direction on these types of activities (C-16 through C-19).

During the period from December 1996 through January 1997, visits were made to individual land management units to collect details on existing land uses and additional items of note. See Table 6 for the summary of "Multiple Use Activities Other Than Silviculture". At that time, none of the current uses were judged to have adverse effects on LSR objectives.

There may, however, be some site-specific areas that are outside of ACS or LSR objectives. These will need to be reviewed at a finer scale, either in watershed analyses or environmental assessments.

ROAD CONSTRUCTION AND MAINTENANCE

Substantial road related restoration is needed in LSR 222 due to increased slides the past two winters. Deferring road maintenance may have adverse effects on LSR objectives as impaired drainage increases the potential of roadbed slumps and increased sediment delivery to streams. When deferred maintenance keeps roads closed, this will affect the ability to respond rapidly to fire, increasing the chance of large scale fire.

Access and Travel Management Plans are also needed.

Improvements are planned by Fed. Highway Administration on the Elk Cr. Road in LSR 224. This project does have some impact on the riparian area.

During road upgrades and maintenance, consider the following:

- Facilitate the upstream/downstream movements of species with culvert size and placement (or other stream crossing structures) decisions.
- Increase the frequency of drainage dips or culverts to reduce changes in drainage patterns.
- Stockpile down wood from hazard removal sites and place in areas near wetlands, ponds, and lakes where past management has reduced dead and down wood.
- Modification or removal of culverts and water diversion structures where possible to restore aquatic connectivity.

ROAD DECOMMISSIONING

The objectives of road decommissioning include:

- reducing the length of the road-related drainage network;
- improving habitat connectivity for amphibian and other species;
- restoring riparian and aquatic conditions;
- increasing terrestrial late seral patch size; and,
- reducing sediment delivery from roads and upslope areas.

These objectives are derived from ACS riparian and fisheries goals.

In addition to the objectives, there are other considerations when planning road systems and road decommissioning. Access to non-federal land needs to be considered. In addition, access may be needed for fire suppression, outdoor recreation, restoration projects, other LSR projects, or projects in other land allocations.

Nevertheless, there are opportunities to reduce the amount of existing roads within the South Cascades LSR network. Priority consideration for decommissioning and improvements in existing roads should be given to:

1. <u>Roads within riparian reserves in key watersheds;</u> particularly where roads have major influences on ground water, drainage patterns, flows and sedimentation on wetland, pond, spring, and seep habitats.
2. <u>Roads within riparian reserves not in key watersheds;</u> but where roads are within 600 feet of ponds, wetlands, springs, seeps and lakes, especially upslope of wet areas and where roads bisect a system of wetlands, ponds, or where roads exist between streams, wetlands, or ponds.
3. <u>Roads outside of riparian reserves in key watersheds.</u>
4. <u>Roads within watersheds that have road density below 3 miles/square mile</u>. The rationale is to improve or reinforce areas that are considered close to "fully functioning" based on road density.
5. <u>Roads where density in the transient snow zone is greater than 3 miles per square mile</u>; and,
6. <u>roads where density in the nontransient snow zone is greater than 3 miles per square mile</u>.

DEVELOPMENTS

Pelican Butte Ski Area, LSR 227

There is a proposed ski area at Pelican Butte on the Winema National Forest. Most of the facility would be outside of LSR 227, but access and potentially some development may be proposed within the LSR. The implications will be addressed with REO separately from this assessment.

Westfir Administrative Site, LSR 222

The reconstruction of the Westfir Administrative Site will require an additional 1/2 to 1 acre clearing for expansion of the parking lot.

RANGE MANAGEMENT

Tiller Ranger District on the Umpqua National Forest has an environment assessment in progress. Some potential conflicts with LSR objectives due to traditional use areas, riparian concerns, and introduction of nonnative species.

Generally, livestock grazing is incompatible with desired vegetative conditions in wet areas. Consider excluding livestock from wet areas and their associated riparian reserves. Restore vegetative condition through planting if natural reproduction is unlikely. Maintaining or restoring riparian and forest vegetative structure including height, canopy cover, and vigorous reproduction in herb, shrub, hardwood and conifer tree layers, is desired to meet LSR and ACS objectives.

Rights-of-Way, Contracted Rights, Easements, Special Use Permits

A proposed flood control dam on Elk Creek is half-build, but the project is currently on hold due to fish blockage issue. Other special use permits are inconsequential.

Nonnative Species

Roads have provided pathways for nonnative and noxious weed introductions and spread within the LSRs. See Table 6 and the Existing Conditions section "Nonnative Species" for additional information.

Plans for addressing negative impacts on native species in wet areas need to be developed (ROD C-19). Several of the following recommendations are outside the direct authority of the federal land management agencies. Work cooperatively with the State of Oregon when considering the following restoration items:

- Reduce water levels in ponds and wetlands to depths unsuitable for fish and bull frogs.
- Eliminate fish stocking in lakes determined to be important in habitat value or spatial connectivity.
- Control bull frog populations through removal of adults and egg masses.
- Reduce the potential for disease, parasite and nonnative species spread with the use of clean equipment policies (e.g. for multiple drafting set up portable tanks with one clean draft line to water).

Fuelwood, American Indian Uses, Mining, Land Exchanges, Habitat Improvement Projects, Special Forest Products, Recreation Uses, and Research

None of these current uses have adverse effects on LSR objectives. There may be some site-specific areas that are outside of ACS or LSR objectives. Some will need to be reviewed at a finer scale either in watershed analyses or project environmental assessments. Firewood harvest and mushroom permits, in particular, should continue to be examined for consistency with standards and guidelines and LSR objectives. Generally, though, most sites occupy such a small area that, overall, the ecological functions the LSRs will not be disrupted.

TABLE 53: SUMMARY TABLE OF TREATMENT NEEDS AND CRITERIA IN LSRs[52]

PRIMARY OBJECTIVE Rationale	WHAT'S NEEDED Appropriate Mgm't Activities and Treatments	WHERE Landscape Condition Landscape Criteria	WHERE Stand Condition Stand Criteria	HOW MUCH Amounts & Schedule
LOW PRIORITY TREATMENTS				
If all objectives are or will be met, no need for add'l treatments.	No treatment at this time, or low priority treatment.	Not in high fire risk area. Watershed meets late seral DFC.	All structural components are in place, or area is on track for attainment of late-successional conditions.	Not estimated.
TREATMENTS TO ENHANCE LATE SERAL CONDITIONS, (ROD silvicultural Standards and Guidelines apply, C-12 & C-13.)				
Put stand on path to produce late seral structures. Increase size of eventual late seral blocks.	Reforestation, Revegetation,	Artificial reforestation priority 1: Areas without seed sources in the middle of large stand replacement sites, with low amounts of down wood. Priority 2: No seed sources, but high amounts of down wood. Priority 3: Mosaics with seed sources and mod-high amounts of down wood.	Early seral stands (generally <10 years). Focus on natural regeneration where appropriate. Use 4/20/95 REO exemption criteria, page 123.	As needed.
Same as above. Reintroduce tree species previously native to the area.	Same as above. Include rust resistant white pine and sugar pine in planting mix, as available.	Landscapes where white pine blister rust has reduced stocking of five-needle pines below historic levels.	Early seral stands (generally <10 years). Use 4/20/95 REO exemption criteria, page 123. Avoid clumpy pine distribution pattern.	As needed.
Same as above. Reintroduce tree species previously native.	Same as above. Include minor species in planting mix, as available.	Areas where previously native species have been eliminated or greatly reduced.	Early seral stands (generally <10 years) in riparian areas, (e.g. Western redcedar and other minor species). Use 4/20/95 REO exemption criteria, page 123.	As needed.
Put stand on path to produce late seral structures. Increase size of existing and eventual late seral blocks.	Release, Young Stand Thinning.	Priority 1: Areas with large amounts of young stands. Priority 2: Stands near large blocks of late seral.	Early seral stands (generally <25 years). Use 4/20/95 REO exemption criteria, page 123. See root disease guidelines, page 143.	Rogue NF will do 1500-2000 acres, several hundred/year in LSR 225/226.

[52] Any conflicts, if they exist, between this table and the preceding text are to be resolved in favor of the text.

TABLE 53: SUMMARY TABLE OF TREATMENT NEEDS AND CRITERIA IN LSRs

PRIMARY OBJECTIVE Rationale	WHAT'S NEEDED Appropriate Mgm't Activities and Treatments	WHERE Landscape Condition Landscape Criteria	WHERE Stand Condition Stand Criteria	HOW MUCH Amounts & Schedule
Put stand on path to produce late seral structures. Long-term large wood recruitment.	Release, Young Stand Thinning.	See Table 4 for suggested watershed priorities for riparian areas. Within watersheds, focus on smaller basins where it is possible to do enough to make a real improvement.	Early and mid-seral stands in riparian areas. Use 4/20/95 REO exemption criteria, page 123. Follow recommendations from watershed analyses. See root disease guidelines, page 143.	As needed.
Enhance LS structure. Put stand on path to produce late seral structures.	Density Management Snag Creation Prescribed Fire Underplanting Down wood recruitment	Focus on areas where opportunities exist to decrease fragmentation of late seral. Focus on large blocks of previously harvested early and mid-seral stands. Where dispersal habitat for owls is dependent on treatment candidate stands, spread treatments over time.	Early and mid-seral stands. Stand is not a complex, diverse stand that will soon meet and retain LS conditions w/o treatment. Reaching LS conditions will be substantially delayed, or desirable components of the stand will likely be eliminated, because of stocking levels. Basal area weighted avg. age of stand is < 80 years. Use 7/9/96 REO exemption criteria, page 138. Use Snag and LWM criteria, page 130. See root disease guidelines, page 143.	Table 37 provides the amount of harvested acres within each watershed and LSR. This is a maximum estimate of density mgm't treatment needs in previously harvested stands, and represents the bulk of treatment acres.
Enhance LS structure. Put stand on path to produce late seral structures.	Density Management Snag Creation Prescribed Fire Underplanting Down wood recruitment	Focus on areas where opportunities exist to decrease fragmentation of late seral. Focus on large blocks of previously harvested stands. Where dispersal habitat for owls is dependent on treatment candidate stands, spread treatments over time.	Late seral stands. Stand is not a complex, diverse stand that will soon meet and retain LS conditions w/o treatment. Reaching LS conditions will be substantially delayed, or desirable components of the stand will likely be eliminated, because of stocking levels. Basal area weighted avg. age of stand is >= 80 yrs. REO review is required for these project proposals. Use Snag and LWM criteria, page 130. See root disease guidelines, page 143.	North side Larison Ridge, (Shortridge Cr., 600 acres); South side of Larison Cr., 700 acres; Staley Ridge (west side in Coal Cr., 500 acres; East side in Staley Cr, 400 acres). Other stands may also exist throughout LSRs.

TABLE 53: SUMMARY TABLE OF TREATMENT NEEDS AND CRITERIA IN LSRs

PRIMARY OBJECTIVE Rationale	**WHAT'S NEEDED Appropriate Mgm't Activities and Treatments**	**WHERE Landscape Condition Landscape Criteria**	**WHERE Stand Condition Stand Criteria**	**HOW MUCH Amounts & Schedule**
Maintain native species. Enhance vigor of pine components and avoid undesirable losses due to bark beetles by reducing moisture competition.	Density Management, or Prescribed Fire.	Low elevations and in the Oregon White Oak Plant Series north of the Rogue-Umpqua Divide, and at mid to low elevations south of the Rogue-Umpqua Divide in the Douglas-fir, Oregon White Oak, and White Fir Plant Series. Where dispersal habitat for owls is dependent on treatment candidate stands, spread treatments over time.	Early and mid-seral stands with Sugar or Ponderosa pine (less than 80 years old). In immediate vicinity of pine: Manage density near sugar and white pine such that basal area <= 140 sq. ft/acre. Manage density near ponderosa pine to not exceed these basal areas; 120 sq. ft/acre on dry sites, 150 sq. ft/acre on moderate sites, and 180 sq. ft/acre on moist sites with deep soils. For prescribed fire, use guidelines from prescribed fire plan. Use 7/9/96 REO exemption criteria, page 138. In mixed species stands, vary density in species other than pine. Avoid clumpy pine distribution. Use Snag and LWM criteria, page 130. See root disease guidelines, page 143.	North of the Rogue-Ump Divide, approx. 110,800 acres include pine. South of the Rogue-Ump Divide, approx. 50,600 acres include pine. See page 145.

TABLE 53: SUMMARY TABLE OF TREATMENT NEEDS AND CRITERIA IN LSRs

PRIMARY OBJECTIVE Rationale	WHAT'S NEEDED Appropriate Mgm't Activities and Treatments	WHERE Landscape Condition Landscape Criteria	WHERE Stand Condition Stand Criteria	HOW MUCH Amounts & Schedule
Enhance development of late seral characteristics, shorten time to crown closure, or selectively improve competitive position of desired vegetation.	Fertilization by broadcast or selective methods.	None.	Early and mid-seral stands (less than 80 years old). Use applicable agency guidelines, keeping in mind LSR objectives. Conduct appropriate surveys to determine existing and likely species to benefit. Avoid treatment where treatment is likely to enhance nonnative species or noxious plants. Keep fertilizer out of streams/wet areas. See fertilization criteria, page 148.	Burnt Peak fire area in LSR 224. 2500 acres possible, treat for max. of 10 years.
Maintain habitats that have been vanishing due to fire exclusion.	Maintain opening by prescribed fire, manual or mechanical clearing	Oregon White Oak Plant Series in LSR 222 and 224 and in meadows throughout the LSR network.	Oak Woodland habitats and meadows with shrub or tree encroachment. Control exotics/noxious plants.	Oak plant series total 1300 acres. Meadows total 15,000 acres, see page 149.

TABLE 53: SUMMARY TABLE OF TREATMENT NEEDS AND CRITERIA IN LSRs

TREATMENTS TO REDUCE RISK OF LARGE SCALE DISTURBANCE, (ROD Silvicultural Standards and Guidelines apply, C-12 & C-13.)				
Protect areas from large scale fire disturbance by reduction of fuel loading. Increase ability to safely and effectively conduct initial attack fire control activities. Minimize treatment risk to LS habitats.	Treat to create shaded fuel breaks by young stand thinning, density management, and/or by use of prescribed fire. See page 151.	High fire risk areas (see fire risk map 8 for estimate) or east of the Cascades in LSR 227 (see note in associated write-up). Avoid locations which would split large blocks of late seral habitat. Give priority to treatment near rural interface and high density recreation areas. Give priority to treatment in or near recent stand replacement events. See also Salvage section. See page 21 for watershed priorities.	In areas designated as control lines on preattack or equiv. plans. All seral stages. Reduce fuels within approx. 200' (horizontal distance) each side of control line. Where there are interlacing crowns, remove only those green trees needed to eliminate the interlacing. Thin understory to spacing of not less than 6' between crowns. Leave the following LWM: 0-9" dia., leave 2-10 tons; 9-20" dia., leave 10-15 tons; 21"+ dia., leave 5-10 tons/acre; for maximum total of 17-35 tons per acre. Emphasize retention of large hardwoods. For connectivity, provide dispersed, variable-spaced small piles (3-5' hi and 6-10' in diameter. When cutting snags or trees on ridgetops, cut stumps as high as possible. Since large snags are the best habitat, do not cut them all. Meet fuel break requirements, yet leave some of the largest snags. Also see fire plan guidelines.	28,000 acres over entire LSR network (max.). Implemented over 20 years, the maximum acres to treat is 1400/yr.
Make stands less susceptible to large-scale disturbances, while accelerating development of late-successional conditions and minimizing risk to late seral habitat.	Reduce fuel loading by young stand thinning, density management, and/or by use of prescribed fire.	High fire risk areas (see fire risk Map 8 for first estimate) or east of the Cascades in LSR 227. Treat where highest probability exists of high intensity wildfire spreading into late seral habitat. Identify high priority blocks for treatment.	In early and mid-seral stands (areas < 80 years old). Priority: younger stands, dry sites (90-270 degree aspects, upper slopes), plant series with pines, areas adjacent to fuel breaks. Treat around (outside of) owl core areas to minimize future risk to core from fire disturbance. For young stand or density management, use REO exemption criteria 4/20/95 or 7/9/96. See also root disease guidelines. For prescribed fire, use guidelines from prescribed fire plan. Use Snag and LWM criteria, page 130.	Of the 192,000 early/mid seral acres estimated in high risk fuels, treat 54,000 acres (upper third of slopes) over 20 years, or 2700 acres per year.

TABLE 53: SUMMARY TABLE OF TREATMENT NEEDS AND CRITERIA IN LSRs

TREATMENTS TO REDUCE RISK OF LARGE SCALE DISTURBANCE, (ROD Silvicultural Standards and Guidelines apply, C-12 & C-13.)				
Protect areas from large scale disturbance while minimizing risks of treatment to LS habitat.	Reduce fuel loading by use of prescribed fire.	High fire risk areas (see fire risk Map 8 for first estimate) or east of the Cascades in LSR 227. Treat to protect the largest blocks of late seral habitat first. See page 21 for watershed priorities. Where areas of fire refugia exist, fire is not recommended.	Late-seral stands (areas > 80 years old). Priority: younger stands, dry sites (90-270 degree aspects, upper slopes), plant series with pines, areas adjacent to fuel breaks. Focus treatments in areas most removed from known owl sites. Use guidelines from prescribed fire plan. Use Snag and LWM criteria, page 130.	Of the 190,000 late seral acres estimated in high risk fuels, treat 48,000 acres (upper third of slopes) over 20 years, or 2400 acres per year.
Maintain native species. Enhance vigor of pine components and avoid undesirable losses due to bark beetles by reducing moisture competition.	Remove competing vegetation near large pines.	Low elevations and in the Oregon White Oak Plant Series north of the Rogue-Umpqua Divide, and at mid to low elevations south of the Rogue-Umpqua Divide in the Douglas-fir, Oregon White Oak, and White Fir Plant Series. Give priority to areas where pine are the only large tree structure (White Oak). Also see text.	Late or complex mid-seral stands with large Sugar or Ponderosa Pine. Remove competing veg. under 24 inches DBH to the pine drip line plus 20'. In situations where mortality risk is caused predominantly by trees >24" DBH, individual trees may be killed and left standing. When not using prescribed fire, leave all snags and LWM, subject to operational safety concerns, unless precluded by criteria under "Reduce Fuel Loading in Stands over 80 years. Also see text.	North of Rogue-Ump Divide, approx. 990 acres to treat. South of Rogue-Ump, approx. 400 acres to treat. See page 167.

TABLE 53: SUMMARY TABLE OF TREATMENT NEEDS AND CRITERIA IN LSRs

SALVAGE TREATMENTS, (ROD Salvage Standards and Guidelines apply, C-13 through C-15)				
Ensure a conservative approach to minimize loss of habitat components.	Area Salvage Approach (Salvage by small patch clearcut or group selection methods). See page 169	Consider LWM leave needs in context of the watershed and surrounding vicinity. See text for additional criteria and clarification.	In areas that have had recent stand replacement event (sites >10 acres and <40 percent crown closure). See text for additional criteria and clarification.	As needed. Exemption from further REO review of all salvage treatments limited to 7000 acres over 5 years.
Reduce (not eliminate) risk of reburn after stand replacement event. Increase ability to safely and effectively conduct initial attack fire control activities. Ensure a conservative approach to minimize loss of habitat components.	Fuel Break Salvage. Treat to create fuel breaks by removing material from site. See page 180.	Where the fuel break goes through non-stand replacement areas, use the fuel break criteria in the above section, "Treatments to reduce Risks". Focus fuel breaks in strategic areas (ridgetops, upper slopes, and roads). Avoid mid-slopes and areas around perennial streams. Leave the following LWM: 0-9" dia., leave 2-10 tons; 9-20" dia., leave 10-15 tons; 21"+ dia., leave 5-10 tons; for total of 17-35 tons per acre. Leave largest dia. Snags. For snags >=16" DBH, leave ecology plot snag/acre mean for each size class by plant series. For <16" snags, remove material to meet fire risk reduction needs. If stand replacement area averages <16", then leave 7-10 snags/acre in the 9-16" class. When cutting snags on ridgetops, cut stumps as high as possible.	In areas that have had recent stand replacement event (sites >10 acres and <40 percent crown closure). Reduce fuels within 200' (horizontal distance) each side of control line. Where there are interlacing crowns, remove only those snags needed to eliminate the interlacing. See text for additional criteria and clarification.	As needed. Exemption from further REO review of all salvage treatments limited to 7000 acres over 5 years.
MULTIPLE USE ACTIVITIES OTHER THAN SILVICULTURE, (ROD Standards and Guidelines apply, C-16 through C-19). Some watershed restoration projects covered in the silviculture section.				
Reduce drainage network. Improve connectivity for amphibians. Restore riparian and aquatic conditions. Increase terrestrial late seral patch size. Reduce sediment delivery from roads.	Reduce road density. Road restoration. Slope stabilization. Culvert maintenance. Create channel complexity Place LWM in channels. Recruit wood off-site. Other projects from watershed analyses.	Watersheds with road densities >2 miles/sq.mile, or where valley bottom roads exist. See Table 4 for fifth field watershed priorities.	Roads. Focus on roads in riparian areas. Follow recommendations in watershed analyses and ACS. Focus in smaller basins where it may be possible to do enough to make a positive difference. Encourage partnerships with private landowners.	See watershed analyses and access and travel mgm't plans.

CHAPTER 6: FIRE MANAGEMENT PLAN

INTRODUCTION

One goal of the fire management plan is to provide an overview of the areas at risk from large scale fire and provide guidelines on how to deal with that risk. This information is contained in two sections of this assessment: within Chapter 3, the "Ecological Processes" section; and in Chapter 5, "Treatments and Criteria to Reduce Risks of Large Scale Disturbance".

The other goal of the fire management plan is to provide direction for the suppression of wildfire and the use of prescribed fire within the assessment area. This information is contained in this chapter.

Fire management activities consist of wildfire suppression, wildfire hazard reduction, and prescribed fire applications. In the course of implementing the guidelines contained in this fire management plan to achieve ecosystem management objectives within the LSRs, it is critical that wildfire suppression and prescribed burning activities do not compromise the safety of firefighting personnel or the public. Safety is the highest priority for all fire activities conducted in the LSRs.

WILDFIRE SUPPRESSION

The goal of wildfire suppression in the LSRs is to minimize the negative impacts of wildfires on ecosystem management objectives, consistent with economic efficiency. Wildfire should be suppressed to avoid loss of habitat in order to maintain management options.

Fire managers will respond to all wildfires by taking appropriate suppression responses. In most situations aggressive initial attack is the most cost efficient means to suppress wildfire. When these actions fail, extended attack priorities should be established utilizing the Escaped Fire Situation Analysis Process to determine cost effective actions and management priorities.

Guidelines for fire suppression actions are as follows:

- Firefighter and public safety is the first priority in every fire management activity.
- Design fire suppression strategies, practices, and activities to meet aquatic conservation strategy objectives.
- Avoid building control lines in riparian reservoirs.
- Where possible, use existing roads and natural fuel breaks for control lines.
- Construct firelines only wide and deep enough to check fire spread. Consider use of cold trailing and wet line to lessen impacts.
- Use burning-out as a fire suppression tool to enhance firefighter safety and minimize the amount of acres lost to high intensity fire.
- Consider rapidly extinguishing smoldering large woody material and duff.
- Minimize impacts of suppression activities near spotted owl nest sites.
- Locate and manage water drafting sites to minimize adverse effects on riparian habitat and water quality.

- Minimize bucking and cutting of trees to establish firelines.
- Consider allowing trees and snags to burnout instead of felling them, provided they do not pose a significant safety risk or pose a significant risk of spotting outside the fireline.
- Locate portable pumps to minimize the risk of fuel spills entering streams, ponds, or other areas containing water.

PRESCRIBED FIRE

Prescribed fire is recognized as a valuable tool to meet LSR objectives, especially in southwest Oregon where fire is such an integral part of ecosystems function.

The goal of prescribed burning in the LSRs is to:
1. Protect or enhance stand conditions for old growth associated species, and
2. Reduce the risk of large scale, high intensity disturbances.

Application of prescribed fire should vary in extent and frequency of application, and intensity of burning. The differences in applications should be related to the fire return intervals for the specific area, current ecosystem needs, and the wildfire risk analysis contained in this assessment. The use of prescribed fire for ecosystem management and wildfire risk reduction will restore processes that have been limited by relatively effective fire exclusion, reduce the risk of stand replacement fire in the LSR, lower smoke emissions from wildfire, and reduce the cost of wildfire suppression.

Management ignited and naturally ignited fire may be used for prescribed burning. Both types of ignition need a project specific prescribed burn plan that meets current agency direction. In addition, a prescribed natural fire plan must be approved prior to the use of naturally ignited prescribed fire.

Guidelines for prescribed fire usage are as follows:

- Site specific burn plans must be prepared for all prescribed burn activities. Prescribed burn plans must meet Agency Manual direction and, in the case of the Forest Service, the FEIS for managing competing and unwanted vegetation.
- Prescribed fire operations would implement the same suppression guidelines as wildfire suppression activities to minimize adverse impacts to late-successional habitat.
- Prescribed fire projects and prescriptions would be designed to contribute to attainment of aquatic conservation strategy objectives.
- Keep as many large trees as possible, i.e. keep the percentage of the burned area below 15 percent in high intensity fire behavior and create snags, canopy gaps, and patchy understory for developing multiple canopy layers, large woody material, and future understory trees.
- Use prescribed fire in areas where the overstory is at risk due to an overstocked understory and in areas where fire exclusion has lead to increased fuel loading and potentially extreme fire behavior.
- Use prescribed fire to maintain a diversity of habitats, such as meadows and oak/pine savannas.

A number of treatments may be utilized to reduce fuel loading and enhance stand conditions for old growth associated species. Underburning could be used where stand densities, presence of ladder fuels, and fire intolerant species don't make it impractical. In cases where underburning is impractical, hand or machine piling of fuels can be used to reduce the risk of stand replacement fire, when high fuel loads are concentrated in contiguous stands. These treatments should be designed to retain an adequate amount of large woody material. The upper third of southerly slopes should receive highest priority for treatment. Sufficient snags of various species and size should be retained to ensure future recruitment of large woody material. Underburning should follow harvests or thinnings which have stands dominated by fire tolerant species.

Shaded fuel breaks should:

1) Reduce the fuels within the fuel break with prescribed burning;
2) Where interlacing crowns exist, remove only those green trees needed to eliminate the interlacing;
3) Thin understory to spacing of not less than 6 feet between crowns;
4) Leave large woody material in the following ranges: 0-9", leave 2-10 tons; 9-20", leave 10-15 tons; 21"+, leave 5-10 tons/acre; for a total of 1-35 tons per acre, where they do not compromise the integrity of the fuel break;
5) Leave small well dispersed handpiles where they do not compromise the integrity of the fuel break to provide habitat for various small mammals, birds, reptiles, amphibians, arthropods, fungi, mosses, lichens, bacteria and viruses;
6) Where snags can be left that do not compromise the integrity of the fuel break, emphasize leaving the largest snags;
7) Emphasize the retention of larger hardwoods in ridge-top fuel breaks;
8) Avoid direct and indirect introduction of nonnative plants and noxious weeds.

LOGISTICS

Logistics in the LSRs include incident bases, helispots, and heliports. Interdisciplinary teams will propose sites for these facilities, using the Fire Situation or the Escapes Fire Situation Analysis process. Incident bases will not be located within Riparian Reserves. Evaluate the use of short-term impact camps, such as Spike and Coyote camps, versus the use of longer-term, higher impact incident base camps. Use existing pre-planned sites whenever possible. New site locations should be on naturally draining areas, such as sites with rocky or sandy soils, or in natural openings surrounded by heavy timber. Avoid locating camps in moist meadows. When laying out a camp define cooking, sleeping, latrine, command post, and water supply locations to minimize the number of trails in camp, thus reducing compaction to the site. Adequately mark trails. Ensure the crews do not clear vegetation or dig trenches in sleeping areas. Use commercial portable toilet facilities. Constantly evaluate the impacts, long term and short term, of the camp. Be sure to include rehabilitation of campsites in the rehabilitation plan.

AVIATION MANAGEMENT

One of the goals for Late Successional Reserve managers is to minimize the disturbance caused by air operations during an incident.

Aviation guidelines for Late Successional Reserves stress use of the minimum size helicopter that can do the job and still meet the intended suppression strategy and objectives. If possible, utilize long-line remote hooks, instead of constructing helispots. Do not construct helibases or helispots within Riparian Reserves. Pre-planned helispots and helibases will be determined by an interdisciplinary team on a watershed basis. If an area is needed that is not included in the pre-planned map, consider utilizing natural openings or already impacted areas, such as landings for logging operations, but avoid areas with high visitor use.

During initial attack, fire managers must weigh the use of retardant versus the probability of initial attack crews being able to successfully control or contain a wildfire. If a determination is made that retardant will prevent a larger and more damaging wildfire, then retardant may be used. Retardant or foam will not be dropped on surface waters, in perennial Riparian Reserves or on spotted owl and bald eagle nest sites.

FIRE REHABILITATION

Rehabilitation plans must be designed to restore or move the area towards the late successional or old growth conditions, prevent or stop sediment from reaching Riparian Reserves, and restore camp sites and similar areas to the pre-fire condition. Wildfire suppression and the logistical support to the effort will cause some significant damage regardless of how careful and conscientious incident managers and firefighters are. The Incident Commander will consult with the Line Officer's designated resource advisor to mitigate all site specific concerns. Rehabilitation planning and implementation should begin as soon as possible after firefighting efforts begin and must begin before the fire is declared contained.

POST FIRE MONITORING AND EVALUATION

Post fire monitoring and evaluation will serve to identify areas of this plan or of the suppression effort that need improvement, formulate different strategies and tactics to add to the plan, and assist in adaptive management. Initial evaluation should occur before the firefighting effort ends on all extended attack and project fires. This evaluation should discuss the strategy and tactics used and success or failure of minimum impact tactics in meeting LSR and Riparian Reserve objectives, standards, and guidelines. It should also discuss whether firefighter safety was compromised and what changes might be made to better protect firefighters and still meet LSR and Riparian Reserve objectives. Lastly, the evaluation should rate the incident resource advisor and the Escaped Fire Situation Analysis in providing clear direction to the incident management team on meeting LSR and Riparian Reserve objectives. A copy of the evaluation should be files with the incident management package and with the LSR Assessment.

Within one year of any fire exceeding five acres, an interdisciplinary team should revisit the burn area to ascertain the success or failure of rehabilitation in meeting LSR and Riparian Reserve objectives and standards and guidelines. This team should be comprised of resource specialists with expertise in the areas of concern on a given fire and a representative of the fire management organization. A team need not be very large if the concerns or items under evaluation are considered to be minor or small scale. A copy of the evaluation should be filed with the incident management package, line officer, and LSR Assessment.

CHAPTER 7: MONITORING

The ROD directs that LSR assessments should generally include proposed monitoring and evaluation components to help evaluate if activities are carried out as intended (implementation monitoring) and achieve desired results (effectiveness monitoring).

This monitoring discussion for the South Cascades LSRA is not intended to be comprehensive or exhaustive. For a more thorough discussion of implementation, effectiveness, validation monitoring and the monitoring relationship to adaptive management, research and management needs, the reader is referred to the ROD (Section E), BLM District Resource Management Plans (RMPs) and US Forest Service Land and Resource Management Plans (LRMPs).

Specific monitoring strategies for the South Cascades LSRA are tied to both the stand and landscape scale description and application of existing conditions, desired future conditions, treatment needs and criteria. This LSRA provides information upon which management decisions may be based. Unlike Forest Service and BLM planning documents, this LSRA does not contain management decisions. Modifications to existing Plan monitoring as set forth in current approved plans would of course depend on management decisions that may be based on a number of considerations in addition to the information in this LSRA.

LSR MONITORING GOALS

IMPLEMENTATION MONITORING

The short term goal of monitoring is to provide information to evaluate whether activities in the LSR have been carried out as intended. This is accomplished by implementation monitoring. Management approaches on how to apply the standards and guidelines, or the standards and guidelines themselves, may need to be modified if monitoring indicates significant problems in implementing plans and procedures to on-the-ground projects.

Implementation monitoring of the application of the standards and guidelines is currently accomplished under the monitoring plans of the various Forest Service and BLM administrative units that this LSRA encompasses. Since no new standards and guidelines have been proposed in this LSRA, additional implementation monitoring, in general, is not proposed or needed. However, since refinement of the standards and guidelines has been proposed through this LSRA, it is proposed that implementation monitoring plans may be adjusted to recognize these refinements. The main proposed management activities discussed in this LSRA that may require implementation monitoring plan refinements are density management, salvage, fire risk reduction, and forest health-pine management.

EFFECTIVENESS AND VALIDATION MONITORING

The long term goal of monitoring is to provide information to evaluate the effectiveness of different management strategies to achieve LSR objectives. This is accomplished through effectiveness and validation monitoring. Many of the important issues about how to manage for older forest conditions will take at least [30 to 80] years to begin to address. The nature of management in LSRs is such that most management actions are aimed at producing results that are measurable only in the long term.

The management strategies contained in this LSRA do not represent changes, but rather refinements to the goals and objectives contained in the ROD. As such, existing effectiveness and validation monitoring plans do not need to be significantly changed or revised, but rather may need to be refined. Refinements to the goals and objectives that effectiveness and validation monitoring will evaluate should be based on the Desired Future Conditions variables discussed in this LSRA. For example, the goal of Late Successional Reserves "to maintain late-successional forest ecosystems" (ROD, B-1), has been refined by the desired future condition of "Terrestrial and Riparian areas with about 75 percent late seral conditions are desired." (Chapter 3, Desired Future Condition). Likewise, one of the goals of silvicultural systems, "prevention of large-scale disturbance by fire" (ROD, B-5), has been refined by the desired future condition of "No more than 28 percent of a watershed is in a high fire risk condition." (Chapter 3, Desired Future Condition).

Many of the Desired Future Conditions are described more in a qualitative rather than quantitative manner. Evaluation of monitoring results requires establishment of specific threshold conditions to determine if goals are being achieved. If goals are described in ambiguous or broad terms, they are not easily measured, and the degree of success or failure is not easily determined. Where Desired Future Conditions are broadly or qualitatively described, a further step of refinement is necessary for practical and functional effectiveness monitoring to take place. If the broad or qualitative nature of the Desired Future Condition is the result of incomplete information, then a research need may be identified to establish meaningful levels or thresholds. If the Desired Future Condition is broadly or qualitatively expressed due to the nature or ecology of the structural components being described, then the limitations of monitoring must be acknowledged.

LSR MONITORING STRATEGY

Management and ID team expectations for receiving information from monitoring late successional reserves need to be grounded in a realistic understanding of the time associated with processes involved in late-successional ecosystems. Implementation monitoring in Late Successional Reserves will produce rather immediate answers as to whether the standards and guidelines or management action/direction are being followed. However, much effectiveness and validation monitoring related to Late-Succession Reserve management will not be able to provide answers in the short term. Silvicultural treatments which are designed to be beneficial to the creation or maintenance of late-successional forest conditions may not yield answers to effectiveness monitoring for decades.

The overall approach to monitoring should be guided by direction established in the ROD, page E-2: "The monitoring process will collect information on a sample basis. Monitoring could be so costly as to be prohibitive if it is not carefully and reasonably designed. It will not be necessary or desirable to monitor each standard and guideline for every project. Unnecessary detail and unacceptable costs will be avoided by focusing on key monitoring questions and proper sampling methods. The level and intensity of monitoring will vary depending on the sensitivity of the resource or area and the scope of the management intensity." Based on this strategy, not all projects or management actions will be monitored. In addition, this strategy will not address all questions concerning Late-Successional Reserve management. Focusing on key monitoring questions will result in a monitoring strategy that may leave many interesting but non-essential questions unanswered through the monitoring process.

Although implementation monitoring will be conducted on a sample basis, it will probably be required for plan conformance to do implementation monitoring on each Forest or BLM District encompassed by this LSRA. However, due to the universal nature of many of the effectiveness and validation monitoring issues and questions within this and other Late-Successional Reserves, it would be unnecessary to duplicate all effectiveness and validation monitoring in each administrative unit. Administrative units, through coordination, should avoid duplicating efforts in unnecessary monitoring of the same effectiveness and validation questions.

MONITORING COMPONENTS

The ROD has identified key items to monitor in late-successional reserves. The key items identified by the Record of Decision are:

- Timber harvests consistent with standards and guidelines and with Regional Ecosystem Office review requirements.

- Other management activities in the late-successional reserve consistent with the standards and guidelines

- Late-successional reserve assessment completed

- Management activities consistent with late-successional reserve assessment

Bureau of Land Management Resource Management Plans, and National Forest Land and Resource Management Plans have incorporated or been amended to include all monitoring requirements and guidance contained in the Northwest Forest Plan. In addition, individual RMPs and LRMPs may contain other monitoring requirements pertinent to Late-Successional Reserves that are specific to individual administrative units.

Below are monitoring components that the South Cascades late-successional reserve assessment highlights based on various discussions and desired Future conditions contained in the assessment.

STAND LEVEL

At the stand level scale, effectiveness monitoring should examine the broad question that addresses the changes in vegetation structural characteristics: Are management actions enhancing the attainment or maintenance of late-successional characteristics? Stand level management activities that may be examined through effectiveness monitoring in the LSR include: reforestation, young stand thinning or release, down wood recruitment, shaded fuel breaks, fuel loading reduction activities, and area salvage.

Stand level evaluations under effectiveness monitoring require establishment of specific levels or threshold conditions by which achievement or non-achievement of goals may be measured. For example, a desired future condition such as "snag and down wood at levels high enough and variable enough to maintain site productivity and species diversity after silvicultural, salvage, or fuel management activities", does not set a level or threshold specific enough to monitor. Further refinement is needed. In addition, an established baseline of site productivity and species diversity would be needed to measure the goal of "maintain". Other factors influencing site productivity and species diversity may need to be identified in order to discriminate the effects or "noise" created by other components on the desired condition. In many cases, management will proceed in the face of uncertainty or incomplete information such that the specific links and thresholds needed for effectiveness monitoring may not be able to be made. In these cases, the uncertainty or incomplete information should be acknowledged, and if the uncertainty is identified as key or critical, appropriate research or validation monitoring could be proposed.

Examples of stand level evaluations based on described desired future conditions include the following:

1. Are snags and down wood at the levels identified as high enough and variable enough to maintain site productivity and species diversity after silvicultural, salvage or fuel management activities? (Implementation monitoring will evaluate levels as established by the criteria. Effectiveness monitoring will require that further specificity or thresholds be added in order to measure the goal of maintaining site productivity and species diversity.)

2. Do management activities in stands associated with meadows and unique habitats maintain ecological processes necessary to maintain these features? (For a given meadow or unique habitat, the ecological processes necessary to maintain the feature would need to be identified in order for effectiveness monitoring to evaluate the goal.)

Refinement of implementation monitoring at the stand level may include actions that are proposed in TABLE 53 or in other treatment sections of the LSRA. An example of refined implementation monitoring using this information would be the removal of competing vegetation of all sizes and ages to the drip line plus 20 feet around large Sugar or Ponderosa pine. Refined effectiveness monitoring would evaluate the objective of enhancing vigor of pine components and avoid undesirable losses due to bark beetles be reducing moisture competition.

LANDSCAPE LEVEL

At the landscape scale, effectiveness monitoring should examine the broad question that addresses the changes in landscape ecology: Are management actions and strategy protecting and enhancing the conditions of late-successional and old-growth forest ecosystems?

Examples of landscape level evaluations based on described desired future conditions include the following:

1a. Are fifth field watersheds, where capable, in 75 percent late-successional condition? (Evaluated through implementation monitoring.)

1b. Is forest vegetation structure and pattern diverse? (Specificity or additional detail needed in order for effectiveness monitoring to evaluate this goal.)

1c. Is late-successional habitat arranged in a pattern that promotes connectivity? (Specificity or additional detail needed in order for effectiveness monitoring to evaluate this goal)

1d. Does patch size, plant species composition, and other late successional characteristics meet habitat requirements for late successional associated species? (Specificity or additional detail needed in order for effectiveness monitoring to evaluate this goal.)

2. Does the frequency of low and moderate intensity fire closely resemble the regime that existed prior to fire exclusion? (Effectiveness monitoring may evaluate this goal with the added information of local fire frequency.)

3a. When fires occur, are the fires of low to moderate intensity over about 75 percent of the area on a fifth field watershed basis? (Evaluated through effectiveness monitoring.)

3b. No more than 28 percent of a fifth field watershed is in high fire risk condition. (Evaluated through long term implementation monitoring. Need to add time frame by which to achieve this objective with possible time frames for check points of interim progress; time frame to achieve this objective would be dependent on condition and acreage to treat of local watershed.)

SUMMARY

The above discussion of monitoring has been general and has provided process and examples for the refinement of unit monitoring plans. A detailed monitoring plan that encompasses all proposed management activities has not been provided because of the certainty of local modification and adaptation of the management proposals contained in this LSRA.

This Late-Successional Reserve assessment has only proposed refinements and modifications to existing Forest Plan goals and objectives, and standards and guidelines related to Late-Successional Reserves. "Decision space" is basically unchanged. As a result, the monitoring of the Late-Successional Reserves and management activities addressed or proposed in this assessment only require refinement or modification of existing monitoring plans. New and separate monitoring plans, or significant changes to existing Northwest Forest Plan monitoring are not proposed or needed.

Monitoring is necessary for plan and NEPA compliance, and to support adaptive management. Successful monitoring must be cost effective, use sample methodology, and focus on key questions. This means that key questions, but not all "interesting" questions, will be addressed through monitoring. Intensity of monitoring should logically vary with the scope and sensitivity of the proposed action and resource. The management of the LSRs addressed under this assessment does not generally require high intensity, high cost monitoring. Actions such as a density management project may receive implementation monitoring on a sample basis close to the time of execution of the project. Subsequent effectiveness monitoring of the density management project, also done on a sample basis, may only evaluate the project initially and then perhaps once every 10 or 20 years because of the long term nature of developing late successional characteristics. Monitoring all or an unnecessarily high sample of a given type of project, or monitoring more frequently than necessary when results are only expected in the long term could likely lead to failure of monitoring and the monitored programs due to the inability to provide funding and support.

APPENDICES

APPENDIX A: Aquatic-Riparian Ecosystem Function, Organization and Assessment

Separate document available on request.

APPENDIX B: Fish Life History and Stock Status

Separate document available on request.

APPENDIX C: Native American Tribal Consultation

Notice of the LSR Assessment was sent August 21, 1996, to the following tribal representatives:

Mr. Mark Mercier, Chair, Confederated Tribes of Grand Ronde

Mr. Jeff Mitchell, Chairman, Klamath Tribes

Ms. Delores Pigsley, Chairperson, Confederated Tribes of Siletz Indians

Mrs. Sue Shaffer, Chairperson, Cow Creek Band of Umpqua Indians

APPENDIX D: Seral Stage Classification

Late seral vegetation is classified differently, depending on data source. Table D-1 presents the classification from satellite data to vegetation seral stages, for the Forest Service portion of the South Cascades LSR network, exclusive of the east-half of LSR 227.

On Forest Service lands in most of this LSR network, late seral characteristics are defined from satellite data as canopy cover greater than 70 percent and tree size of small, medium, and large sawtimber. There may be some stands (over 80 years old, less than 70 percent canopy, with three layers) that have been classified as mid-seral. As a result, there may be a slight underestimate of these late seral acres.

Seral stages for the eastern portion of LSR 227 have, appropriately, been defined differently. See the Appendix B section of the "Late Successional Reserve Assessment for the Oregon Eastern Cascades Physiographic Province South of Crater Lake National Park". It is included here as Appendix J.

On Bureau of Land Management areas, satellite data were not available. Stand age was used, with late seral vegetation defined as stands greater than 80 years old.

Table D- 1: Classification Assumptions from Canopy and Size/Structure to Seral Stage for Forest Service portion of South Cascades LSRA (not including east half of LSR 227)

Seral Stage definition	Seral code	Canopy Cover	Size/Structure	SZ #
Water	1	1	water	1
Rock	2	2	rock	2
Grass/forb	4	<10 %	grass	4
Shrub	5	<10 %	shrub	5
Early Seral	6	<70 %	seed-sap-pole	10
			pole	11
			pole/mlsd	20
			pole/ms+	21
			medium/seed-sap	36
		>70 %	seed-sap-pole	10
			pole	11
			pole/ms+	21
			medium/seed-sap	36
Mid-seral	8	<70 %	pole-small	12
			small	14
			medium-large	16
			small/msld	23
			small/ms-	24
			small/ms+	25
			small/ms++	26
			medium/msld	27
			medium/ms-	28
			medium/ms+	29
			large/ms+	32
		>70 %	pole-small	12
			small	14
			small/ms+	24
Late Seral	9	<70 %	large	17
			large/msld	30
			large/ms-	31
			giant/msld	33
			giant/ms-	34
	9	>70 %	small	13
			small/ms+	25
			small/ms++	26
			medium/ms-	28
			medium/ms+	29
			large/ms-	31
			large/ms+	32
			giant/ms-	34

APPENDIX E: Fire and Fuel Assumptions

FUEL MODELS DESCRIPTIONS

The assessment area is most representative of fuel models 1, 2, 5, 6, 8, 9, 10, 11, and 12. These fire behavior models are described as follows:

Fuel Model 1

Relatively short, continuous grasses best represent this model. Very few shrubs or timber are present. Fires are surface fires that move rapidly through the cured grass and associated litter.

Fuel Model 2

Stands with young reproduction stands or open long needle pines with annual grass are represented by fuel model two. Fire spread is primarily through the herbaceous fuels, either curing or dead. These are surface fires where the herbaceous material, in addition to litter and dead-down stem wood from the open shrub or timber overstory, contribute to the fire intensity.

Fuel Model 5

Young reproduction, prior to canopy closure, is fairly well represented by fuel model five. Fire is generally carried in the surface fuels that are made up of litter cast by the shrubs and forbs in the understory. The fires are generally not very intense because surface loads are light, the shrubs are young with little dead material, and the foliage contains little volatile material. Usually shrubs are short and almost totally cover the area.

Fuel Model 6

A shrub model that has heavier fuel loading and a larger dead to live fuel ratio than that represented by fuel model five. Fires in this fuel model also burn more intensely than those represented by fuel model five, although fires will drop to the ground at low wind speeds or in openings in the stands.

Fuel Model 8

Slow burning ground fires with low flame lengths are generally the case, although the fire may encounter an occasional heavy fuel concentration and can flare up. Only under severe weather conditions involving high temperature, low humidities, and high winds do the fuels pose a fire hazard. Closed canopy stands of short-needle conifers, such as white-fir, are included in this model. The litter layer is mainly needles and twigs. The stands usually have little undergrowth.

Fuel Model 9

In this model, fires run through the surface litter faster than in fuel model eight and have longer flame heights. Long-needle conifer stands, such as ponderosa pine, are included in this model. Concentrations of dead-down woody material will contribute to possible torching of trees, spotting, and crowning.

Fuel Model 10

In this model, fires burn in surface and ground fuels with greater fire intensity than the other timber litter models. Dead-down fuels include greater quantities of three inch or larger limbwood resulting from over maturity or natural events that create a large load of dead material on the forest floor. Crowning out, spotting, and torching of individual trees are more frequent in this fuel situation, leading to potential fire control difficulties. Examples are insect or disease-ridden stands, windthrown or overmature situations with deadfall, and aged light thinning or partial-cut slash.

Fuel Model 11

The fires that burn in this model are fairly active in slash and herbaceous material intermixed with slash. The spacing of the rather light fuel load, shading from overstory, or the aging of the fine fuels can contribute to limiting the fire potential. Light partial cuts or thinning operations in mixed conifer stands are indicative of this model.

Fuel Model 12

This model depicts rapidly spreading fires with high intensities. When fire starts, it is generally sustained until a fuel break or change in fuels is encountered. This model is dominated by slash and much of it is less than three inches in diameter. Heavily thinned conifer stands, clearcuts, and medium or heavy cuts are represented.

Fuel Model and Fire Risk Classification

Table E- 1: Classification Assumptions for NFFL Fuel Models from Satellite Information, South Cascades LSRA

Fuel model data-definition. Rogue River and Umpqua					
Species group		Canopy Cover	Size Structure		
PMR Code	Definition	PMR Code	PMR code	NFFL	Remarks
1	Water	1	1	99	~
2	Rock	2	2	98	~
4	Grass	4	4	2	~
5	Shrub	5	5	5	~
7	Pacific Silver Fir	~	=10,11,12,35	8	~
7	Pacific Silver Fir	~	>=13(except 35)	10	Higher LWD as older
8	White Fir	~	=10,11,12,35	8	~
8	White Fir	~	>=13(except 35)	10	Higher LWD as older
9	Shasta Red Fir	~	=10,11,12,35	8	~
9	Shasta Red Fir	~	>=13(except 35)	10	Higher LWD as older
11	Hardwoods	~	~	5	~
12	Hardwood Mix	~	~	5	~
14	Mixed Conifer	~	=10,11,12,35	8	~
14	Mixed Conifer	~	>=13(except 35)	10	Brushy
15	Lodgepole Pine	~	=10	8	~
15	Lodgepole Pine	~	=11+	10	~
18	Ponderosa Pine	~	=10,11,12,35	9	~
18	Ponderosa Pine	~	>=13(except 35)	10	Brushy
19	Douglas-fir High CC	~	=10,11,12,35	8	Brushy
19	Douglas-fir High CC	~	>=13(except 35)	10	Thinned with slash
20	Douglas-fir Low CC	~	=10	5	Brushier
20	Douglas-fir Low CC	~	=11	11	Higher LWD as older
20	Douglas-fir Low CC	~	=12, 35	6	~
20	Douglas-fir Low CC	~	>=13(except 35)	10	Higher LWD as older
22	Western Hemlock	~	=10,11,12,35	8	~
22	Western Hemlock	~	>=13(except 35)	10	Higher LWD as older
23	Mountain Hemlock	~	=10,11,12,35	8	~
23	Mountain Hemlock	~	>=13(except 35)	10	Higher LWD as older
24	Mountain Hemlock Mix	~	=10,11,12,35	8	~
24	Mountain Hemlock Mix	~	>=13(except 35)	10	~
25	Low Density	~	=10,11,12,35	8	~
25	Low Density	~	>=13(except 35)	10	~

Table E- 2: Classification Assumptions for NFFL Fuel Models from Satellite Information, South Cascades LSRA

Fuel Model for the Winema					
Species Group PMR code	PMR Class	Canopy Cover PMR code	Size Structure PMR code	NFFL	Remarks
1	Water	1	1	99	
2	Rock	2	2	98	
3	Snow	3	3	97	
4	Grass	4	4	2	
5	Shrub	5	5, 7	5	More live FM
5	Shrub	5	8	6	More dead FM
7	White Fir	All	=10, 11, 12, 35	8	
7	White Fir	All	>=13,(except 35)	10	More LWF as older
8	White Fir/mixed	All	=10, 11, 12, 35	8	
8	White Fir/mixed	All	>=13,(except 35)	10	More LWF as older
9	Shasta Red Fir	All	=10, 11, 12, 35	8	
9	Shasta Red Fir	All	>=13,(except 35)	10	More LWF as older
10	Shasta Red Fir mixed	All	=10, 11, 12, 35	8	
10	Shasta Red Fir mixed	All	>=13,(except 35)	10	More LWF as older
11	Juniper	7,12-15	All	1	More grass
11	Juniper	8-11, 16+	All	6	More brush than grass
12	Mixed Conifer	All	=10, 11, 12, 35	8	
12	Mixed Conifer	All	>=13,(except 35)	10	More LWF as older
13	WF/DF/PP	All	=10, 11, 12, 35	8	
13	WF/DF/PP	All	>=13,(except 35)	10	More LWF as older
15	Lodgepole	15, 18, 20, 21	11	11	First thinning
15	Lodgepole	15, 18, 20, 21	12, 14, 16, 20,		
			21, 24, 25, 26	6	Brush coming in
15	Lodgepole	23, 24	10, 11	8	
15	Lodgepole	23, 24	>12	10	More LWF as older
15	Lodgepole	15, 18, 20, 21	27-31	10	More LWF as older
15	Lodgepole	15, 18, 20, 21	10, 23	8	
16	Ponderosa Pine	15, 18, 20	10-13	8	
16	Ponderosa Pine	15, 18, 20	>14	6	More Brush
16	Ponderosa Pine	23, 24	10-13	2	
16	Ponderosa Pine	23, 24	>14	9	
17	Aspen	All	All	2	Heavy grass
18	Mountain Hemlock	All	10, 11, 12, 25	8	
18	Mountain Hemlock	All	>=13,(except 35)	10	More LWF as older
19	Mixed Conifer Species	All	10, 11, 12, 25	8	
19	Mixed Conifer Species	All	>=13,(except 35)	10	More LWF as older

Table E-3: Classification Assumptions for Fire Behavior and Fire Risk South Cascades LSRA

Fire Behavior and Fire Risk Classifications based on Fuel Model, Slope, and Aspect				
NFFL code	Slope	Aspect	Fire Behavior	Fire Risk[53]
2	<35 %	S	6	High
2	<35 %	N	5	High
2	>35 %	S	7	High
2	>35 %	N	6	High
5	<35 %	S	6	High
5	<35 %	N	2	Low
5	>35 %	S	7	High
5	>35 %	N	2	Low
6	<35 %	S	6	High
6	<35 %	N	5	High
6	>35 %	S	7	High
6	>35 %	N	6	High
8	<35 %	S	1	Low
8	<35 %	N	1	Low
8	>35 %	S	1	Low
8	>35 %	N	1	Low
9	<35 %	S	3	Mod
9	<35 %	N	2	Low
9	>35 %	S	3	Mod
9	>35 %	N	3	Mod
10	<35 %	S	5	High
10	<35 %	N	4	Mod
10	>35 %	S	6	High
10	>35 %	N	5	High
11	<35 %	S	3	Mod
11	<35 %	N	3	Mod
11	>35 %	S	4	Mod
11	>35 %	N	4	Mod
12	<35 %	S	8	High
12	<35 %	N	7	High
12	>35 %	S	9	High
12	>35 %	N	8	High

[53] Fire risk is a direct measure of fire behavior. Environmental conditions that are estimated to produce flame lengths of less than three feet are classified as low, three to four feet are moderate, and five feet or greater are classified as high.

APPENDIX F: Insect and Diseases in the LSRs

Insects and diseases have had significant influences on the forest ecosystems in the South Cascades LSRs and they will continue to in the future. Key points about these disturbance agents that should be considered in the planning process include:

1) Bark beetles and flatheaded woodborers cause extensive mortality in overstocked stands, and/or drought-stressed stands, especially in the pine, Douglas-fir, and White Fir plant associations. Without fire or management intervention, these insects will greatly reduce or even eliminate certain stand components. Especially vulnerable are large, older sugar pines, white pines, and ponderosa pines, Douglas-fir on drier sites, and true firs during drier years. If these species, especially large trees, need to be maintained in the LSRs to meet long term objectives, density management treatments should be considered in appropriate areas.

The guild of primary tree-killing insects in the South Cascades LSRs includes mountain pine beetle (*Dendroctonus ponderosae*) and pine engravers (*Ips paraconfusus*, *I. emarginatus*, and *I. latidens*) on ponderosa, western white, and sugar pine; western pine beetle (*D. brevicomis*) on ponderosa pine only; flatheaded fir borer (*Melanophila drummondi*) and Douglas-fir beetle (*D. pseudotsugae)* on Douglas-fir; and fir engraver (*Scolytus ventralis*) on white fir. In addition, red turpentine beetle (*D. valens*) and the California flatheaded borer (*M. californica*) have been associated with some pine mortality; Douglas-fir engraver (*S. unispinosis*) and Douglas-fir pole beetle (*Pseudohylesinus nebulosa*) have killed Douglas tops and small trees; and numerous species of roundheaded borers (family Cerambycidae) have attacked trees of all species in association with other beetles. Bark beetles and woodborers kill trees by feeding in the inner bark and cambium. Large numbers of beetles can successfully kill trees on their own; however, most of these insects carry staining fungi that they introduce into the sapwood when constructing their galleries. Many of these staining fungi are capable of physically blocking water flow through the sapwood, hastening the death of the tree by preventing water uptake. Bark beetles and woodborers kill trees individually or in groups and have greatly reduced or even eliminated stand components, especially large, old pines in some areas.

The bark beetles or wood borers do not spread into and kill healthy, vigorous trees. Rather, they are most successful on low vigor or stressed hosts. They prefer trees weakened by disease, injury, drought, or intense competition. Major contributing factors to the high level of tree mortality in the South Cascades have been dense conditions in the stands due to fire exclusion and a succession of extremely dry years.

Pine bark beetles are initially attracted to pines that are under stress. Once a stressed tree has been successfully invaded, pheromones emitted by invading beetles attract additional beetles to the same tree, overpowering its defenses. A vigorous tree is able to eject invading beetles with its pitch; a tree under stress has a reduced capability of responding to the invasion. As a general rule, stands where growth rates are greater than or equal to 1.5 inches of diameter growth per decade or with less than 150 square feet of basal area per acre are less prone to pine bark beetle attack. Average stand criteria will vary slightly depending on site quality and pine species of concern and individual trees will be at greater risk when the basal area surrounding them exceeds the thresholds. All vegetation, including nonhost trees, smaller trees of all species, shrubs, and even herbaceous vegetation, compete with host trees for water.

Their presence near hosts increases the risk of beetle attack. Stands on south and east aspects below 3500 foot elevations are particularly vulnerable when their densities are high. Beetles will spread into and kill trees in dense stands regardless of climatic conditions; however beetle activity will be most intense during dry periods.

Pine bark beetles were present in forests of the South Cascades prior to the influence of European-Americans. Their level of activity was kept in check where frequent ground fires that reduced understory vegetation and created relatively well-spaced open stands of high vigor trees.

Fir engraver beetle biology is similar to that of pine bark beetles except that its host species are true firs. Mortality caused by fir engraver beetles in moister years is generally low and often associated with trees colonized by root disease fungi. The beetles act as a thinning agent, killing the weakest trees. However, recently, fir engraver-caused mortality has occurred at high levels, particularly at the lower elevations south of the Rogue Umpqua Divide and east of the Cascade Crest where true fir populations would normally have been much lower due to frequent fires.

Stand density levels associated with high risk for fir engraver beetle attack are not well defined. In general, stands in the White Fir plant Series with more than 40% of the stand composition in white fir and that exceed the theoretical site potential defined for their particular plant association are considered to be at risk.

2) The Douglas-fir beetle (*D. pseudotsugae*) is always present in low to moderate numbers in Douglas-fir forests of the Pacific Northwest. The beetle commonly infests fresh windfalls, other damaged or weakened trees, and fresh logging slash and logs. The windthrown or felled Douglas-fir provides prime habitat for the bark beetles to rapidly increase their populations and, in subsequent generations, move into standing green timber where they attack and kill living trees. If adequate windfalls or other freshly cut trees continue to be available, the new beetle populations will colonize the more preferable host material first, rather than infest living trees.

The Douglas-fir beetle has one generation per year. Adults fly and infest new host trees during March through May in most westside locations. Beetles can fly up to several miles before infesting new trees. A smaller flight composed of re-emerged parent beetles may occur later in the summer. Only the spring flight of beetles is significant in terms of increasing populations to levels capable of infesting significant numbers of standing green trees.

In western Oregon, the occurrence of windthrow is common due to saturated shallow soils and windstorms in the fall and winter. Occasionally, these storms are severe and result in extensive windthrown timber over large acreages. A critical threshold of fallen trees that will result in rapid bark beetle population increases and subsequent attacks on living trees is not known with certainty. Based on past experience, it is generally expected that when the number of windthrown trees reaches or exceeds three trees per acre, Douglas-fir beetle populations will begin to increase to levels that can lead to attack and mortality of green, standing Douglas-fir in the following season.

Winter storms result in blowdown ranging from scattered down trees to small patches or concentrations of windthrown trees, to large acreages of down timber. Mortality of standing trees in the years following the blowdown event is more likely to be concentrated in areas where concentrations of blowdown occur. Salvaging blowdown concentrations is therefore more likely to be successful in reducing the risk of standing tree mortality. Scattered blowdown does not indicate a lesser potential impact from Douglas-fir beetle; trees in partial to full shade provide better conditions for brood production that trees fully exposed to the sun. However, scattered blowdown does make predicting the location of standing tree mortality more difficult. Impacts of Douglas-fir beetle can be predicted as follows: For every two attacked downed trees, beetles emerge and attack one green standing Douglas-fir in the spring following the storm(s). For every four standing infested trees in year two, the beetles emerge and attack one tree in the third year. This results in over a 60 percent increase in mortality of green Douglas-fir above those already downed. Given no additional windthrow, Douglas-fir mortality due to Douglas-fir beetle attack generally subsides to background levels by the fourth year following the storm. Infested but green standing trees are difficult to detect. There often are no signs of bark beetle attack or if present, pitch streaming in the upper portions of the bole is not readily visible from the ground. Bark beetle infestation is usually detected the year following attack when trees fade tree color fades to light green and red. Therefore, it will be two years after a windstorm before mortality is evident in forest stands.

In the following example 200 tree are downed and attacked in the spring following a winter storm:

Number of years following blowdown	Number of currently infested trees	Number of newly-attacked trees
year of blowdown	0	200 (downed trees)
1	200	100
2	100	25
3	25	1

Historically, salvage logging has been used to limit additional tree mortality. Removal of downed material and standing, damaged Douglas-fir prior to beetle flight in the spring limits the breeding sites for Douglas-fir beetles. Removal of down material prior to beetle emergence the spring following infestation limits spread to standing green trees. Once the beetles have left the downed material, salvage logging of green infested trees is much more challenging due to the difficulty associated with identifying the standing green infested trees The anti aggregating pheromone 3-methyl-2cyclohexen-1-one (MCH)- of df beetle,, has been shown to reduce the number of beetle attacks on down Douglas-firs; however, its effectiveness for reducing attacks on live standing trees has not been demonstrated in western Oregon. While registration has been applied for, MCH is not currently registered. Douglas-fir beetle aggregation pheromones are commercially available. These chemical lures can be used to entice beetle populations to selected trees or areas, away from high value locations. Trees selected for bark beetle infestation are then removed in a timely fashion prior to bark beetle emergence. Other actions to interfere with bark beetle brood production, such as physical removal of tree bark are labor intensive and expensive, but can be effective.

3) Western white pine and sugar pine mortality occurs throughout the South Cascades due to white pine blister rust and density-related bark beetle mortality. White pine blister rust, caused by the fungus *Cronartium ribicola*, is an exotic disease that causes topkill and branch flagging of larger five-needle pines and mortality of smaller regenerating western white and sugar pines throughout the area. Mountain pine beetle kills western white pine and sugar pine when trees are overstocked or are stressed by other agents, including white pine blister rust. Currently, these agents, working separately and in complexes, are killing both the overstory and regeneration five-needle pine components of some stands.

Since its introduction to the west coast of the United States in 1910, white pine blister rust, has been responsible for mortality of 5-needle pines throughout their range. This fungus has a complex life cycle with five spore stages and requires an alternate host in the genus *Ribes*. Sporidia produced from teliospores on leaves of *Ribes* species are windblown for short distances and infect pine needles during late summer and early autumn. Infection can take place on needles of the current year but is more frequent on two- to three-year-old needles. One to two, or frequently three years after infection the fungus has penetrated the needle into the stem and becomes obvious as a yellow or orange discoloration of the bark, accompanied by a spindle-shaped swelling. Pycniospores are produced; later in spring, yellow-orange aeciospores burst from blistered bark. Aeciospores can travel long distances to infect young *Ribes* leaves. Within a few weeks after infection, urediospores are produced on lower leaf surfaces of *Ribes*. Urediospores infect *Ribes* leaves and intensify infection within a local area. Late in summer, the telial phase is produced that gives rise to the sporidia that can infect pine hosts. Bark tissue dies once aeciospores have been shed. On small diameter trees and branches, it may take only a few years for the fungus to completely girdle the tree and kill the cambium. Larger diameter trees will be girdled more slowly. Stress associated with infection predisposes trees to attack by bark beetles.

Blister rust impact is greater on moist sites than on dry sites. Infection is favored by moist conditions in the fall; the disease tends to intensify in "wave years" when particularly wet conditions prevail. In southwestern Oregon, higher rust hazard is closely associated with those areas where summer and fall fog is held close to mountain slopes. In many areas, environmental conditions for spore survival and infection are good and adequate populations of the alternate hosts, *Ribes* spp. exist. White pine blister rust infections are common and threaten the long term survival of wild type white and sugar pines in these stands.

Mountain pine beetle (*D. ponderosae*) kills western white pine and sugar pine when trees are overstocked or are stressed by other agents, including white pine blister rust. Large five-needle pines are even more sensitive to stresses imposed by overstocking than are other species of pine; they are often the first members of the stand component to die. As a general rule, trees that are greater than 14 inches DBH, are 140 years old or older and that occupy stands with basal areas of 140 square feet per acre or more are at the highest risk.

Currently, these agents, working separately and in complexes, are killing both the overstory and regeneration five-needle pine components of some stands. With the loss of regeneration in stands where the disease is favored, and overstocked conditions in many places, the risk is great for the continued decline of five-needle pines.

Rust-resistant western white pine and sugar pine stock is available. It can be planted where appropriate in mixes that represent historic levels of five-needle pines. Density management treatments can be used to maintain the vigor of these species to reduce the risk of bark beetle mortality.

4) Several root diseases are found throughout the South Cascades. Root diseases are diseases of the site; the causal fungi can survive for decades as saprophytes in dead trees and stumps. New hosts are infected when the root of susceptible species contact infected roots. Root diseases influence species composition, stand structure and density. While generally compatible with achieving late-successional stand conditions, areas of high impact occur. The presence of root disease may eliminate the most susceptible hosts from stands or may preclude susceptible trees from attaining larger than seedling or sapling size.

Laminated root rot, caused by the basidiomycetous fungus *Phellinus weirii*, occurs throughout the South Cascades. It is the most damaging root disease in the region. It is found in forest stands from low elevation sites to high elevation subalpine locations, on a variety of soil types and management regimes. *P. weirii* can infect all conifer species, however some tolerate the pathogen better than others. Douglas-fir, mountain hemlock, white fir, and grand fir are highly susceptible; they are readily infected and killed. Pacific silver fir, Shasta red fir, subalpine fir, noble fir, Engelmann spruce, and western hemlock are considered intermediately susceptible. These species are readily infected but usually not killed. They often suffer butt decay. Lodgepole pine, sugar pine, and western white pine are tolerant of the fungus. They are infrequently infected unless growing in association with the most susceptible species. They are rarely killed. Ponderosa pine, western redcedar, and incense-cedar are considered resistant. These species are rarely infected and almost never killed. All hardwoods are immune.

P. weirii extensively decays roots of highly susceptible host trees and either causes windthrow or kills them 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. Infected trees may suffer growth loss for several years prior to death. *P. weirii* often predisposes highly susceptible hosts to bark beetle attack. Some highly susceptible trees that become infected survive for many years by confining the fungus to a small number of roots and the interior of butts where it causes extensive decay. These trees are most frequently found in old growth stands.

The presence of laminated root rot in forest stands is indicated by group killing of trees over a period of years. These pockets or centers appear in the stand as variable-sized, understocked openings that contain dead standing trees, stubs, windthrows, and some unaffected trees. Fallen trees with many of their major roots broken off or decayed at the root collar are common. In plantations, initial mortality is often found associated with infected stumps. Symptomatic trees in various stages of decline occur around the margins of centers. As susceptible trees die, centers commonly fill in with hardwoods, shrubs, resistant conifers, and sometimes regeneration of highly susceptible conifers. Many susceptible conifers within 50 feet of the apparent edge of the disease center have a high probability of being infected even though they do not show crown symptoms.

Laminated root rot spreads to new susceptible hosts when their roots grow into contact with infested stumps or roots left from the previous stand and are colonized by *P. Weirii.* The fungus advances along newly infected roots and eventually penetrates through the bark to the host's cambium. Once inside the roots, the fungus progressively causes decay, resulting in reduced uptake of water and nutrients and weakened structural support. Crown symptoms may appear 5 to 15 years after initial infection. As roots are progressively killed and decay, a tree eventually dies or is windthrown. As the new stand develops, the fungus spreads among living trees via root contact. At first, tree killing involves scattered individuals close to the old stumps or seedlings planted directly over infected roots, but by the time the stand is 15 to 20 years old, *P. weirii* may be spreading from the original infection foci and forming expanding disease centers. Average spread rate is one to two feet per year. Although both external superficial mycelia and internal mycelia of *P. weirii* are involved in spread and infection of new trees, external spread of the fungus is the most common and successful.

When infected trees die, the fungus continues to live saprophytically in their stumps and large roots for as long as 50 years. Disease-induced resin impregnation of wood surrounding infections and the ability of *P. weirii* to form a protective hyphal sheath around itself are responsible for the pathogen's long-term survival.

P. weirii occurs and causes severe damage on a variety of site types. It appears to be well adapted to the same environmental conditions that favor susceptible hosts. Individual tree vigor does not play a role in host susceptibility to infection. Effects of laminated root rot can be reduced by managing resistant or immune species on sites where fungal inoculum is present.

Armillaria root disease, caused by the basidiomycetous fungus *Armillaria ostoyae*, is widespread throughout the South Cascades. The disease is often found affecting trees that have been weakened by other agents, but large epidemics caused by Armillaria root disease alone have been detected in mixed conifer and pine stands east of the Cascade Range. *A. ostoyae* can kill trees of all ages and sizes, singly or in patches, throughout the life of a stand. It may kill natural or planted regeneration with mortality rates decreasing with stand age. Pre-existing or new infections may kill trees weakened by stress. The fungus may cause a butt rot in older trees. All conifers can be damaged by Armillaria root disease but there are differences in degree of susceptibility and damage expression. In forests west of the crest of the Cascade Range, tree killing by Armillaria root disease is frequently associated with conditions that stress trees such as off-site stock, stock that is poorly planted, or soil compaction along old roads and skid trails. In forests east of the Cascade Range crest, Armillaria root disease is more widely distributed in stands and pockets tend to be large; when in these areas, however, there is a higher probability of disease incidence where man-caused disturbance has occurred.

Tree killing is the most common form of damage caused by Armillaria root disease. Affected trees can be windthrown, but tend to die standing. Various species of bark beetles, particularly fir engravers (*S. ventralis* in white and grand fir) will attack trees weakened by Armillaria root disease and may hasten tree mortality. Tree killing by Armillaria root disease will often increase one to two years after severe droughts or severe defoliation by insects. *A. ostoyae* is able to break out of callus tissues on roots and spread rapidly when trees are severely stressed or when they are cut.

Large stumps or snags may serve as disease center foci. Mycelium of *A. ostoyae* can survive for at least as long as 35 years in large stumps and roots before being replaced by other fungi and microorganisms. Duration of fungal survival is influenced by tree size, tree species, and site characteristics. Large stumps and roots infected prior to harvesting provide more inoculum potential than do small stumps. Stumps of precommercial size are not considered effective inoculum sources.

Spread of the fungus from infected trees or stumps to adjacent healthy trees occurs mainly by mycelium growing across root contacts and, to a much lesser extent, by rhizomorphs. Rhizomorphs of *A. ostoyae* form after a stump or large root system has been colonized. They are capable of growing several feet through soil and can cause infection if they contact susceptible roots. Rhizomorphs do not have as much inoculum potential as mycelium growing in roots. Once a root is infected, the fungus can spread in all directions within it. Some trees are capable of successfully blocking the fungus, resulting in little or no decay and growth reduction.

The effects of Armillaria root disease can be reduced by managing species that are locally resistant to the fungus. Individual tree vigor should be high; off-site stock, poor planting, planting on compacted or wet sites, and wounding of roots or stems should be avoided.

Annosus root disease, caused by the fungus *Heterobasidion annosum* damages true firs and hemlocks in the South Cascades. Infection results in butt rot in larger, older trees (greater than 150 years old), often leading to windthrow and breakage, and predisposition to bark beetle attack. Mortality of understory trees in close proximity to infected overstory trees may occur. Impacts occur at increased levels in stands where true firs and hemlocks have been harvested. The fungus is able to colonize recently cut stumps when spores land on newly-created stump surfaces. Once the stumps have been colonized, tree to tree spread occurs when roots of healthy trees contact infected root material. It takes 10 to 20 years after trees are harvested before the effects of annosus root disease are readily observed. Infection levels and mortality are much greater when stands have been entered more than once. In mature mountain hemlock stands, 50 percent or more of the trees may have significant amounts of decay in the butt log caused by *H. annosum*. While tree mortality is rare in this situation, stem breakage is common.

Effects of annosus root disease can be minimized by favoring nonsusceptible species in areas where true firs and hemlocks have been harvested. In areas where the disease is at low levels or is not currently present, stump treatment at the time of harvest will prevent infection.

Leptographium wageneri, the cause of black stain root disease, infects and kills Douglas-fir in the South Cascades LSRs This ascomycetous fungus colonizes water conducting tissues of the host's roots, root collars, and lower stems, ultimately blocking the movement of water to foliage. Severely infected trees exhibit wilting symptoms characteristic of vascular wilt diseases. Black stain kills young trees within a year or two of infection. Older infected trees decline more slowly and are often predisposed to bark beetle infestation. Soil type does not appear to be a major factor in the distribution of the disease. Soil moisture and temperature, however, may influence disease distribution significantly. Cool, moist soil conditions in spring and early summer are ideal for infection, growth, and tree-to-tree spread of the fungus.

Black stain root disease usually affects groups of trees in distinct infection centers. Typical infection centers have trees in various stages of decline near the perimeter and dead trees in the interior near the origin of the initial infection. Infection centers usually occur in well-stocked stands where a preferred host predominates or occurs in unmixed clumps. In stands where species composition is well mixed, infection and mortality are less common, but isolated trees or tree clusters can be infected.

Long distance spread of *L. wageneri* involves insect vectors. The root-feeding bark beetles *Hylastes macer* and *H. nigrinus* are believed to be the primary vectors of the fungus on ponderosa pine and Douglas-fir, respectively. Two weevils, *Steremnius carinatus* and *Pissodes fasciatus*, have also been implicated as vectors in Douglas-fir, but their involvement in local and long-distance spread of the pathogen is still poorly understood.

Vector insects commonly breed in roots of recently dead or dying host trees including those infected by *L. wageneri*. Several vectors also breed in Douglas-fir stumps, which are susceptible to infection by *L. wageneri* for up to 7 months after stems have been cut. *L. wageneri* sporulates readily inside Insect galleries in infected roots and root collars. Stalked microscopic conidiophores form on the gallery walls, each bearing a sticky spore droplet that protrudes into the gallery. These sticky spore droplets are well suited to insect dispersal.

During emergence, some young adult beetles are contaminated with spores as they brush against spore droplets in galleries or pupal chambers. Contaminated beetles fly (or walk) from brood trees, burrow through the duff and soil, visit roots of healthy, dead, or dying trees, and deposit spores on the root sapwood exposed during feeding. Wounds that expose sapwood xylem are required for infection because *L. wageneri* hyphae are unable to penetrate live bark and cambial tissues.

Once established, the black stain fungus colonizes root and stem sapwood xylem, reducing water uptake and the vertical ascent of xylem sap by clogging water conducting vessels with hyphae and host reaction compounds. In live trees the fungus is confined to tracheids.

Black stain infection centers are most prevalent in areas where substantial tree damage or site disturbance have occurred, especially along road and skid trails, in areas with a history of tractor logging and resultant soil compaction, and in areas that have been precommercially thinned. The appearance of infection centers in areas of disturbance reflects the preference of vector insects for stressed or injured trees.

Once a new infection center is established, spread of the infection from tree to tree occurs through root grafts between healthy and diseased trees and through intimately associated roots via limited growth of the pathogen (less than 6 inches) through the soil. Small rootlets (less than 1/4 inch diameter) serve as infection courts where roots are not grafted. Infection centers in pine enlarge at a rate of about one meter per year. The spread rate in Douglas-fir is approximately three to four feet per year, but enlargement of infection centers for this host often decreases markedly after stands reach 30 to 35 years of age. *L. wageneri* is relatively nonpersistent in infected root systems. The fungus usually does not remain active for more than 1 year after its host dies.

Black stain root disease can be managed by avoiding the planting of Douglas-fir on compacted sites. Precommercial thinning of plantations within one mile of known black stain centers should be timed to avoid vector flight and to allow for maximum drying of slash prior to vector flight. Other species in mixture with Douglas-fir should be managed.

5) Several species of dwarf mistletoe occur in the South Cascades LSRs and influence tree survival, growth, and form. These include Douglas-fir dwarf mistletoe (*Arceuthobium douglasii*), true fir dwarf mistletoe (*A. abietinum*), and western and mountain hemlock dwarf mistletoes (*A. tsugense* sbsp. *tsugense* and *A. tsugense* subsp. *mertensiana*). Impacts of dwarf mistletoes include reduced growth, distortion, increased incidence of stem decay infection, predisposition to attack by other agents such as bark beetles and *A. ostoyae*, and mortality.

Dwarf mistletoes are parasitic plants that infect conifer species. They depend almost entirely on food produced by the host; they photosynthesize little material for themselves. Their aerial shoot system functions mainly for reproduction. Small inconspicuous flowers are produced in the axils of the shoot segment. Flowers are pollinated by both the wind and insects. Short stalks bear fruits that are approximately three mm long when ripe. Unlike the true mistletoes, dwarf mistletoes are less frequently disseminated by birds, but depend on an explosive mechanism for spread. During maturation the fruits swell with water and build up considerable hydraulic pressure. At maturity the seeds, one per fruit, are explosively discharged by the water pressure in the fruit. Discharged seeds may travel horizontally from 30-40 feet. With the aid of the wind, seeds discharged from the tops of trees may travel 100 feet or more. The seeds are sticky; they initially adhere to foliage until they are washed by rain to the tree's branches. There they germinate and infect the host. The root system of dwarf mistletoe penetrates and grows within the tree branch. Localized swellings occur. Abnormal proliferation of many small twigs into "witches-brooms" also occurs. Depending upon the species of dwarf mistletoe, these brooms may be very large and comprise the bulk of the tree, or they may remain small and inconspicuous. Infection is favored by multi-layered canopies. Damage is greatest when the growing tops of trees are infected.

The impact of Douglas-fir dwarf mistletoe is of particular concern in southern portion of the South Cascades LSRs where infected Douglas-fir occurs in multi-storied stand structures. Because of the forcible discharge of seeds from parent infections, understory trees of the same species as the infected overstory are vulnerable to infections in the top portions of their crowns. Infections in upper portions of crowns seriously affect the growth and survival potential of these trees. Douglas-fir dwarf mistletoe incidence and severity levels in multistoried, predominantly Douglas-fir stands have increased with fire exclusion. Infected understories were removed with frequent ground fires. Large infected overstory trees were killed by fire when brooms close to the ground acted as efficient fuel ladders
Large brooms created by Douglas-fir dwarf mistletoe infections may serve as nesting sites for several wildlife species, including the northern spotted owl. Recruitment of future nest trees will not come from infected understories, but rather from mid-sized previously infected trees growing under different stand conditions. It appears that a certain amount of Douglas-fir dwarf mistletoe is desirable, but in the long run, development of large tree character in Douglas-fir is virtually impossible in stands developing under dwarf mistletoe-infected overstories. A careful planning approach, keeping dwarf mistletoe in some areas and minimizing it in others, is necessary to meet objectives in some locations.

White fir dwarf mistletoe occurs throughout its host type in the South Cascades, however it is not often associated with direct tree killing. Branches infected by white fir dwarf mistletoe are commonly attacked and killed by a canker fungus, *Cytospora abietis*; branch flagging is apparent. Large swellings on main stems of large, old white fir are also frequently seen. These swellings are often pronounced and may become infected by stem decay fungi.

Hemlock dwarf mistletoes are common and well distributed in the South Cascades causing branch and bole swelling, witches' broom formation, growth loss, tree deformity, and early mortality. Swellings also become infection courts for various stem decay fungi. Young infections cause small brooms that are not readily observed. With increasing age, brooms become massive, up to several hundred pounds. Heavy infections in younger stands may slow or preclude development of larger hemlocks in some areas.

APPENDIX G: Team Charter

CHARTER FOR LATE SUCCESSIONAL RESERVE ASSESSMENT
1/24/96

Overview: This charter establishes an interagency team to complete an LSR Assessment to NW Forest Plan standards for LSRs #222-227 on the west slope of the Cascades in Southwest Oregon by October 1, 1996.

The Umpqua National Forest and the Roseburg District BLM will serve as lead agencies. The Willamette and Rogue River National Forests, the Roseburg Office of the U.S. Fish and Wildlife Service, and the Eugene and Medford BLM Districts will work as cooperating agencies and will assist in guidance and accomplishment of this effort.

The assessment will be coordinated with the Eugene Office of the Corps of Engineers, the Watershed Division of the Seattle Office of the Environmental Protection Agency, the Oregon Department of Fish and Wildlife, the Regional Ecosystem Office, and the Winema National Forest.

Rationale: The Provincial Interagency Executive Committee (PIEC) has the responsibility to ensure consistency for projects and analyses within and between provinces.

LSR assessments are required prior to habitat manipulation within the Reserves (ROD, p. C-11). Completing an LSR assessment in fiscal year 1996 will provide the basis for projects beginning in fiscal year 1997.

One LSR Assessment could be completed for each Reserve, but since LSRs do not stand alone, but were designed to function as a network, connected through Riparian Reserves and other land allocations (ROD, p. 6), a combined, interagency effort will result in a more coordinated, ecosystem-based product.

The Regional Ecosystem Office has recommended that assessments be prepared by interdisciplinary, interagency teams. An assessment that covers an entire LSR and displays its relationship to the LSR network, provides a more complete picture and a more credible foundation for proposed management activities.

A combined approach is the least cost method to obtain this assessment.

Roles and Expectations:

PIEC:
Provide coordination and support across the Province.
Resolve questions of organizational resources.
Hold the Core Team accountable.
Change timelines if priorities change.

Core Team Members:

Mike Hupp	Umpqua Nat'l Forest	Co-lead.
Phil Hall	Roseburg BLM	Co-lead.
Ed Hall	Umpqua Nat'l Forest	Info Mgt and GIS
Jake Ritter	Roseburg BLM	Info Mgt and GIS
Craig Tuss	Roseburg USFWS	Aquatic Ecology
Scott Center	Roseburg USFWS	LSR Wildlife
Diane White	SW Oregon Ecology Group	Terrestrial Ecology & Veg
Allyn Wiley	Umpqua Nat'l Forest	Fire Planning & History
Ellen Goheen	SW Oregon Forest Health Group	Forest Health

Core Team Responsibilities:

The bulk of the work will be accomplished by the core team. Time commitment on the part of the members will be substantial. GIS support will include compiling, manipulating, and displaying existing information.

Design and coordinate the assessment effort.
Coordinate early with REO and consider their direction.

Operate within the established budgets of each administrative unit.
Utilize existing information and incorporate watershed analyses and interim assessments, as appropriate.
Utilize the Southwest Oregon LSR assessment as an example for this project.
Produce maps and information products.
Interpret information and write document.
Communicate progress to the PIEC.
Complete a useable assessment plan that addresses the 8 points in the ROD.

Cooperating Agencies:

Neal Forrester of the Willamette and Chuck Anderson of the Rogue River National Forest will work as liaisons for their units. Phil Hall will represent the BLM units.

The impact on the cooperating agencies will be limited to the providing of existing GIS information and the review of core team work.

Timely GIS support will include assistance in determination of appropriate layers, and the transfer of data with appropriate data dictionaries. Limited analysis of information at the individual unit scale may be needed.

Review of core team work will be needed. Cooperating agencies can expect requests from the core team for specialists to review findings and interpretations of information. Establishment of mini-LSR core teams on each unit will not be requested.

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APPENDIX H: Sustainable Late Seral Vegetation in the South Cascades LSRs

INTRODUCTION

In Review Copy 1 of the LSRA, 75% was stated as the desired future condition for amount of late seral vegetation throughout the South Cascades LSRs. Several reviewers suggested that amount may not be sustainable in certain portions of the LSR network. In response to these comments, the Vegetation Dynamics Development Tool, Version 2.0 (VDDT) was used to simulate the effects of fire disturbance over time on the amounts of vegetation in each of three seral stages, and six portions of the LSR network.

VDDT OVERVIEW (FROM VDDT USER'S GUIDE VERSION 2.0)

VDDT is a computer tool that provides a stochastic modeling framework for examining the role of various disturbance agents in vegetation change. It allows users to create descriptions of vegetation dynamics in successional pathway diagrams. Two types of pathways between vegetation classes are defined in the pathway diagram: changes driven by disturbances and changes due to stand dynamics in the absence of disturbance. Disturbance-related pathways specify, for each successional class, the type of disturbance, its probability (which defines the return frequency) and its impact on vegetation. Changes due to stand dynamics are defined by the time a stand remains in a structural stage and by the successional class it will move to after this time has passed.

For model simulations, the landscape is partitioned into a number of pixels, each initially assigned a successional class and age. The model simulates the probability of each pixel being affected by one of the disturbance types, and if a disturbance does occur, moves the pixel to the class defined in the pathway diagram. Disturbance probabilities are only dependent on the current state of the pixel, defined by its successional class. They are independent of the state of the neighboring pixels and the disturbance history. Thus, the model does not simulate contagion in space or time.

VDDT can be used to test the assumptions of disturbance probabilities and pathways. The model simulates changes in landscape-level indicators, such as changes in the frequency distribution of successional classes and the area affected by each disturbance type. Results are presented at user-specified time intervals or as average statistics for certain time periods.

The successional pathway diagrams summarize disturbance probabilities and pathways. The model simulates changes in landscape-level indicators, such as changes in the frequency distribution of successional classes and the area affected by each disturbance type.

METHODS

BASIC MODEL STRUCTURE

Five seral classes were used: Early, late-early, early-mid, mid, and late seral. Ages of each class were defined for the dynamics of the model in the absence of disturbance. Early was defined as 0-20 years, late-early was 21-40, early-mid was 41-60, mid was 61-80, and late seral was 80 years and greater.

Acres were assigned to each class based on the existing amounts of early, mid, and late seral in each portion of the LSR network. In VDDT, all acres in the first class are assumed to be age 0. Since our assumption was that the average age of early seral acres in the LSRs was 20 years, all early seral acres were initially placed in the late-early class. LSR acres in mid-seral were split between the early-mid and mid seral classes in the model. All late seral acres were placed in the late seral model class.

PATHWAYS AND DISTURBANCE PROBABILITIES

Each seral class had two basic pathways. In the absence of disturbance, aging would occur, eventually moving each acre to the next seral class. With disturbance, two "prescriptions" might apply. Hi-intensity wildfire would result in that acre reverting to the early seral class. Low-intensity wildfire would result in that acre remaining in the same seral class.

In VDDT, probabilities of disturbance are expressed per acre per year. Thus, the basic model was 1 divided by the fire return interval (FRI), modified for estimated percentages of stand replacement. Fire return intervals were taken from watershed analysis as displaced in the LSRA section, "Ecological Processes--Fire". These data are considered to be the "natural", or pre-fire exclusion, fire return intervals.

In early seral classes, it was assumed that if a fire occurred, the probability of stand replacement was 80%. Thus, the probability of hi-intensity wildfire would be [(1/FRI)*.8]. Likewise, the low-intensity probability was [(1/FRI)*.2]. Similarly, in mid seral classes, it was assumed that if a fire occurred, the probability of stand replacement was 60%.

In late seral, the fire return interval was modified by an estimated stand replacement percentage by aspect. Thus, in the simulation of the sustainability of natural late seral, the probability of hi-intensity wildfire causing an acre to revert to early seral on a south aspect was [(1/FRI)*.25)]. On as north aspect, the proportion of stand replacement was generally assumed to be 35%. In the simulation of fire exclusion, the amount of stand replacement on south slopes was assumed to be 35%, north aspects 25%.

For each portion of the LSR network, both the maximum and minimum fire return intervals for each aspect were used to determine disturbance probabilities to simulate the range of natural conditions.

SIMULATIONS

Three basic scenarios were simulated: natural, pre-fire exclusion; fire exclusion, and fire exclusion with fuel reduction treatments. In the fire exclusion case, fire specialists were asked to estimate the effect of fire suppression on return intervals relative to the natural fire intervals. The estimate was assumed to be 1.75 times longer than natural fire return intervals. Though recognized that these intervals will not be sustainable over time due to increases in fuel loading, disturbance probabilities were not increased in the model.

To estimate the effects of fuel reduction treatments, model pathways were modified. The late seral class was split into two classes. One reflecting no fuel treatment, and one reflecting late seral that had been treated. Late seral acres were estimated to be treated over 100 years.

Once treated, the late seral acres were assumed to have a lower probability of hi-intensity wildfire.

RESULTS

Regardless of starting seral distribution or scenario, over time the disturbance probabilities showed their effect and resulted in an amount of late seral with a range of about 20%. Figure 1 shows one such simulation with range of 30-50%. There is no attempt here to conclude amounts of late seral vegetation at any point in time. The simulation was run for 900 years only to clearly discern the pattern in the range of late seral vegetation given these fire intervals.

The amount of late seral in the natural fire return scenario varied widely, as expected from the wide range of fire return intervals tested (Table H-1). Disturbance probabilities were varied 20% plus and minus to test the sensitivity of the model. These differences resulted in 5-10% changes in the range of late seral over time.

The fire exclusion simulations resulted in about a 10% increase in the range of late seral over time. Given model assumptions, the increase in late seral associated with an aggressive fire control policy appears sustainable, if prescribed fire is included. It should be noted this conclusion is tentative and dependent on the assumptions.

Figure 1. Late Seral Over Time, LSR 222, North of Calapooya Ridge South Aspect, Minimum Fire Return Interval, 100 pixel simulation

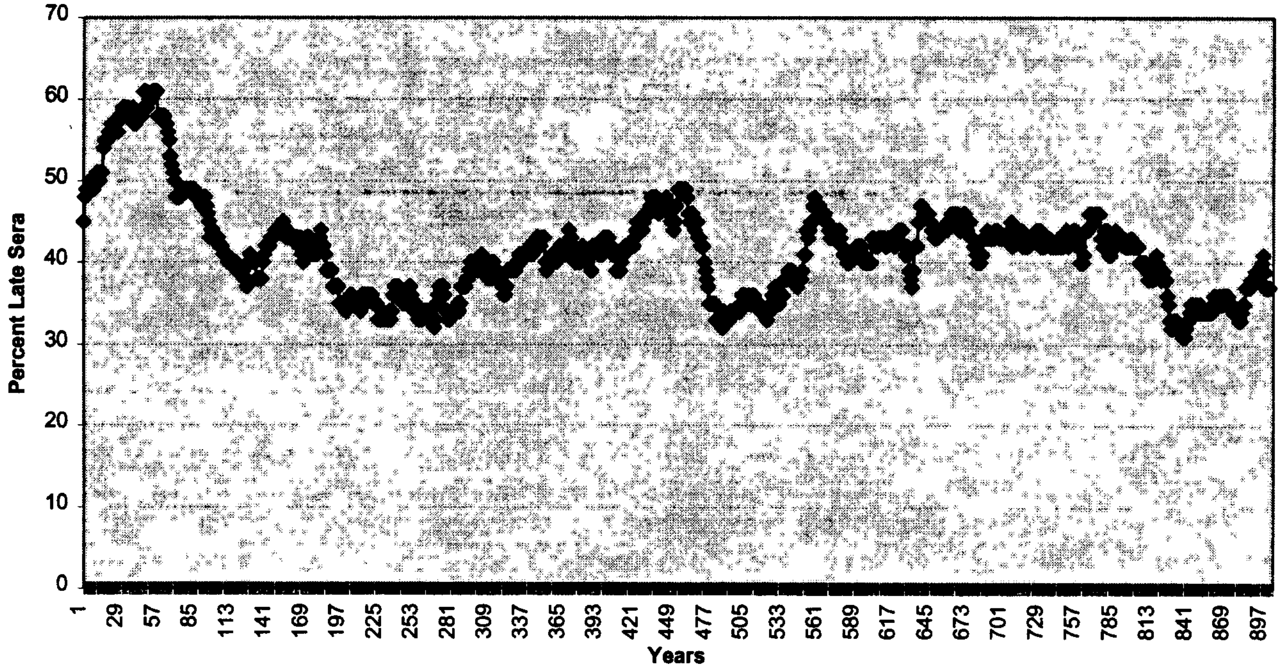

Table H- 1: Model Results (Natural Scenario) and Existing Late Seral

LSR Segment	Natural Scenario, Late Seral		Existing Condition, Late Seral All Plant Series	
	North Aspect	South Aspect	North Aspect	South Aspect
LSR 222, N. of Calapooya Divide	30-50%, min.[54] 70-80%, max.	30-50%, min.60-75%, max.	44%	38%
LSR 222, Calapooya to S. Umpqua R.	10-20%, min. 70-80%, max.	0-10%, min. 65-85%, max.	47%	42%
LSR 222, S. Umpqua R. and South, and LSR 227 West	5-15%, min. 45-65%, max.	5-20%, min. 35-50%, max.	45% 22%, 227 West	32% 17%, 227 West
LSR 225/226	35-55%, min. 55-75%, max.	5-15%, min. 55-75%, max.	27%	19%
	All Aspects, Late seral			
LSR 224 Douglas-Fir Series	15-30%, min., 20-40%, max.		47%	39%
LSR 224 White Fir Series	30-50%, min., 35-55%, max.			
LSR 224 White Oak Series	0-10%, min., 25-40%, max.			
LSR 227, East White Fir Series	5-10%, min., 50-65%, max.		28%	22%
LSR 227, East Shasta Red Fir	40-60%, min., 55-75%, max.			

[54] These percentages are the range in the amount of late seral over time. Minimum and maximum refer to the fire return intervals used, i.e. the shortest and longest fire return intervals from the applicable watershed analysis.

MODEL COEFFICIENTS

Initial Seral Conditions Proportions--These are the starting proportions used in all simulations.

	LSR 222	LSR 224	LSR 225	LSR 226	LSR 227
Early Seral	.0	.000	.00	.00	.000
Late-early Seral	.2	.321	.39	.31	.3737
Early-mid Seral	.17	.123	.18	.22	.2222
Late-mid Seral	.18	.123	.19	.23	.2222
Late Seral	.45	.433	.24	.24	.1818

PROBABILITIES USED IN "NATURAL" SCENARIO

The harvest treatments (PCT and ComThin) shown below were not used in the simulations.
The WF_HI "prescription" was the probability that any one acre would burn with stand replacement intensity and thus transfer to the early seral stage per year. The WF_LO "prescription" would result in that acre staying in the same seral stage class for at least that year.

KEY: There are generally four columns of coefficients below. From left to right, they represent:
the minimum fire return interval for south aspects,
the maximum fire return interval for south aspects,
the minimum fire return interval for north aspects,
the maximum fire return interval for north aspects.

For LSR 224, there are 6 columns of coefficients. They represent:
the minimum fire return interval for Douglas-fir Series,
the maximum fire return interval for Douglas-fir Series,
the minimum fire return interval for White Fir Series,
the maximum fire return interval for White Fir Series,
the minimum fire return interval for White Oak Series,
the maximum fire return interval for White Oak Series.

For LSR 227 East, there are 4 columns of coefficients. They represent:
the minimum fire return interval for White Fir Series,
the maximum fire return interval for White Fir Series,
the minimum fire return interval for Shasta Red Fir Series,
the maximum fire return interval for Shasta Red Fir Series.

SCN: 222N1.SCN These are the coefficients used in the portion of LSR 222 from the Calapooya Ridge north.

1 NewPVT
A 1 EARLY 2001 Conifer
Succession: B 20

A	1101 WF_HI	.025	.0101	.0211	.0056	0
A	1032 PCT	.01	.01	.01	.01	5

B 2 LATE EARLY 2001 Conifer
Succession: C 20

A	1101 WF_HI	.025	.0101	.0211	.0056	0
A	1032 PCT	.01	.01	.01	.01	5
B	1102 WF_LO	.0063	.0025	.0053	.0014	0

C 3 EARLY MID 2001 Conifer
Succession: D 20

A	1101 WF_HI	.0188	.0076	.0158	.0042	0
C	1012 ComThin	.01	.01	.01	.01	10
C	1102 WF_LO	.0125	.0051	.0105	.0028	5

D 4 LATE MID 2001 Conifer
Succession: E 20

A	1101 WF_HI	.0188	.0076	.0158	.0042	0
D	1102 WF_LO	.0125	.0051	.0105	.0028	5
D	1012 ComThin	.01	.01	.01	.01	10

E 5 LATE 2001 Conifer
Succession: E 999

A	1101 WF_HI	.0078	.0032	.0092	.0024	0
A	1071 BUGS	.001	.001	.001	.001	0
E	1102 WF_LO	.0234	.0095	.0171	.0045	5

SCN: 222M1.SCN These are the coefficients used in the portion of LSR 222 from the Calapooya Ridge south to the South Umpqua River.

1 NewPVT
A 1 EARLY 2001 Conifer
Succession: B 20

A	1101 WF_HI	.0727	.0065	.0421	.0063	0
A	1032 PCT	.01	.01	.01	.01	5

B 2 LATE EARLY 2001 Conifer
Succession: C 20

A	1101 WF_HI	.0727	.0065	.0421	.0063	0
A	1032 PCT	.01	.01	.01	.01	5

C 3 EARLY MID 2001 Conifer
Succession: D 20

A	1101 WF_HI	.0545	.0049	.0316	.0048	0
C	1012 ComThin	.01	.01	.01	.01	10
C	1102 WF_LO	.0364	.0033	.0211	.0032	5

D 4 LATE MID 2001 Conifer
Succession: E 20

A	1101 WF_HI	.0545	.0049	.0316	.0048	0
D	1102 WF_LO	.0364	.0033	.0211	.0032	5
D	1012 ComThin	.01	.01	.01	.01	10

E 5 LATE 2001 Conifer
Succession: E 999

A	1101 WF_HI	.0227	.002	.0184	.0028	0
A	1071 BUGS	.001	.001	.001	.001	0
E	1102 WF_LO	.0682	.0061	.0342	.0052	5

SCN: 222S1.SCN These are the coefficients used in the portion of LSR 222 from the South Umpqua River and South. These were also used for the West Half of LSR 227.

1 NewPVT

A 1 EARLY 2001 Conifer

Succession: B 20

A	1101 WF_HI	.0533	.0242	.05	.0127	0
A	1032 PCT	.01	.01	.01	.01	5

B 2 LATE EARLY 2001 Conifer

Succession: C 20

A	1101 WF_HI	.0533	.0242	.05	.0127	0
A	1032 PCT	.01	.01	.01	.01	5

C 3 EARLY MID 2001 Conifer

Succession: D 20

A	1101 WF_HI	.04	.0182	.0375	.0095	0
C	1012 ComThin	.01	.01	.01	.01	10
C	1102 WF_LO	.0267	.0121	.025	.0063	5

D 4 LATE MID 2001 Conifer

Succession: E 20

A	1101 WF_HI	.04	.0182	.0375	.0095	0
D	1102 WF_LO	.0267	.0121	.025	.0063	5
D	1012 ComThin	.01	.01	.01	.01	10

E 5 LATE 2001 Conifer

Succession: E 999

A	1101 WF_HI	.0167	.0076	.0219	.0056	0
A	1071 BUGS	.001	.001	.001	.001	0
E	1102 WF_LO	.05	.0227	.0406	.0103	5

SCN: 224.SCN These are the coefficients used in LSR 224.

1 NewPVT

A 1 EARLY 2001 Conifer

Succession: B 20

A	1101 WF_HI	.0444	.032	.0229	.02	.16	.0533	0
A	1032 PCT	.01	.01	.01	.01	.01	.01	5

B 2 LATE EARLY 2001 Conifer

Succession: C 20

A	1101 WF_HI	.0444	.032	.0229	.02	.16	.0533	0
A	1032 PCT	.01	.01	.01	.01	.01	.01	5
B	1102 WF_LO	.0111	.008	.0057	.005	.04	.0133	0

C 3 EARLY MID 2001 Conifer

Succession: D 20

A	1101 WF_HI	.0333	.024	.0171	.015	.12	.04	0
C	1012 ComThin	.01	.01	.01	.01	.01	.01	10
C	1102 WF_LO	.0222	.016	.0114	.01	.08	.0267	5

D 4 LATE MID 2001 Conifer

Succession: E 20

A	1101 WF_HI	.0333	.024	.0171	.015	.12	.04	0
D	1102 WF_LO	.0222	.016	.0114	.01	.08	.0267	5
D	1012 ComThin	.01	.01	.01	.01	.01	.01	10

E 5 LATE 2001 Conifer

Succession: E 999

A	1101 WF_HI	.0111	.008	.0086	.0075	.01	.0033	0
A	1071 BUGS	.001	.001	.001	.001	.001	.001	0
E	1102 WF_LO	.0444	.032	.02	.0175	.19	.0633	5

SCN: 2252261.SCN These are the coefficients used LSR 225 and LSR 226.

1 NewPVT

A	1 EARLY 2001 Conifer					
	Succession: B	20				
A	1101 WF_HI	.0571	.0114	.0178	.0096	0
A	1032 PCT	.01	.01	.01	.01	5
B	2 LATE EARLY 2001 Conifer					
	Succession: C	20				
A	1101 WF_HI	.0571	.0114	.0178	.0096	0
A	1032 PCT	.01	.01	.01	.01	5
C	3 EARLY MID 2001 Conifer					
	Succession: D	20				
A	1101 WF_HI	.0429	.0086	.0133	.0072	0
C	1012 ComThin	.01	.01	.01	.01	10
C	1102 WF_LO	.0286	.0057	.0089	.0048	5
D	4 LATE MID 2001 Conifer					
	Succession: E	20				
A	1101 WF_HI	.0429	.0086	.0133	.0072	0
D	1102 WF_LO	.0286	.0057	.0089	.0048	5
D	1012 ComThin	.01	.01	.01	.01	10
E	5 LATE 2001 Conifer					
	Succession: E	999				
A	1101 WF_HI	.0179	.0036	.0078	.0042	0
A	1071 BUGS	.001	.001	.001	.001	0
E	1102 WF_LO	.0536	.0107	.0144	.0078	5

SCN: 227EAST.SCN These are the coefficients used in LSR 227 East Half.

1 NewPVT

A	1 EARLY 2001 Conifer					
	Succession: B	20				
A	1101 WF_HI	.08	.02	.02	.0133	0
A	1032 PCT	.01	.01	.01	.01	5
B	2 LATE EARLY 2001 Conifer					
	Succession: C	20				
A	1101 WF_HI	.08	.02	.02	.0133	0
A	1032 PCT	.01	.01	.01	.01	5
B	1102 WF_LO	.02	.005	.005	.0033	0
C	3 EARLY MID 2001 Conifer					
	Succession: D	20				
A	1101 WF_HI	.06	.015	.015	.01	0
C	1012 ComThin	.01	.01	.01	.01	10
C	1102 WF_LO	.04	.01	.01	.0067	5
D	4 LATE MID 2001 Conifer					
	Succession: E	20				
A	1101 WF_HI	.06	.015	.015	.01	0
D	1102 WF_LO	.04	.01	.01	.0067	5
D	1012 ComThin	.01	.01	.01	.01	10
E	5 LATE 2001 Conifer					
	Succession: E	999				
A	1101 WF_HI	.015	.0038	.0063	.0042	0
A	1071 BUGS	.001	.001	.001	.001	0
E	1102 WF_LO	.085	.0213	.0188	.0125	5

APPENDIX I: Aquatics Tables

Table I-1

									Acres of Harvest by Decade									
Eugene BLM	HUC 4	HUC 5	KWS	Total HUC Acres	LSR Acres	RIP Roads	Roads	Road Density	1950	1960	1970	1980						
222	Coast Fk Willamette	1		126873	5314	12.53	27.64	3.33		52	513	452						
222	Coast Fk Willamette	2		62181	10693	12.26	64.99	3.89			1457	1203						
222	Coast Fk Willamette	3		97420	8860	20.6	42.29	3.05		107	790	1442						
222	North Umpqua	10		62699	294		1.67	3.64			48	46						
Roseburg BLM																		
222	North Umpqua	9		40560	431	1.92	5.98	8.88		59	8	33						
222	North Umpqua	9	Steambo at Cr	40560	17885	66.55	127.9	4.58	54	842	1775	1061						
222	North Umpqua	10		62699	13713	21.04	101	4.71	3601	833	1126	1299						
222	North Umpqua	10	Steambo at Cr	62699	373	0.51	3.22	5.52		65	2	2						
Medford BLM																		
224	Upper Rogue	5	Elk Cr	85362	26670	151.32	217.9	5.23	128	697	155	2494						
Willamette NF	HUC 4	HUC 5	KWS	Total HUC Acres	LSR HUC Acres	RIP Roads	Roads	Road Density	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
222	Coast Fk Willamette	19		67266	31132	29.22	173.4	3.57	7					936	2412	1577	2605	744
222	Coast Fk Willamette	19	Dell Cr	67266	1168	6.31	10.76	5.9							48	3	66	16
222	Coast Fk Willamette	19	Fern Cr	67266	308	0.15	1.16	2.41			12							39
222	Coast Fk Willamette	21		109889	41153	21.83	169	2.63						709	2756	2067	3400	462
222	Coast Fk Willamette	23		113438	18914	17.84	88.63	3						700	1503	1557	1807	281

									Regen Harvest					
Umpqua NF	HUC 4	HUC 5	KWS	Total HUC Acres	LSR HUC Acres	RIP Roads	Roads	Road Density	Acres of Harvest by Decade					
									1940	1950	1960	1970	1980	1990
222	North Umpqua	1		126873	9635	36.6	55.38	3.68		41	1471	628	950	140
222	North Umpqua	5		65024	11153	11.47	54.32	3.12			621	1405	789	232
222	North Umpqua	6	Boulder Cr	19492	781	0.16	9.64	7.9			114	19	37	1
222	North Umpqua	7		123915	19728	26.89	74.3	2.41	2	23	1088	310	159	160
222	North Umpqua	7	Boulder Cr	123915	502	0	2.58	3.29			66			
222	North Umpqua	7	Calf Cr	123915	12858	8.68	54.1	2.69		418	855	369	649	34
222	North Umpqua	7	Copeland Cr	123915	23036	21.88	86.76	2.41		223	967	908	920	941
222	North Umpqua	7	Deception/ Wilson	123915	5464	6.23	32.13	3.77			456	162	172	273
222	North Umpqua	7	Williams/ Fairview	123915	7406	7.51	23.39	2.02		84			298	17
222	North Umpqua	8	Steamboat Cr	104677	104625	133	536.6	3.28		2890	8818	6638	8498	3232
222	North Umpqua	9	Steamboat Cr	40560	13568	10.79	55.87	2.64		261	484	976	1160	120
222	North Umpqua	1	South Umpqua	87049	52434	52.06	288.4	3.52		2571	239	69	459	204
222	South Umpqua	2	South Umpqua	102333	31135	25.86	146	3		396	736	677	552	
222	South Umpqua	3	Dumont Cr	98958	21243	26.61	124.3	3.74	55	197	247	43	89	1105
222	South Umpqua	3	Quartz/ Boulder	98958	23365	14.87	79	2.16		800	275	38	53	72
222	South Umpqua	4	South Umpqua	54399	4896	3.05	17.12	2.24			117	48	114	158
									Acres of Harvest by Decade					
Rogue River NF	HUC 4	HUC 5	KWS	TOTAL HUC Acres	LSR HUC Acres	RIP roads	Roads	Road Density	1940	1950	1960	1970	1980	1990
222	Upper Rogue	5	Elk Cr	85362	25477	62.24	105.4	2.65		93	450	568	2319	649
222	Upper Rogue	1		245286	39812	146.42	203.5	3.27	4	636	1061	1439	2872	1034
226	Upper Rogue	1		245286	2683	5.66	10.99	2.62		1	97	50	225	
226	Upper Rogue	2		159117	45794	58.03	243.4	3.4		219	222	99	834	407
226	Upper Rogue	4		158199	1330	0.23	7.16	3.45						
227	Upper Rogue	8	Jenny Cr	238534	836	0.18	5.72	4.38						
227		8	S. Fk/N. Fk L Butte Cr	238534	51318	15.68	186.8	2.33						

Winema NF	HUC 4	HUC 5	KWS	Total HUC Acres	LSR HUC acres	RIP roads	ROADS	Road Density	Harvest Acres									
227	Upper Klamath	13	Spencer Cr	95452	2495		6.6	1.69	689									
227	Upper Klamath Lake	2		247762	11776	3.3	12.4	0.67	513									
227	Upper Klamath Lake	3		74887	33047	6.23	66.4	1.29	3109									
227	Upper Rogue	8	S. Fk/N. Fk L. Butte Cr	238534	1493	0	2	0.84	59									

Table I-2

Eugene BLM LSR	HUC 4	HUC 5	KWS	Total HUC Acres	LSR ACRES	RIP Roads	Roads	Road Density	ECA
222	Coast Fork Willamette	1	N	126873	5314	12.53	27.64	3.33	> 5%
222	Coast Fork Willamette	2	N	62181	10693	12.26	64.99	3.89	>5%
222	Coast Fork Willamette	3	N	97420	8860	20.6	42.29	3.05	>5%
222	North Umpqua	10	N	62699	294		1.67	3.64	>5%
Roseburg BLM LSR									
222	North Umpqua	9	N	40560	431	1.92	5.98	8.88	<5%
222	North Umpqua	9	Steamboat Cr	40560	17885	66.55	127.9	4.58	<5%
222	North Umpqua	10	N	62699	13713	21.04	101	4.71	<5%
222	North Umpqua	10	Steamboat Cr	62699	373	0.51	3.22	5.52	<5%
Medford BLM LSR									
224	Upper Rogue	5	Elk Cr	85362	26670	151.32	217.9	5.23	<5%
Willamette NF LSR									
222	Coast Fork Willamette	19		67266	31132	29.22	173.4	3.56	<5%
222	Coast Fork Willamette	19	Dell Cr	67266	1168	6.31	10.76	5.9	<5%
222	Coast Fork Willamette	19	Fern Cr	67266	308	0.15	1.16	2.4	<5%
222	Coast Fork Willamette	21		109889	41153	21.83	169	2.6	>5%
222	Coast Fork Willamette	23		113438	18914	17.84	88.6	3	>5%
Umpqua NF LSR									
222	Coast Fork Willamette	1		126873	9635	36.6	55.38	3.68	<5%
222	North Umpqua	5		65024	11153	11.47	54.32	3.12	<5%
222	North Umpqua	6	Boulder Cr	19492	781	0.16	9.64	7.9	<5%
222	North Umpqua	7		123915	19728	26.89	74.3	2.41	<5%
222	North Umpqua	7	Boulder Cr	123915	502	0	2.58	3.29	<5%
222	North Umpqua	7	Calf Cr	123915	12858	8.68	54.1	2.69	<5%
222	North Umpqua	7	Copeland Cr	123915	23036	21.88	86.76	2.41	<5%
222	North Umpqua	7	Deception/Wilson	123915	5464	6.23	32.13	3.77	>5%
222	North Umpqua	7	Williams/Fairview	123915	7406	7.51	23.39	2.02	<5%

222	North Umpqua	8	Steamboat Cr	104677	104625	133	536.6	3.28	<5%
222	North Umpqua	9	Steamboat Cr	40560	13568	10.79	55.87	2.64	<5%
222	South Umpqua	1	South Umpqua	87049	52434	52.06	288.4	3.52	<5%
222	South Umpqua	2	South Umpqua	102333	31135	25.86	146	3	<5%
222	South Umpqua	3	Dumont Cr	98958	21243	26.61	124.3	3.74	>5%
222	South Umpqua	3	Quartz/Boulder	98958	23365	14.87	79	2.16	<5%
222	South Umpqua	4	South Umqpua	54399	4896	3.05	17.12	2.24	<5%
Rogue River NF LSR									
222	Upper Rogue	5	Elk Cr	85362	25477	62.24	105.4	2.65	>5%
222	Upper Rogue	1		245286	39812	146.42	203.5	3.27	>5%
226	Upper Rogue	1		245286	2683	5.66	10.99	2.62	<5%
226	Upper Rogue	2		159117	45794	58.03	243.4	3.4	<5%
226	Upper Rogue	4		158199	1330	0.23	7.16	3.45	N/A
227	Upper Rogue	8	Jenny Cr	238534	836	0.18	5.72	4.38	N/A
227	Upper Rogue	8	S. Fk/N.Fk L. Butte Cr	238534	51318	15.68	186.8	2.33	N/A
Winema NF LSR									
227	Upper Klamath	13	Spencer Cr	95452	2495		6.6	1.69	>5%
227	Upper Klamath Lake	2		247762	11776	3.3	12.4	0.67	<5%
227	Upper Klamath Lake	3		74887	33047	6.2	66.4	1.29	>5%
227	Upper Rogue	8	S. Fk/N. Fk L. Butte Cr	238534	1493	0	2	0.86	<5%

APPENDIX J: Late Successional Reserve Assessment of the Oregon Eastern Cascades Physiographic Province South of Crater Lake National Park

Separate document available on request.

APPENDIX K: References Cited

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APPENDIX L: Projected Cover in Managed Stands

Managed yield tables were used to obtain average tree sizes in order to estimate the projected cover percentage associated with three age classes in each Plant Series. The following presents the average tree size assumptions and cover calculations.

Table L-1 Individual Tree Size Assumptions and Projected Cover

Yield Table and Age	Large end Diameter (inches)[55]	Length to 3" Top (feet)[56]	Calculated Area Per Tree (sq. ft.)	Trees per Acre needed for 1% Cover
CF/CR, Age 40[57]	10	60	32.5	13.4
CF/CR, Age 60	13	85	56.67	7.7
CF/CR, Age 80	16	110	87.08	5.0
CM/CE, Age 40[58]	NA	NA	NA	NA
CM/CE, Age 60	NA	NA	NA	NA
CM/CE, Age 80	9	30	15.00	29
CH/CW, Age 40[59]	12	60	37.5	11.6
CH/CW, Age 60	17	90	75.00	5.8
CH/CW, Age 80	27	105	131.25	3.3
CD/CP, Age 40	9	60	30.00	14.5
CD/CP, Age 60	12	80	50.00	8.7
CD/CP, Age 80	17	95	79.17	5.5
Western Redcedar, THPL[60]	NA	NA	NA	NA
Oregon White Oak, QUGA[61]	NA	NA	NA	NA
Lodgepole Pine, PICO[62]	NA	NA	NA	NA
Ponderosa Pine, PIPO[63]	NA	NA	NA	NA

[55] One inch was added to yield table values to convert DBH to stump height where DBH was <20". Two inches were added where DBH was equal or greater than 20".

[56] Ten feet was subtracted from yield table values to convert from total tree height to length at 3" top.

[57] In managed yield tables, the high elevation true fir series were combined.

[58] The amount of density management treatment is expected to be very low overall, and then only in stands >70.

[59] White fir and Western Hemlock Series were combined in managed yield tables.

[60] No managed yield table data available for this Series. The CH/CW Group is used in this table.

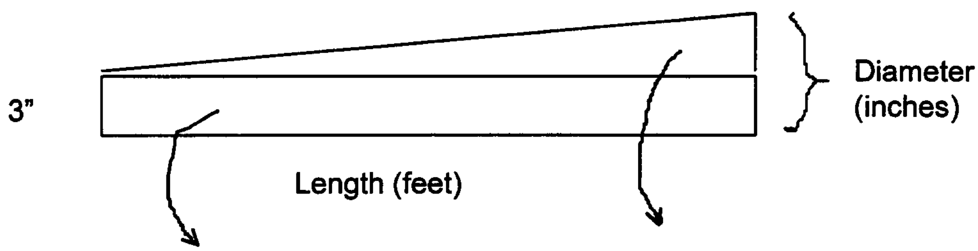
[61] Data were unavailable for this Plant Series. This Series is most closely represented by the CD/CP Group, therefore those numbers are used. For the eastern portion of LSR 227, use guidelines from the Winema NF LSR Assessment.

[62] Data unavailable for these Series. In the South Cascades LSR network, these Series are mostly within the eastern portion of LSR 227, therefore use LWM guidelines from the Winema NF LSR Assessment.

[63] Data unavailable for these Series. In the South Cascades LSR network, these Series are mostly within the eastern portion of LSR 227, therefore use LWM guidelines from the Winema NF LSR Assessment.

CALCULATIONS OF PROJECTED COVER PER TREE

The following formula was used for all ages and yield table groups:

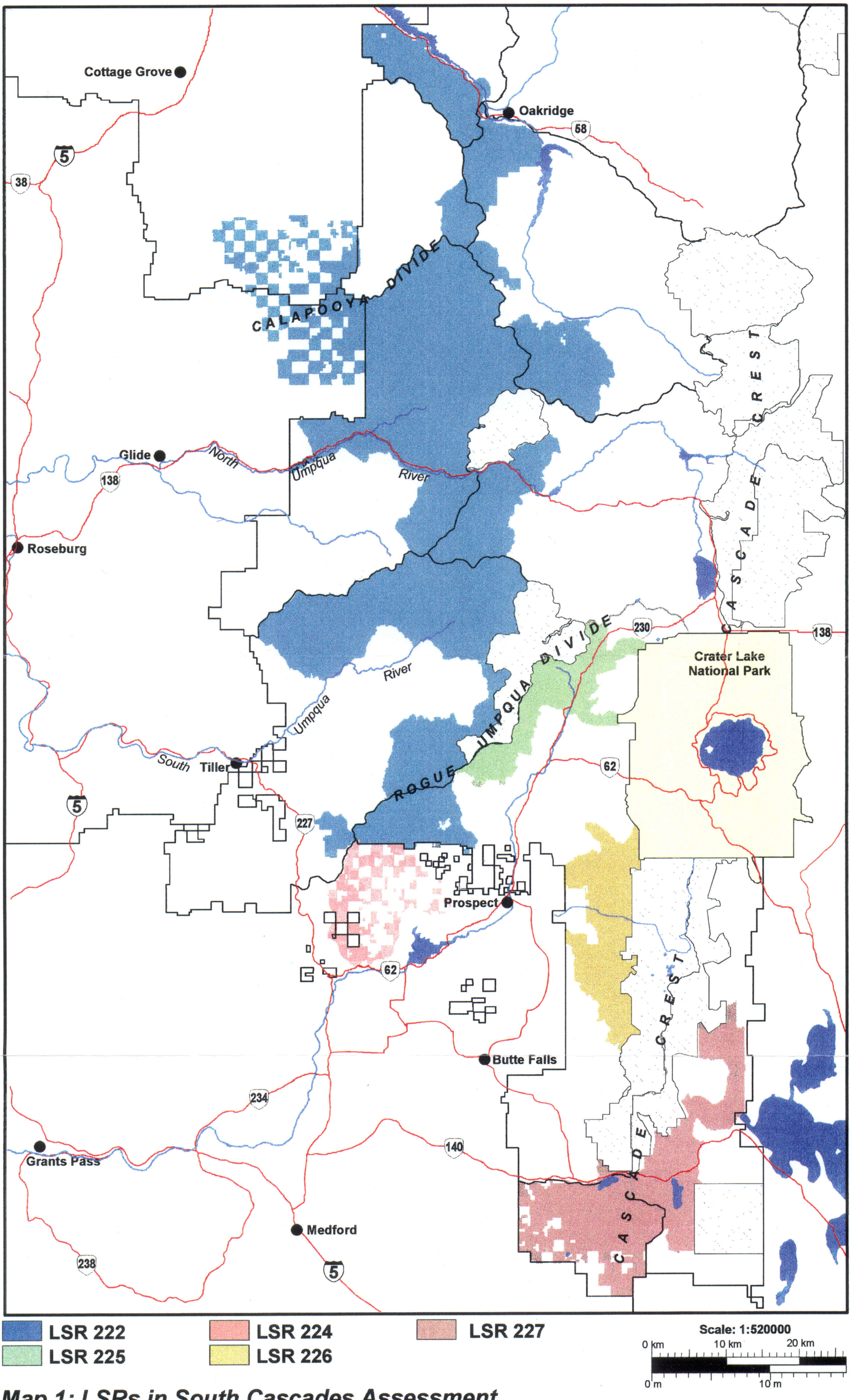


Area of Rectangle + Area of Triangle

Sq Ft./Tree = (3/12 * Length in Feet) + (((Diameter in inches/12 - 3/12) * Length in Feet)/2)

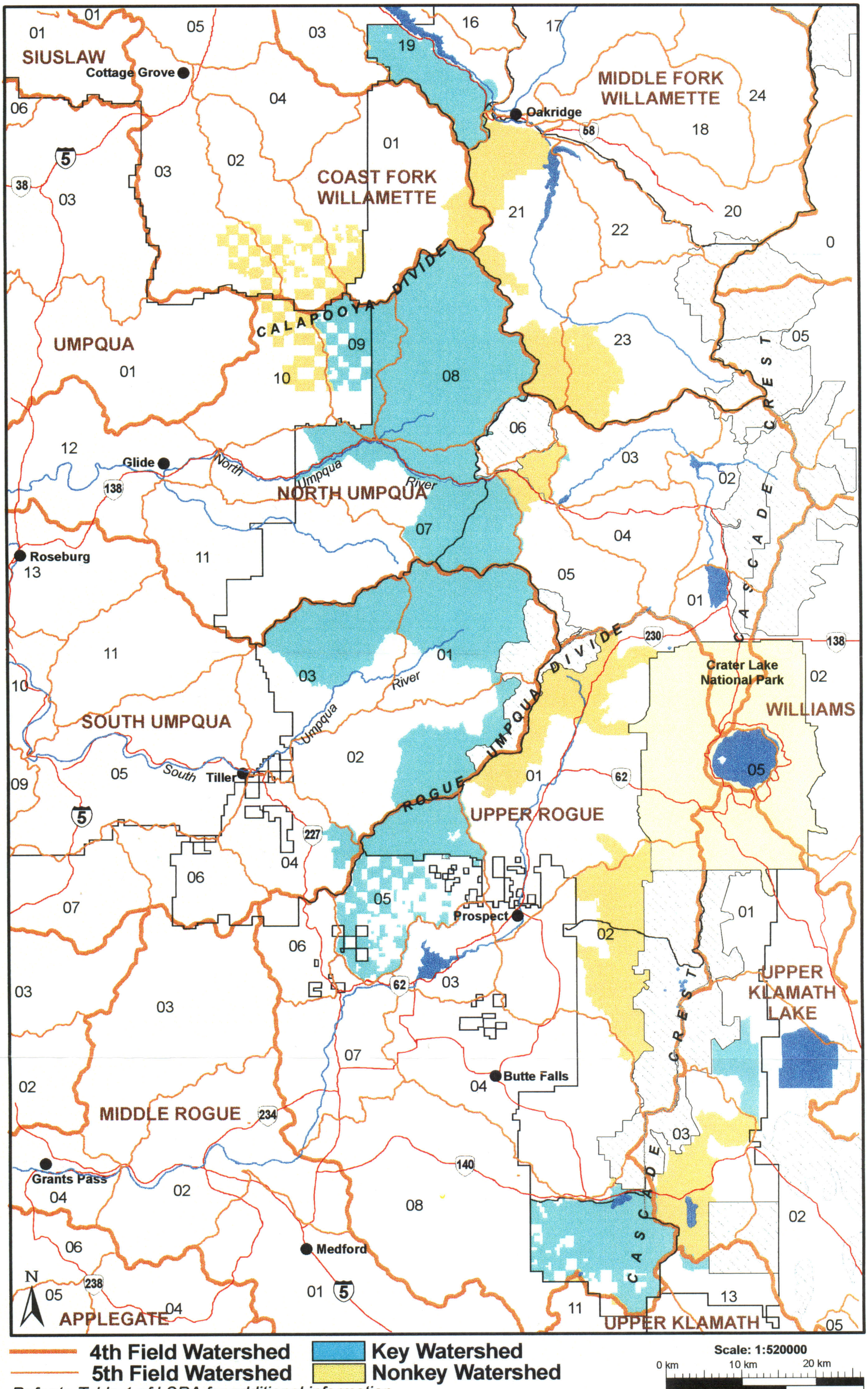
SOUTH CASCADES LATE SUCCESSIONAL RESERVE ASSESSMENT MAPS

Map 1: LSRs in South Cascades Assessment



Map 1: LSRs in South Cascades Assessment

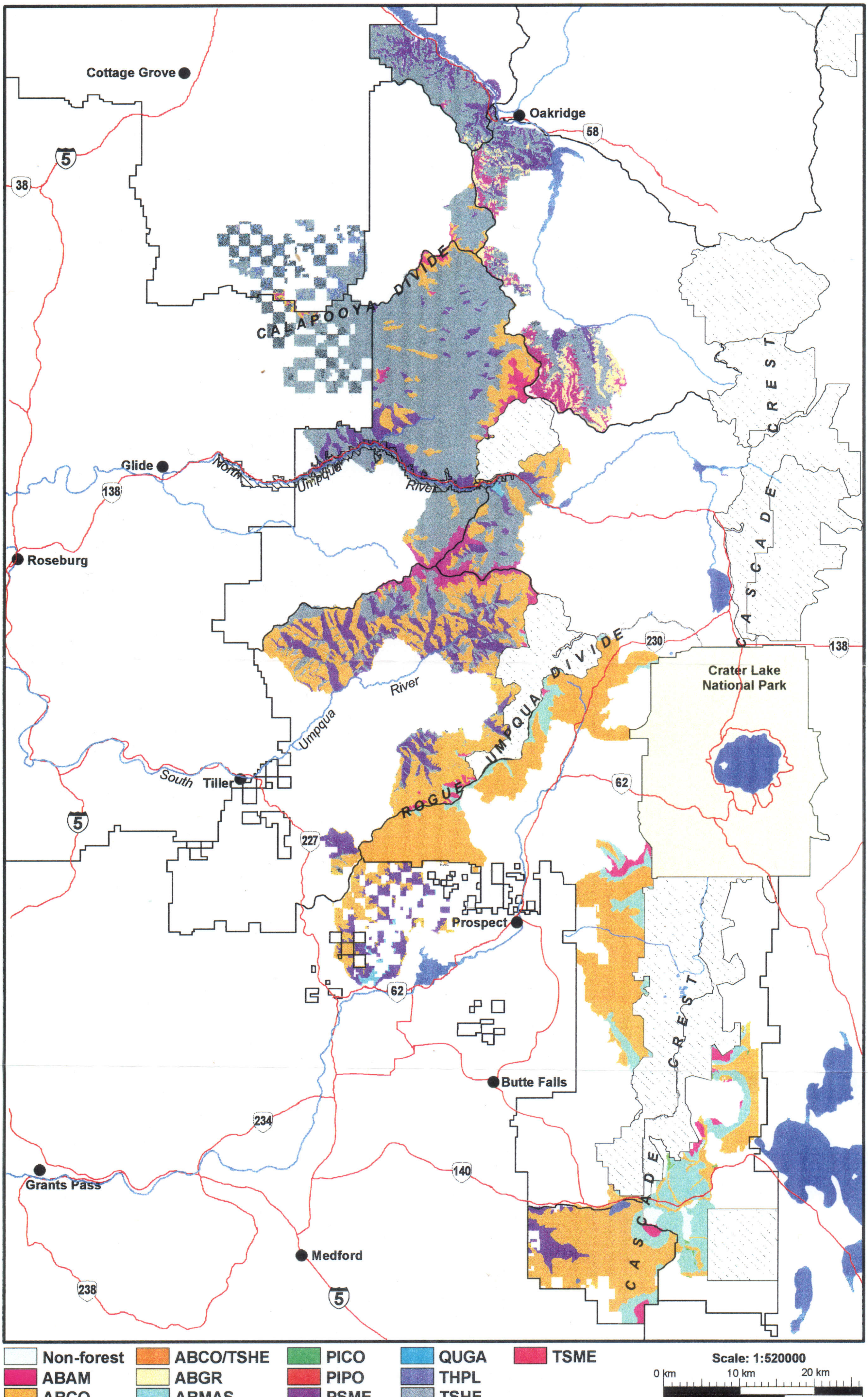
Map 2: Watershed Boundaries in South Cascades LSRA



Refer to Table 1 of LSRA for additional information

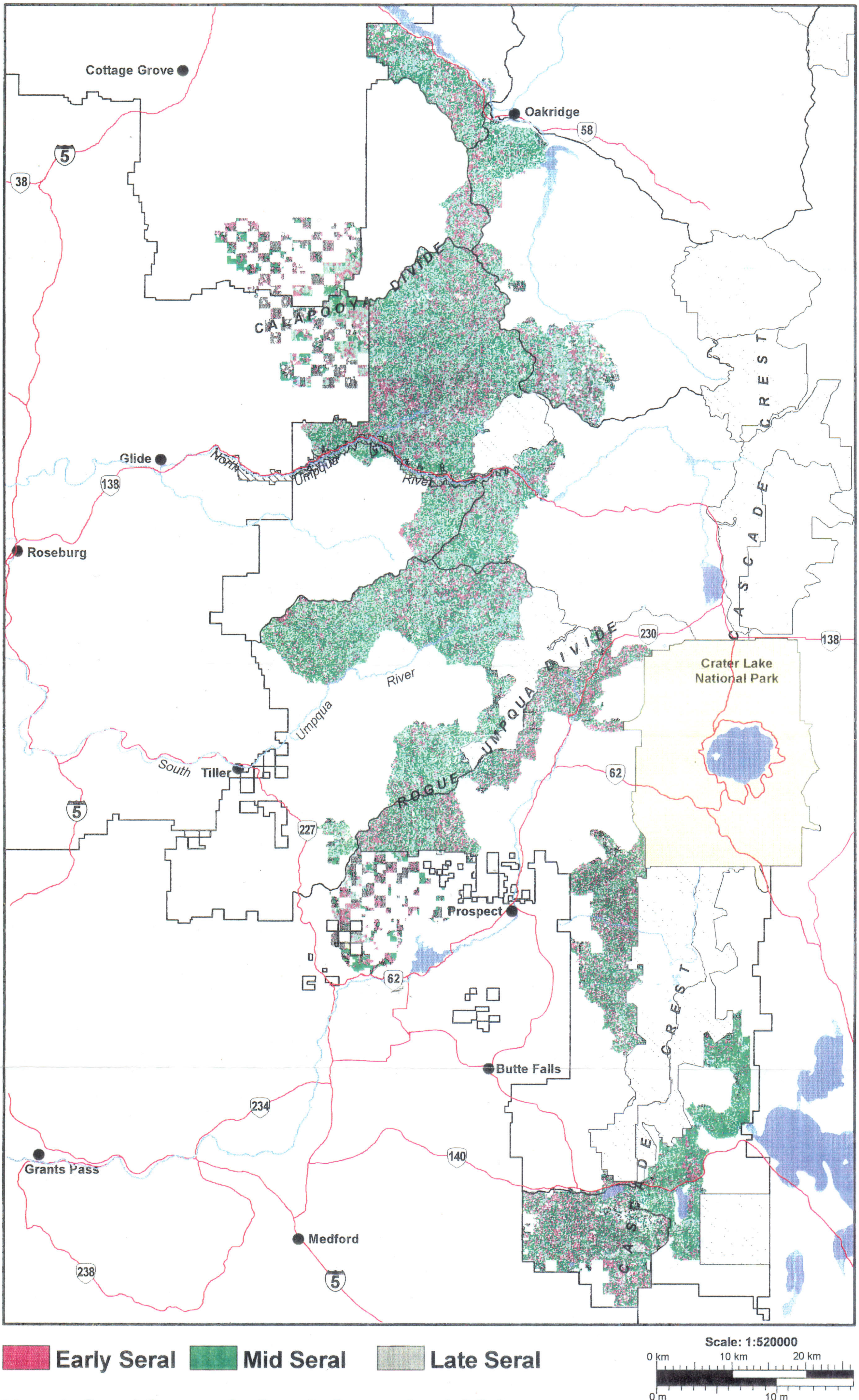
Map 2: Watershed Boundaries in South Cascades LSRA

Map 3: Plant Series in South Cascades LSRA



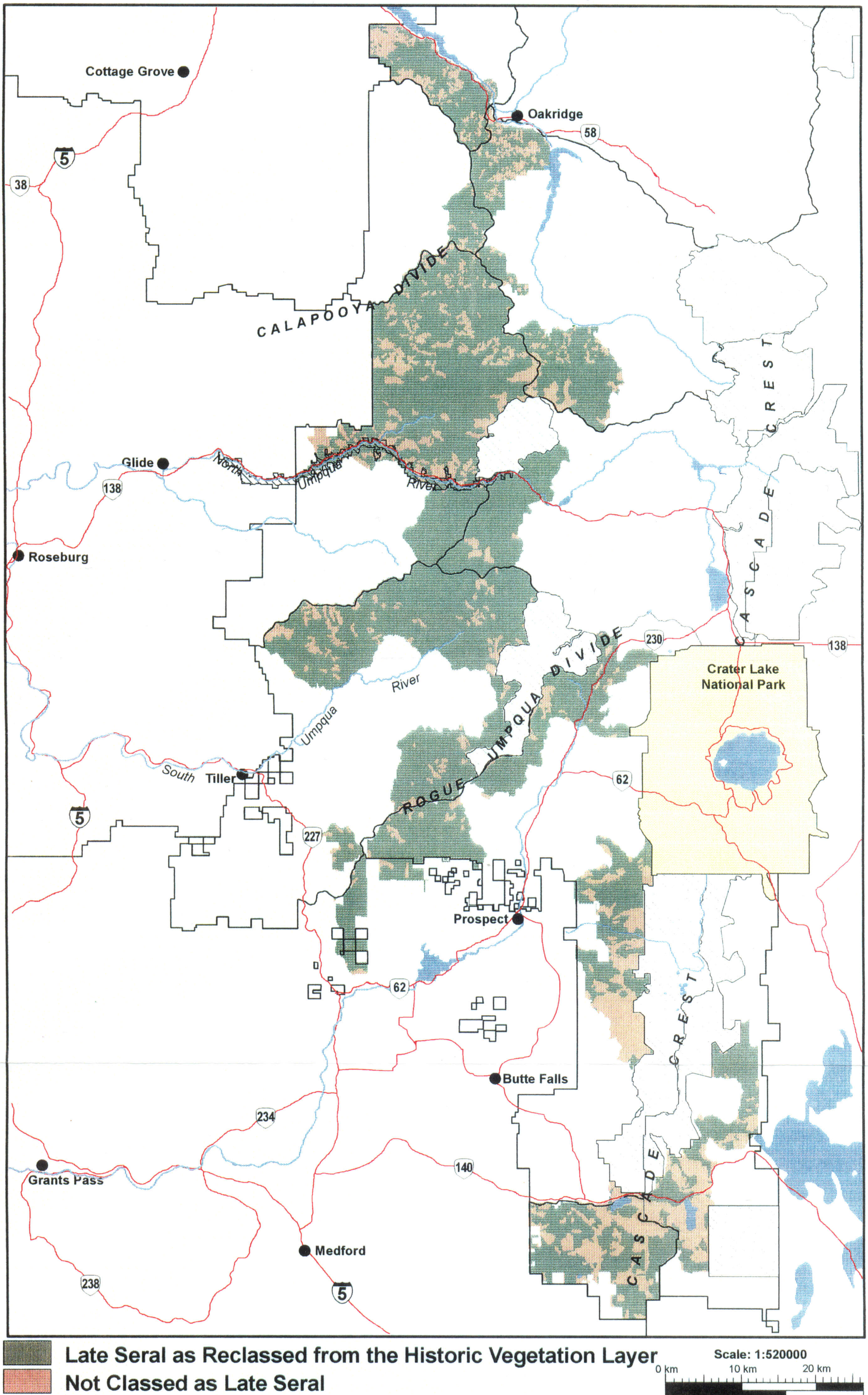
Map 3: Plant Series in South Cascades LSRA

Map 4: Seral Stages in South Cascades LSRA



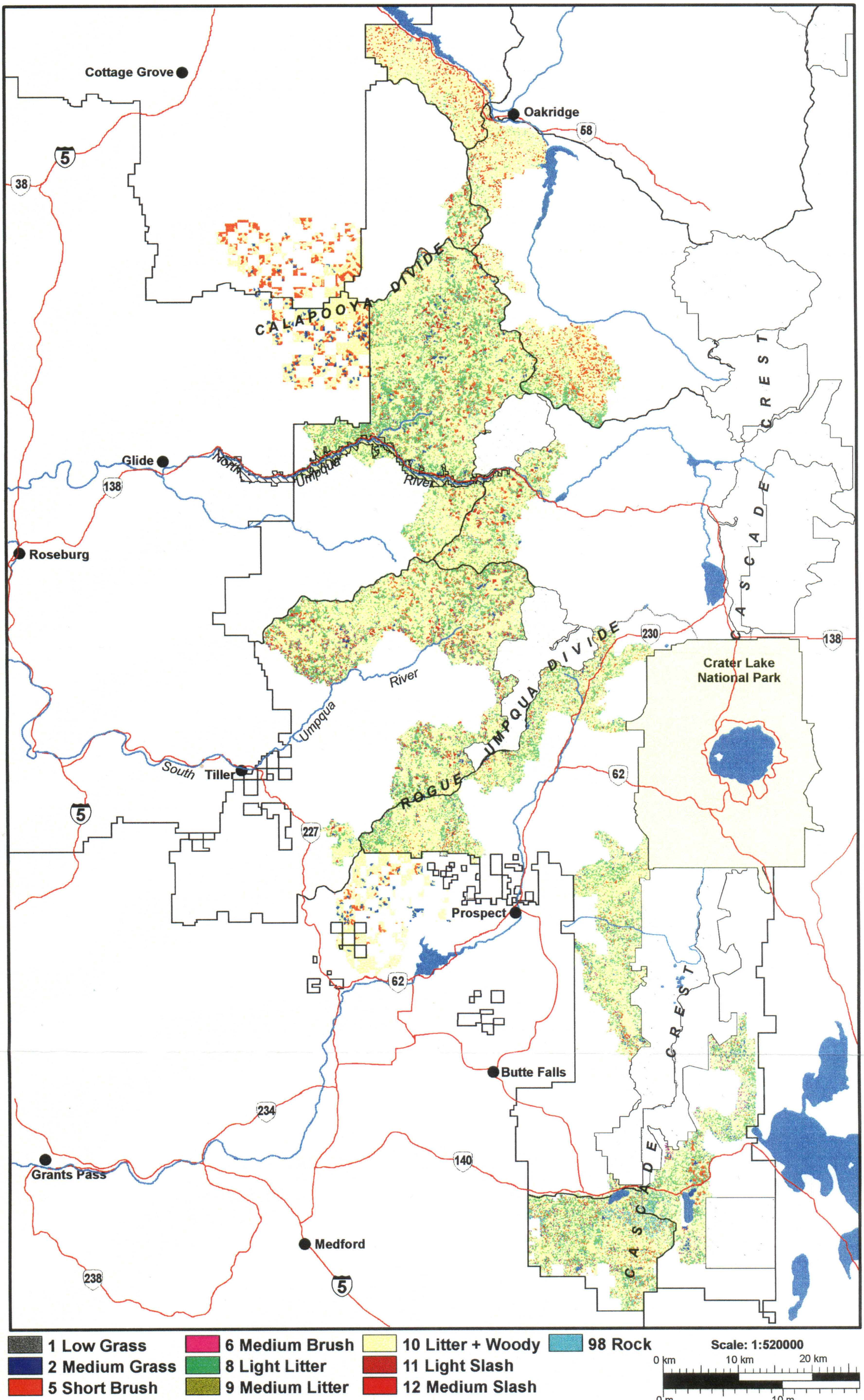
Map 4: Seral Stages in South Cascades LSRA

Map 5: Historic Vegetation South Cascades LSRA
(From 1948-1954 Photos)



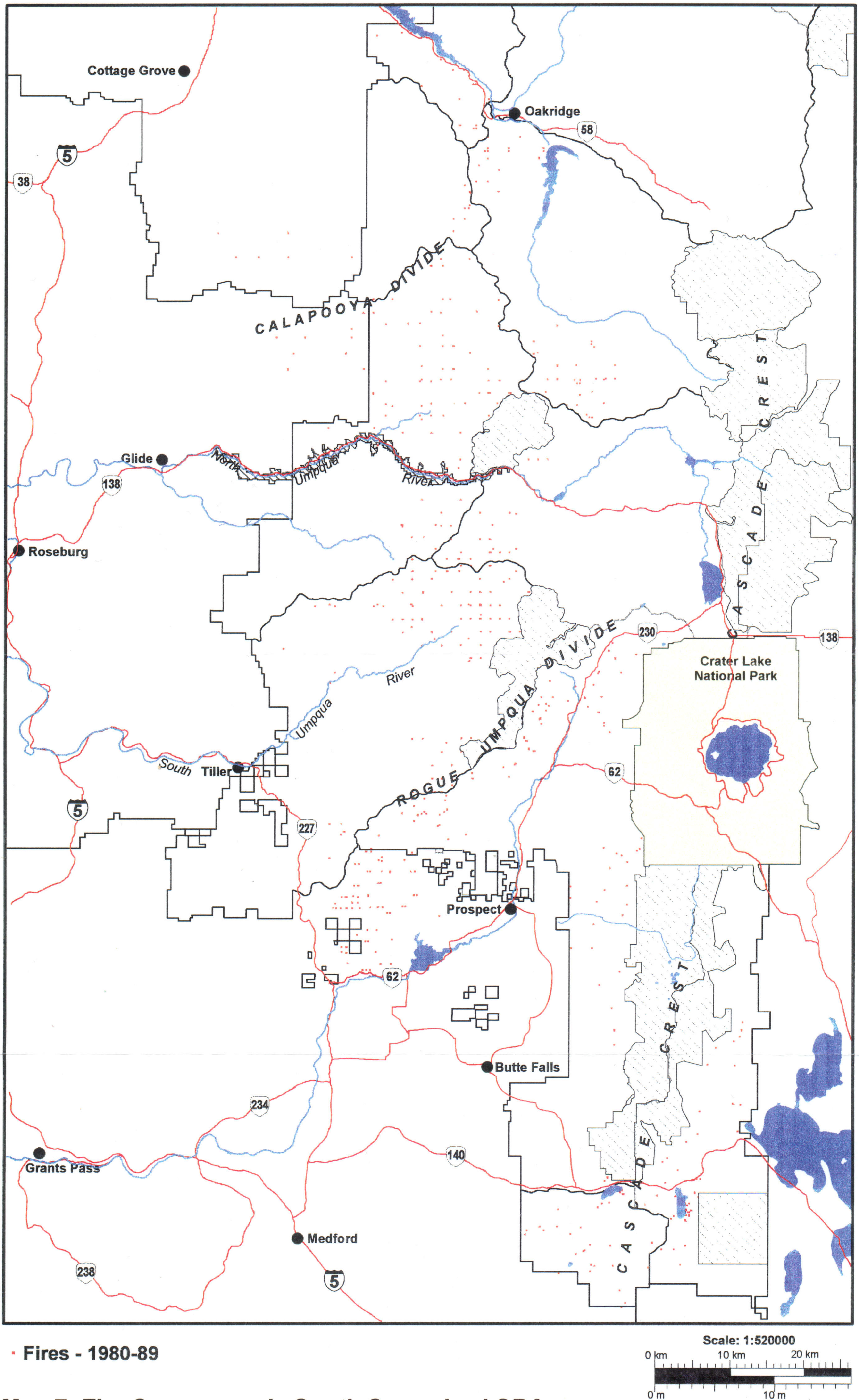
Map 5: Historic Vegetation in South Cascades LSRA

Map 6: NFFL Fuel Model in South Cascades LSRA



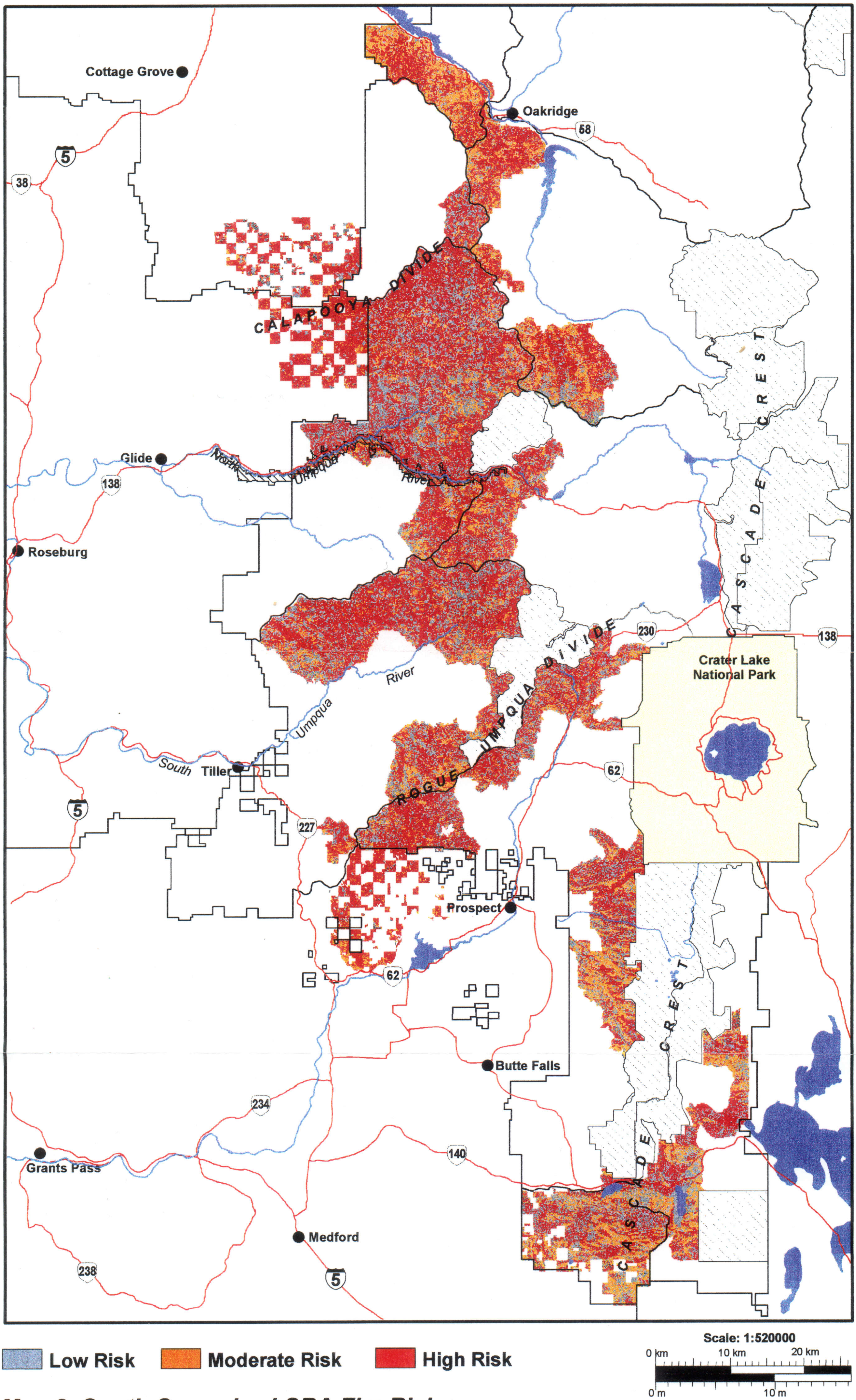
Map 6: NFFL Fuel Models in South Cascades LSRA

Map 7: Fire Occurrence in South Cascades LSRA



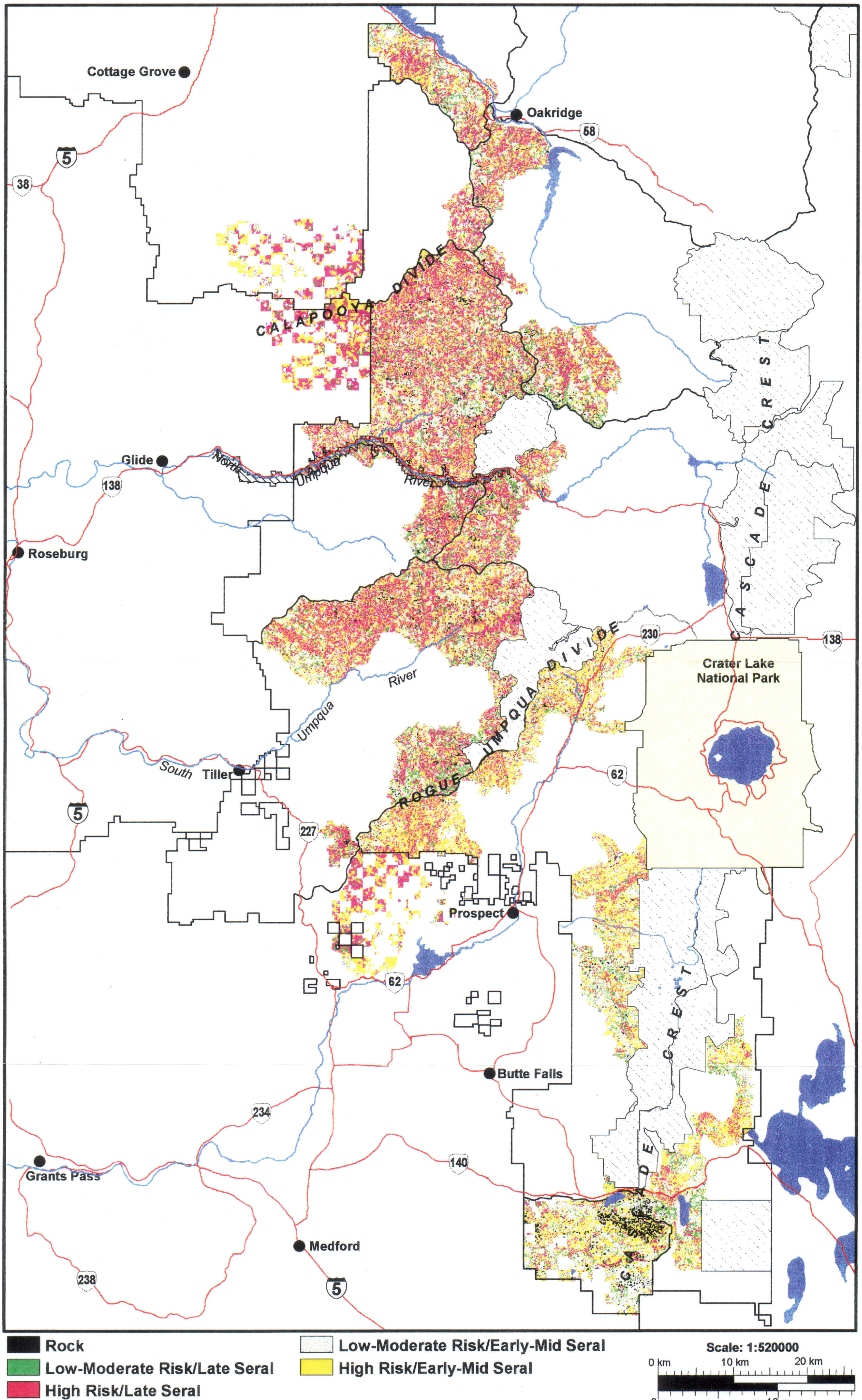
Map 7: Fire Occurrence in South Cascades LSRA

Map 8: South Cascades LSRA Fire Risk



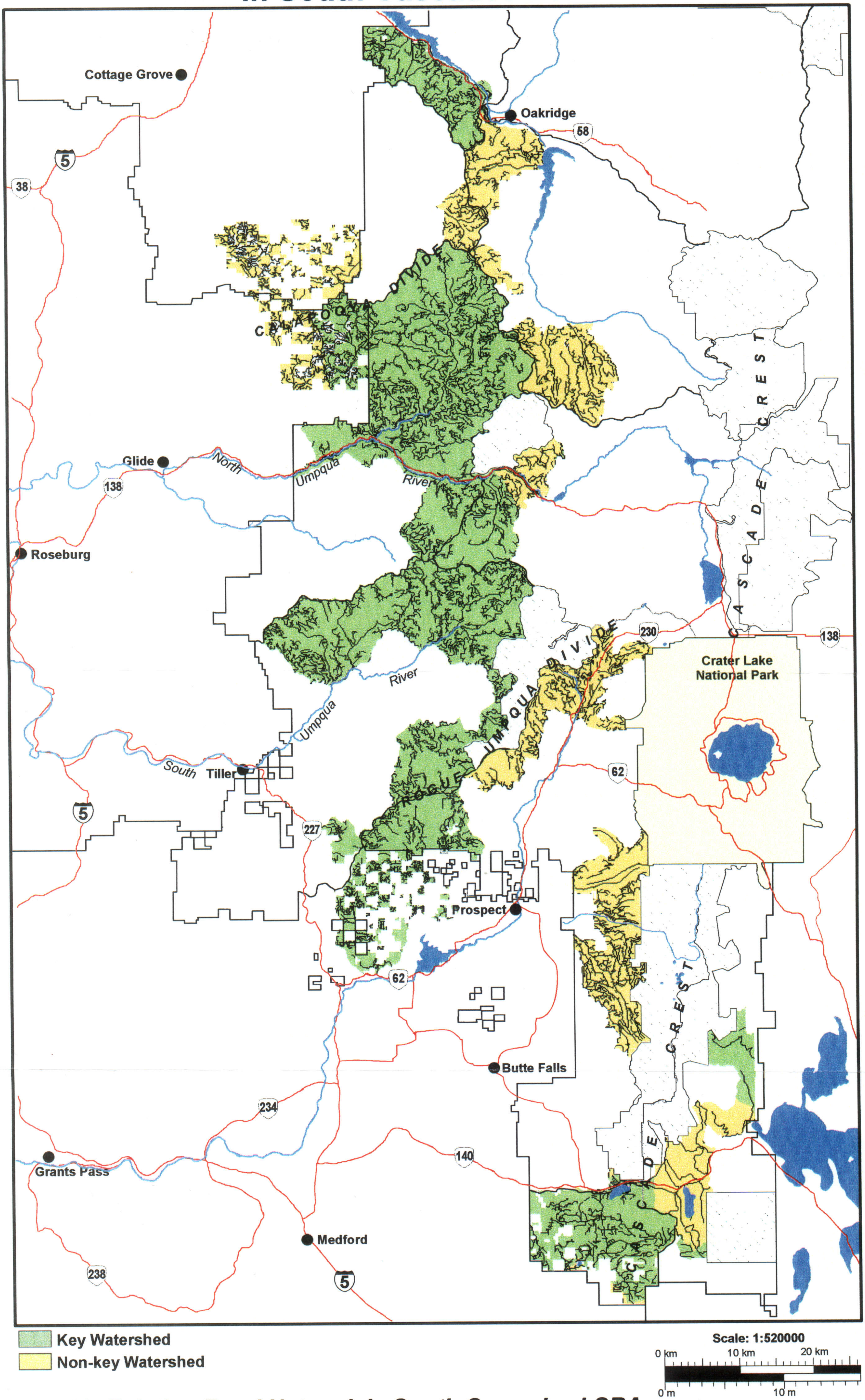
Map 8: South Cascades LSRA Fire Risk

Map 9: Seral Vegetation and Fire Risk Summary in South Cascades LSRA



Map 9: Seral Vegetation and Fire Risk Summary in South Cascades LSRA

Map 10: Existing Road Network in South Cascades LSRA



Map 10: Existing Road Network in South Cascades LSRA