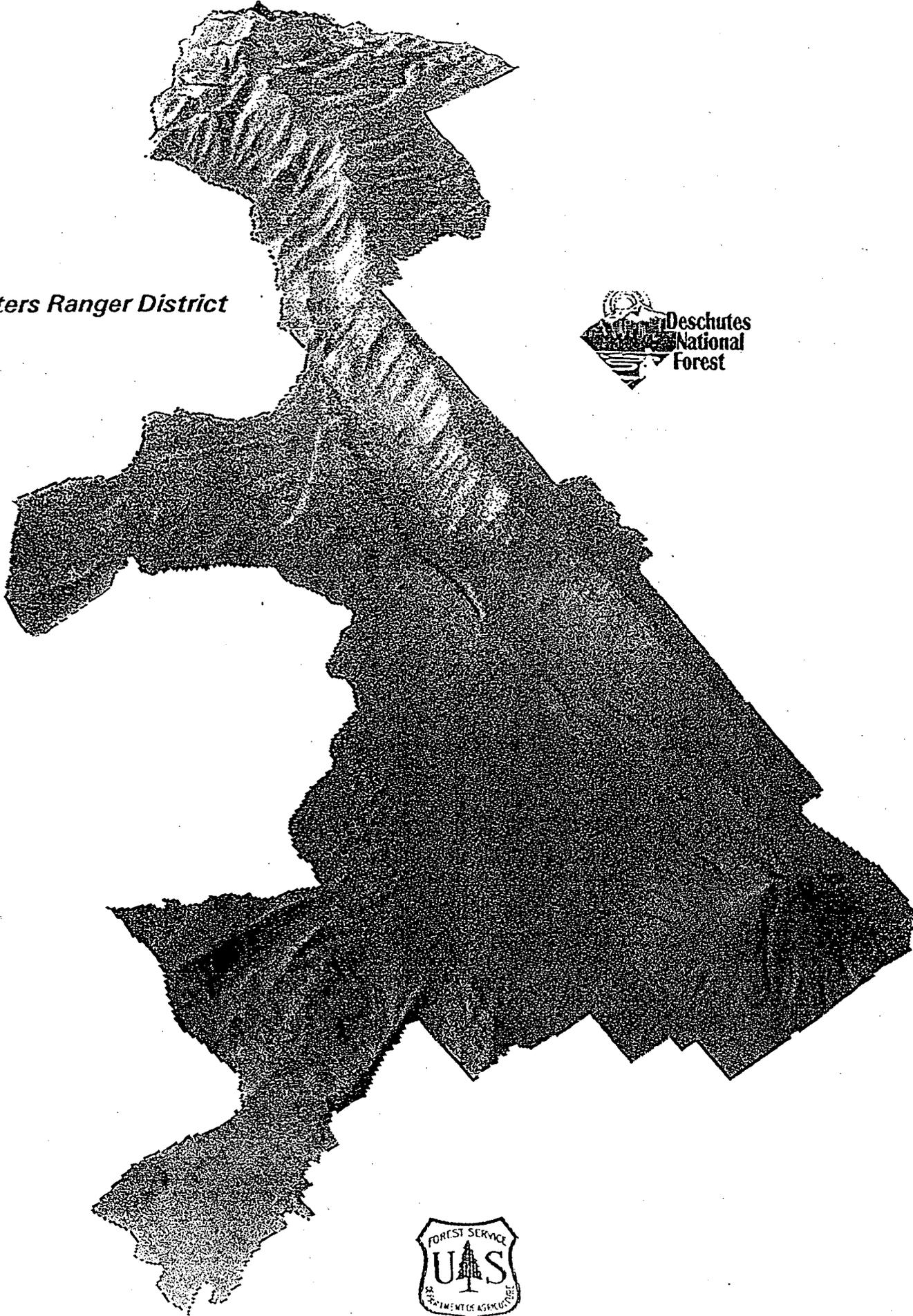


Metolius Late Successional Reserve

Sisters Ranger District



REGIONAL ECOSYSTEM OFFICE

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

MEMORANDUM

DATE: August 8, 1996

TO: Robert W. Williams, Regional Forester, Forest Service, Region 6

FROM: Donald R. Knowles, Executive Director

Don Knowles

SUBJECT: Regional Ecosystem Office Review of the Davis and Metolius Late-Successional Reserve Assessments, Deschutes National Forest

Summary

The Regional Ecosystem Office (REO) and the interagency Late-Successional Reserve (LSR) Work Group have reviewed the Davis and Metolius LSR Assessments (LSRA). The REO finds that the Davis and Metolius LSRAs provide a sufficient framework and context for future projects and activities within their respective LSRs. Future silvicultural and salvage activities described in these LSRAs that meet both the criteria and objectives of the respective LSRAs and the Standards and Guidelines (S&Gs) in the Northwest Forest Plan (NFP) are exempted from subsequent project-level REO review.

Basis for the Review

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

1. The review considers whether the assessment contains sufficient information and analysis to provide a framework and context for making future decisions on projects and activities. The eight specific subject areas that an assessment should generally include are found in the NFP S&Gs (page C-11). The REO may find that the assessment contains sufficient information or may identify topics or areas for which additional information, detail, or clarity is needed. The findings of the review are provided to the agency or agencies submitting the assessment.
2. The review considers potential treatment criteria and treatment areas addressed in the LSRA. When treatment criteria are clearly described in the LSRA—their relationship to achieving desired late-successional conditions are also clear—subsequent projects and activities within the LSR(s) may be exempted from REO review, provided they are consistent with the LSRA criteria and NFP S&Gs. REO authority for developing criteria to exempt these actions is found in the S&Gs (pages C-12, C-13, and C-18).

Robert W. Williams

2

Scope of the Assessment and Description of the Assessment Area

Davis—The LSRA addresses the 48,890-acre Davis LSR (#0-57), located east of the Oregon Cascade Crest on the Crescent Ranger District, Deschutes National Forest. Much of the Davis LSR is occupied by dry mixed conifer forest that is characterized as a "fire climax" ecosystem. Many of these forest stands are heavily stocked and at high risk for insect and disease infestation and catastrophic fire.

Metolius—The LSRA considers the 75,762 acre Metolius LSR (#0-51), located in the Deschutes Province on the Sisters Ranger District, Deschutes National Forest. Roughly 2/3 of the Metolius LSR is occupied by a mixed conifer plant group, with almost 1/3 occupied by the ponderosa pine plant group. Minor components of mountain hemlock and lodgepole pine occur. The LSRA identifies 4 major vegetation trends: (1) greatly increased stand densities, (2) increasing mortality of larger trees and insect and disease damage, (3) species composition shifting from early to late seral species, and (4) stand structure shifting from larger to smaller trees and from single or double canopy layers to multi-canopy layers. Given these trends, and considering that almost 2/3 of the ponderosa pine and mixed conifer plant groups are considered a dry type, there is concern over the occurrence of large-scale stand replacing events.

Review of the Assessments

Documents submitted for review of the Davis LSRA included the LSRA, fire plan, two "white papers" (included as appendices) entitled "Definition and Procedures for Classifying Stands as Imminently Susceptible to Insect Attack and Wildfire" and "Desired Late-Successional Reserve Condition," and appendices. Documents submitted for review of the Metolius LSRA included the LSRA (June 25, 1996 version) and its attached appendices "Vegetation," "Desired Condition for Late-Successional Habitats," and "Fire Management Plan." In addition, the document Deschutes National Forest: a Late-Successional Reserve Overview (September 1, 1995) was submitted with both assessments to set the context for site-specific LSR Assessments.

The LSRAs and the associated "Forest Overview" provide an excellent description of the area and its history. It identifies important conditions and processes, disturbance regimes, historic and current uses, and their implications for future management. It also identifies plant and animal species of interest or concern within the LSRs, and addresses connectivity within the LSR and with other LSRs.

Late-successional stand conditions necessary for late-successional species were compared with stand conditions that were considered sustainable under east Cascades fire regimes (as determined, in part, by stand density and fuel loading). The LSRAs developed and documented a strategy that would foster the retention, to the greatest extent practicable, of suitable habitat. This is balanced with maintaining the LSRs in sustainable habitat conditions where maintaining suitable habitat may put LSRs at an unacceptable risk to large-scale stand replacing disturbances.

The difference between "suitable habitat" and "sustainable habitat" required the determination of a balance of vegetative conditions that would allow the LSR to function as intended and be sustainable in the short and long term. The following considerations were factored into quantifying the desired balance:

- Habitat threshold for late-successional old-growth associated species.
- Context of the LSRs within the surrounding landscape and management allocations.

Robert W. Williams

3

- The "upper management zone" (UMZ) for each "plant association group" (PAG). The UMZ for a given PAG is that point at which tree suppression or mortality begins due to competition.
- The historic range of variability.
- The cycling of structural stages to provide different habitat through time.

Davis—The Forest has divided the Davis LSR into 28 management strategy areas (MSA) based on: (1) common plant association groups, (2) known late-successional associated species, (3) rural interface areas, (4) common silvicultural opportunities, and (5) common fire management strategies. For each MSA the LSRA discusses existing conditions for wildlife, botany, and invertebrates; forest dynamics; insect and fire risk; the social context; and risks. For each MSA, the document also presents treatment criteria, displays management options and identifies monitoring needs.

Descriptions of conditions that characterized silvicultural treatments were presented in tabular format with the following categories of information presented for each PAG: snag and downed wood levels (in number of logs, tons/acre and ft³); canopy cover; canopy layers; and density measures (including the number of trees/acre by broad tree size class).

Metolius—Criteria for developing treatments are described for each of 4 seral classes within each PAG. Under each seral class is a description of (1) the existing stand condition, (2) objectives and thresholds for action, (3) treatment strategies, (4) a description of the resulting stand after treatment, and (5) how the treatment meets LSR objectives. The LSR is divided into 13 MSAs. Current conditions, goals, objectives and management recommendations are described for each MSA. The treatment criteria by PAG and seral class provides sideboards for treatment in specific vegetative conditions; treatments are then further refined by MSA goals and objectives, thus providing guidance for designing future activities within the LSR.

Assumptions

Davis—In reviewing this LSRA the REO assumed that the wording in the LSRA (page 3-28) regarding regeneration cutting will be replaced with the following:

"Overstory removal of trees highly infected with dwarf mistletoe may occur where conditions are such that the developing understory (of the same species) in areas greater than 10 acres will be prevented from reaching late-successional condition. Each large (>21") tree will be considered individually."

Metolius—In reviewing this LSRA the REO assumed that the wording in the LSRA regarding small group treatment (c.g., pages 76 and 82) will be replaced with the following:

Small Group Treatments—Designed to reduce the spread of root rot and subsequent loss of late-successional conditions and natural diversity in vast areas over time by removing susceptible tree species from small (2 to 9 acre) root rot pockets. Where they exist, leave all or most (thin from below if necessary) of the trees of resistant species; c.g., pine and larch. If necessary to maintain some short-term structure, consider leaving 10 to 15 of the largest (>21" dbh) trees of root rot susceptible species, and interplant with seral, resistant species. Also, in order to create a mix of composition and structure across the landscape to benefit development and retention of late-successional conditions, small group treatments can be used to reestablish seral species where no seed source exists because of mortality or the dominance in the stand of climax species.

Robert W. Williams

4

In addition, there are locations in the Metolius LSRA that describe ranges of earlier seral conditions or smaller size classes (e.g., Tables 13 & 14; pages 66, 72, 78, 84) that could lead the reader to conclude these conditions are desirable to maintain within the stated range. After discussions with the forest staff, it is understood that these ranges are presented solely to help understand historic vegetative conditions and how that may contribute to sustainable habitats. There is no intention to move a late-successional or large size class stand to an early-successional stage or a smaller size class; the objective for these earlier seral stands is move them towards a late-successional condition.

Additional Comments

Historic Range of Variability (HRV) has been used in this document to help understand historic vegetation composition and fire regimes. While HRV may help determine what amount of late-successional (climactic-climax) habitats can be sustained through time across the landscape, it should not be the sole determinant. The LSR assessment teams considered habitat needs for late-successional species. The teams defined acceptable levels of risk of loss from large-scale stand-replacement events to help determine a logical mix of fire-climax and late-successional structure. The resulting structure will provide for late-successional species as well as meet an acceptable level of risk from large-scale stand replacement events. Such stands could be maintainable outside the historic range of variability. Maintenance of existing late-successional habitats and their associated species is an important component of the NFP, especially for the current planning period and until the more sustainable portions of the LSRs become fully functional.

Conclusions

Based on documentation submitted with and found in the Davis and Metolius LSRAs, field visits by members of the interagency Work Group, discussions held with members of the Deschutes National Forest staff, and the above noted assumptions, the REO finds that the Davis and Metolius LSRAs provide sufficient context and framework for decisions on future projects within each LSR. In addition, silvicultural and salvage activities described in the LSRAs that are consistent with Forest Plan S&Gs and with the respective LSRA objectives and treatment criteria are exempted from further REO review.

cc: REO Reps, RIEC, Tom Nygren, Crescent & Sisters Ranger Districts

705/ly

June 25, 1996

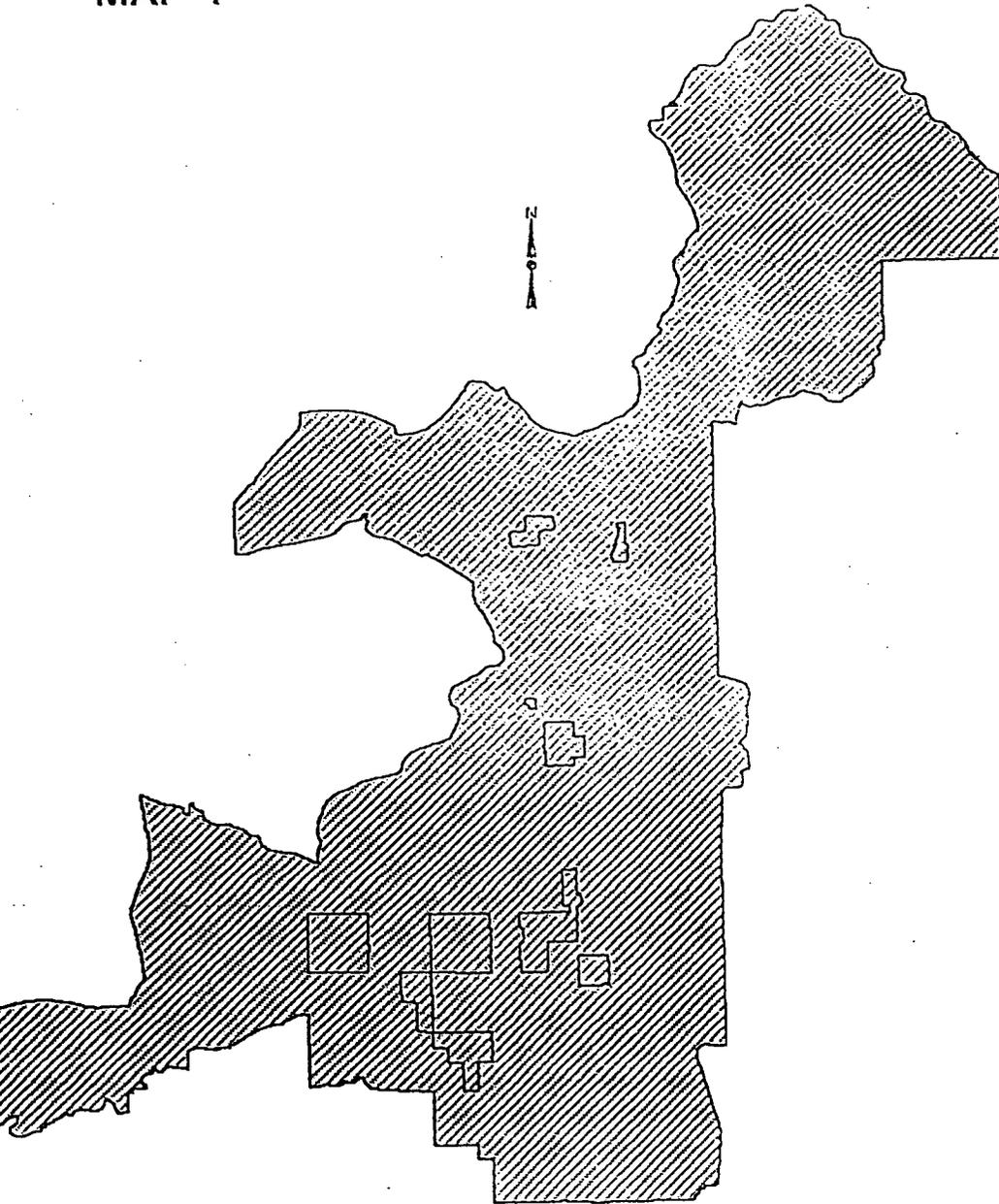
. I. INTRODUCTION AND BACKGROUND.....	4	
A. THE NORTHWEST FOREST PLAN	4	
B. 1990 DESCHUTES NF LAND AND RESOURCE MANAGEMENT PLAN.....	5	
C. DESCHUTES NF FOREST-WIDE LSR OVERVIEW.....	5	
D. METOLIUS WATERSHED ANALYSIS (MWA).....	5	
E. METOLIUS AQUATIC CONSERVATION STRATEGY	7	
. II. PHYSICAL OVERVIEW.....	7	
. III. VEGETATION ANALYSIS OVERVIEW.....	8	
A. INTRODUCTION.....	8	
B. POTENTIAL NATURAL VEGETATION	8	
C. SPECIES COMPOSITION AND STRUCTURE.....	11	
D. CANOPY COVER.....	15	
E. RANGE OF HISTORICAL VARIABILITY AND SUSTAINABILITY.....	15	
F. SUSTAINABLE CONDITIONS.....	16	
G. TREE DENSITY AND MORTALITY.....	16	
H. CURRENT AND HISTORIC CONDITIONS AND TRENDS BY PAG	19	
1. MIXED CONIFER DRIER PAG	41% of total	19
2. MIXED CONIFER WETTER PAG	21% of total	21
3. PONDEROSA PINE PAG	32% of total.....	23
4. LODGEPOLE PINE PAG	2% of total.....	25
5. RIPARIAN PAG	3% of total LSR.....	27
. IV. DISTURBANCE EVENTS THAT INFLUENCE VEGETATION.....	28	
A. OVERVIEW	28	
B. HARVEST, REGENERATION, AND STAND IMPROVEMENT RELATED DISTURBANCES.....	28	
C. INSECTS AND DISEASE	28	
D. FIRE.....	29	
. V. LATE-SUCCESSIONAL/OLD-GROWTH ASSOCIATED SPECIES.....	29	
A. INTRODUCTION.....	29	
B. STATUS OF FOCAL LATE-SUCCESSIONAL SPECIES	29	
1. Terrestrial Wildlife Species	30	
2. Riparian/Aquatic Wildlife Species	45	
3. PLANT SPECIES OF CONCERN KNOWN OR SUSPECTED TO OCCUR IN THE LSR	46	
. VI. HISTORIC AND CURRENT LAND USES.....	51	

. VII.	LATE-SUCCESSIONAL HABITAT CONDITIONS	52
A.	LATE-SUCCESSIONAL HABITAT DEFINITIONS	52
B.	HISTORIC AND CURRENT LATE-SUCCESSIONAL HABITAT CONDITIONS.....	54
	1. Surveyor Notes	54
	2. 1953 Mapping	54
	3. Current Conditions.....	54
	4. Summary and Conclusions.....	55
C.	OLD GROWTH HABITAT CONDITIONS FOR 10 SELECTED INDICATOR SPECIES.....	56
D.	SUITABLE WILDLIFE HABITAT COMPARED TO SUSTAINABLE VEGETATION.....	56
E.	CYCLING AND SUSTAINING DESIRED LS/OG CONDITIONS IN THE METOLIUS LSR.....	58
. VIII.	CRITERIA FOR APPROPRIATE TREATMENTS	61
A.	HABITAT RISK IN THE EAST CASCADES PROVINCE	61
B.	GOALS OF THE METOLIUS LSR.....	64
C.	OVERALL OBJECTIVES FOR THE METOLIUS LSR.....	65
D.	STAND-LEVEL CRITERIA FOR DEVELOPING APPROPRIATE TREATMENTS	66
	1. Ponderosa Pine PAG (25,120 acres).....	66
	2. Mixed Conifer Dry PAG (31,908 acres).....	72
	3. Mixed Conifer Wet PAG (17,468 acres).....	78
	4. Lodgepole pine PAG (1631 acres).....	84
E.	ACTIVITIES NEUTRAL TO LSR OBJECTIVES	86
. IX.	MANAGEMENT STRATEGY AREAS (MSA)	88
A.	MSA DESCRIPTIONS AND INTEGRATED STRATEGIES	88
B.	MANAGEMENT STRATEGY AREAS.....	90
	1. Management Strategy Area A	90
	2. Management Strategy Area B	93
	3. Management Strategy Area C.....	97
	4. Management Strategy Area D.....	100
	5. Management Strategy Area E.....	104
	6. Management Strategy Area F.....	108
	7. Management Strategy Area G.....	112
	8. Management Strategy Area H.....	116
	9. Management Strategy Area I.....	119
	10. Management Strategy Area J.....	122
	11. Management Strategy Area K.....	126
	12. Management Strategy Area L.....	130

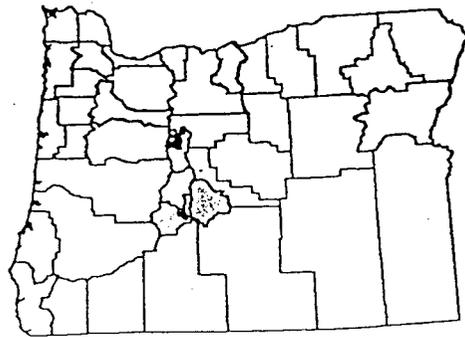
13. Management Strategy Area M.....	133
. X. PRIORITIES AND IMPLEMENTATION.....	136
A. OVERALL MSA PRIORITY FOR MANAGEMENT TO PROTECT AND DEVELOP LS/OG HABITAT:	136
B. PRIORITIES FOR MANAGEMENT TO REDUCE RISK OF HABITAT LOSS:.....	136
C. PRIORITIES FOR MANAGEMENT TO DEVELOP LS/OG.....	138
D. PRIORITIES FOR MANAGEMENT OF SENSITIVE PLANTS.....	139
E. PRIORITIES FOR INVENTORY OF OTHER J2 BRYOPHYTES, LICHENS, AND MOLLUSK SPECIES	139
F. PRIORITIES FOR MANAGEMENT OF NOXIOUS WEEDS.....	139
G. PRIORITIES FOR FIRE SUPPRESSION.....	140
H. PRIORITIES FOR MANAGEMENT TO DEVELOP LS/OG IN REGENERATION AREAS.....	140
I. PRIORITIES FOR UNDERBURNING.....	142
. XI. DATA NEEDS AND MONITORING.....	143
. APPENDIX 1 - VEGETATION.....	146
. APPENDIX 3 - BIBLIOGRAPHY.....	155
. APPENDIX 4 FIRE MANAGEMENT PLAN.....	157

Metolius Late Successional Reserve Boundary Locator Map

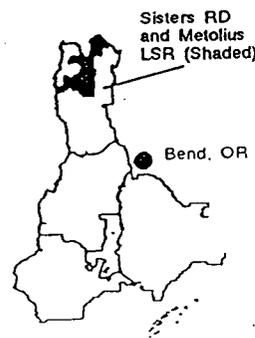
MAP 1



Sisters Ranger District



State of Oregon



I. INTRODUCTION AND BACKGROUND

The Metolius Late-Successional Reserve (MLSR) #0-51, is within the Eastern Oregon Cascade Physiographic Province and is the largest of eleven LSRs on the Deschutes National Forest.

The MLSR (Map 1) is located northwest of Sisters, Oregon and encompasses 75,762 acres or 24% of the Sisters Ranger District. There are an estimated 3,200 acres of private land within the LSR boundary. The LSR borders the Confederated Tribes of Warm Springs Reservation to the north, the Mt. Jefferson Wilderness and Mckenzie Ranger District, Willamette National Forest to the west, Matrix, Administratively Withdrawn and the spotted owl range line to the south, and private lands, Matrix and the spotted owl range line to the east.

This assessment is a strategic document that addresses the ecological significance of eastern Cascade disturbance regimes and the need to provide late-successional habitat conditions for species such as the northern spotted owl. The assessment identifies management activities needed to: (1) reduce the risk of habitat loss from catastrophic disturbances such as fire, insects and disease, and (2) sustain late-successional habitats whether the goal is to provide fire or climatic late-successional conditions. In addition, this assessment addresses activities currently occurring within the LSR, and provides recommendations for maintaining, restricting or eliminating activities to meet LSR objectives.

The assessment sets the framework for projects, but does not make any decisions to undertake a project. It serves as a way to think about where we should be going with the LSR and what are the best ways to get there. The assessment is not a NEPA or decision document; it does not make site-specific decisions.

The Northwest Forest Plan, The Metolius Watershed Analysis and Deschutes NF Forest-Wide LSR Overview create the foundation for the assessment.

A. THE NORTHWEST FOREST PLAN

As defined in the Record of Decision (ROD) for Management of Late-Successional and Old-Growth Related Species Within the Range of the Northern Spotted Owl (April, 1994), the MLSR should be managed to meet objectives described in the ROD and Attachment A, Standard and Guidelines. As described in the Standards and Guidelines C-11, a management assessment for Late-Successional Reserves should be prepared for each LSR before habitat manipulation activities are designed and implemented. This document provides the management assessment for the Metolius LSR, including:

- a history and inventory of overall vegetative conditions within the reserve
- a list of identified late-successional associated species known to exist within the LSR and information on their locations
- a fire management plan
- criteria for developing appropriate treatments
- identification of specific areas that could be treated under those criteria
- a proposed implementation schedule tiered to higher order (i.e., larger scale) plans

- proposed monitoring and evaluation components to evaluate if future activities are carried out as intended and achieve desired results.

The Northwest Forest Plan amends the 1990 Deschutes National Forest Land and Resource Management Plan.

B. 1990 DESCHUTES NF LAND AND RESOURCE MANAGEMENT PLAN

The MLSR overlaps the following management allocations from the 1990 LRMP: Metolius Special Forest, Metolius Scenic Views, Metolius Heritage, Metolius Black Butte Scenic, Metolius Special Interest, Metolius Wildlife Primitive, General Forest, Scenic Views, Metolius Wild and Scenic River, Metolius Research Natural Area and Metolius Old Growth. See the 1990 LRMP for management area themes, goals and objectives. The ROD directs that standards and guidelines from the ROD be applied to LSRs unless standards and guidelines from the underlying LRMP allocations are "more restrictive or provide greater benefits to late-successional related species."

C. DESCHUTES NF FOREST-WIDE LSR OVERVIEW

The Deschutes National Forest Overview For Site-Specific Late-Successional Reserve Assessment Teams (September 1995) was completed to set context for the Deschutes NF LSR assessments, by providing general information on forest processes, pattern and structure, and forest function. The Forest Overview establishes a desired condition for LSRs that includes providing for a landscape mosaic of "fire climax" and "climatic climax" late-successional habitat typical of eastern Oregon Cascade ecological conditions.

The Forest Overview describes the importance of the Metolius LSR for late-successional associated species such as the Vaux's swift, northern spotted owl, American marten, northern bald eagle, pileated woodpecker, white-headed woodpecker, black-backed woodpecker, northern goshawk, tailed frog, cascade frog, bull trout and *Allotropa virgata*.

The Forest Overview also discusses the importance of Matrix lands (surrounding the MLSR) to maintaining habitat connectivity throughout the MLSR.

D. METOLIUS WATERSHED ANALYSIS (MWA)

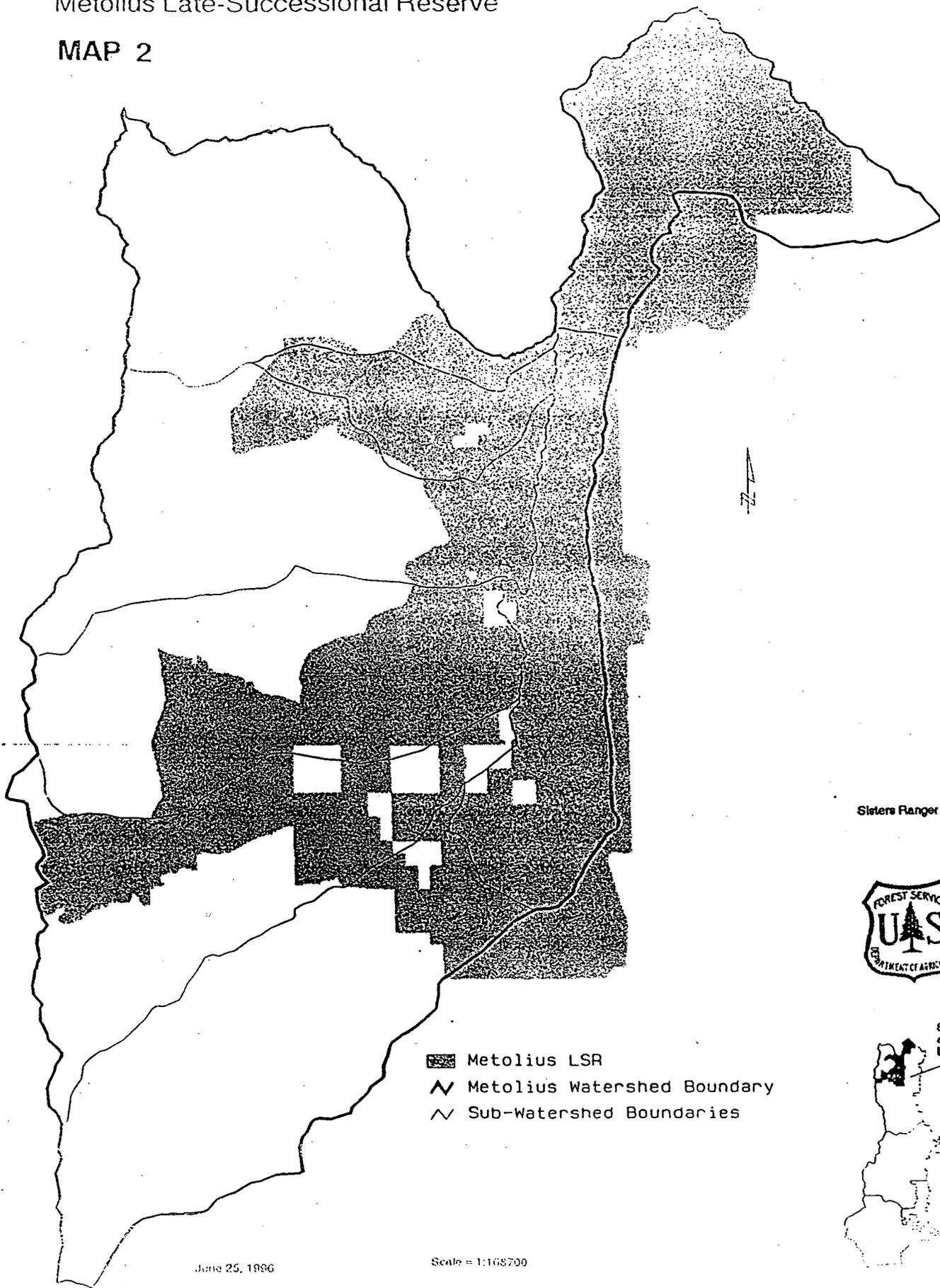
Approximately 50% of the Metolius Watershed is allocated to LSR. The Cache/Trout LSR (#0-52) encompasses 6% of the watershed, and the Metolius LSR encompasses 44% of the watershed. An additional 10,600 acres of the MLSR are outside the Metolius watershed boundaries (Map 2).

Watershed analysis is required for the Metolius Key Watershed prior to resource management. The analysis is a systematic procedure for characterizing watershed and ecological processes to meet specific resource and social objectives. The Metolius Watershed Analysis (MWA) was completed in October 1995 and provided essential resource and social information needed to complete the MLSR assessment, including the current and historic physical, biological, and social resource conditions and trends, historic ranges of variability, and management opportunities and recommendations for a variety of resources including general guidelines for providing late-successional habitats.

Compared to the MWA, the MLSR assessment provides specific objectives, guidelines and treatment opportunities relative to managing resources to sustain late-successional habitat.

Metolius Late-Successional Reserve

MAP 2



-  Metolius LSR
-  Metolius Watershed Boundary
-  Sub-Watershed Boundaries

Sisters Ranger District



Sisters RD and Metolius LSR (Shaded)

Bend, O

June 25, 1996

Scale = 1:168700

E. METOLIUS AQUATIC CONSERVATION STRATEGY

The Aquatic Conservation Strategy (ACS) as defined by the Northwest Forest Plan was developed to restore and maintain the ecological health of the watershed and the aquatic ecosystems contained within them. The primary goals are to identify and maintain disturbance regimes within the watersheds, prevent further degradation of habitat, and restore habitats and ecological processes. Management activities proposed for watersheds must meet the ACS objectives as specified in the Northwest Forest Plan (pages C31-C38).

The Metolius Watershed was selected as a Key Watershed based on the presence of bull trout. High water quality and its contribution to the Deschutes Basin is also an important feature of the watershed. Key watersheds serve as refugia which are the basis of most species conservation strategies. Riparian reserves are designed to best meet the ACS objectives and to provide habitat connectivity for terrestrial and late successional species.

- Riparian Reserve boundaries have been recommended by the Metolius Watershed analysis as follows:
- Permanent streams with fish, natural ponds and lakes.....320 ft
- Wetlands, intermittent streams, permanent streams without fish.....160 ft
- created ponds and reservoirs.....160 ft

These widths are based on site-potential tree heights as specified in C-30, and may be adjusted during site specific project analysis where rationale for appropriate widths is presented in the decision making process (B-13 - B-17). Special features to be included in the riparian reserves are: floodplains, riparian vegetation, unstable areas, habitat connectivity corridors, inner gorge or terrace and aggregations of special features. Riparian reserves may be expanded to include these special features.

. II. PHYSICAL OVERVIEW

The LSR is part of the Cascade Range of Oregon with virtually all landforms, rocks and soil being products of volcanism, glaciation, and major earth movements. It is part of three ecological subsections: Upper Cascades, Lower Cascades and Green Ridge. The Upper Cascades subsection includes the volcanic upper slopes of the Cascade range where glaciers have left major imprints on the shape of the land and soils. The Lower Cascades subsection is dominated by gently sloping plains of glacial outwash and by hills and ridges of lava that rise above the outwash plains. The Green Ridge subsection includes the west-facing scarp of Green Ridge which rises 2000 feet above the Metolius River.

The climate of the MLSR is characterized by a major precipitation gradient from west to east. In the upper elevations, average annual precipitation is about 100 inches. Just nine miles to the east, precipitation decreases to about 30 inches. Immediately east of the LSR, annual precipitation decreases to less than 15 inches. About two-thirds of the annual precipitation falls between October and March. Winter storms bring heavy snowfalls to the upper elevations. At lower levels, storms bring more rain than snow.

An assessment of the inherent soil quality indicates that 39%, 32% and 29% of the soils are in high, moderate and low soil quality, respectively. Sensitivity to compaction is a dominant condition throughout the LSR. Due to their inherent porosity, these soils are normally not prone to erosion except

along steep slopes. Mass wasting in the form of landslides, debris torrents and slumps is not a significant concern in the LSR, although the winter flood of 1996 resulted in several large debris slides within the basin. Some of these were associated with clearcuts or roads, others were located in intact forests. Slide potential in some drainages may be higher historically than we currently recognize.

III. VEGETATION ANALYSIS OVERVIEW

A. INTRODUCTION

This section contains an introduction to the vegetation in the LSR, and discussion and analysis of potential natural vegetation, disturbance events that have influenced vegetation, and current and historic size, structure, canopy cover, species, and habitat pattern and conditions across the landscape. A discussion of the range of variability and sustainable conditions in the LSR sets the stage for more specific discussions in the following sections on current and historic vegetation conditions and trends in each PAG.

There are four major vegetation trends that apply to all plant associations in the LSR:

- Greatly increased stand densities are putting all sizes of trees at risk.
- Mortality of larger trees, insect and disease damage, and catastrophic fire risk are all increasing.
- Species composition has been shifting from early to late seral species.
- Stand structure has been shifting from larger tree sizes to smaller tree sizes, and from single or two canopy-layers to multi-canopy-layers.

B. POTENTIAL NATURAL VEGETATION

The field mapping of the potential natural vegetation (PNV) to the plant association level was based on field observations by silviculturists, soils scientists, ecologists, and stand exam experts to determine the divisions between plant associations. The associations and series were then grouped by their climax species, site potential, and temperature and moisture similarities into Plant Association Groups (PAGs), using the categories listed in the Deschutes WEAVE document, version 1.12, as shown below and on Map 3.

Table 1 - Plant Association Groups

PLANT ASSOCIATION GROUP (PAG)	COMMON ABBREVIATION	LUMPED PAGS FOR ANALYSIS	ACRE	% LSR
Mixed Conifer Drier	MCD	MCD	31,915	41
Mixed Conifer Wetter	MCW	MCW	16,588	21
Ponderosa Pine Drier	PPD	PP	16,855	21
Ponderosa Pine Wetter	PPW	PP	8,265	11
Mountain Hemlock	MH OR TSME	HIGH ELEV FOREST	5	.01
Lodgepole Pine	LP OR PICO	LP	1,633	2

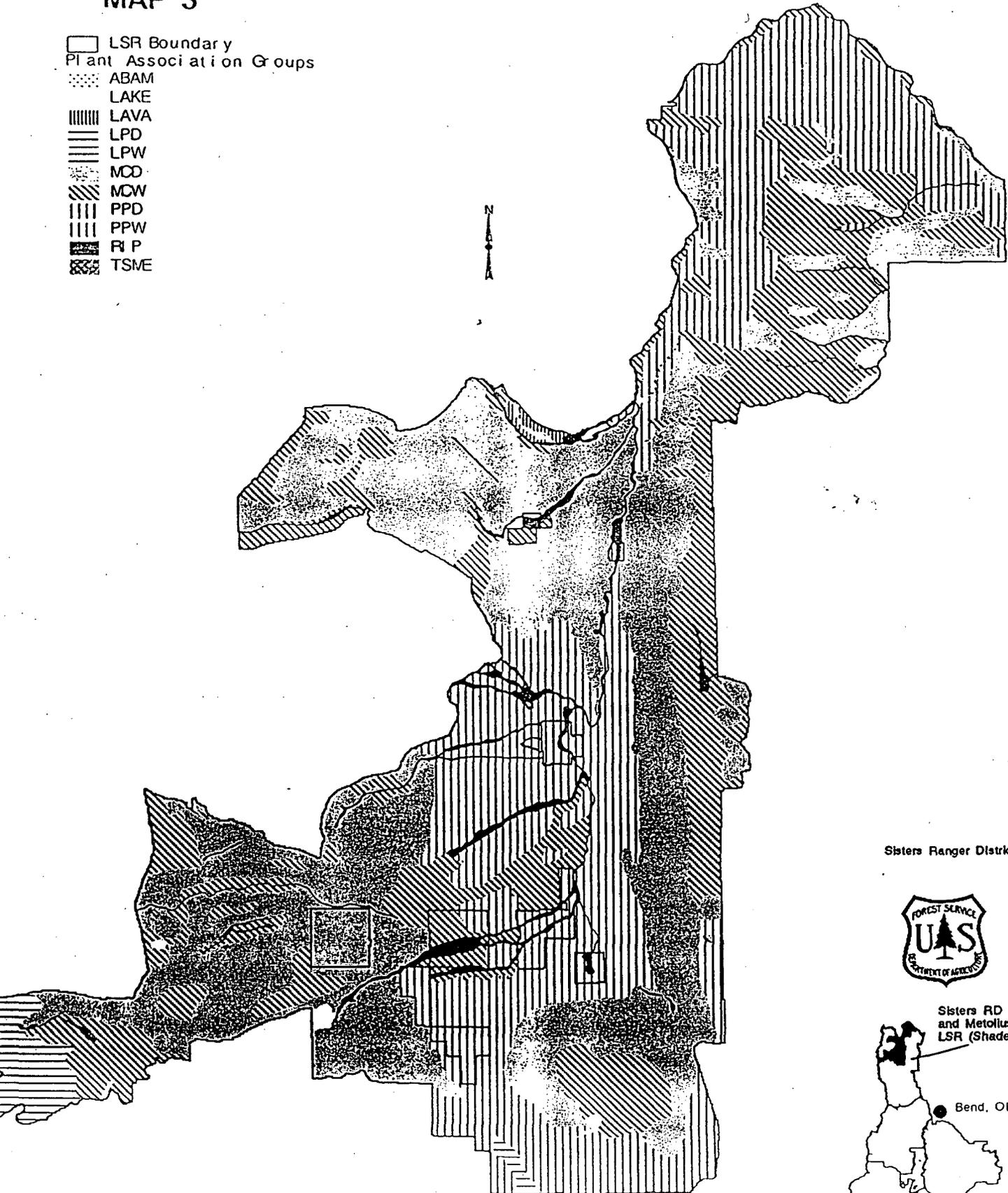
Rock or Lava	ROCK	SPECIAL	138	.18
Riparian	RIP	RIP	2551	3
Water	WATER OR LAKE	AQUATIC	127	.16

These "lumped" plant association groups reflect differences in response to disturbances such as fire. The climax species would be the dominant species with little or no disturbance, and in most cases except in Ponderosa pine and Lodgepole pine PAGs, other species would dominate after a disturbance event.

Metolius LSR Plant Association Groups

MAP 3

- LSR Boundary
 Plant Association Groups
 ABAM
 LAKE
 LAVA
 LPD
 LPW
 MCD
 MCW
 PPD
 PPW
 R1 P
 TSME

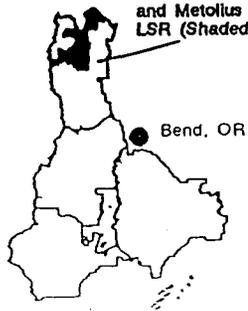


Sisters Ranger District



Sisters RD and Metolius LSR (Shaded)

Bend, OR



The majority of the LSR is made up of Mixed Conifer plant associations where the dominant climax species are grand fir/white fir and Douglas fir. In these series ponderosa pine, incense cedar, larch, and Douglas-fir should be the dominant seral species, but throughout much of the area they are now subordinate to the true firs. A significant development in these series over the last eight to ten years has been the defoliation of the fir by epidemic numbers of western spruce budworm, and more recently, tussock moth larvae. Some years have been more severe than others but the result of this prolonged defoliation has been a noticeable decline in the vigor of the fir. As a result of the combined effects of excessive stocking, insect and disease infestation, and prolonged drought, an average of 40 % of the standing basal area is dead, with the upper end of the range as high as 90%.

The Ponderosa Pine plant associations are mostly in the eastern part of the LSR, west of Green Ridge, where the land is flatter. Pine stands are also found in the northern part near the Metolius River, where many slopes exceed 30%, and ponderosa, although currently mapped as climax, is also mixed with Douglas-fir. The weather in these areas is warmer and drier than other portions of the LSR. Ponderosa pine is the dominant species, but fir is increasing in the western, higher, and/or wetter areas due to adjacent seed sources and protection from fire during this century.

The Lodgepole Pine plant associations are found in some of the colder high elevation areas with poor cold air drainage, and in lower elevation frost pockets. These plant associations make up 2% of the area.

Riparian areas comprise approximately 3% of the area. Rock, water, and other special habitats make up the remaining 1%.

C. SPECIES COMPOSITION AND STRUCTURE

Species composition was mapped from 1991 and 1953 photo interpretation. 1991 aerial photos were used to identify species for this analysis. A comparison between current overstory species and the 1953 overstory species is shown below. (Maps 4 and 5)

Table 2 - Species Composition and Structure

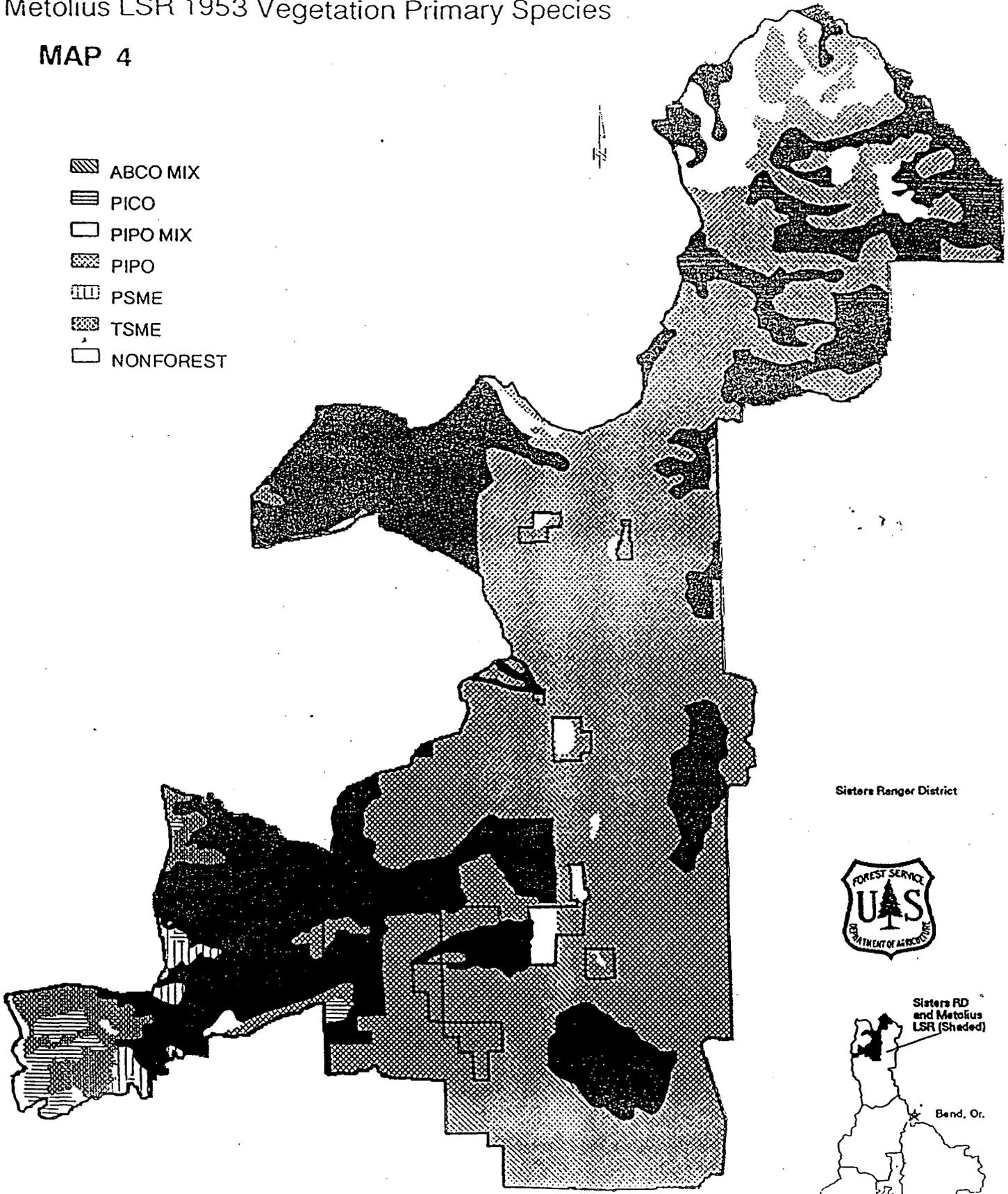
SPECIES GRP	1953 ACRES	PERCENT	1991 ACRES	PERCENT
PONDEROSA PINE	74169	94 %	32410	41 %
WHITE FIR	6	0 %	29763	38 %
LODGEPOLE PINE	737	1 %	51	0 %
MOUNTAIN HEMLOCK	1889	2 %	2268	3 %
DOUGLAS FIR	594	1 %	5156	6 %

The dramatic changes are the decrease in acres of ponderosa pine and ponderosa pine mix and the increase in white fir mix and Douglas-fir., and the change from areas dominated by medium and large-sized trees to smaller areas dominated by small-sized trees. There has also been an increase in seedlings, saplings and pole-sized trees since 1953.

Metolius LSR 1953 Vegetation Primary Species

MAP 4

-  ABCO MIX
-  PICO
-  PIPO MIX
-  PIPO
-  PSME
-  TSME
-  NONFOREST



Sisters Ranger District



Sisters RD
and Metolius
LSR (Shaded)

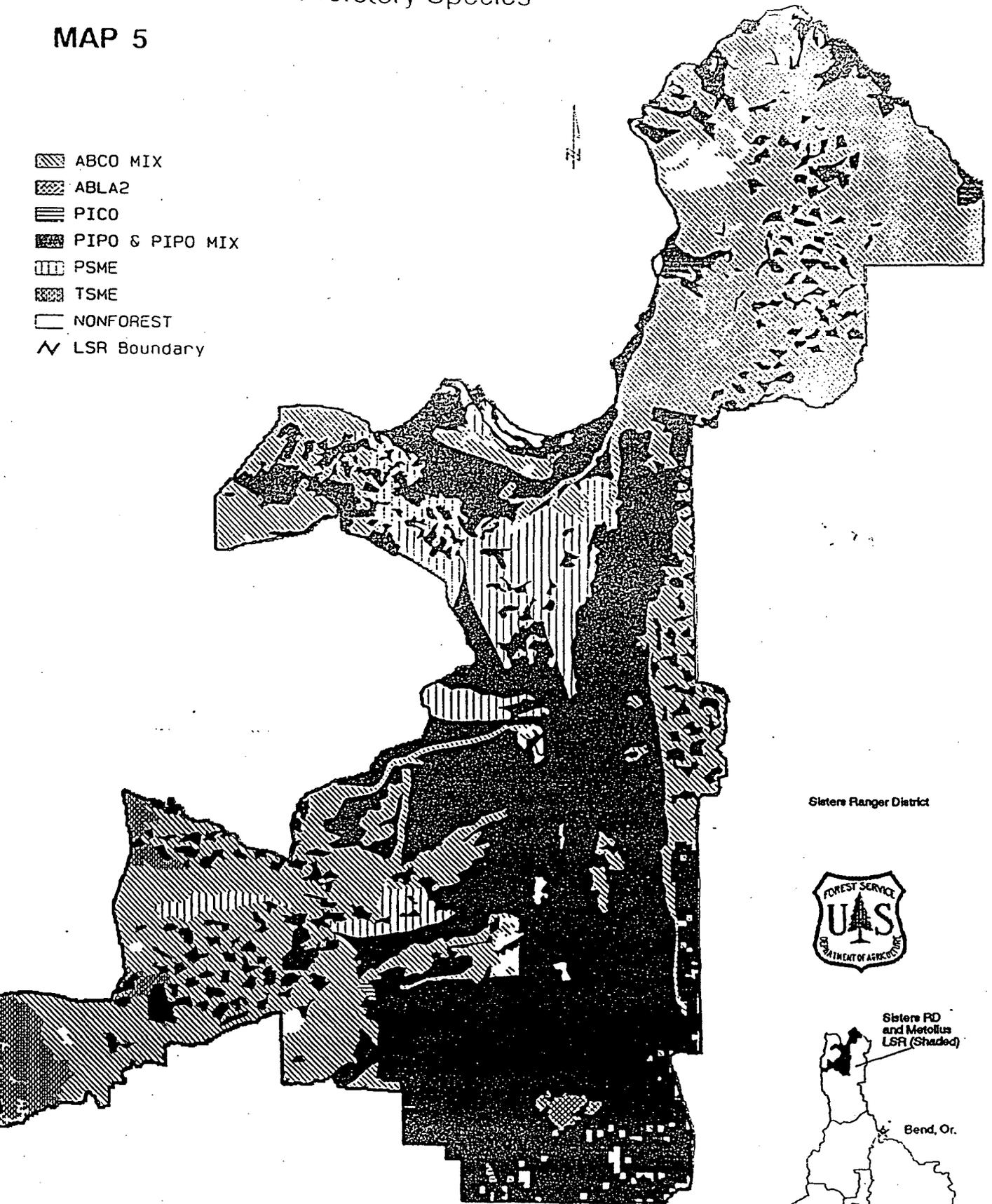


Some tree species found in this area are not common or present on the rest of the forest. There are vigorous cottonwood stands in riparian areas. Western red cedar grows in Canyon Creek. Western Hemlock can be found in some of the higher areas. Yew is found in the mixed conifer areas.

Metolius LSR 1991 Overstory Species

MAP 5

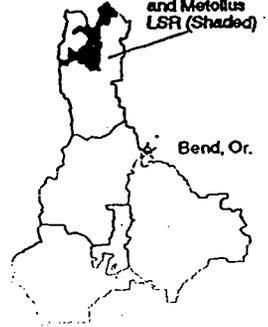
-  ABCO MIX
-  ABLA2
-  PICO
-  PIPO & PIPO MIX
-  PSME
-  TSME
-  NONFOREST
-  LSR Boundary



Sisters Ranger District



Sisters RD and Metolius LSR (Shaded)



D. CANOPY COVER

Canopy cover has decreased in mixed conifer areas in the last ten years because of the spruce budworm infestation. There are no historical records of canopy cover, but we can estimate that with lower densities maintained by frequent underburns in much of the LSR, historical canopy cover was lower. Except in some of the budworm defoliated areas, canopy cover in current natural stands exceeds historical canopy cover levels. The thinned and regenerated stands are more representative of the lower canopy cover found historically in areas with frequent underburns, or in areas following stand replacement fires.

Table 3 - Canopy Covers

COVER %	1953 ACRES	PERCENT	1991 ACRES	PERCENT
0-<10%	4111	5%	8526	11 %
11-40%	424	0.5%	20076	28 %
41-70%	70524	90%	38901	54 %
71-100%	3520	4%	4376	6 %

E. RANGE OF HISTORICAL VARIABILITY AND SUSTAINABILITY

The historical ranges of variability for vegetation within PAGs were derived from vegetation information mapped from the late 1800's, from 1953 maps of vegetation that developed with fire exclusion and risk cutting, from information on past disturbance events, successional pathways, current stand ages, and ranges of variability already calculated for the Ochoco National Forest and for the Davis LSR on the Deschutes National Forest, and from discussions among ecologists, silviculturists, fire managers, entomologists and pathologists. **The primary assumption of this analysis is that landscapes within the historical range of conditions are more likely to provide healthy sustainable ecosystems and habitats than landscapes outside of that range of conditions.**

For Deschutes NF mixed conifer, ponderosa pine, lodgepole pine and Douglas-fir plant association groups, we describe species composition and structure, maximum densities, and historical fire periodicity focusing on stand-level considerations. Landscape level considerations, particularly involving structure and composition over the landscape, are considered by noting where the current conditions are outside the range of historical variability, and are integrated into the goals and opportunities for this LSR.

It is possible to temporarily have conditions that are outside the range of historical variability, such as in much of the denser spotted owl habitat on the east side of the Cascades in the dry mixed conifer PAG. Because of limited moisture, these habitats cannot be maintained over time without some density reduction by thinning or burning, but can provide short-term habitat at high risk and probability of loss. Eventually, a combination of drought and some form of disturbance bring densities and species composition back to more historic levels. This is currently happening in many areas of the Metolius due to insect and disease infestations. However, the risk is currently very high for losing much of this remaining habitat to large catastrophic fires, or even more wide-scale insect and disease outbreaks.

F. SUSTAINABLE CONDITIONS

For both lodgepole pine and ponderosa pine plant associations, lodgepole pine and ponderosa pine are the primary species, both at seral stages and climax stages. For mixed conifer associations, determining species composition for long-term healthy conditions is more difficult. For most of these associations ponderosa pine makes up the major seral tree species. Maintenance of early seral species in mixed conifer sites is recommended in the Deschutes LRMP for biological and social reasons (p. 4-47). Maintenance of stands at slightly higher densities is possible, but there would be a greater risk of losing big ponderosa pine and Douglas-fir trees, and growth would be slower, making all trees more susceptible to insects and diseases.

Maintaining stand densities at manageable levels is essential for promoting forest health and maintaining or creating large tree character and habitats in dry areas. Stand Density Index (Cochran, et al. 1993) is being used to describe a range of stand densities that are likely to result in healthy forest conditions. Of particular importance is the maximum "healthy" limit: that density above which forest health conditions and large tree health are likely to deteriorate.

Excessive numbers of small trees or vigorous brush species in the understory, even though they don't contribute to the total basal area, do compete for moisture, and can lower the vigor of larger trees in the stand, even if basal areas are below critical levels. When the objective is to keep healthy large trees over time as a component of the landscape, the understories need to be thinned to reduce competition for moisture. These treatments may also decrease the risk of catastrophic crown fires.

Descriptions of sustainable size and structure, species, and densities for each PAG in the following sections are based on the concept of moving conditions toward the historic range of variability. The maximum healthy density determinations (MAX SDI) for each PAG (see Appendix 1) were calculated using a revised draft paper by Cochran, et al, (January 1994 draft), which describes a method of setting maximum SDI to sustain healthy stand conditions for forest stands in northeastern Oregon and southeastern Washington. These procedures were adapted for the Deschutes National Forest, with review by Pat Cochran and Fred Hall. The descriptions and recommendations for species composition shown in each PAG summary are based on the Deschutes LRMP the Northwest Forest Plan, and on biodiversity and long-term forest health and sustainability considerations for the major plant associations mapped in the Metolius LSR.

G. TREE DENSITY AND MORTALITY

The overstory and understory densities were estimated from 1991 aerial photo data, and calculated from 1995 entomology tree mortality plots and from stand exam data. Even with the high mortality that has occurred in the mixed conifer areas, many acres still exceed sustainable density levels. Specific areas that exceed sustainable maximum density levels are currently being mapped as part of the forest Eco-mapping contract, and will be available for project-level planning. The densities being mapped are an estimate of the higher end of the maximum sustainable density levels for high, medium, and low productivity plant associations. These grouping correlate closely with the plant association groupings developed for LSR analysis. Early estimates indicate that at least 60% of the forested acres in the LSR exceed sustainable densities. **A very visible and current example of the consequences of trying to maintain densities above sustainable levels is the amount of mortality in the mixed conifer areas within previously mapped suitable spotted owl habitat. (Map 6).**

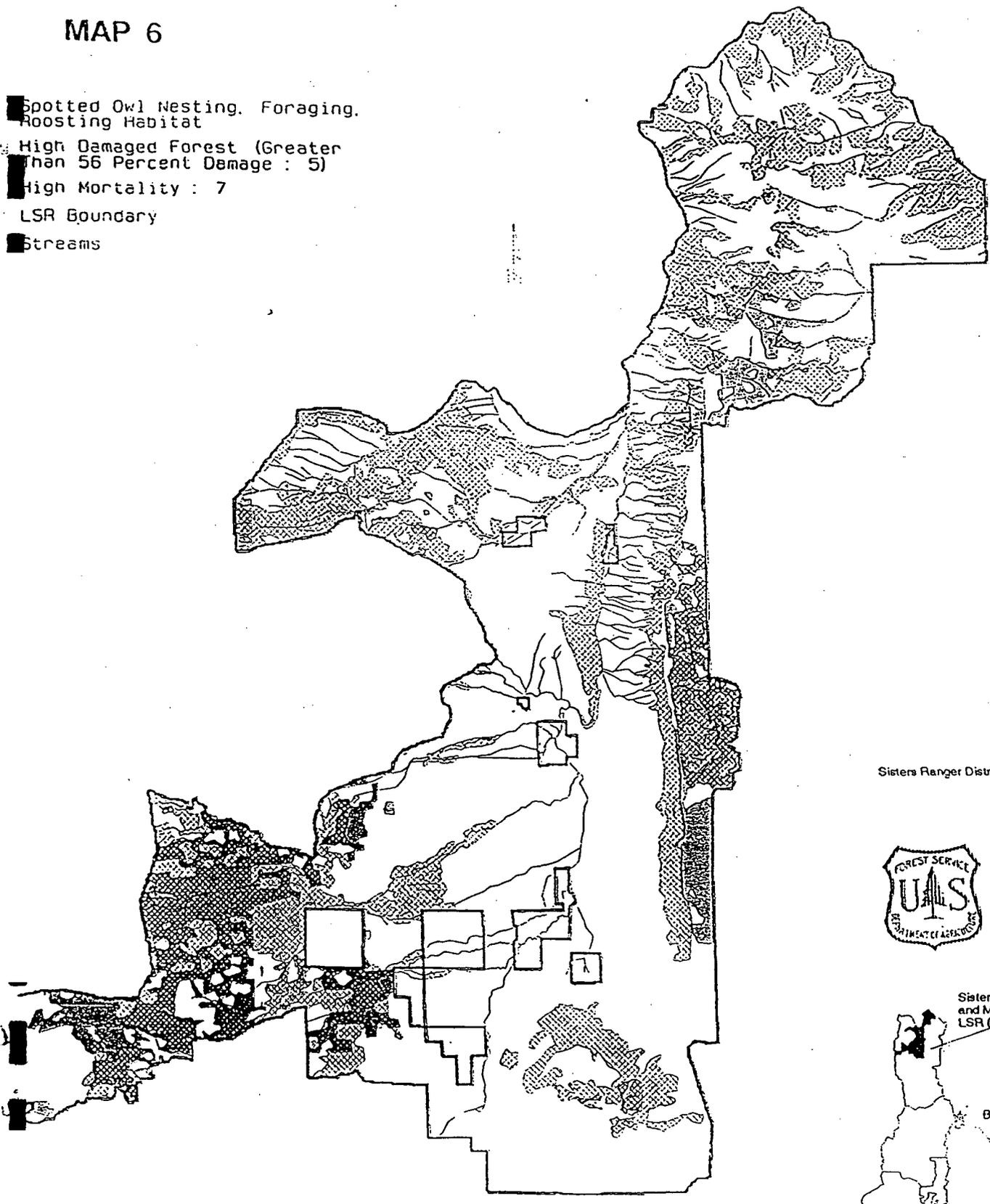
The estimated volume of dead standing timber in the analysis area was determined by calculating the board foot volume of salvageable dead trees from stand exam data in all the areas identified as

"medium or high decline" from the 1991 forest decline mapping, excluding wilderness areas of high decline. The total volume of dead trees in the area exceeds half a billion board feet.

Metolius Late Successional Reserve, Decline and Spotted Owl Habitat

MAP 6

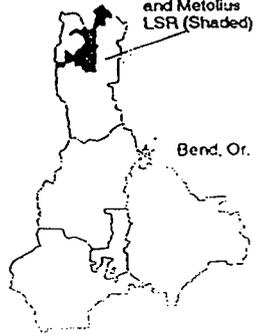
- Spotted Owl Nesting, Foraging, Roosting Habitat
- High Damaged Forest (Greater than 56 Percent Damage : 5)
- High Mortality : 7
- LSR Boundary
- Streams



Sisters Ranger District



Sisters RD and Metolius LSR (Shaded)



June 24, 1996

Scale = 1:145000

H. CURRENT AND HISTORIC CONDITIONS AND TRENDS BY PAG

The PAG summaries in the following sections include discussion and analysis of current and historic size and structure species composition and density, and trends.

1. MIXED CONIFER DRIER PAG

41% of total

These plant associations are found on the slopes of the Cascades and on Green Ridge, with moderate to high productivity and a mean annual precipitation of 35 to 75" (most sites are in the lower half of this range). Current vegetation consists of true firs, ponderosa pine, Douglas-fir, larch, incense cedar, and lodgepole pine.

Table 4 - MCD Size And Structure

Mixed Conifer Dry PAG									
		Species Composition							
Size/Structure Class	Year or Time	Pioneer(P)		Mixed(M)		Climax(C)		Totals	
		Acres	%	Acres	%	Acres	%	Acres	%
Grass/Forb/ Shrub	1991	4104	13					4104	13
	1953	422	1					422	1
	Historic	319-2234	1-7						
Seed/Sapling 0-4.9"	1991	442	1	59.7	0	37.7	0	538	1
	1953	0	0	0*	0*	0	0	0	0
	Historic	638-4787	2-15	319-3192	1-10	0-319	0-1		
Pole 5-8.9"	1991	469	1	328	1	320	1	1117	3
	1953	50	0*	50	0*	0	0*	100	0
	Historic	1596-6702	5-21	638-4787	2-15	319-1277	1-4		
Small 9-20.9"	1991	8446	26	11186	35	4499	14	24131	75
	1953	0	0	0	0	350	1*	350	1
	Historic	3830-12766	12-40	1915-9575	6-30	957-1596	3-5		
Medium/Large 21"+	1991	138	0*	1493	5	387	1	2018	6
	1953	16698	52	13638	52	0	0*	30336	95
	Historic	4787-13404	15-42	1596-8936	5-28	957-1596	3-5		
TOTALS	1991	13599	41	13066	41	5243	16		

- The areas dominated by medium and large pioneer and mixed size classes have decreased below the historical range of variability (HRV). These same classes exceed HRV in 1953.
- The small mixed and climax size classes have increased and exceed HRV.

- The pole pioneer size class have decreased below HRV.
- The opportunity exists to move toward a HRV by thinning smaller size classes to move smaller trees into larger size classes and to maintain existing live larger size classes. Removing dead trees to protect existing medium / large size classes from being burned by a catastrophic fire would also move this PAG toward HRV.

MCD SPECIES COMPOSITION AND DENSITY

The MCD PAG groups Moderate and Lower Productivity CW Series plant associations, include CW-S1-12, CW-C2-11, CW-C2-13, CW-S1-15, and CW-H1-11. Historically, mature stands were primarily composed of early seral species. Ponderosa pine was the major species present, with minor amounts of lodgepole pine, Douglas-fir, western white pine, white fir and western larch. On a landscape scale, stands currently exist outside this range, being partially or totally composed of white fir or Douglas-fir, with varying levels of mortality.

Surveyor's notes from 1870 describe lots of heavy yellow pine (ponderosa pine) and fir overstories, as well as heavy western larch, and cedar overstories. Larch was noted fairly often in the surveyor's notes from the late 1800's.. Hardly any of the understories in the lower elevations were described as dense. In some areas laurel, manzanita, bunchgrass and/or pinegrass were common. The entire area appeared to have been forested with contiguous stands. There was a dense western larch thicket over a mile long mentioned in the survey notes from the late 1800's. One of the surveyors in this PAG was very verbose, and noted sizes and species of a lot of the largest trees that fell on his survey lines. In the western part of this PAG, he mentioned pines 40" and firs 40"-70", although most trees noted were 10"-30".

The current vegetation types have shifted from open, park-like stands of ponderosa pine and Douglas-fir to dense stands of white fir. Much of the largest ponderosa pine and Douglas-fir has been removed.

2. MIXED CONIFER WETTER PAG

21% of total

These plant associations occur on the slopes of the Cascades with a mean annual precipitation of 35 to 75 inches. The productivity is generally higher than in the MCD PAG. Current vegetation consists of true firs, ponderosa pine, Douglas-fir, larch, incense cedar, and lodgepole pine. Spruce can be found in the wetter and riparian areas.

Table 5 - MCW Size And Structure

Mixed Conifer Wet PAG									
		Species Composition							
Size/Structure Class	Year or Time	Pioneer(P)		Mixed(M)		Climax(C)		Totals	
		Acres	%	Acres	%	Acres	%	Acres	%
Grass/Forb/ Shrub	1991	0	0					0	0
	1953	563	3					563	3
	Historic	0-3318	0-20						
Seed/Sapling 0-4.9"	1991	47	0	57	0	37	0	141	0
	1953	6	0	0	0	0	0	6	0
	Historic	498-3318	3-20	0-4147	0-25	0-1493	0-9		
Pole 5-8.9"	1991	44	0	80	0	320	2	444	2
	1953	13	0*	170	1*	0	0	183	1
	Historic	166-1825	1-11	829-4976	5-30	166-1659	1-10		
Small 9-20.9"	1991	1265	8	7583	46	4499	27	13347	81
	1953	0	0	571	3	350	2	921	5
	Historic	166-1825	1-11	1659-5308	10-32	332-2322	2-14		
Medium/Large 21"+	1991	882	5	823	5	387	2	2092	12
	1953	5964	36	9326	56	0	3	15290	92
	Historic	166-1825	1-11	1327-4645	8-28	332-2322	2-14		
TOTALS	1991	2238	13	8543	51	5243	31		

- The small-sized climax species have increased from HRV, and the pole-sized mixed species have decreased below HRV.
- The medium and large pioneer and mixed species exceeded HRV in 1953, but are now more in balance with landscape HRV.

MCW SPECIES COMPOSITION AND DENSITY

The MCW PAG includes the CD Series and the most productive sites in the CW series. The most productive CW plant associations in this PAG include CW-C2-12, and CW-S1-13. Historically, mature stands in this series were primarily composed of early seral species mixed with climax species. Ponderosa pine was the major species present, with some lodgepole pine, Douglas-fir, western white

pine, white fir, and western larch. Species composition included white fir regeneration, with mature trees usually making up 30% or less of stocking. On a landscape scale, stands currently exist outside this range, being largely composed of mature and immature white fir or Douglas-fir.

Surveyor's notes from 1870 describe lots of heavy yellow pine (ponderosa pine) and fir overstories, as well as heavy western larch, cedar, and spruce overstories. They described dense understories of pine, fir, willow, and chinquapin in some areas. The entire area appeared to have been forested with contiguous stands.

White fir should probably compose less than 30% of tree stocking on the site (personal communication, H. Maffei).

The CD Series plant associations in the PAG include CD-S6-12, CD-S6-13, and CD-S6-14. These associations are climax to Douglas-fir and white fir. The major seral species is ponderosa pine, with western larch also present in CD-S6-12, and as a minor associate in CD-S6-14. Historically in these associations were small amounts of Engelmann spruce, incense cedar, and pacific silver fir. White fir and Douglas-fir were present, but made up less than 30% of the stands. On a Landscape scale, stands currently exist outside this range, being partially or largely composed of mature white fir or Douglas-fir.

3. PONDEROSA PINE PAG

32% of total

This PAG has some slopes, but the pure ponderosa pine areas are mostly fairly flat. It is located in much of the eastern portion of the Metolius LSR, and includes fairly productive ponderosa pine sites. Annual precipitation ranges from 15 to 40".

Table 6 - PP Size and Structure

Ponderosa Pine PAG			
		Species Composition	
Size/Structure Class	Year or Time	Pioneer Mixed & Climax	
		Acres	Percent
Grass/Forb/ Shrub	1991	1853	7
	1953	2613	10
	Historic	1256-7536	5-30
Seed/Sapling 0-4.9"	1991	587	4
	1953	0	0
	Historic	754-5275	3-21
Pole 5-8.9"	1991	1336	5
	1953	350	1
	Historic	754-5275	3-21
Small 9-20.9"	1991	19464	77
	1953	0	0
	Historic	5024-12560	20-50
Medium/Large 21"+	1991	1861	7
	1953	22027	87
	Historic	5056-11798	30-70
TOTALS	1991	25120	100

- The medium/large and the seed/sapling size classes have decreased below HRV.
- The small size classes have increased above HRV.

PP SPECIES COMPOSITION AND DENSITY

Historic surveyor's information describes the stands in this area as large even-aged stands of pure ponderosa pine, many with grass understories. Some fir, probably Douglas-fir, is mentioned, and there are many references to "best bunchgrass." Most of the understories, if present, are not "dense", and include "sweet laurel" or "Greasewood."

The PP PAG includes the High, Moderate, and Lower Productivity Sites in the CP Series. In the CP-S2-17, CP-S2-13, CP-S2-16, CP-S1-11, and CP-S1-12 associations, ponderosa pine was and is the main seral and climax species, growing in small, even-age groups. Minor amounts of western juniper and sometimes Douglas-fir are present particularly on ecotones.

In the CP-S2-12, CP-S2-11, and CP-S3-12 associations, ponderosa pine and lodgepole pine are seral, lodgepole with disturbance and on colder sites. Historically, stands are composed of mature ponderosa pine and ponderosa pine regeneration, in relatively even-age groups, with minor amounts of lodgepole pine and possibly Douglas-fir present, and juniper on ecotones.

4. LODGEPOLE PINE PAG

2% of total

This vegetation type is found mostly at higher elevations. There is also a very small patch of lodgepole on the southeastern side of the LSR. The areas where lodgepole pine is climax tend to have poor cold air drainage, or soil or moisture conditions that other species can't tolerate.

There is a wide range of historical conditions because of the boom and bust cycles of fire and insects in these plant associations. Because of this, none of the size classes are shown as outside HRV.

Table 7 - LPP Size and Structure

Lodgepole Pine PAG			
		Species Composition	
Size/Structure Class	Year or Time	Pioneer	
		Mixed & Climax	
		Acres	Percent
Grass/Forb/ Shrub	1991	80	5
	1953	49	3
	Historic	0-979	0-60
Seed/Sapling 0-4.9"	1991	91	5
	1953	0	0
	Historic	0-979	0-60
Pole 5-8.9"	1991	654	40
	1953	213	13
	Historic	163-1305	10-80
Small 9-20.9"	1991	744	45
	1953	988	60
	Historic	0-1305	0-80
Medium/Large 21"+	1991	0	0
	1953	185	11
	Historic	0-32	0-2
TOTALS	1991	1632	100

LPP SPECIES COMPOSITION AND DENSITY

The CL High Productivity Sites in this LSR include CL-M4-11 and CL-G4-12 plant associations. Historically, mature stands were composed mainly of lodgepole pine, with minor amounts of sub-alpine fir, mountain hemlock, or white pine present at higher elevations. Lodgepole pine associations are relatively simple in structure. Most are relatively even-age, even-sized stands.

The CL Moderately Productive sites include the CL-S9-11 plant association. Historically, mature stands were mainly composed of lodgepole pine, with minor amounts of ponderosa pine and white fir present. The moderately productive lodgepole plant associations also are composed of relatively even-

sized, even-age lodgepole pine. Scattered mature ponderosa pine is often present near edges with ponderosa pine associations.

5. RIPARIAN PAG

3% of total LSR

Table 8 - RIP Size And Structure

Riparian PAG									
		Species Composition							
Size/Structure Class	Year or Time	Pioneer		Mixed		Climax		Totals	
		Ac	%	Acr	%	Acre	%	Acres	%
Grass/Forb/ Shrub	1991	80	3					80	3
	1953	49	2					49	2
	Historic								
Seed/Sapling 0-4.9"	1991	281	11					281	11
	1953	249	10					249	10
	Historic								
Pole 5-8.9"	1991	19	1	30	1	10	0	59	2
	1953	2	0	30	1	0	0	32	1
	Historic								
Small 9-20.9"	1991	433	17	863	34	562	22	1858	73
	1953	0	0	1	0	13	1	14	1
	Historic								
Medium/Large 21"+	1991	110	4	225	9	15	1	350	14
	1953	1448	57	798	31	0	0	2246	88
	Historic								
TOTALS	1991	922	36	1118	44	587	23		

RIP SPECIES COMPOSITION AND DENSITY

The amount of riparian habitat has probably not changed much from historic conditions. The quality of riparian habitats, however, probably changed over the decades. In the early 1900's sheep grazing, and to a lesser degree, cattle grazing were common. More recently, timber harvest activities and recreational uses have impacted many of the riparian habitats in the LSR.

Riparian vegetation can be very diverse. The successional classes of riparian vegetation in the LSR for 1953 show a dominance of riparian acres in medium/large sized pioneer species. In 1991 the dominant successional class was small mixed and climax species. This trend is primarily the result of the increase of white/grand-fir with the exclusion of wildfire, shifting most mixed conifer stands toward white fir dominated, pole and small sized stands.

IV. DISTURBANCE EVENTS THAT INFLUENCE VEGETATION

A. OVERVIEW

Disturbance to natural vegetation has occurred in many forms: insects and disease, tree harvesting, roads and fires have all played a role in shaping the current LSR.

The roles of insects and diseases as disturbance agents in the forest are very closely tied to vegetation patterns. Factors such as species composition, size structure, and density of forest stands are all very important in determining which agents are likely to be present in the forested environment, their abundance, and how profound their effect is likely to be on that vegetation. By their actions, forest insects and diseases sometimes alter the vegetative patterns that provided them with suitable habitat, and set the stage for new processes to occur.

Tree harvest and silvicultural treatments have had a large impact in the LSR. Historically large ponderosa pine and other species were selectively removed (partial or risk cutting) from large tracts of land, leaving white fir and other species. More recently, treatments have been prescribed to reduce dwarf mistletoe and stand densities.

B. HARVEST, REGENERATION, AND STAND IMPROVEMENT RELATED DISTURBANCES

In the Mixed Conifer PAGs regeneration harvest has been a significant disturbance in the last 40 years. Many regeneration harvests have been implemented to reduce the impacts from dwarf mistletoe and the probability of western pine beetle and recently spruce budworm and tussock moth outbreaks

In the Ponderosa Pine PAGs removal of "high risk" ponderosa pine, and other types of partial cutting harvests have been a source of disturbance in this area during the past 50 years

The known regeneration units cover 9,772 acres. There are still large trees in some of the units. The known timber stand improvement acres cover 4,614 acres, mostly in pole size or small size structure. There were previous entries in some of these same areas, many of them partial cuts, covering 13,609 acres.

C. INSECTS AND DISEASE

The primary insects and diseases are dwarf mistletoe in the fir, pine and larch, fir engraver, mountain pine beetle, western pine beetle, tip moth, *Ips pini*, armillaria, annosus root rot, gall rust, commandra rust, white pine blister rust, blackstain, indian paint fungus, pecky cedar rot, brown cubical butt rot, Douglas-fir bark beetle, tussock moth, and western spruce budworm.

Western spruce budworm was very active in the late 1980's and early 1990's. Noticeable defoliation occurred on true and Douglas-fir between 1986 and 1992. In those cases where defoliation was light, the affected trees recovered and now show minimal effects of the prolonged budworm outbreak. In the western part of the LSR the effects of defoliation were more profound. Many trees sustained moderate to severe top-kill while others were killed, either by the budworm defoliation, or in combination with the high levels of Armillaria root disease, which is pervasive throughout the Mixed Conifer PAGs.

In addition, the budworm outbreak set the stage for secondary bark beetles such as the Douglas-fir beetle and fir engraver which attacked and killed trees weakened by defoliation and by the complex of other factors which are operating in that area.

The combined effects of western spruce budworm, *Armillaria* root disease, and other agents such as bark beetles have produced substantial tree mortality in the western portion of the LSR.

In the Mixed Conifer PAGs there has been a large increase in insects and disease due to the increase in stand densities with lack of frequent low intensity fires. In many areas the stand densities have recently been reduced by mortality from defoliators, increasing the fuel loading, and leaving behind low vigor and top-killed trees.

In the Ponderosa Pine PAG the occurrence of insects is relatively low. There are endemic levels of western pine beetle and mountain pine beetle. Due to fire exclusion, dwarf mistletoe has had a significant influence in the area. It has influenced the vegetation and motivated much of the harvesting that has occurred. Windthrow occurs occasionally but has produced no significant changes in vegetation.

In the Lodgepole Pine PAG the mountain pine beetle is the major disturbance factor .

D. FIRE

Fires have historically been a major influence in shaping these landscapes. The suppression of fires in this century, combined with timber harvest, has changed the composition of the forest a great deal, and estimating those fire regimes can be difficult. Our estimates combine the knowledge of Area Ecologist Bill Hopkins, former Fire Staff Gary Stelle, Fire Management Technician Pat McCauley, silviculturists, and fire specialists.

See Metolius LSR Fire Management Plan (Appendix 4) for detailed discussion of the fire regimes, effects of fire exclusion, risk and hazard analysis.

V. LATE-SUCCESSIONAL/OLD-GROWTH ASSOCIATED SPECIES

A. INTRODUCTION

This chapter identifies the focal terrestrial, aquatic/riparian and plant species of concern associated with late-successional habitats conditions present in the Metolius Late-Successional Reserve.

Based on a review of databases, the Metolius Watershed Analysis, and the Scientific Analysis Team (Thomas et al. 1993) there are over 350 terrestrial and aquatic wildlife species and 41 plant species of concern associated with late-successional habitat conditions present in the MLSR. There are an estimated 282 wildlife species known or suspected to occur in riparian habitats. These riparian habitats are a relatively small portion of the LSR, but contribute significantly to habitat and wildlife species diversity.

B. STATUS OF FOCAL LATE-SUCCESSIONAL SPECIES

The following is a summary of the status and habitat conditions of the focal species that are known or suspected to occur in the MLSR. These species represent a variety of other species with similar habitat needs. Where discussed, habitat conditions are summarized from the information found in more detail in Appendix 2 - Desired Habitat for Late-Successional Species. References are also in this Appendix.

1. Terrestrial Wildlife Species

PROPOSED, THREATENED, ENDANGERED AND SENSITIVE FOCAL SPECIES

Bald Eagle (Ponderosa Pine and Mixed Conifer PAGs)

The bald eagle is a federally threatened species within the High Cascades Recovery Zone that includes the Metolius LSR. Within the LSR, the Metolius River and forested areas adjacent to Suttle Lake provide large diameter Douglas-fir and ponderosa pine trees used for nesting, roosting and foraging habitat for bald eagles.

Two known bald eagle nest sites occur within the LSR: the Suttle Lake and Wizard site in the upper Metolius River. There is another nest site on the lower Metolius River adjacent to the LSR, and a fall/winter roost site on the lower Metolius River near Monty Campground. In addition to these eagle sites, there are nests just outside the LSR at Box Canyon (Warm Springs Reservation) and associated with Lake Billy Chinook.

Historically, bald eagles foraged on anadromous fish that moved up the Metolius River from the Deschutes River. The number of bald eagles utilizing this forage resource is not known, however, it is likely that during fish spawning, bald eagle use was common, especially in the upper river where calmer waters prevailed.

In 1964 Round Butte Dam was completed and Lake Billy Chinook was formed. The impacts of the dam on bald eagle populations is not clear. The lake probably improved the forage base for eagles by providing habitat for waterfowl, increasing fish availability, and providing a season-long forage resource. By the middle 1970's, kokanee salmon runs were established in the lake and Metolius River and are now an important food source for resident and migrating eagles from September to October.

The bald eagle nest site at Suttle Lake has been productive since the early 1970's. Eagles have been observed at Suttle Lake, Dark Lake, Scout Lake, in the Meadow Lakes basin, at Square and Long Lakes in the wilderness. It is likely that these eagle observations represent home range use of the Suttle bald eagles.

The bald eagle populations in the MLSR appear to be stable, and there is abundant potential habitat associated with the Metolius River and the Suttle and Meadow Lakes areas.

Northern Spotted Owl (Mixed Conifer PAGs)

The northern spotted owl is a federally threatened species.

There are 17 known spotted owl nest sites associated with the Metolius watershed, 9 of which are found within the LSR (Map 7). These sites were located during survey efforts between 1989 and 1995, but have not been monitored on an annual basis, so productivity is not well established (Table 9).

Table 9 - Reproductive Status of NSO Pairs Known To Occur In the MLSR.

Spotted Owl Pair	1995	1994	1993	1992	1991
5001	UK	R/1	UK	UK	NA
5003	UK	UK	PO	UK	PO
5004	UK	UK	UK	UK	UK
5005	UK	UK	UK	UK	UK
5006	NA	R/1	NA	UK	UK
5007	NA	R/?	NA	R/2	PO
5012	NA	R/?	PO	R/1	PO
5016	NA	R/?	NA	UK	R/2
5018	NA	R/?	PO	R/2	UK

NA = Surveyed, but not active, UK = Not surveyed, status unknown, R/# = Reproductive with # young observed, PO = Pair occupancy, but not reproductive.(data from Regional Stris database)

There are three USFWS Critical Habitat Units (CHU) associated with the LSR (Map 8). CHU 0-41 is approximately 13770 acres in size and O-42 is approximately 22,228 acres. These CHUs are completely within the MLSR. CHU O-44 is 33,691 acres in size primarily within the MLSR, Trout/Cache LSR, and Administratively Withdrawn allocation. A small piece (approximately one section) is allocated to Matrix.

There are 3 Designated Conservation Areas (DCAs) from the Final Draft USFWS Spotted Owl Recovery Plan (December 1992) associated with the MLSR (Map 7). The OD-51 (Metolius Horn) is totally within the MLSR. The DCAs OD-52 and OD-53 overlap MLSR and the Mount Jefferson Wilderness Area. The Recovery Plan established desired future spotted owl pair numbers as part of a strategy to maintain spotted owl population viability. Nine spotted owl pairs are associated with these DCAs. Two of these owl sites are within the Mount Jefferson Wilderness and seven are within the MLSR.

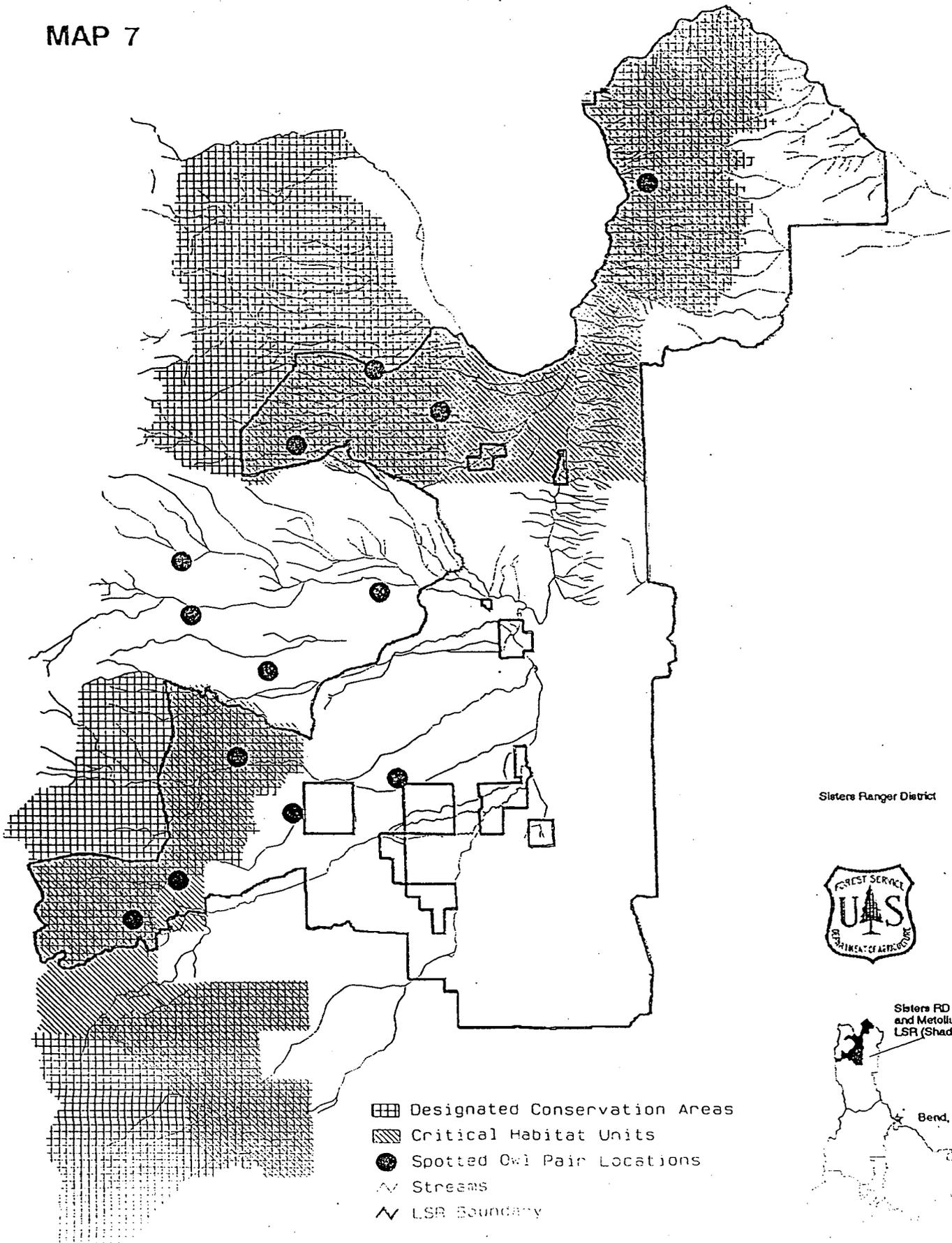
Table 10 - Designated Conservation Area NSO Pair Status and Overlap with MLSR.

DCA	Total Acres	% in LSR	Current Pairs	Future Pairs
OD-51	9585	100%	#5001	2*
OD-52	20000	25%	#5002 (Wilderness), #5003, #5004, #5005, #5019 (Wilderness	5
OD-53	29367	60%	#5006, #5007, #5016	3

*This MLSR Assessment recommends one future pair due to limited spotted owl habitat on the eastern edge of the spotted owl range and the desire to allow fire to play a natural disturbance role in this area.

Metolius Late Successional Reserve, Spotted Owl Habitat

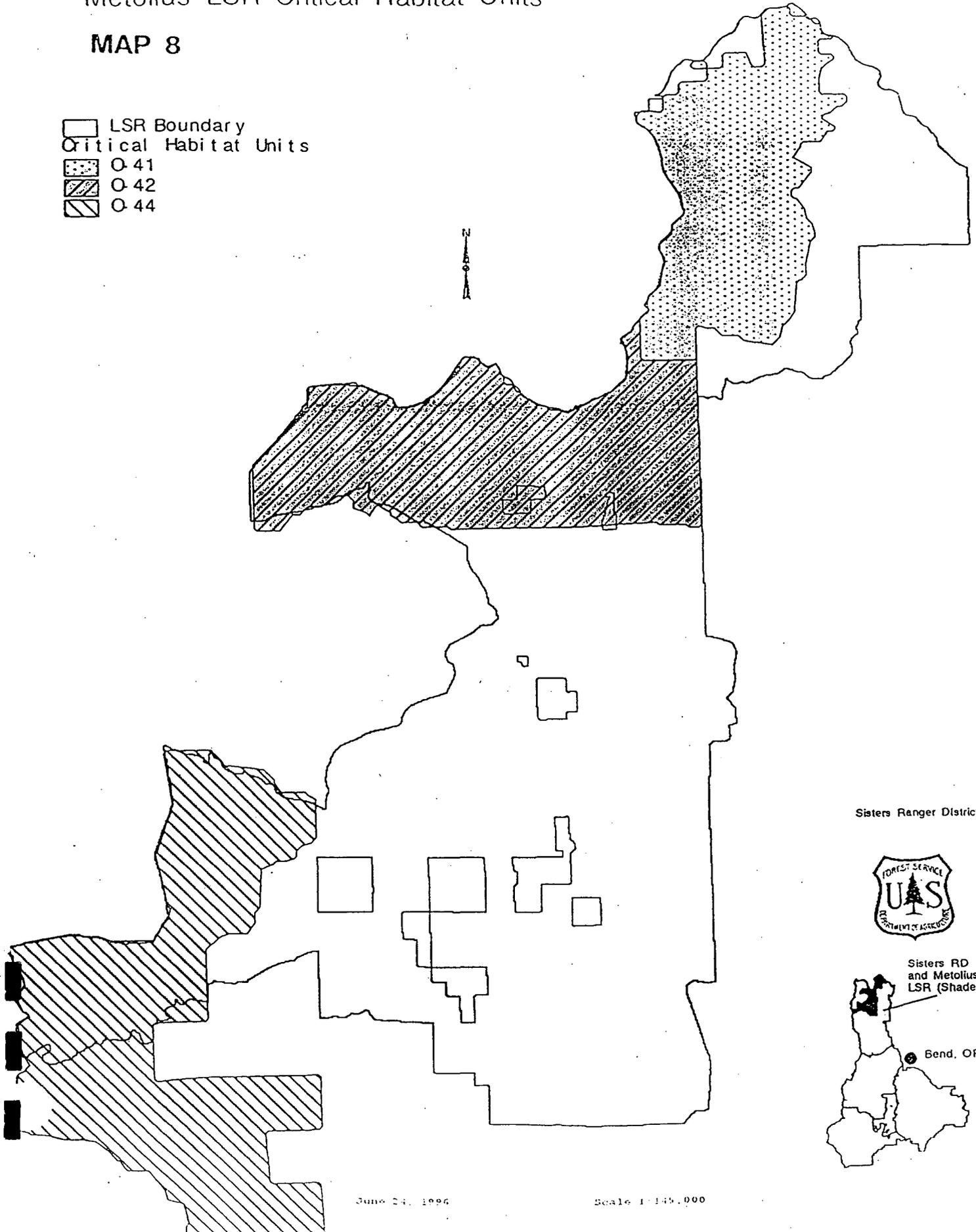
MAP 7



Metolius LSR Critical Habitat Units

MAP 8

-  LSR Boundary
- Critical Habitat Units**
-  O-41
-  O-42
-  O-44

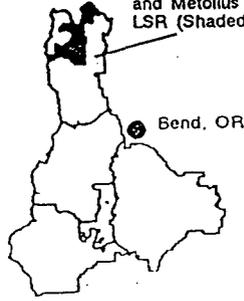


Sisters Ranger District



Sisters RD and Metolius LSR (Shaded)

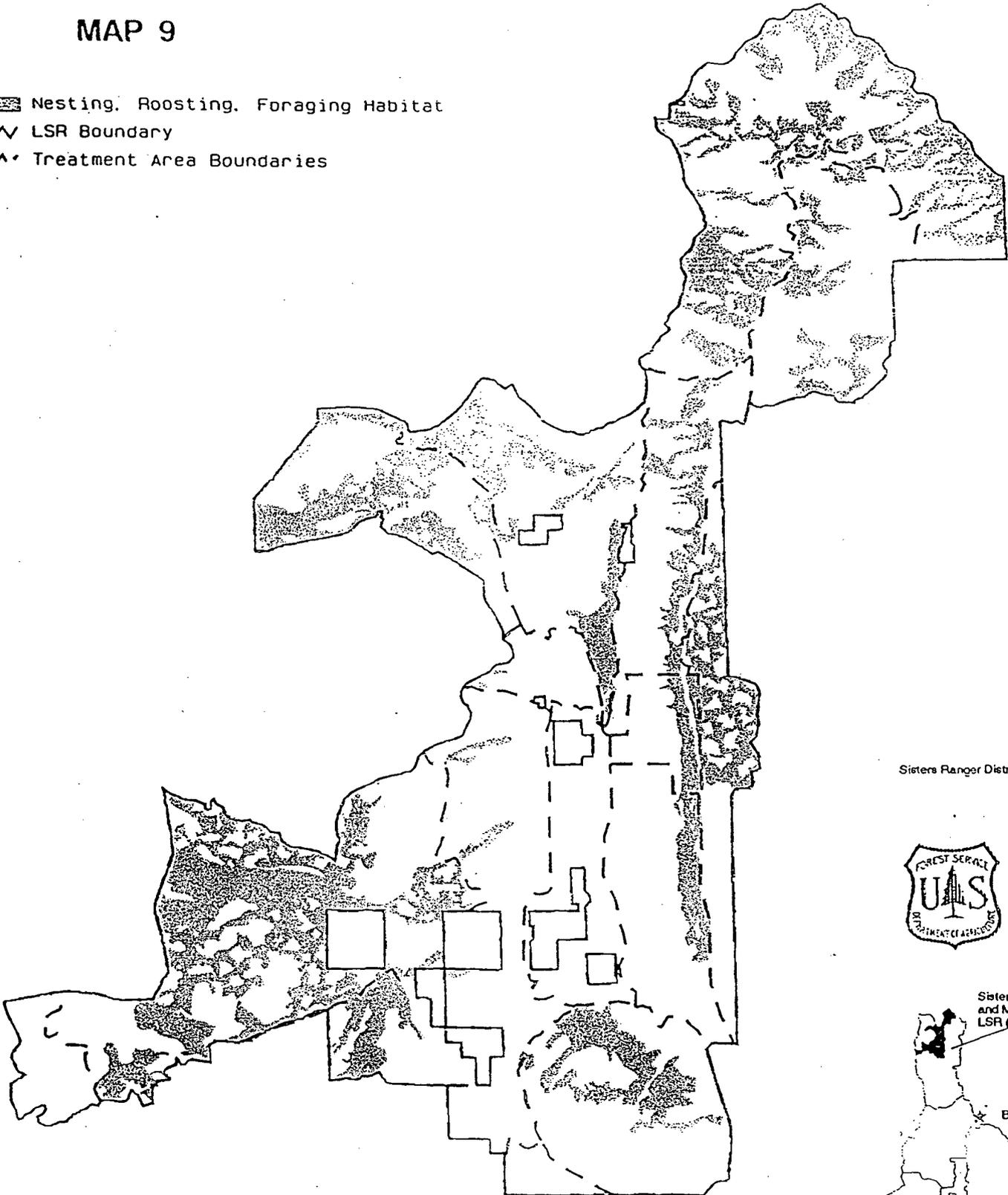
Bend, OR



Metolius Late Successional Reserve Spotted Owl Habitat

MAP 9

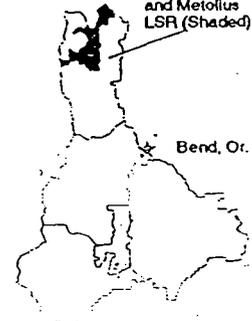
- ▣ Nesting, Roosting, Foraging Habitat
- ∨ LSR Boundary
- △ Treatment Area Boundaries



Sisters Ranger District



Sisters RD and Metolius LSR (Shaded)



June 24, 1996

Scale = 1:145000

Based on 1992 aerial photo interpretation, there are an estimated 21,816 acres of suitable NFR habitat (Map 9) in the MLSR. This does not completely reflect the amount of late-successional habitat within the LSR, but provides a landscape overview of the habitats used by spotted owls for nesting, roosting and foraging. The NRF habitat mapping was based on vegetative sampling at various nest sites across the Deschutes NF, including 3 sites within the Metolius watershed. Based on this sampling, NRF habitat on the Deschutes NF has the following minimum structural characteristics: mixed conifer PAG, multi-storied stands of at least 40 contiguous acres, with at least 60% canopy cover, at least 8 trees per acre greater than or equal to 21" dbh; and at least 82 smaller trees per acre in the understory.

In 1995, an evaluation of NFR habitat estimated 5206 acres within the nine home ranges in the LSR (Table 11). Two additional spotted owl home ranges overlap portions of the LSR but the associated nest sites and most of the home ranges are outside. Since some home ranges overlap, there are NFR acres that are counted twice in Table 11.

Table 11- Estimated acres of suitable NSO habitat associated with 9 known Pairs within the Metolius LSR

Owl Home Ranges in LSR	Suitable Habitat (NFR)			Overlap Acres	With Home Range
	Total Acres	Outside LSR	Inside LSR		
5001 (Castle Rock 53)	1000	76	924	0	
5003 (Abbot/Cabot 85)	851	0	851	252	5055
5004 (Brush Creek 83)	309	0	309	31	5005
5005 (Cabot Creek 86)	827	353	474	31 252	5004 5003
5006 (First Creek 182)	942	12	930	230 0	5018 5019
5007 (Key West 38)	433	223	210	126	5016
5012 (Davis Creek 05)	386	0	386	8	5018
5016 (Santiam 39)	401	196	205	126	5007
5018 (Suttle 07)	917	0	917	8 230	5012 5006
13 (Canyon Creek 82)	367	220	147	0	
17 (Spring Creek 186)	571	571	0	0	

If suitable habitat was less available historically because of frequent fires, then one conclusion might be that spotted owl densities were lower than they are today. However, the Metolius watershed probably always provided some suitable spotted owl habitat, especially in wet and dry mixed conifer PAGs.

Spotted owls may have used habitat with slightly less structure than today's standards; and spotted owl densities may have always been relatively high.

The insect and disease impacts (effects on movement, vulnerability to predation, foraging success, fledgling and juvenile mortality, home range size) on spotted owl habitat capabilities is a concern. Approximately 20% of identified suitable habitat in the LSR has been heavily damaged by spruce budworm defoliation. Another 27% of suitable habitat has a high level of mortality (>75% tree mortality). Several changes to suitable spotted owl habitat have occurred:

- Increased densities of snags and down logs material may have increased spotted owl prey.
- High tree mortality has reduced live tree canopy closure and canopy layers, thus reducing hiding and foraging cover for spotted owls.

In 1995, a spotted owl administrative study was developed by Mike Gerdes, Forest Wildlife Biologist. Radio telemeters were attached to the males of four pairs of spotted owls, and the females and two juveniles were banded. The spotted owl nest sites involved are: Canyon Creek, Spring Creek, Upper Canyon Creek and Bear Valley. The objective of the study is to monitor northern spotted owl habitat selection and use during and after harvest activities.

Spotted owls on the Confederated Tribes of Warm Springs Reservation are monitored. While juvenile dispersal has not been documented between the Reservation and the LSR, it is highly probable, as is adult movement.

Habitat fragmentation throughout the western United States has allowed the barred owl to spread its range east of the Rockies to the Cascades. The barred owl, a close relative of the spotted owl, appears to be better adapted to fragmented late-successional habitats than the northern spotted owl.

Barred owls out-compete spotted owls for suitable habitat where limited habitat exists. There is one known sighting of barred owl immediately adjacent to the LSR. There are reported sightings west of the watershed on the McKenzie Ranger District, three sightings south of the watershed on the Bend Ranger District, and several sightings in the northwest corner of the Reservation.

California Wolverine and Fisher (Mt. Hemlock, Lodgepole Pine and MC PAGs)

The wolverine and fisher are both federal candidate species (Category 2). There have been no formal surveys and there are no recent sightings of wolverine or fisher in the LSR. There are two documented wolverine sightings prior to 1980; one on Highway 20 north of Suttle Lake and another in the Santiam Pass area. Wolverine use of the area may include individuals migrating or dispersing through the Cascades from northern Washington to northern California. It is doubtful that the LSR supports any resident wolverines. This assumption is based on: 1) No recent sightings even though there is high human use in this area, 2) limited unfragmented, primitive, isolated habitat or alpine areas, and 3) there are 23 records of wolverine in Oregon from 1981 to 1992, compared to 57 records from 1913 to 1980. A resident fisher population is more likely, especially in the higher elevation mixed conifer stands.

Prior to timber harvest activities, the wolverine and fisher may have been found throughout the LSR, though they were probably always rare and uncommon. Currently, the high elevation mixed conifer, lodgepole pine and mountain hemlock PAGs have the highest potential for wolverine and fisher occurrence because of the large unfragmented nature of these areas.

Northern Goshawk (Mixed Conifer and Ponderosa Pine PAGs)

The goshawk is listed as a State Sensitive Species due to conversion of mature and late-successional habitats to younger, even-aged stands. This species is also listed as a federal category 2 species (C2) and is proposed for listing on the Region 6 Regional Foresters Sensitive Species list. Goshawks prefer moist areas on north slopes, often near water. Mature and late-successional (fire and climatic climax) habitats in the mixed conifer and ponderosa pine PAGs are considered potential nesting habitat for this species. Single nest territories may have 2-4 nest stands. The nest areas are usually the stands with the highest density of large trees, high tree canopy cover and high basal areas. The post-fledgling area (450 acres) and foraging areas (5,400 acres) are a mosaic of structural stages.

Goshawk population densities in the watershed are not known. There have been few formal surveys in the MLSR, but 5 known goshawk territories have been identified, and it is likely that formal goshawk surveys in suitable habitat would reveal additional sites.

The amount of suitable goshawk habitat in the LSR was probably higher historically than it is today. The large patches of mature and old-growth ponderosa pine that covered most of the MLSR were ideal habitat for goshawks. In recent decades, timber harvest has reduced the amount of suitable habitat, and probably the number of goshawks nesting in the watershed.

SELECTED FOCAL SPECIES

Flammulated Owl (Ponderosa Pine and Mixed Conifer PAGs)

The Flammulated owl is considered a sensitive species in the critical category by the Oregon Department of Fish and Wildlife due to the conversion of multi-storied mature and late-successional habitats to even-aged small sized forests, and snag loss.

This species nests in ponderosa pine, western larch or Douglas-fir snags having a dbh of 12 - 23 inches. Typical habitat is a mosaic of open forests containing mature or late-successional ponderosa pine mixed with other tree species, patches of dense forest growth and grasslands. More recently, the fragmentation of forests, and selective logging for large diameter ponderosa pine, western larch and Douglas-fir has reduced the amount of suitable habitat. Flammulated owls have been heard throughout the mid and lower elevational mixed conifer and ponderosa pine PAGs.

Great Gray Owl (Ponderosa, Lodgepole Pine and Mixed Conifer PAGs)

The great gray owl is considered a sensitive species in the vulnerable category by the Oregon Department of Fish and Wildlife due to the elimination of nest and roost sites by logging activities. This species prefers open forests with adjoining deep-soiled meadows. This species uses a variety of forest types within the mixed conifer and lodgepole pine PAGs. Late-successional stands and stands with remnant late-successional trees on north facing slopes are high potential nest sites. Lodgepole pine and lodgepole pine/ponderosa pine forests were commonly used in south-central Oregon.

There are no documented great gray owl sighting within the LSR, and potential habitat has been considered scarce because deep-soiled meadow habitats are rare. However, studies in northeast Oregon indicate that the species was found in ponderosa pine, ponderosa pine/Douglas-fir, Douglas-fir/grand fir habitats commonly found within the MLSR.

The historic and current populations trends within the watershed are unclear. However, one could speculate that the fire-climax forests that dominated the LSR in the past provided significant amounts

of suitable great gray owl habitat. More recently, however, the fragmentation of forests and selective logging probably reduced the amount of suitable habitat.

Vaux's Swift (Ponderosa Pine and Mixed Conifer PAGs)

This species requires large hollow snags for nesting and roosting. In eastern Oregon, 89% of nests were in late-successional habitats. 75% of the nesting cavities were accessed through pileated woodpecker cavities.

This species has been observed within the MLSR. The historic and current populations trends are unclear. However, one could speculate that the recent fragmentation of late-successional forests and selective logging probably reduced the amount of large diameter snags and the amount of suitable Vaux's swift habitat.

Black-backed Woodpecker (Lodgepole Pine and Mixed Conifer PAGs)

The black-backed woodpecker is considered a sensitive species in the critical category by the Oregon Department of Fish and Wildlife due to loss of snags and the conversion of mature lodgepole pine stands to younger stands.

Black-backed sightings have been documented in the lodgepole pine and mixed conifer habitats of the LSR. A black-backed study conducted in the DNF showed habitat selection for mature and overmature lodgepole pine stands, against younger stands and logged areas. Ponderosa pine, lodgepole pine and western larch were used in northeastern Oregon. The mature lodgepole pine or mixed conifer with lodgepole pine habitats found in the Mixed Conifer PAG (higher elevations) and the High Elevation Mountain Hemlock PAG of this watershed are ideal habitat for this woodpecker. However, the species may be found throughout all Mixed Conifer and Ponderosa Pine PAGs as well. The preferred lodgepole pine habitats used by this woodpecker were probably never very abundant in the LSR. As a result Black-backed population densities were probably always relatively low and limited in distribution.

White-headed Woodpecker (PP and MC PAGs)

The white-headed woodpecker is considered a sensitive species in the critical category by the Oregon Department of Fish and Wildlife due to loss of snags and the conversion of mature ponderosa pine stands to younger stands. This species is also identified in the Northwest Forest Plan (Appendix J2) as needing special mitigation provisions.

The white-headed woodpecker has been observed within the Mixed Conifer and Ponderosa Pine PAGs of the LSR.. The large diameter ponderosa pine may be essential as foraging areas for this species.

The actual population densities are not known. This species was probably more abundant historically than it is today. The selection harvest and clearcutting of mature ponderosa pine has reduced the amount of suitable habitat. The role that low to moderate intensity fires played in maintaining snag densities is unclear. When compared to current conditions, it is likely that snag levels were much higher under natural fire regimes, when compared to fire exclusion conditions combined with intensive timber harvest.

Pileated Woodpecker (MC and HE PAGs)

The pileated woodpecker is considered a sensitive species in the critical category by the Oregon Department of Fish and Wildlife due to loss of snags and the fragmentation of late-successional mixed conifer habitats.

There have been numerous sightings of pileated woodpeckers in the mixed conifer PAGs of the LSR. Pileated woodpeckers have probably always been uncommon in the LSR, with population densities being the highest in wet mixed conifer PAG and the upper elevations of the dry mixed conifer PAG. This species forages mainly by excavating into wood and scaling or chipping bark. A preference for large diameter logs and trees is related to insect abundance. Nest tree dbh was found to range from 16" to 30" or greater.

Though populations may be benefiting from the recent insect and disease tree mortality, timber harvest activities and late-successional forest fragmentation have probably reduced population levels in recent decades.

Williamson's Sapsucker (MC and PP PAGs)

The Williamson's Sapsucker is considered a sensitive species in the critical category by the Oregon Department of Fish and Wildlife due to loss of snags and the fragmentation of late-successional mixed conifer and ponderosa pine habitats.

The Williamson's sapsucker habitat is found mainly in the mature and late-successional mixed conifer and ponderosa pine PAGs at 3500' to 6500' elevation. They have also been found in lodgepole pine-fir areas. This sapsucker is a poor excavator and requires live or recently dead trees with advanced wood decay, such as occurs in mature and late-successional stands of true fir. The retention of large diameter trees with heart rot is important to maintain this sapsucker species.

This sapsucker has probably always been rare in the watershed, and population densities may have been highest in mixed conifer PAGs. Timber harvest activities have probably reduced population levels in recent decades due to loss of late-successional habitats. The mixed conifer PAG is heavily fragmented, therefore, the remaining mature and late-successional habitats in this association are critical for nesting and foraging.

American Marten (MC and HE PAGs)

The marten is considered a sensitive species in the critical category by the Oregon Department of Fish and Wildlife due to loss and fragmentation of late-successional mixed conifer habitats.

There have been no formal surveys for pine martens in the LSR, but they have been observed in various locations within the wilderness. It is likely that this species can be found throughout the LSR (especially the wilderness) in mature and late-successional mixed conifer, lodgepole pine and high elevation mountain hemlock PAGs at elevations ranging from 5,000' to timberline. Martens prefer extensive stands of relatively dense forests containing abundant down woody material as habitat for prey. Moist forests and areas near streams are important to marten, probably due to an abundance of important prey species on these sites. Prey species include: squirrels, chipmunks, woodrats, rabbits, voles, birds and insects.

The insect and disease conditions have resulted in down log levels that create prime denning and foraging habitat. In addition to down logs, martens use snags for denning and nursery sites.

Population densities were probably higher in the past than today, because of less fragmentation. The fragmentation of mixed conifer PAGs has probably influenced the distribution and densities of martens in these areas.

Neotropical Birds (Ponderosa Pine and Mixed Conifer PAGs)

The MLSR provides habitat for several Neotropical Migratory Birds (NTB) that are associated with late-successional habitats. A Breeding Bird Survey Route (1966-1995) starting at Jack Lake, to Roaring Creek, to Cold Springs, to Lower Bridge and terminating at the Horn of the Metolius observed a total of 87 species of birds, including 44 NTB. Some of the late-successional associated NTB include: olive-sided flycatcher, hermit thrush, western wood pee-wee, western tanager, Vaux's swift. The olive-sided flycatcher, western wood-pewee and western tanager, though common in the LSR, are declining in global population.

The cowbird is found in many habitats throughout the LSR. This species parasitizes the nests of many species. The result is lowered reproductive success for many Neotropical birds. The extent of this threat is not known. Of special concern is the impact of fragmentation on native species that are associated with late-successional habitats. Studies have shown that fragmentation of forested habitats, and the creation of edge habitat has contributed to the expanding range of the cowbird. In addition, fragmented habitats increase cowbird parasitism of bird species associated with late-successional habitats.

Snag and Down Log Species (other than woodpeckers)

Snag and down log habitat are important to a variety of species including: bushy-tailed woodrat, golden-mantled ground squirrel, snowshoe hare, northern pygmy owl, northern flying squirrel, osprey, pygmy nuthatch, brown creeper, and wood duck.

In general, snag densities are highest in the mixed conifer and lodgepole pine PAGs and lowest in the ponderosa pine PAGs. Snag densities vary on a stand by stand basis, but are usually lower in even-aged harvest units and wildfires. In the ponderosa pine habitats, they average approximately 1.2 per acre (range 0 to 2 per acre); in the mixed conifer they average 11 per acre (range 0-35 per acre). The number of snags in mixed conifer habitats has increased in the past two years because of insect and disease. The lodgepole pine and mountain hemlock PAGs are estimated to have snag densities >5 per acre.

In Ponderosa Pine PAGs, the snags are distributed in small patches across the landscape. Snags are primarily 20"+ dbh and hard. The intermediate (12-20" dbh) snags are limited in these habitats. In Mixed Conifer and Mountain Hemlock PAGs, snags are more evenly distributed because of the insect and disease mortality. Snags are primarily 10-20 " dbh class, and Douglas fir snags in the >20" dbh class can be found throughout the Mixed Conifer PAG. In mixed conifer stands, many of the snags are soft white fir. The lodgepole pine snags are generally 8-12" dbh and hard.

Down log densities are similar to snag densities. They are highest in the Mixed Conifer, Mountain Hemlock and Lodgepole Pine PAGs (14 to 37 per acre, except in clear-cuts), and lowest in the Ponderosa Pine PAG (0 to 15 per acre). Tree mortality from insects and disease is a significant contributor of down logs. The logging debris from past timber activities contributes large amounts of woody debris to most managed stands.

In Ponderosa Pine and Mixed Conifer PAGs, snag and down log levels were probably lower in the past than today because of natural fire frequencies. In the lodgepole pine and high elevation mountain

hemlock PAGs, snag and down log densities may be similar to historic conditions. The increases in snag and down log densities, especially in Mixed Conifer PAGs, may have resulted in upward population trends for dependent species.

CONNECTIVITY FOR TERRESTRIAL SPECIES

Connectivity between LSRs and other habitat areas is an essential function of the Reserve system. The Interagency Science Team (Thoma et al 1989) definition of connectivity is used in all Deschutes NF LSR assessments. It is the measure of the extent of intervening habitat that provides for dispersal between suitable habitat for late-successional dependent species, especially juveniles.

Across the Deschutes NF, and especially within the Metolius LSR, there are many areas where insect and disease disturbance has degraded or eliminated effective dispersal habitat, primarily along a north-south axis on the eastern slope of the Cascades.

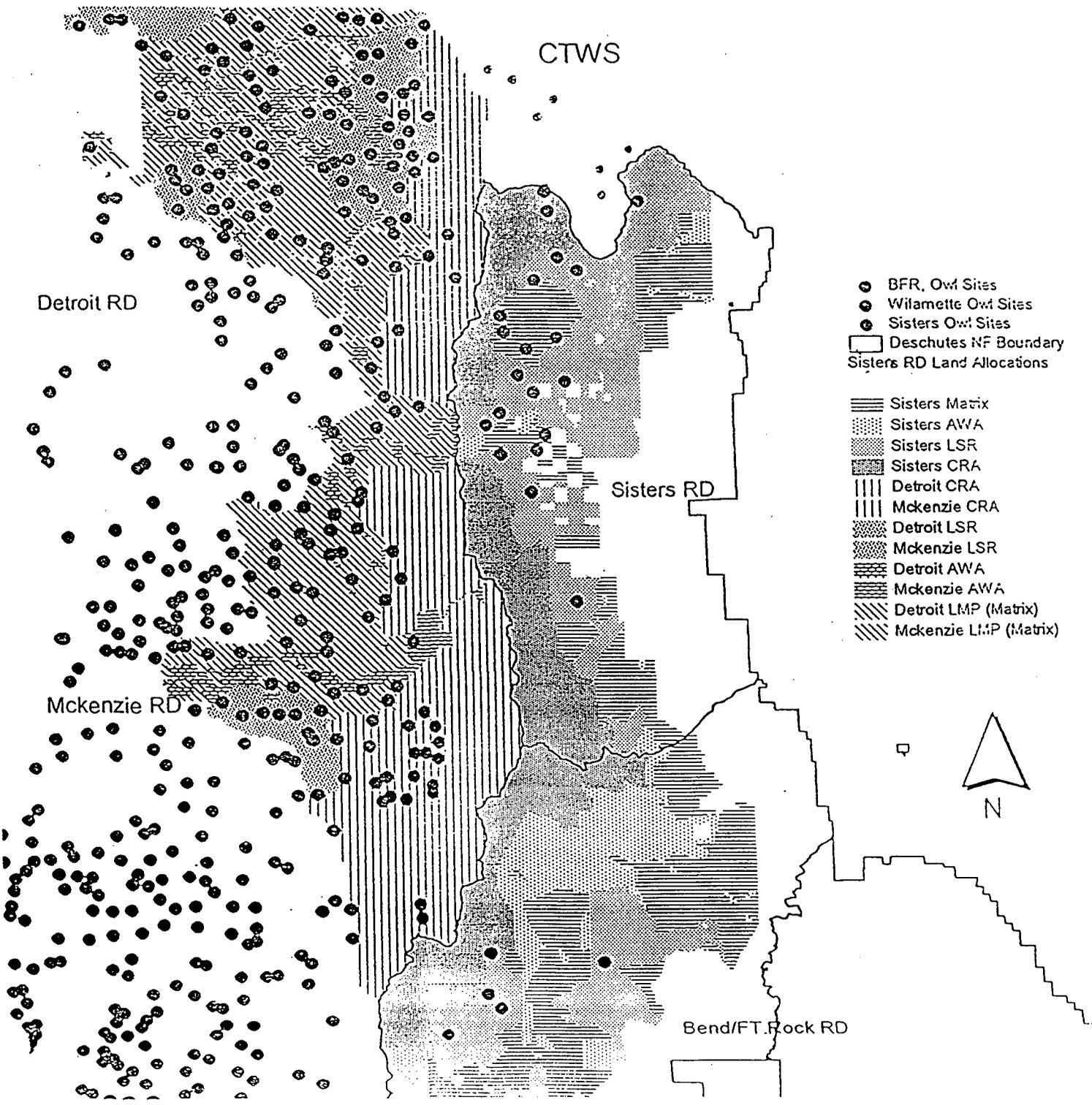
Providing adequate connectivity and dispersal habitat is critical for species viability in the Metolius LSR and the Deschutes NF as a whole. Connectivity between east and west populations is most critical for maintenance of an adequate gene pool, so that populations on the east side do not become more isolated and inbred. Connectivity from north to south is important for Deschutes NF populations as it provides for enhancement of genetic diversity of species at the eastern edge of their ranges.

The weakest link for broad-scale dispersal of late-successional species is from the southern boundary of the Deschutes NF to Lake of the Woods, with only Crater Lake providing a significant block of intervening habitat.

To the north of the Metolius LSR, the Reservation of the Confederated Tribes of Warm Springs provides some late-successional habitat. Some of this habitat is allocated as wildlife habitat under the Tribes' Integrated Management Plan; other habitat exists because of poor economics for harvesting. Currently, connectivity to the north is adequate, but the situation could change with the market making these blocks available for harvest. The Reservation also provides habitat that links dispersal to the Mt. Hood NF and thus, across the Columbia River to Washington populations.

Connectivity from east to west is a lesser issue due to the abundance of Congressionally Withdrawn wilderness areas containing large blocks of late-successional habitat. These areas connect with similar blocks and LSRs on the Willamette and Winema National Forests (Map 10).

Deschutes, Willamette and CTWS 1996 Spotted Owl Distribution and NWFP Allocations



2. Riparian/Aquatic Wildlife Species

HISTORIC FISH POPULATIONS

Historic records show spring chinook, sockeye salmon, rainbow trout, bull trout, mountain whitefish, longnosed dace, bridgelip sucker and sculpins as native to the Metolius Watershed.

PROPOSED, THREATENED, ENDANGERED AND SENSITIVE

Bull Trout (Ponderosa Pine and Mixed Conifer PAGs)

Bull trout are a Category 1 species on the Federal list and are petitioned for listing under the Endangered Species Act. Bull trout have declined in many watersheds throughout the northwest due to habitat degradation from logging, roads, grazing and irrigation diversions and other dams, and from over fishing.

This species may have specific habitat requirements that are linked to late successional forests in the MLSR.

Most important habitat changes that have occurred are the loss of instream wood and the trend towards smaller size trees available for future wood recruitment, the introduction of fine sediment from transportation and access systems, and possible temperature changes in Abbot Creek due to riparian logging.

Invertebrates

Cascades Apatanian Caddisfly (Ponderosa Pine and Mixed Conifer PAGs)

A caddisfly, Apatania Tavalala, listed as a USFS Sensitive Species, has been found in Roaring Creek and the Metolius River.

Amphibians

Amphibians are closely associated with riparian habitats. So little is known about amphibian populations that it is difficult to estimate the impacts of past activities or their current population levels. The following focal amphibian species are known or suspected to occur in the watershed.

Cascade Frog (Mixed Conifer and Ponderosa Pine PAGs)

This species is a Oregon State Sensitive Species in the critical category because populations appear to be declining.

Tailed Frog (Mixed Conifer and Ponderosa Pine PAGs)

This species is a Oregon State Sensitive Species in the critical category because populations appear to be declining.

Spotted Frog (Mixed Conifer and Ponderosa Pine PAGs)

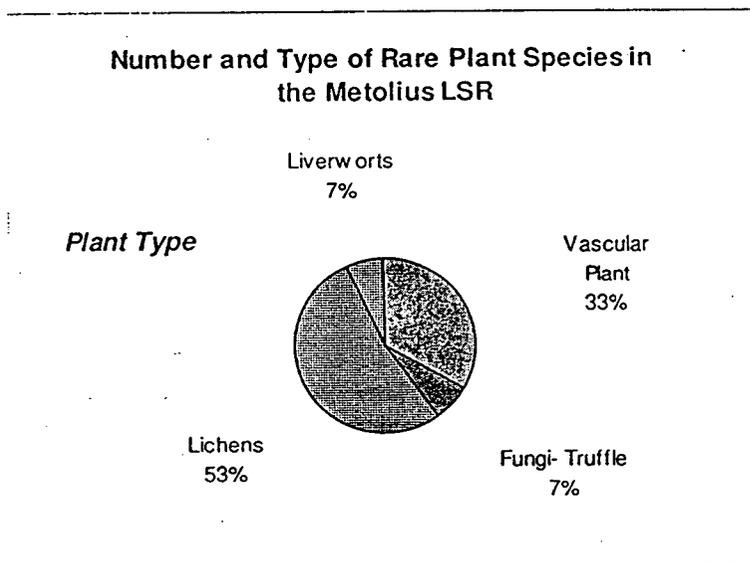
This species is a federally listed category 2 species.

For details on fish, invertebrate, and amphibian current and historic habitat conditions and population distributions, see the Metolius Watershed Analysis (October 1995).

3. PLANT SPECIES OF CONCERN KNOWN OR SUSPECTED TO OCCUR IN THE LSR

Three sensitive plant species (species on the Regional Foresters Sensitive Plant List) are known to occur within the MLSR. Twelve plants classified as "Survey and Manage" species in the Northwest Forest Plan are found within the MLSR. These plant species of concern known to occur in the MLSR are listed in Table A in Appendix 1.

Species with potential to occur in the MLSR include 15 TES plant species and 11 Survey and Manage species which are known to occur elsewhere on the District or the Deschutes NF. Many other Survey and Manage species have potential to occur but are not listed. Species suspected to occur in the MSLR are listed in Table B in Appendix 1. Table C is a list of focal species that include PETS species identified as Federally threatened, endangered or Category 2, rare lichens, bryophytes and/or vascular plants (survey and manage species identified in the Northwest Forest Plan), and other species of interest.



TERRESTRIAL PLANT SPECIES OF CONCERN

The following is a summary of the status and habitat conditions of the focal plant species that are known to occur within the MLSR. These species represent a variety of other species with similar habitat needs.

Peck's penstemon (Penstemon peckii)

Focal Species representing habitat requirements for open canopied pine and dry mixed conifer forests and meadows, fire maintained habitats, patch patterns, seasonally moist areas with high

water table or channels. May represent other fire adapted species such as fungi (morels), other sensitive vascular plants (tall agoseris) .

Rarity/ Status: This rare endemic wildflower is found only on approximately 325 square miles centered around Black Butte on the Sisters Ranger District. Field (1985) found the center of the range of PEPE overlies a distinct quaternary alluvium, or an area of glacier deposit formed at the end of the Pleistocene. Most known populations are on National Forest Lands. Half of the known global population (109059 plants) is found within the LSR, while 64% of the global population is within the Metolius Watershed. Half of the "protected populations" identified by the Species Conservation Strategy as crucial to long term species survival are found within the Metolius watershed. The plant is classified as "sensitive" on the R6 Sensitive Plant List.

Habitat: Peck's penstemon is a good indicator of fire maintained habitats including open canopy patch patterns, meadows, and of seasonally moist habitats or channels. It is closely associated with pine dominated open canopied forests with early seral understories. Several meadow populations exist. These habitats were historically maintained by a low intensity fire regime. The plant often occurs in high watertable areas or in intermittent and ephemeral stream channels. Populations display a patchy distribution, with greatest concentrations of plants found at lower ends of watersheds on level ground with relatively high water retention. The plant has a wide genetic amplitude and can be found persisting in a variety of habitats, including recently disturbed sites such as plantations, skid trails, and roadsides.

Changes to Habitat: Peck's penstemon has been affected by fire exclusion, ground disturbing activities, timber harvest, and land development. For detail on the effects, see the Metolius Watershed Analysis, (October 1995).

The Metolius Watershed and LSR are the heart of the population and are mostly in federal ownership. This remains the most important watershed for the survival of the species, and may become even more important in the future as development affects populations in the urban interface.

Candy Stick (Allotropia virgata)

Focal Species representing habitat requirements for mixed conifer forests with areas of deep humus and woody debris . These forests experience a complex sequence of periodic fire . The plant is mycorrhizal with soil fungi, one of its fungal partners is believed to be the matsutake mushroom. May represent other species of complex mixed conifer forests with abundant woody debris, and mycorrhizal fungi

Rarity/ Status: The plant has highly isolated populations and is rare throughout its range. One population has been documented in the LSR consisting of only three current year stems and 12 stems from the previous year in an isolated remnant of closed canopy old growth hemlock/Douglas-fir forest. Similar remnants of suitable habitat exist throughout the watershed, however the plant's episodic flowering habitats may make it difficult to detect. The plant is a "Survey and Manage" category 1,2.

Habitat: Candy Stick is believed to benefit from some level of periodic fire and occurs in primarily old growth forests with well drained soils and abundant woody debris.

Changes to Habitat: The exclusion of fire, fragmentation of older stands, and effects to the plant's obligate mycorrhizal fungi through soil compaction and disturbance has affected suitable habitat. Excluding fire from these forests is believed to have been the single greatest detriment to landscape and habitat diversity on the eastside (Hessburg et al. 1994).

Mountain Lady Slipper (Cypripedium monatum)

Focal Species representing habitat requirements for full canopied pine and wet mixed conifer forests near streams. The plant appears to persist in areas which have been burned. These orchids are mycorrhizal with soil fungi, and may represent other long lived species such as lichens or fungi.

Rarity/ Status: One known site of 26 stems is documented within the MLSR. The population was found in a dry mixed conifer forest 120 feet from a stream. Two other unverified sightings reported the plant along the Metolius River trail and lower Metolius River road. The plant is a "Survey and Manage" category 1,2.

Habitat: Mountain Lady Slipper occurs in moist sites often near riparian areas, with up to 60% canopy closure and populations of appropriate mycorrhizal fungi. Periodic fire is believed to be important as are healthy soil ecosystems.

Changes to Habitat: Fire exclusion and logging of stream-side forests have affected potential habitats. The plant is extremely slow growing; it may take more than 100 years to recolonize and become well distributed.

Fungi/Rare Truffle-(Elaphomyces anthracinus)

Focal Species representing habitat requirements for fungi species which are ectomycorrhizal associates in mature pine forests. This truffle may be an indicator for old growth pine habitats. It's fire ecology is unknown but it may be assumed the truffle evolved with periodic fire regimes. This fungi may represent other fungi and plant species, and is tied to mycophagus rodents which are an important part of the forest food base for owls and other wildlife.

Rarity/ Status: Elaphomyces anthracinus has been reported as widely distributed but rare since its discovery in Italy in 1832. Only 50 collections are known. The Metolius LSR population is the only known site within the range of the spotted owl. The truffle is classified as "Survey and manage category 1,3.

Habitat: The known site is a streamside campground in a pine forest which contains many old growth trees, a high water table and an early to mid seral understory. Fire scars in the area point to a history of periodic fire. Rodents play an important role in the dispersal of truffle spores and colonization of new habitats. Additional potential habitat exists within the LSR.

Changes to Habitat: The harvest of mature ponderosa pine is believed to have reduced available habitat. The known site was, in past years, impacted by unrestricted traffic flow. The site has since been closed to vehicles and is now walk-in camping only.

RIPARIAN/AQUATIC PLANT SPECIES OF CONCERN

Nitrogen fixing Lichen Group

- Lobaria halli
- Lobaria pulmonaria
- Nephroma helveticum

- Nephroma resupinatum
- Pseudocyphellaria anomala
- Pseudocyphellaria anthrapsis

Focal Species representing habitat requirements for lichen and other species found in moist stream-side forests. These species may disperse only over small distances (i.e. 6 ft). These may represent other lichen species, such as the riparian lichen Collema, the pin lichen Calicium, and some invertebrates.

Rarity/ Status: This group of lichens is generally found associated with trees from 140- 200 years old and have been found at four sites in the SLR. They are classified as "Survey and Manage" category 4.

Habitat: This group has been found in association with late-successional and old growth forests and requires sheltered microsites with complex canopy structure, leaning tree boles, increased humidity and the presence of hardwoods or coastal distinct species such as Pacific yew. In eastside watersheds these distinct species are restricted mainly to riparian areas, drainages, high watertable areas, or floodplains.

Changes to Habitat: Many moist forest habitats have been altered by harvest. Harvest within and next to riparian areas has modified and dried micro-climates. Fragmentation within riparian habitats has probably affected their dispersal capabilities to suitable adjacent habitats, since they are known to be dispersal limited. One cottonwood dominated site is maintained by beaver activity and reduced numbers of beaver may be affecting other potential habitats.

Bryophyte/ Liverwort- Tritomaria exsectiformis

Focal Species representing habitat requirements for riparian liverworts which form a living layer over stream banks and woody infalls along stable spring fed streams. This liverwort may represent other bryophyte species such as mosses and associated invertebrates.

Rarity/Status: This liverwort was first found near a headsprings in the watershed in 1977, which is one of two known sites in Oregon. It is classified as "Survey and Manage" category 1,2.

Habitat: Stable spring fed stream systems on mossy mounds and waterlogged woody infalls.

Changes to Habitat: The population site has experienced some adjacent timber harvest and heavy recreational use causing trampling of stream-side habitats.

Bryophyte/Liverwort- Chiloscypus polyanthos

Focal Species representing habitat needs for aquatic liverworts. This species may be very sensitive to air pollution. This species has almost disappeared from streams of the northeastern United States, a loss ascribed to acid rain. This liverwort may represent other bryophyte, fish and invertebrate species which require very cold pure water.

Rarity/Status: This aquatic liverwort is found in the headwaters of Jack Creek where the population was described by an expert as "one of the most luxurious in the state". This species has no status on sensitive species lists.

Habitat: In the waters of stable, very cold, spring fed stream systems.

Changes to Habitat: No current threats. This will be a population to watch into the future as an indicator of changes to air or water quality.

NON-NATIVE PLANTS /NOXIOUS WEEDS

In order to maintain the composition, structure, and function of late successional ecosystems it is critical to manage and control the spread of aggressive non-native plants and noxious weeds. Weeds replace native plants which support complex relationships with insects, mycorrhizal fungi, and other plants.

Historic Condition: Noxious weeds and other non-native plants were introduced from other countries both intentionally and inadvertently during international trade of goods and livestock. Natural biological controls which existed in the weed's native country were not present and populations could expand unchecked. Once introduced to this country, weeds were spread by animals, vehicles and numerous other vectors.

Current Condition: Noxious weeds and other non-native plants are increasing in the watershed.. The increasing use of mechanized harvest equipment , sub-soiling equipment, reintroduction of contaminated native plants and seed, and prescribed fire have the potential to infect new areas, lower the quality and quantity of native and rare plant habitat, and disrupt relationships within the ecosystem. Prevention is considered the most effective and, in the long term, least expensive control tactic.

The following noxious weed and aggressive non-natives species are known to occur in the watershed:

Terrestrial Species

Diffuse Knapweed
Spotted Knapweed
Dalmatian Toadflax
Tansy Ragwort
Scotch Broom
St. Johns wort
Canada Thistle
Bull Thistle
Cheatgrass
Oxe-eye daisy
Bulbous bluegrass and other exotic grasses

Riparian /Moist site Species

Scotch Broom
St. Johns wort
Ornamental iris
Ribbon grass
Bulbous bluegrass and other exotic grasses
Canada Thistle
Oxe-eye daisy
Reed Canary grass (undocumented but high potential)

Terrestrial Noxious weeds and Non-natives

Most of these species colonize disturbed habitats, especially roadsides and areas of severe ground disturbance such as old timber sale landings and informal parking areas. The knapweeds, an aggressive group of plants, are spreading rapidly along roads and in some areas invading some undisturbed habitats. Tansy ragwort sites are associated almost exclusively with old timber sale areas or near horse camps and were probably introduced by contaminated logging equipment or hay from the westside

where the plant is prevalent. Hay and vehicle tires remain top concerns as vectors of new weed infestations. Many areas of the watershed remain unsurveyed for noxious weeds.

Cheatgrass is widespread in areas which have had soil disturbance, particularly old timber sale units, landings and skidtrails. Cheatgrass is of particular concern because when dried and cured in the late summer and fall it is a highly flammable fine fuel which increases fire hazard. Other non-native grasses such as crested wheatgrass were widely applied to timber sale landings as wildlife forage and persist, displacing native grasses. Bulbous bluegrass (*Poa bulbosa*), a non-native grass appears to be rapidly increasing in disturbed areas of the watershed. It is reproductively aggressive and non-palatable.

Prescribed fire has not been shown to be effective in control of most weed species and often leads to increases in populations because of new disturbed ground and enhanced nutrient and water availability. Vehicles supporting fire operations may carry weed seeds from roadsides into new areas. Weed risks need special consideration in prescribed fire planning.

An Integrated Weed Management Strategy for the Deschutes National Forest is in progress. Manual and biological control methods are currently being used to control weed populations. Prevention of weed introduction is done by the consideration of weed introduction risk during project planning and recommendations for mitigation.

Riparian Noxious weeds and Non-natives

Because of their moist micro-climate, the LSR riparian areas harbor weed species which are more typically found on the westside. These non-native plants displace native riparian plants and their mycorrhizal and invertebrate counterparts, as well as more palatable or nutritious wildlife forage species.

Scattered scotch broom are found along the Metolius River, near other streams, or in road drainages, but are rare outside these moist areas. Reed canarygrass has not been documented in this watershed but is found in other riparian areas of the forest.

In the Camp Sherman area, non-native ornamentals have escaped from summer homes along the Metolius River and spread downstream into riparian areas and vegetated islands. Ribbon grass is found widely and replaces bigleaf sedge and small-fruit bulrush associations on active channel shelves. In a natural sequence bulrush/sedge associations are replaced by other sedges and nitrogen fixing alders. How non-natives affect successional pathways is unknown. Yellow iris are also found in scattered locations and have the potential to displace native stream-side wildflowers. These non-native plants may play similar physical roles as their native counterparts in stream-side stabilization, but may not support the same plant-insect interactions.

No control efforts have been done for ribbon grass, scotch broom or other riparian non-natives. Significant sediment introduction could result from mechanical control (pulling out stream-side plants).

. VI . HISTORIC AND CURRENT LAND USES

Heritage Resources, Recreation, Commercial Uses, Special Forest Products and Utilities are all discussed in detail in the Metolius Watershed Analysis (October, 1995)

. VII . LATE-SUCCESSIONAL HABITAT CONDITIONS

The amount of habitat that is considered late-successional is relatively low due to past harvest activities and natural disturbances. There is a range of vegetative structural conditions, and many of these, while not possessing all the characteristics of "late-successional" habitat, do possess a number of late-successional habitat components or characteristics.

There are a variety of seral stages and forest structures associated with each PAG group as described in Chapter III of this assessment. The LSR landscape has changed from a fairly homogeneous, large tree landscape composed primarily of large and medium trees to a heterogeneous landscape with numerous small, early and mid-seral patches. There are significant amounts of edge habitat with high edge contrast. Late-successional interior habitats are highly fragmented and poorly connected.

A. LATE-SUCCESSIONAL HABITAT DEFINITIONS

Late-successional forests are those that include mature and old-growth age classes. The characteristics of the natural structure and composition of late-successional forests vary among geographical provinces. Historically, fires played a significant role in the structural development, vegetative composition and maintenance of late-successional habitats in the LSR.

The identification and delineation of late-successional habitats for this Assessment is a rough estimation at best. Based on 1991 Aerial Photo Interpretation data and current late-successional habitat definitions (Region 6 Interim Old Growth Definitions 1993) there are few areas in the MLSR that possess all the characteristics necessary to be delineated as "climatic late-successional habitats", but there are many more acres of habitat that possess some late-successional habitat characteristics. For example, many of the mixed conifer stands have less than 10 large to medium size trees per acre, but may be multi-storied; or there may be 10 large to medium trees per acre, but only 1 to 2 stories. Those areas where late-successional habitat have been identified are generally small in size and highly fragmented.

The successional pathways that lead to climatic climax forests can be considered "directional" where an accumulation of changes lead to community-wide changes (Barbour et al. 1987). The resulting climax community takes a long time to develop, perhaps several hundred years, primarily because combinations of weather, elevations, aspects, productivity and disturbance agents don't provide conditions for frequent community-level disturbance and change.

Another type of succession is cyclic (Barbour et al. 1987) where a community is perpetuated by the reoccurrence of a disturbance event. Certain elements of the community are resistant to the effects of the reoccurring disturbance and so survive the events time after time. In the Metolius LSR, frequent low intensity fire was the reoccurring element which favored open "park-like" stands of ponderosa pine.

In this Assessment, late-successional habitats that developed under frequent, low-moderate intensity fire regimes are referred to as "fire-climax" habitats. Those late-successional habitats that developed under suppressed or infrequent, high intensity fire regimes are referred to as "climatic climax". The Metolius Watershed Analysis indicated that, historically, the fire climax conditions dominated the ponderosa pine and mixed conifer PAGs with climatic climax conditions scattered throughout.

Fire Climax Ponderosa Pine

In general, ponderosa pine "fire climax" conditions would consist of 1-2 storied, open (<40% canopy closure) pine forest dominated by large diameter (greater than 21" dbh) trees. Understory tree and shrub cover would be limited and composed of shade intolerant species.

The following "fire climax" definition for ponderosa pine is based on a definition developed by Bill Hopkins, Area 4 Ecologist as an eastside expression of the climatic climax definition for ponderosa pine from the Region 6 Interim Old Growth Definitions (1993)

- 1-2 storied, open (<40% canopy closure) canopied
- 10-30 large diameter (17" dbh or greater) trees per acre
- 0 -2 snag per acre
- few down logs per acre

Fire Climax Mixed Conifer

The "fire climax" definition for mixed conifer is not well defined, but has been described by Agee (1990) and Oliver, et. al (1991).

A mixed conifer "fire-climax" forest would consist of 1-2 storied, open (but less open than ponderosa pine) forests dominated by large diameter (21" dbh or greater) ponderosa pine, Douglas-fir, western larch, and in some plant associations, lodgepole pine. Understory tree and shrub cover would be limited and primarily shade tolerant species (except Douglas-fir, which may be early seral on some sites).

Climatic Climax Ponderosa Pine

A "climatic climax" ponderosa pine forest would also be dominated by large diameter ponderosa pine, but there would also be significant amounts of seedling, saplings and pole size ponderosa pine trees, and some shade tolerant species (i.e. white-fir) in the understory. There might also be lodgepole pine trees throughout the understory. There would be high cover levels of shrubs such as bitterbrush and manzanita.

Hopkins' definition of eastside "climatic climax" ponderosa pine would contain:

- 1-2 storied, open (<40% canopy closure) canopied
- 15-40 large diameter (17" dbh or greater) trees per acre
- 3 snag per acre (10% stand with spiral tops)
- 3-6 down logs per acre at least 12 inch diameter on the large end.

Climatic Climax Mixed Conifer

The "climatic climax" mixed conifer condition would consist of multi-storied (3 canopy layers), high canopied (60% or greater) forests dominated by Douglas-fir, ponderosa pine, white fir, western larch and incense cedar. There would be a variety of age classes present in the understory composed primarily of shade-tolerant species such as white and Douglas-fir, and the shrub cover would be significant.

The "climatic climax definition for mixed conifer in the Region 6 Interim Old Growth Definitions (1993) for the Grand Fir/White Fir Series is:

- multi-storied (3 canopy layers), high canopied (60% or greater) forests dominated by Douglas-fir, ponderosa pine, white fir, western larch and incense cedar.
- 2-12 snags greater than 14" dbh per acre
- 20-50 down logs at least 12 inches diameter on the large end per acre
- 15-50 large overstory trees greater than 21" dbh per acres

Lodgepole Pine and Mountain Hemlock

In the MLSR a lodgepole pine and mountain hemlock climatic climax forest would consist of mountain hemlock and lodgepole pine dominated overstories. Generally the understory would be dominated by shade tolerant species, including other true firs and mountain hemlock. The shrub cover would be sparse and composed of manzanita and snowberry. These forests usually develop under long fire intervals (100-300 years) and are generally replaced by early seral conditions due to catastrophic fires. They are generally climatic climax in nature and are not considered fire climax plant associations.

B. HISTORIC AND CURRENT LATE-SUCCESSIONAL HABITAT CONDITIONS

1. Surveyor Notes

Fire played a significant role in creating open, park-like, fire climax forests from the eastern boundary of the MLSR to the upper elevation mixed conifer forests. The surveyor's notes described the area included in the Ponderosa Pine PAGs as large even-aged stands of pure, large diameter ponderosa pine with grass understories. The surveyor's notes describe the areas within the Dry Mixed Conifer PAGs as lots of heavy yellow pine (ponderosa pine) and fir (Douglas-fir) overstories, as well as, western larch and incense cedar. The understories are described as open (not dense). The area of the Wet Mixed Conifer PAG was described as being similar to the dry mixed conifer, except that dense understories of pine, fir and chinquapin were present in some areas. The entire mixed conifer area was described as being contiguous stands of large diameter ponderosa pine and Douglas-fir.

2. 1953 Mapping

Similar to 1870, a large contiguous forest of medium/large diameter ponderosa pine and Douglas-fir dominated the LSR. Fire climax conditions were common in the lower elevations, while denser, multi-storied stands were common in the middle and upper elevations. The presence of climatic climax conditions increased due to the suppression of fire. The Ponderosa Pine PAG was dominated by large open, large diameter ponderosa pine with grass. The presence of a ponderosa pine understory with some white-fir is more common due to the suppression of fires. The Dry and Wet Mixed Conifer PAGs are dominated by open, medium/large diameter trees. The presence of dense, mixed-species understories is more common due to the suppression of fires.

3. Current Conditions

The amount and condition of late-successional habitat in the LSR has changed considerably over the last 50 years, primarily as a result of fire exclusion allowing understory densities to increase and timber harvest removal of the largest trees.

DRY MIXED CONIFER PAG (TABLE 4)

An estimated 2000 acres (6%) of this PAG can be considered late-successional habitats. These stands include acres of open park-like stands and multi-storied stands, most with canopy closure less than 40%.

Historically these stands were dominated by pioneer species such as ponderosa pine. Currently the few med./large sized stands are dominated by mixed and climax species such as white fir and Douglas fir. The small-sized stands are also dominated by mixed and climax species (almost 15,700 acres or 49% of the PAG). Stands in the drier, less productive plant communities could be considered fire climax, while those more productive communities (CW-C2-11 and CW-H1-11) may be able to support denser habitat at least during wet periods.

WET MIXED CONIFER PAG (TABLE 5)

An estimated 2100 acres (12%) of the PAG can be considered potential late-successional habitats. A majority of these stands (1700 acres) do not possess the climax species composition, but most do have a mixed species composition with medium to large tree character. These stands include acres of open low-canopied and multi-storied stands. About 81% of the PG is in stands of smaller sized trees, some of which have species composition, multiple canopy layers or other characteristics of late-successional habitat, but lack the larger trees

PONDEROSA PINE PAG (TABLE 6)

Approximately 1861 acres or 7% of the PAG can be considered late-successional habitat. These are stands dominated by med./large trees in either open park-like stands or denser stands that have begun to develop additional understory layers due to fire exclusion. Most of the rest of the PAG (77%) is in stands dominated by smaller sized trees where the largest trees have either been removed by harvest or natural mortality, or where the site potential is poorer.

LOGEPOLE PINE / HIGH ELEVATION MOUNTAIN HEMLOCK PAG

The 1,632 acre lodgepole pine and 4 acre mountain hemlock PAGs are in a "climatic climax" condition are primarily late-successional in character and function.

4. Summary and Conclusions

There are several factors that make the Metolius LSR unique among the many LSRs in the reserve network within the range of the northern spotted owl. These differences include:

- The majority of the area (41%) is comprised of dry mixed conifer associations strongly dependent on frequent intervals of low intensity fire to maintain sustainable species composition and densities. With minor exceptions, these forests were historically much more open than what is currently considered optimum spotted owl habitat.
- Another large portion (32%) of the LSR is comprised of ponderosa pine associations, also dependent on frequent low intensity fire, and even more open in structure.
- In significant portions of the LSR, especially in the dry mixed conifer, the combination of high stand densities and tree species that are favored hosts to many pathogens have resulted in very high

levels of mortality, poor vigor in the remaining trees, and fuel loads and arrangements that contribute to extremely high risk of large stand replacement fires.

- The resources at risk from future high intensity and large scale disturbance are those that we most value and desire for Late-Successional Reserves: remnant large pine and Douglas fir trees, remnant patches of LS/OG habitat, riparian corridors, and components of smaller sized stands that are currently being used as habitat by LS species, particularly high canopy closures, multi-storied structure, and snags and down logs.
- Portions of the Metolius LSR are nearly rural in social character. The community of Camp Sherman and the popular resort and camping areas of the Metolius River and Suttle Lake areas, the heavily traveled Santiam Pass, are all exposed to substantial risk from high intensity fires.

C. OLD GROWTH HABITAT CONDITIONS FOR 10 SELECTED INDICATOR SPECIES

The Deschutes National Forest Science Team developed a process to determine desired future habitat conditions in LSRs. Ten indicator species were selected to reflect suitable late-successional old growth habitats for each PAG. Selected species are American martin, boreal owl, pileated woodpecker, northern spotted owl, bald eagle, flammulated owl, whiteheaded woodpecker, blackbacked woodpecker, great grey owl, and northern goshawk. These species all depend on LS/OG structural components for nesting, denning, roosting, hunting, and foraging. The Science team quantified needs for several critical components including snags, down logs, canopy cover, canopy layers, trees per acre, and other special features.

Habitat characteristics were identified for each indicator species by PAG (Appendix 2, Table 1), based on characteristics identified in a broad range of current published research. Although developed for the Cultus/Sheridan LSR on the Bend Ranger District, the information is a close reflection of optimal habitat requirements for species found in the Metolius LSR.

D. SUITABLE WILDLIFE HABITAT COMPARED TO SUSTAINABLE VEGETATION

Table 12 compares suitable wildlife habitat with sustainable vegetation conditions. Suitable habitat is displayed using trees per acre (tpa), Stand Density Index (SDI), and fuel loading of snags and down logs as tons per acre. Sustainable vegetative conditions are also described for each PAG, as measured by the upper management zone of SDI (UMZ-SDI) which is the density level at which sufficient competition and stress begin to suppress tree growth and vigor. Fuel loading for low to medium hazard is also indicated in tons per acre.

Table 12 - Comparison of Suitable Habitat and Sustainable Vegetation Conditions for Metolius LSR Plant Associations

PAG	SUITABLE HABITAT (1)			SUSTAINABLE (2)	
	DENSITY	FUELS		DENSITY	FUELS
	TPA	(UMZ) SDI	TONS/AC	UMZ (SDI)	TONS/AC
MH	220-330	411-620	25-40 tons	256	< 40 tons
climatic MCW	284-430	365-581	25-35 tons	195-265	< 35 tons
climatic MCD	175-261	279-405	12-24tons	150-177	<24 tons
fire MCD	23-294	141-373	LOW	150-177	LOW
climatic PPW	150-224	347-535	12-24 tons	145	< 24 tons
fire PPW	23-294	141-373	LOW	145	LOW
climatic PPD	144-216	313-472	10-15 tons	92-124	15 tons
fire PPD	8-273	27-216	LOW	92-124	LOW
LPW	296-444	222-353	12-24 tons	170	< 24 tons
LPD	288-432	132-198	8-12 tons	80	< 12 tons
mid - low elev LPD	282-424	172-259	8-12 tons	161	< 12 tons

(1) Within the PAG, identify the plant association that is predominant in the LSRs. If there are several major plant associations, a range of UMZ's could be used here. For subsequent site specific project analysis, use the best site specific data available for density prescriptions, keeping areas below the UMZ in order to sustain or create future suitable conditions, wherever possible, while still providing current, but perhaps unsustainable habitat as well, to meet current suitable late successional old growth habitat needs.

(2) Based on Cochran et al. 1994, Joanna Booser and Jim White developed the paper "Calculating Maximum Stand Density Indexes (SDI) for the Deschutes National Forest Plant Associations" (1996), that was used in determining the above table's values. Cochran advised using the lowest plant association values within the PAGs as the index. Again, the approach here is to use the UMZ of the major plant association (or major plant associations) in the PAG, which pushes management closer to the unsustainable level, but allows leaving more short term suitable habitat. The best available site specific density values will be used when managing specific stands overtime across the landscape, not the lumped PAG value used here for broadscale planning purposes. (See Appendix 1)

UMZ - For most species, the upper management zone is defined as the density level at which a suppressed class of trees begins to develop (Cochran et al. 1994). This is the point at which sufficient competition is happening between trees to cause some trees to begin to slow down in growth, even to the point of death. The primary cause is that, on any given piece of ground, there are limits to the resources available for plant growth. These resources include light, water, nutrients, and growing space. When these limits are reached, loss of plant growth and/or mortality are common elements of the stand. These conditions can be ideal for certain late successional old growth plant and animal species. However, they are often providing the ideal habitat conditions only after there has been sufficient limitations of previous density levels that allowed a large tree component to develop. Historically, these limitations were provided in drier plant associations by frequent fire intervals which tended to limit development of understories and favored growth of the forest with overstory trees.

In ponderosa pine or lodgepole pine, the UMZ is calculated somewhat differently from the other species. This was recommended by Cochran et al. (1994), to show the level above which higher levels of large tree mortality are much more likely to occur. For these tree species, the UMZ correlates to a high risk threshold for markedly increased tree mortality due to many of the forest pests which are dependent on density and lower tree growth for epidemic levels to be reached. Other factors besides density, such as species composition, must be considered for the density independent forest pests such as the fir engraver beetles and spruce budworm. However, the use of UMZ in stands which are typically not hosts to density dependent pests is still recommended if the desire is to let small trees grow to large trees more quickly and safely especially where large trees are in short supply. This is because the presence of a suppressed class of trees would indicate average tree growth in the stand is beginning to slow down, perhaps significantly.

Results of the comparison show little or no overlap between sustainable vegetative conditions and those conditions considered optimal habitat for the 10 indicator species described above and in Appendix 2, Table 1. For example, in Mixed Conifer Dry PAG, the required stand densities would result in an SDI almost double of what is indicated for the upper management zone of the representative plant association. As described in Appendix 2, vegetation management to achieve LSR objectives will need to follow a process of cycling suitable (but not sustainable) habitat with sustainable (but less than optimal habitat) stand conditions across the landscape over time.

E. CYCLING AND SUSTAINING DESIRED LS/OG CONDITIONS IN THE METOLIUS LSR

As described in Appendix 2, the cycling model uses four stages:

1. **preliminary vegetation stage** where large trees are not yet present
2. **stable fire climax suitable habitat stage** where density management or natural fire maintains habitat below the upper management zones of SDI
3. **transitional vegetation stage** where stands become less stable as densities increase, but are not yet optimal habitat.
4. **climatic climax suitable habitat stage** where structural features provide optimal habitat for species like the spotted owl. This stage is unstable and only sustainable for short periods.

Using rotation cycles for each PAG, different structural stages are maintained and managed through time so there will be habitat developing to replace habitat that is lost or becomes nonfunctional due to

disturbance. Suitable wildlife habitat loss or decline will occur as a result of a combination of excessive densities, drought, insect, disease, and fire.

Table 13 describes three ways of distributing stands in different size classes across the landscape. The first column describes distribution from the standpoint of thresholds for optimal habitat; the second describes column describes, for different rotation lengths depending on the PAG, the distribution of early size classes necessary to result in the largest size classes at the culmination of the rotation; the third column describes the historic range of variability for the Metolius watershed. Finally, Table 14 describes the desired distribution of vegetative stages by PAG.

Table 13 - Evaluation Criteria for Size Class Distribution in Metolius LSR

SIZE CLASS	SUIT HAB. THRESHOLDS. % of Acres in ea size class				CYCLING (1) % of Acres in ea size class				HRV (4) % of Acres in ea size class				
	MCW	MCD	PPW/D	LPPW/D	MCW	MCD	PPW/D	LPPW/D	MCW	MCD	PPW/D	LPPW/D	HM
SEED/SAP (2) 0-5"	-	*	*	25	6	7	5	25	3-54	3-25	3-21	0-60	0-8
POLE (2) 5-9"	-	*	*	25	7	7	5	25	7-50	8-40	3-21	10-80	0-35
SMALL (2) 9-21"	40	30*	40*	50	12	15	10	50	13-57	20-75	20-50	0-80	5-50
MEDIUM (3) 21-32"	60*	70*	60*	-	25	38	20	-	11-53	23-75	30-70	0-2	5-20
LATE/OLD (3) >32"	*	*	*	-	50	33	60	-	*	*	*	*	*

- (1) Different rotation lengths were used for each plant association group. These rotation lengths (until regeneration is required) are as follows: MH, 600-1200 + years; MCW, 400 years; MCD 350 years; PPW/D, 500 years and LPPW/D, 100 years. The number of years within each structural group maybe calculated by multiplying the percent (as a decimal) in the table by the rotation length.
- (2) These two size/structure classes represent the preliminary stage.
- (3) These size/structure class represents either the stable fire climax habitat stage, transitional stage or the climatic climax habitat stage.
- * - Percentage is shared between size structure classes, either up or down the size scale.
- (4) Historic ranges of variability are for the Metolius LSR based on plant associations described in the Metolius Watershed Analysis (10/95).

Table 14 - Desired Amounts of 4 types of vegetative Conditions for Metolius LSR

PAG (1)	PRELIMINARY STAGE (2)	SUITABLE HABITAT % FIRE (3)	TRANSITIONAL STAGE (4)	SUITABLE HABITAT % CLIMATIC (5)
MH	15 (0-30)	NA	15 (0-30)	70 (40-70)
MCW	30 (20-40)	10 (5-20)	10 (0-20)	50 (40-60)
MCD	25 (20-30)	60 (45-75)	10 (5-20)	5 (0-10)
PPW/D	20 (10-30)	65 (50-80)	10 (5-20)	5 (0-10)
LPW/D	40 (20-60)	NA	10 (0-20)	50 (30-70)

(1) Plant Association Groups (PAGs) are the combinations of plant associations, described by Volland (1988), and grouped according to productivity and growth potential. While PAGs work well as guidelines for landscape analysis, specific plant associations or individual stand measurements where available, should be used for site specific prescriptions to best meet long term habitat objectives

(2) Preliminary vegetation: Stands in this group do not satisfy the habitat requirements of either climatic climax or fire climax dependent or associated species. These stands encompass a wide range of structures and densities but share the common characteristic that large trees are not prevalent.

Management of these stands should emphasize growth into the late successional old growth condition as quickly as possible. Management activities in high risk stands could move them towards this group by thinning to lower susceptibility to bark beetles so existing trees can rapidly continue their development towards large trees. It may also take the form of a prescribed burn to remove hazardous levels of fuels. In frequent fire adapted ecosystems, lack of management will result in cycling from other categories back to this category as a result of insect, disease, and wildfire.

(3) Stable fire climax suitable habitat: Stands in this group satisfy the requirements for suitable fire climax habitat and are below upper management zones. Without density management, or the re-introduction of fire, these stand types often progress into the unstable fire climax stage described below and may progress into unstable climatic climax suitable habitat. Continued density reduction through mechanical thinning or thinning by prescribed fire will maintain stands in this category.

(4) Transitional vegetation: This condition exists when stable fire climax vegetation increases in density and becomes unstable fire climax but not yet suitable climatic climax. This condition is above the upper management zone but below the density levels or large tree sizes required to achieve optimal climatic climax suitable habitat. Management in these stands should focus on developing large trees, developing the understory conditions needed for climatic climax, when large trees are already present, or density reduction to return the stand to suitable fire climax conditions.

(5) Climatic climax suitable habitat: This group has the structural attributes necessary for climatic climax late successional old growth habitat, i.e. nesting, roosting and foraging habitat for the northern

spotted owl. In most situations, this habitat cannot be managed to both retain these essential characteristics and be below the upper management zone. In some cases, however, it could be thinned, prior to some natural endemic event, to a fire climax late successional old growth condition which is stable and could, in a relatively short period of time once again be suitable climatic climax. This action might be appropriate if there are disproportionately large amounts of climatic climax and small amounts of fire climax. Without treatment this vegetation group will revert to some variation of the preliminary vegetation stage or, less likely, to transitional vegetation.

Under active management and no management scenarios, it is very likely that the stand would not remain over time as climatic climax habitat. The difference would be that under active management the desired large tree structure could likely be retained over time; under no management it would likely not be retained.

. VIII . CRITERIA FOR APPROPRIATE TREATMENTS

The ROD lists two principal objectives for silvicultural activities in LSRs. The primary objective is the development of late-successional and old growth forest habitats (enhancement). The second is the prevention of large scale high intensity disturbance that would affect habitat to the extent that the LSR would no longer be able to sustain viable populations of LS/OG-dependent species (risk reduction). Additional treatments can be used in LSRs to reduce risks of large scale disturbance to Riparian Reserves, and to meet Aquatic Conservation Strategy objectives.

Treatments are determined to be appropriate when they move stand or landscape conditions from what exists to what is desired to meet LSR objectives. A list of MLSR management goals and objectives that address the intent of the Northwest Forest Plan, Forest-wide LSR Overview, the Deschutes National Forest Land Management Plan, the Final Draft Recovery Plan, and sustainable ecosystems are provided, followed by criteria for the landscape and the various structural stages for stands in specific PAGs.

A. HABITAT RISK IN THE EAST CASCADES PROVINCE

Both the Northwest Forest Plan and the Spotted Owl Recovery Plan recognized the increased risk of fire, insect and disease associated with the MLSR. The following summary of these two plans provides the basis for MLSR treatment criteria and management recommendations.

Northwest Forest Plan

The Northwest Forest Plan acknowledges the ecological principles important in the east Cascade provinces:

“in the warmer, drier Physiographic provinces,...fire is more frequent, less intense, and is an integral part of the internal dynamics of a typical stand (tens to thousands of acres). In the drier provinces, fire control and timber harvest have decreased the abundance of some types of OG, such as ponderosa pine, that are dependent on frequent low intensity fires. Other types of late-successional forest that are less fire resistant or are less desirable for harvest have become more widely distributed. In these areas, the potential for stand-replacing wildfires has increased, resulting in a higher risk to the stability of current stands reserved for LS species” (B-4).

It is recognized that in the East Cascade province, management that goes beyond these guidelines may be considered: “silviculture aimed at reducing the risk of stand-replacing fires may be appropriate.

Density reduction in mid-level canopy layers by thinning may reduce the probability of crown fires”(B-7). and “In some LSRs in these provinces, management that goes beyond these guidelines may be considered. Levels of risk in those LSRs are particularly high and may require additional measures. Consequently, management activities designed to reduce risk levels are encouraged in those LSRs even if a portion of the activities must take place in currently late-successional habitat. While risk reduction efforts should generally be focused on young stands, activities in older stands may be appropriate if: 1) the proposed management will clearly result in greater assurance of long-term maintenance of habitat, 2) the activities are clearly needed to reduce risks, and 3) the activities will not prevent the LSRs from playing an effective role in the objectives for which they were established.” (C-13)

Final Draft Recovery Plan For The Northern Spotted Owl (Dec, 1992)

The Recovery Plan sets goals and recommends management actions needed to bring the northern spotted owl to a condition in which it no longer needs the protection of the Endangered Species Act. The Plan clearly recognizes the threats in the Eastern Cascades province:

“Declining Habitat - a moderate threat. Habitat levels probably increased in historic times, as fire suppression allowed pine-dominated stands to develop a second canopy of mixed conifer.” (page 148)

“Vulnerability to Natural Disturbance - The potential for large-scale loss of owl habitat from fire is higher here than for any other Oregon province, and is considered a severe threat. There is a low probability that DCAs in the province will avoid a stand replacing fire over a significant portion of the landscape during the next century. Loss of habitat is currently occurring as drought is creating forest health conditions which are expected to decrease the acreage of suitable habitat in the province.” (page 149)

Biological Goals and Implementation on Federal lands -

“These forest health concerns include the potential for significant loss of habitat on the Deschutes National Forest. DCAs in this area of catastrophic risk may require forest management activities beyond those recommended for most DCAs. These activities should focus on unsuitable habitat, but may occur in suitable habitat.” (page 149)

Forest protection Guidelines for the NSO - Appendix E (Agee and Edmunds, 1992)

“Fire - HIGH RISK - will need fuelbreak system plus substantial underburning particularly in lower elevation habitat, to break up fuel continuity. South aspects a high priority.... Subsequent wildfire severity and extent reduced t some cost to existing owl habitat.

“Wind - LOW RISK

“Insects - HIGH RISK - stand density control is imperative on most sites to reduce stocking and stress on existing stands. Extensive thinning could increase root rot problems. Mortality already occurring in pine.

“Diseases - HIGH RISK - likely to increase in absence of fire. Underburning may help to control some disease by burning out stumps harboring disease organisms.” (page 185 - Disturbance Agents and Risk)

“FIRE - A total fire suppression strategy has created the multilayered yet unstable forest structure present on the landscape today. There is a very low probability that any DCA created in the East

Cascades sub-region will avoid catastrophic wildfires over a significant portion of its landscape during the next century

“INSECTS - Fire exclusion, coupled with natural mortality factors, gradually reduce the pine and larch components of mixed conifer stands.the resulting multistoried stands of Douglas-fir and true fir create conditions for the buildup of defoliators. Douglas-fir tussock moth and western spruce budworm populations will increase with frequent outbreaks.Accumulations of heavy fuels within stands will make total fire protection very difficult.” (Likely Outcome of a Total Protection Strategy During the Next Century, page 232-233)

“There are no forest protection options to maintain owl habitat at its current level in the East Cascades sub-region. As noted, the current extensive habitat is likely a result of an historical anomaly: successful fire protection. The structure resulting from this anomaly is inherently unstable, subject to increased fire, wind, disease, and insect damage. Any stand manipulation which will significantly increase resistance to these disturbance factors apparently will result in decreased owl habitat.” (Forest Protection Guidelines, page 233)

“Forest ecosystems are dynamic. They change with or without active management.A recommendation to implement a strategy that in fact reduces optimum owl habitat may seem a paradox. We believe that such implementation will in the long run better protect owl habitat than a short-sighted attempt to continue total protection. ...Active management of habitat in the East Cascades sub-region, through protection strategies designed to prevent large-scale catastrophic events, is the most rational management direction.” Conclusions, page 234)

The Designated Conservation Areas (DCAs) on the Deschutes National Forest were recognized as being vulnerable to large scale loss of owl habitat from severe threat of fire (page 149). The Plan indicates that DCAs on the DNF may require forest management activities beyond those recommended in Section III.c (pages 63-93) of the Plan. The plan recommends focusing on unsuitable habitat, but activities may occur in suitable habitat. The Recovery Plan states: “at this time, three DCAs (OD-51, OD-52 and OD-53) have been identified as possibly needing higher levels of forest management to reduce the risk of significant habitat loss”. These three DCAs are within the Metolius LSR. The Recovery Plan recommends that Matrix Prescription C (Managed Pair Areas) be established around all currently known and future-discovered owl activity centers in the matrix outside of DCAs.

The Deschutes NF met with Dave Johnson and Kay Ogden for the Recovery Plan Team on October 2, 1992 and October 16, 1992, respectively, to discuss the severe risk of habitat catastrophic habitat loss. An October 26, 1992 letter to Richard S. Holthausen, Northern Spotted Owl Recovery Team, from Jose Cruz, Forest Supervisor, documents the Forest recommendations for the Recovery Plan.

The Deschutes NF Science Team has recently recommended (January, 1996) an approach for consistently defining and determining spotted owl dispersal habitat for east side ecosystems on the Deschutes. Two solutions are proposed for evaluating dispersal habitat:

- 1) For those plant associations with the site capability to meet and sustain the 11-40 standard, continue to do so.
- 2) For those plant associations that cannot meet or sustain the 11-40 standard, we will use local forest conditions and local biological knowledge of what is likely to be dispersal habitat.

In areas that cannot meet or sustain the 11-40 standard, local biological conditions will be described using peer reviewed literature, practical field experience, and radio telemetry data pertinent to East

Cascade ecosystems. Site-specific requirements include the physical elements that provide overhead cover, roosting structure, prey habitat, and dispersal habitat amounts.

Project-level assessments will evaluate dispersal habitat conditions and forward site-specific descriptions, together with the rationale for the descriptions, to the Deschutes Science Team for peer review.

B. GOALS OF THE METOLIUS LSR

(1) Provide sustainable vegetative conditions within the natural range of variability typical of the Eastern Oregon Cascade Province where succession of vegetation occurred under natural fire regimes. The presence of specific vegetative conditions on the landscape is not static, and will constantly change over time.

The sustainability of habitats across the landscape is most likely when the distribution is similar to that of the historic range of variability. Historically Dry Mixed Conifer med/large tree stands were dominated by early seral (pioneer) species, especially ponderosa pine. These kinds of stands are estimated to have covered between 15% and 42% of the PAG (Table 4). Actively managing for stand conditions that provide habitat over the low end of the range will increase the likelihood of sustainability, but could reduce the amount of currently available habitat for species dependent on dense multi-layered stands. Managing at the high end of the range increases the risks of large scale disturbance, but provides more habitat for species like the spotted owl at least for the short term.

In the Wet Mixed Conifer PAG, the mix of species in med/large tree stands was much broader, depending primarily on the site and length of time since the last disturbance. Approximately 11% to 53% of the PAG was covered by stands dominated by med/large trees (Table 5). Currently, about 12% of the PAG is in stands of this structure and another 81% is in stands dominated by small-sized trees. While the existing amount of med/large tree habitat is within HRV, more can be provided by developing small tree stands into larger tree stands in the sites and plant communities that are able to sustain higher densities of large trees (especially the CD-S6 series which cover 8-10% of the LSR in the mid-elevations).

The best chances to provide climatic-climax conditions will be on lands capable of sustaining them over the long-term. Potential areas include: north-facing slopes, high vegetative site potentials, known terrestrial and avian reproductive core areas, interior and dispersal habitat, existing suitable spotted owl habitat, survey and manage species habitats, and other late-successional refuge areas.

(2) Maintain vegetation conditions in mixed conifer PAGs that support at least nine spotted owl pairs. This desired spotted owl pair number is based on the Designated Conservation Area Future Expected Pair numbers described in the USFWS Final Draft Recovery Plan for the Northern Spotted Owl (December 1992). The goal is to maintain habitat for: one pair within DCA OD-51 (Metolius Horn), three pairs in LSR portion of OD-52 (Abbot Butte), three pairs in OD-53 (Round Lake), and two pairs outside the DCAs. Three additional pairs of spotted owls from the wilderness would contribute to the future desired number for OD-52. Consider trading one or two pairs in Jack-Canyon Matrix for pairs in OD-53 and the adjacent area outside this DCA. This will provide better distribution of owls across the Metolius Watershed, and provides additional management flexibility in the LSR. Providing enough habitat to avoid a "Take" situation would require a total of 10,638 acres or 14% of the LSR. Maintaining suitable habitat levels recommended in the Recovery Plan would require 16,164 acres of suitable spotted owl habitat or an estimated 33 % of the Mixed Conifer PAGs.

(3). Provide 1200 to 1800 acres of suitable spotted owl habitat per pair for a total of 10,600 to 16,200 (14% to 21% of the LSR). This acreage is within the natural range of variability of 15% to 42% and 11% to 53% climatic late-successional conditions in the Dry and Wet Mixed Conifer PAGs, respectively. The nine known spotted owl sites do not currently contain the desired 1,796 acres per home range. In fact the amount of suitable spotted owl habitat in these nine sites ranges from 309 to 1000 acres (Table 11).

(4) Meet the Aquatic Conservation Strategy (ACS) objectives as defined by the Northwest Forest Plan (ROD B-9 thru 17) and the Metolius Watershed Analysis ACS (pages 145 - 149), by restoring and/or maintaining the riparian ecosystem and natural disturbance regimes commensurate with the type of vegetation in the associated uplands (ROD B-9 thru 17, B-20, B-32, B-35). Riparian Reserves constitute a small percentage of the MLSR. Many of these areas are also at risk from fire and insect and disease. Emphasize activities that are needed to protect Riparian Reserves from these high risk disturbance factors.

C. OVERALL OBJECTIVES FOR THE METOLIUS LSR

(1). Move the Ponderosa Pine PAG towards fire-climax late-successional habitat conditions, and the Mixed Conifer PAGs to a mosaic of fire-climax and climatic climax late-successional habitats. Manage for late-successional habitat conditions in fire climax stands that allow for low-intensity/severity prescribed or natural fires.

(2) Promote late-successional habitat by managing stand densities that restore and maintain med/large tree (21" dbh and greater) character. Since medium and large trees are limited, activities that restore the overall abundance and/or reduce the loss of these trees due to overstocked conditions are emphasized. The recent western spruce budworm outbreak has reduced live tree densities in some areas, however, stress-induced root rots and other insects and disease are still likely to occur.

(3) To keep species within a healthy range of variability, white fir should compose less than 20% of tree stocking on dry sites, and less than 30% on wetter sites (personal communication, H. Maffei). Age is a consideration, too. Phillip and Schmitt (1990) cite Aho (1977) stated that grand fir has little defect when less than 100 years old, and has considerable decay after age 150. "Second generation" true fir may experience insect and disease problems at earlier ages, due to the increased level of pathogens introduced from first generation firs (personal communication, H. Maffei). Minor amounts of true firs can help to meet various resource objectives, such as presence of soft snags for cavity excavators, hiding cover, foraging, nesting, roosting habitat, etc. while minimizing potential for stand-level and landscape-level forest health problems, but major amounts are outside the range of historical variability and cannot be sustained over time.

(4). Remove dead material necessary to reduce the potential for catastrophic habitat loss from wildfire. High stand densities and large amounts of dead fuels have resulted in ladder and ground fuels increasing the risk of catastrophic fires in some areas. Reducing down fuel loads in the large size classes represented by the current mortality could reduce predicted fire sizes by 50-80%. Reducing stand densities in mid-level canopy layers will also reduce ladder fuels and the probability of crown fires.

(5). An estimated 94%, 79% and 92% of the dry mixed conifer, wet mixed conifer and ponderosa pine, respectively, have an average stand size of 20.9" dbh or smaller. Use treatments such as commercial thinning, precommercial thinning, salvage, pruning, release and/or prescribed fire to develop late-successional habitats and large tree characteristics.

(6). Design, develop and maintain fuel-breaks in the LSR. Fuelbreaks should be used to protect known terrestrial and avian reproductive core areas and activity centers; Riparian Reserves and associated uplands identified to meet connectivity concerns; interior and other connectivity habitats; existing suitable spotted owl habitat, survey and manage species habitats, and other late-successional refugia areas.

(7). Design treatments to reduce forest fragmentation and provide well connected late-successional habitats. The LSR is highly fragmented and existing late-successional habitats are poorly connected.

(8). Retain all down log and snag habitat components necessary to promote sustainable late-successional habitat conditions. In the long term, snags retained should have the diversity of tree species and sizes representative of the site. Maintain a variety of down wood sizes. Numbers of snags and amounts of coarse woody material necessary to provide 100% MPP will be determined at the project analysis level and should be consistent with the current peer reviewed literature discussed in Appendix 2.

(9). Identify reproductive sites and/or activity centers when possible, and protect the integrity of these sites. In addition, implement activity restrictions as need to avoid disturbing reproducing species.

D. STAND-LEVEL CRITERIA FOR DEVELOPING APPROPRIATE TREATMENTS

The number of acres listed for each PAG and the percentages for each structural class may be noted differently in this section than what is shown in Chapter III, Tables 4, 5, and 6. This difference is due to refinement in the inventory process and more accurate GIS calculations.

There are no treatment strategies discussed in this section for the High Elevation Mountain Hemlock PAG. This Pag is very small in the Metolius LSR (less than .01%) and is almost always associated with Riparian Reserves.

1. Ponderosa Pine PAG (25,120 acres)

LANDSCAPE DESIRED CONDITION

Range of Seral Classes:

- grass/shrub/forb - 5-30%
- seed/sapling - 3-21%
- pole - 3-21%
- small - 20-50%
- medium/large - 30-70%

Generally homogenous landscape of scattered large trees, reproduction in even-aged clumps up to several acres in size, scattered grass/shrub/forb openings, 1/10 to 1/4 acre in size with a few larger. Stands are denser in riparian bottomlands and other moist ecotones, sparser on steep south facing slopes. Other species present include Douglas-fir and western larch in moist ecotones, juniper and incense cedar on drier ecotones; some lodgepole stands. Understories are primarily shrub and grass. Large snags and down logs are evenly distributed, and only rarely concentrated where openings result from root rot, bark beetle mortality, or localized high intensity fire. Low intensity fire is the primary disturbance agent, with fire return intervals ranging from 8 to 20 years. Windthrow is locally a factor.

NEW REGENERATION (5% OF PAG)

Existing Stand Condition:

The amount of this seral class is within the historic and desired range of conditions. Even-aged plantations, generally exclusively planted to pine, occasionally containing volunteer or natural regeneration of other species from adjacent areas. Generally high shrub, grass and forb component. Usually few if any large down logs, snags, or remnant large green trees are present, unless it is a recent (since about 1985) shelterwood.

Objectives and Thresholds for Action:

Objective - Develop future late-successional stands quickly by taking advantage of the potential for regenerated stands to rapidly develop large healthy trees. Allow high stand densities to encourage the development of a dominant size class.

Threshold - usually none. Monitor for insect, disease, or predation that would remove enough young trees that an adequate stand could not develop without additional planting.

Treatment Strategies:

Base density prescriptions on adjacent stand health and the previous survival history of similar plantations.

Resulting Stand:

No significant changes prior to stands reaching seedling/sapling size class. New plantations in this PAG should include some species diversity where possible. Consider other seral species as appropriate for the plant association. Also consider varying planting densities and patterns where past history indicates good survival success.

Meeting LSR Objectives:

Plantations provide conditions conducive to development of future LS/OG stands. New plantations can be designed to enhance LS conditions by retaining or adding species diversity, variable spacing, and retaining large green trees, snags, and down logs.

SEEDLING, SAPLING, AND POLE PLANTATIONS (10% OF PAG)

Existing Stand Condition:

The amount of this seral class is within the range of historic or desired conditions. High density of young trees, (400+ per acre) usually single species between 5" and 9" dbh, but often with some variety in species from residual stand or natural regeneration; high variety of early seral shrubs, grass, and forbs. Few or no overstory trees remaining.

Objectives and Thresholds for Action:

Objective - Develop future late-successional stands quickly by taking advantage of the potential for regenerated stands to rapidly develop large healthy trees.

Threshold - The timing for precommercial-sized thinning is difficult to quantify. These stands are usually growing at rates that discourage insect and disease problems, and only develop basal areas that approach the upper management zones of the appropriate plant association when they reach sizes of approximately 4"- 6" dbh. Desired stocking levels are generally between the upper and low management zone boundaries for the appropriate plant association. Generally, plantations are thinned after stand densities have forced some individual trees to begin to express dominance, but before growth begins to slow down. The timing must be balanced between the desire to provide some cover via dense stands, and the need to thin before trees become so large that cover is reduced by self-pruning, growth rates slow down or stagnate, and/or the cut trees will produce an unmanageable fuel load.

Treatment Strategies:

Thin plantations to favor and develop the larger dominant and co-dominant trees. Favor seral species such as ponderosa pine, Douglas fir, and larch. Climax species such as white fir can be left for diversity, but should not comprise more than 5% of the resulting stand, and should be left in clumps rather than as individual trees. Spacing should be as random as possible given the limitations of marking and contracting feasibility. Specify several spacing regimes or variable spacing within a plantation, e.g. untreated clumps, 16x16 average and 18x18 average.

Where plantations are surrounded by existing mortality, consider falling dead trees into the plantation to increase coarse woody debris. Balance the increased fuel load with the decreased risk of fire in the surrounding stands.

To the extent practical, thinning should be done to a stocking level that precludes the need for future entries. Generally, this would require a spacing of 35 to 50 feet. Higher stand densities may be maintained to provide short-term cover and require further thinning. Or stand densities may be lowered too much to the extent that future insect, disease, or fire mortality require interplanting to maintain desired stand structure.

Fuel treatment depends on the location of the plantation and the size and number of trees removed. Where they do not contribute significantly to the fuel profile, protect and retain shrubs, grasses, forbs, snags and large (>16" dbh x 16' long) CWD. Resulting fuel profile should not increase the overall risk to the LSR. Consider the following fuel treatments in descending order of preference for enhancing LSR characteristics, but ascending order of risk reduction:

1. no fuel treatment.
2. partial treatment - treat patches sufficient to reduce overall risk; pull fuel back along road to create defensible fuelbreaks; pull fuel away from leave trees and clumps; lop or lop and scatter limbs.
3. prescribed underburn all or part of plantation.
4. hand pile all or part of plantation; burn all or part of the piles (piles can be left for wildlife cover).
5. machine pile and burn all or part of plantation.

Resulting Stand:

Thinned plantations in pine should contain the best dominant and co-dominant pine, Douglas fir and larch. Other species are present but make up less than 5% of the total stand. Trees are randomly scattered, in small groups, or in clumps up to several acres in size. Shrubs, grasses, and forbs are present, as are remnant large trees from the pre-regeneration stand. Snags and down wood, especially large pieces, are present, but overall fuel loads do not increase the risk of fire that would preclude the eventual development of late-successional stands.

Meeting LSR Objectives:

Thinning plantations as described above enhances Late-Successional conditions by: 1) accelerating the development of stand size and structure by taking advantage of rapid growing conditions in young stands, and 2) by retaining other elements of LS/OG forests -- species diversity, soil and undergrowth productivity, untreated refugia, snags and CWD, and other remnants of the original forest.

Thinning reduces the risk to late-successional habitats by: 1) providing stand densities, species composition, and stand arrangements that are sustainable and resilient, and 2) by changing both live and dead fuel profiles to reduce the risk of fires that burn at high enough intensities to threaten LS/OG resources.

SMALL SIZE CLASS STANDS (78% OF PAG)

Existing Stand Condition:

The amount of this seral class is greater than the range of historic or desired conditions. These stands are typically dominated by 25 to 90 ponderosa pine 9"-21" dbh in the representative plant association (CP-S2-11). Understory is usually in high density clumps or continuous stands of pine poles and saplings. Some managed stands of high density pole to small sized trees with no overstory.

Objectives and Thresholds for Action:

Objective - Protect remaining large trees by reducing stress and fire risk from fuel loading and arrangement. Protect private property and rural lands from fire as well as LS/OG stands next to rural development. Reduce risk of high intensity fire damaging core habitat areas for focal species or special and unique habitats. Reduce fuel loads and continuity. Promote the most desirable 9" to 21" individuals into the medium and large size class.

Threshold - Stand basal areas at or exceeding the upper management zones of SDI. Understories may exhibit increasing levels of pine beetle. Understory thickets may form ladder fuels that threaten large trees even in low intensity fires. In stands that have not been thinned or prescription burned, the combination of dense understory, decadent shrubs covering more than 50% of the area, and duff layers more than 2" to 4" deep, will lead to fires of moderate to high intensity. These fires can only be attacked by indirect methods that limit the amount of protection that can be provided to adjacent lands and resources.

Objective - Enhance habitat for PEPE and other fire-dependent flora associated with LS/OG stands.

Threshold - Less than 10% of the area has bare mineral soil and /or canopy closure greater than 60%. Grass and forb communities consist of only a few species or individuals, and species known to occur in this plant community under a low intensity fire regime are missing.

Treatment Strategies:

Stand density reduction -- thin clumps and remove trees in the 9" to 21" range, especially those that contain or surround large trees. Reduce competition for light, water, and nutrients; remove ladder fuels; promote development of future large trees.

Tree culturing -- Thin understory thickets and/or remove sub-dominant trees larger than 9" dbh around large dominant and co-dominant pine, Douglas fir and larch. This reduces stress on specific large trees desired for nesting, perching or roosting habitat, or can also be used where stand level treatments are not appropriate or unfeasible.

Fuel breaks -- combinations of understory thinning, reduction of ladder fuels, break up of fuel continuity, reducing amounts of fine and heavy ground fuels. Reduce fire intensity and increase likelihood of successful suppression. Maintain LS/OG stand conditions at the lower boundary of the management zone, with most of the basal area in the largest available trees.

Prescribed fire -- Use low intensity fire for stand density reduction, fuel profile modification, and to provide conditions conducive to regeneration of grasses, shrubs and forbs. In stands that are deficit in snags and large down wood, use the prescription or low impact methods to protect the necessary amounts.

Resulting Stand:

FOR FIRE CLIMAX STANDS - CP-S2-xx and CPS3-12 plant associations. Stands exhibit most of the characteristics of LS/OG stands described under Moderate to Large size class stands below. Generally one or two storied stands, less than 40% canopy closure, dominated by 10-30 trees larger than 17 inch dbh.. Densities in these stands are usually at or about 90% of the upper management boundary for the appropriate plant association. Initially, there may be few individuals over 21" dbh, but the reduced stand densities and selection of the most vigorous large leaf trees will allow for growth. Understories are almost entirely ponderosa pine in scattered individuals or thinned even-aged clumps. Some (10-25% of the area) is bare soil conducive to regeneration of the associated shrubs and grasses. Snags are present, but some stands may not have sufficient numbers to meet 100% MPP for focal species (usually about 4 snags/acre). Down logs are scattered throughout the stand (2 to 7 pieces per acre, 25" dbh by 16' in size), associated with windthrow or fallen snags. As with snags, some stands may not have the desired levels> Stands managed with prescribed fire or for fuelbreaks may have less than desired numbers of snags and down logs. Some of the large live trees may have spike tops.

FOR CLIMATIC CLIMAX STANDS - CP- S3-11, CP-S3-14, and CP-G2-12 plant associations. In moister ecotones such as riparian bottoms or north slopes, or other areas with longer than usual fire return intervals, stands may be denser (>40% canopy cover), clumps may be larger; more shade tolerant trees and shrubs may be present. There may be higher numbers of large pine in the overstory and more snags and down logs.

Meeting LSR Objectives:

Stand density reduction and tree culturing reduces risks of stress-induced mortality and moderate to high intensity fires, and develops and maintains late-successional habitats.

Prescribed low intensity fire thins understories to reduce risks as described above, creates openings in shrub understories, reduces duff cover, and removes competing species to allow development and expansion of fire dependent focal flora species.

MEDIUM TO LARGE SIZE CLASS STANDS (7% OF PAG)

Existing Stand Condition:

The amount of this seral class is less than the historic or desired range of conditions. Existing stands have 10 to 30 large trees per acre (21+ dbh), with understories in even-aged high density clumps. Some shade tolerant tree species are present, but comprise less than 5% of the total canopy cover.

Objectives and Thresholds for Action:

Objective - Maintain and protect existing LS/OG habitats.

Threshold - Densities exceed the upper management zone of SDI. Stands are imminently susceptible to stand replacing insect, disease or fire mortality over areas larger than 10 acres.

Treatment Strategies:

Stand density reduction -- thin clumps and remove trees in the 9" to 21" range, especially those that contain or surround larger trees. Reduce competition for light, water, and nutrients; remove ladder fuels; promote development of future large trees.

Prescribed fire -- Use low intensity fire for stand density reduction, fuel profile modification, and to provide conditions conducive to regeneration of grasses, shrubs and forbs. In stands that are deficit in snags and large down wood, use the prescription or low impact methods to protect the necessary amounts.

Resulting Stand:

FOR FIRE CLIMAX STANDS - CP-S2-xx and CPS3-12 plant associations Generally one or two storied stands, less than 40% canopy closure, dominated by 10-30 trees larger than 17 inch dbh. Understories are almost entirely ponderosa pine in scattered even-aged clumps. Shrubs and grasses are young and vigorous, reflecting the influence of frequent low intensity fire. Snags are present, but some stands may not have sufficient numbers to meet 100% MPP for focal species (usually about 4 snags/acre). Down logs are scattered throughout the stand (2 to 7 pieces per acre, 25" dbh by 16' in size), associated with windthrow or fallen snags. As with snags, some stands may not have the desired levels> Stands managed with prescribed fire or for fuelbreaks may have less than desired numbers of snags and down logs. As many as 10% of the large live trees may have spike tops.

FOR CLIMATIC CLIMAX STANDS - CP- S3-11, CP-S3-14, and CP-G2-12 plant associations In moister ecotones such as riparian bottoms or north slopes, or other areas with longer than usual fire return intervals, stands may be denser and multi-storied, with more seedlings, saplings or poles in the understory; clumps may be larger; shade tolerant trees and shrubs may be present; there may be higher numbers of large pine in the overstory and more snags and down logs.

Meeting LSR Objectives:

Reducing imminent susceptibility protects and maintains existing LS/OG habitat over the long term.

2. Mixed Conifer Dry PAG (31,908 acres)

DESIRED LANDSCAPE CONDITION:

Range of seral conditions:

- Grass/Forb/Shrub -- 1 to 7 %
- Seed/Sapling -- 3 to 25 %
- Pole -- 8 to 40%
- Small -- 20 to 75%
- Med/Large -- 23 to 75%

Landscape is a mosaic of varying textures and seral stages, but predominately containing stands of small and med/large trees. Patch sizes are quite large -- 100 to 1000 acres. Ponderosa pine and Douglas-fir are the dominant overstory species with sparse understories of shade tolerant species. Low intensity fire return intervals are longer, 15-30 years, than in the Pine PAGs. Low intensity fire serves a role similar to that in pine, maintaining primarily seral species and preventing the dominance of climax species in most stands. Moderate to high intensity fire is the primary stand modifying disturbance agent at varying intervals. Insects and disease also play a role on a smaller scale. Scattered stands exist where disturbance intervals are longer and allow the development of climatic climax conditions. These stands are generally older and have a higher density of the largest trees. Northern spotted owl habitat is best provided by the climatic climax stands. Up to 30% of the dry MC PAG could be in this condition and be still be consistent with the historical range of variability for wet cycles. Generally however, the percentage of stands in a late-successional climatic climax condition will be much lower and limited to moister ecotones with relatively high site potential.

NEW REGENERATION (<1% OF PAG)

Existing Stand Condition:

The amount of this seral class is lower than the historic or desired range of conditions. Even-aged plantations of ponderosa pine and/or Douglas-fir, occasionally containing volunteer or natural regeneration of other species from adjacent areas. Generally high shrub, grass and forb component. Usually few if any large down logs, snags, or remnant large green trees are present, unless it is a recent (since about 1985) shelterwood..

Objectives and Thresholds for Action:

Objective - Develop future late-successional stands quickly by taking advantage of the potential for regenerated stands to rapidly develop large healthy trees. Allow high stand densities to encourage the development of a dominant size class.

Threshold -- usually none. Monitor for insect, disease, or predation that would remove enough young trees that an adequate stand could not develop without additional planting.

Treatment Strategies:

Base density prescriptions on adjacent stand health and the previous survival history of similar plantations.

Resulting Stand:

No significant changes prior to stands reaching seedling/sapling size class. New plantations in this PAG should include some species diversity where possible. Consider other seral species as appropriate for the plant association. Also consider varying planting densities and patterns where past history indicates good survival success.

Meeting LSR Objectives:

Plantations provide conditions conducive to development of future LS/OG stands. New plantations can be designed to enhance LS conditions by retaining or adding species diversity, variable spacing, and retaining large green trees, snags, and down logs.

SEEDLING, SAPLING, AND POLE PLANTATIONS (17% OF PAG)

Existing Stand Condition:

The amount of this seral class is less than the historic or desired range of conditions. High density of young trees, (400+ per acre) usually single species between 5" and 9" dbh, but often some variety in species from residual stand or natural regeneration; high variety of early seral shrubs, grass, and forbs. Few or no overstory trees remaining.

Objectives and Thresholds for Action:

Objective - Develop future late-successional stands quickly by taking advantage of the potential for regenerated stands to rapidly develop large healthy trees.

Threshold - The timing for precommercial-sized thinning is difficult to quantify. These stands are usually growing at rates that discourage insect and disease problems, and only develop basal areas that approach the upper management zones of the appropriate plant association when they reach sizes of approximately 5" to 7" dbh. Desired stocking levels are generally between the lower and upper management zone for the appropriate plant association. Generally, plantations are thinned after stand densities have forced some individual trees to begin to express dominance, but before growth begins to slow. The timing must be balanced between the desire to provide some cover via dense stands, and the need to thin before trees become so large that cover is reduced by self-pruning, growth rates slow down or stagnate, and/or the cut trees will produce an unmanageable fuel load.

Treatment Strategies:

Thin plantations to favor and develop the larger dominant and co-dominant trees. Favor seral species such as ponderosa pine, Douglas fir, and larch. Climax species such as white fir can be left for diversity, but should not comprise more than 20% of the resulting stand, and should be left in clumps rather than as individual trees. Spacing should be as random as possible given the limitations of marking and contracting feasibility. Specify several spacing regimes within a plantation or variable spacing, e.g., untreated clumps, 16x16 average and 18x18 average.

Plantations in Dry Mixed Conifer afford the best opportunities to make long-term adjustments in the types of habitat to be provided in the LSR. Generally, plantations on sites with low productivity and drier ecotones such as south and west slopes, the tops of ridges and other flat areas in the eastern part of the PAGs should be managed to provide fire climax stands maintained by low to medium fire regimes; and characterized by low density, open stands of seral species. Conversely, plantations in areas with higher productivity, on north aspects, midslopes and drainage bottoms, can be aimed towards climatic climax stands with longer disturbance intervals, and characterized by denser, more diverse stands.

Where plantations are surrounded by existing mortality, consider falling dead trees into the plantation to increase coarse woody debris. Balance the increased fuel load with the decreased risk of fire in the surrounding stands.

To the extent practical, thinning should be done to a stocking level that precludes the need for future entries. Generally, this would require a spacing of 35 to 50 feet. Higher stand densities may be maintained to provide short-term cover and require further thinning. Conversely, stand densities may be lowered too much to the extent that future insect, disease, or fire mortality require interplanting to maintain desired stand structure.

Fuel treatment depends on the location of the plantation and the size and number of trees removed. Where they do not contribute significantly to the fuel profile, protect and retain shrubs, grasses, forbs, snags and large (>16" dbh x 16' long) CWD. Resulting fuel profile should not increase the overall risk to the LSR. Consider the following fuel treatments in descending order of preference for enhancing LSR characteristics, but ascending order of risk reduction:

1. no fuel treatment.
2. partial treatment -- treat patches sufficient to reduce overall risk; pull fuel back along road to create defensible fuelbreaks; pull fuel away from leave trees and clumps; lop or lop and scatter limbs.
3. prescribed underburn all or part of plantation.
4. hand pile all or part of plantation; burn all or part of the piles (piles can be left for wildlife cover).
5. machine pile and burn all or part of plantation.

Resulting Stand:

Thinned plantations should contain the best dominant and co-dominant pine, Douglas fir and larch. Other species are present but make up less than 20% of the total stand. Trees are randomly scattered, in small groups, or in clumps up to several acres in size. Shrubs, grasses, and forbs are present as are remnant large trees from the pre-regeneration stand. Snags and down wood, especially large pieces, are present, but overall fuel loads do not increase the risk of fire that would preclude the eventual development of late-successional stands.

Meeting LSR Objectives:

Thinning plantations as described above enhances Late-Successional conditions by: 1) accelerating the development of stand size and structure by taking advantage of rapid growing conditions in young stands, and 2) by retaining other elements of LS/OG forests -- species diversity, soil and undergrowth productivity, untreated refugia, snags and CWD, and other remnants of the original forest.

Thinning reduces the risk to late-successional habitats by: 1) providing stand densities, species composition, and stand arrangements that are sustainable and resilient, and 2) by changing both live and dead fuel profiles to reduce the risk of fires that burn at high enough intensities to threaten LS/OG resources.

SMALL SIZE CLASS STANDS (76% OF PAG)

Existing Stand Condition:

The amount of this seral class is just greater than the historic or desired range of conditions. Overstory primarily pine and Douglas-fir 9-21 inch dbh, averaging 30 to 140 trees per acre in the representative plant association (CW-C2- 11). Understory is uniformly dense and continuous stands of white fir, pine, or Douglas-fir poles and saplings. Some managed stands of high density pole to small sized trees with little to no overstory.

Many of these stands have significant mortality from defoliators, over stocking and root diseases, averaging 20%, but locally up to 80%. Many of the remaining live trees have substantial top kill and poor vigor, and will never grow to larger sizes. Standing fuel loads are extremely high.

Objectives and Thresholds for Action:

Objective - Protect remaining large trees, especially ponderosa pine and Douglas-fir, by reducing stress and fire risk from fuel loading and arrangement. Protect private property and rural lands from fire as well as LS/OG stands next to rural development. Reduce risk of high intensity fire damaging core habitat areas for focal species or special and unique habitats. Reduce fuel loads and continuity. Develop and maintain stands that are predominately influenced by low intensity fire.

Threshold - Stand basal areas in or exceeding the upper management zones of SDI. More than 20% of the understory contains shade-tolerant species such as white fir. Increasing levels of pine beetle, fir engraver, spruce budworm or other defoliators, especially in the understory, will result in significant change to or loss of late-successional characteristics, i.e., canopy cover, large trees or stand co-dominants. Root rot pockets are increasing in size and removing the few remaining large overstory trees. Mortality from insects and disease is more than 10 to 15% of the stand. Understory thickets may form ladder fuels that threaten large trees even in low intensity fires. In stands that have not been thinned or prescription burned, the combination of dense understory and standing and down dead fuels (especially those less than 12" dbh), will lead to fires of moderate to high intensity. These fires can only be attacked by indirect methods that limit the amount of protection that can be provided to adjacent lands and resources.

Objective - Enhance habitat for PEPE and other fire-dependent flora associated with LS/OG stands.

Threshold - Less than 10% of the area has bare mineral soil and /or canopy closure greater than 60%. Grass and forb communities consist of only a few species or individuals, and species known to occur in this plant community under a low intensity fire regime are missing.

Treatment Strategies:

Stand density reduction -- thin understories to reduce competition and ladder fuels, and promote development of additional and future large trees, especially ponderosa pine and Douglas-fir. Desired canopy closure is between 30% and 40% on drier sites, more than 40% on moister ecotones and higher

site potentials. Thinning should favor seral species, with no more than 20% of the site stocked with white fir. Remove most or all dead and dying trees less than 21" dbh, but maintain larger snags and green trees of low vigor. Stands without much mortality will still benefit from understory thinning, but may not need removal of dead material to reduce fire risk.

Fuel breaks -- in areas where stand manipulation is not desirable (riparian reserves, owl activity circles, sensitive soils or remnants of climatic climax habitat), or to isolate areas that won't be entered, combinations of understory thinning, pruning, interruption of dead and down fuel continuity may be used to reduce fire intensity and rate of spread, and increase the likelihood of successful suppression. Link existing openings where feasible. Fuelbreaks should continue to exhibit some LS/OG components at the low end of the stocking range -- open stands of predominately medium to large trees, 20-40% canopy closure, and isolated clumps of younger trees. Widely distributed snags and large down logs will be present, but in limited numbers.

Tree culturing -- Thin understory thickets and/or remove sub-dominant trees larger than 9" dbh around large dominant and co-dominant pine, Douglas fir and larch. This reduces stress on specific large trees desired for nesting, perching or roosting habitat, or can also be used where stand level treatments are not appropriate or unfeasible.

Small Group Treatments - Designed to reduce the spread of root rot and subsequent loss of late-successional conditions and natural diversity in vast areas over time by removing susceptible tree species from small (2 to 9 acre) root rot pockets. Where they exist, leave all or most (thin from below if necessary) of the trees of resistant species, e.g. pine and larch. If necessary to maintain some short-term structure, consider leaving 10 to 15 of the largest (>21" dbh) trees of root rot susceptible species, and interplant with seral, resistant species. Also, in order to create a mix of composition and structure across the landscape to benefit development and retention of late-successional conditions, small group treatments can be used to reestablish seral species where no seed source exists because of mortality or the dominance in the stand of climax species.

Remove Mortality - in stands where mortality exceeds 10 to 15% and excessive standing and down fuels pose a risk of fire at intensities that will threaten LS/OG habitat or other resources, remove most or all of the standing dead especially those less than 12" dbh. Consider safety and feasibility when leaving larger snags, averaging up to 7 per acre. Large snags can be left for future down wood where less than desired amounts exist. Where no adequate seed sources exist or the remaining stand is not fully stocked with healthy seral species, consider interplanting.

Prescribed fire - Use low intensity fire for stand density reduction, fuel profile modification, and to provide conditions conducive to regeneration of grasses, shrubs and forbs. In stands that are deficit in snags and large down wood, use the prescription or low impact methods to protect the necessary amounts.

Resulting Stand:

FOR FIRE CLIMAX STANDS (All MCD plant associations) - Stands exhibit most of the characteristics of LS/OG stands described under Moderate to Large size class stands below. Generally one or two storied stands, 20 to 40% canopy closure, dominated by 15-40 ponderosa pine, Douglas-fir, and larch larger than 17 inch dbh. Initially, there may be few individuals over 21" dbh, but the reduced stand densities and selection of the most vigorous large leave trees will allow for growth. Understories are relatively sparse containing individuals or small clumps of ponderosa pine, Douglas fir, or other seral species. Some dense clumps of climax understory remain, but on less than 20% of the area. Some (10-25% of the area) is bare soil conducive to regeneration of the associated shrubs and grasses. Small openings exist, generally less than 10 acres in size, with 10 to 15 trees per acre and some large snags remaining. Snags are present, but some stands may not have sufficient numbers to meet 100%

MPP for focal species (usually about 4 snags/acre). Down logs are scattered throughout the stand (2 to 7 pieces per acre, 25" dbh by 16' in size), associated with windthrow or fallen snags. As with snags, some stands may not have the desired levels, especially those stands managed to reduce fuels.

FOR CLIMATIC CLIMAX STANDS - (Portions of CW-C2-11 and CW-C2-12) In moister ecotones such as riparian bottoms or north slopes, or other areas with longer than usual fire return intervals, stands may be denser; clumps may be larger; shade tolerant trees and shrubs may be present; there may be higher numbers of large pine, Douglas fir, and true fir in the overstory and more snags and down logs.

Meeting LSR Objectives:

Stand density reduction and tree culturing reduce risks of stress-induced mortality and moderate to high intensity fires, and develops and maintains late-successional habitats.

Small shelterwoods develop future LS/OG characteristics by converting or replacing dead, dying or root rot susceptible species with more desirable rot resistant seral species.

Removing mortality reduces the risk of high intensity fires that threaten the remaining LS/OG habitats or lengthen the time of development of LS/OG characteristics.

Prescribed low intensity fire thins understories to reduce risks as described above, creates openings in shrub understories, reduces duff cover, and removes competing species to allow development and expansion of fire dependent focal flora species.

MEDIUM TO LARGE SIZE CLASS STANDS (6% OF PAG)

Existing Stand Conditions:

The amount of this seral class is well below the historic or desired range of conditions. Existing stands have 10 to 30 large trees per acre (21+ dbh), primarily Douglas-fir and ponderosa pine, but some large white fir too. The understory is usually dense white fir.

The understories in these stand have mortality as described above for small-sized stands. In addition, many of the larger overstory trees are dead or dying from combinations of insect, disease, and stress.

Objectives and Thresholds for Action:

Objective - Maintain and protect existing LS/OG habitats.

Threshold - Understory densities exceed the upper management zone of SDI. Stands are imminently susceptible to stand replacing insect, disease or fire mortality over areas larger than 10 acres.

Treatment Strategies:

Stand density reduction - thin clumps and remove trees less than 21", especially those that contain or surround large trees, especially ponderosa pine and Douglas-fir. Reduce competition for light, water, and nutrients; remove ladder fuels; promote development of future large trees.

Remove Mortality - in stands where mortality exceeds 10 to 15% and excessive standing and down fuels pose a risk of fire at intensities that will threaten LS/OG habitat or other resources, remove most or all of the standing dead especially those less than 12" dbh. Incorporate safety and feasibility when leaving the largest individual snags, averaging up to 7 per acre. Large snags can be left for future

down wood where less than desired amounts exist. Where no adequate seed sources exist or the remaining stand is not fully stocked with healthy seral species, consider interplanting.

Prescribed fire - Use low intensity fire for stand density reduction, fuel profile modification, and to provide conditions conducive to regeneration of grasses, shrubs and forbs. In stands that are deficit in snags and large down wood, use the prescription or low impact methods to protect the necessary amounts.

Resulting Stand:

FOR FIRE CLIMAX STANDS - (All MCD plant associations) Generally , 1 or 2 storied stands, open canopies, (but denser than in the Pine PAG), stands dominated by large ponderosa pine, Douglas-fir, and larch. Understory trees and shrubs are evenly distributed primarily shade-tolerant species. White fir do not comprise more than 20% of the stand. Snags are present sufficient to meet 100% MPP for focal species (usually about 4 per acre). Down logs are scattered throughout the stand associated with windthrown snags fallen

FOR CLIMATIC CLIMAX STANDS - (Portions of CW-C2-11 and CW-C2-12) On wetter ecotones at higher elevations, north slopes, and other areas with longer fire return intervals, stands are multi-storied, with 40% to 60% canopy closure, dominated by Douglas-fir, ponderosa pine white fir, western larch and incense cedar. Understory trees are multi-aged, well distributed, but may occur as dense thickets when pioneering a disturbance opening, and composed primarily of shade tolerant species. Snags and large down logs provide a significant amount of the structural complexity.

Meeting LSR Objectives:

Reducing imminent susceptibility protects and maintains existing LS/OG habitat over the long term.

Removing mortality reduces the risk of high intensity fires that threaten the remaining LS/OG habitats or lengthen the time of development of LS/OG characteristics.

3. Mixed Conifer Wet PAG (17,468 acres)

DESIRED LANDSCAPE CONDITION:

Range of seral conditions:

- Grass/Forb/Shrub - 0 to 20%
- Seed/Sapling - 3 to 54 %
- Pole - 7 to 51%
- Small - 13 to 57%
- Med/Large - 11 to 53%

Landscape is a mosaic of varying textures and seral stages, but predominately containing stands of small and med/large trees. Patch sizes are quite large - 100 to 1000 acres in size. Ponderosa pine and Douglas-fir are the dominate overstory species with sparse understories of shade tolerant species. Moderate to high intensity fire is the primary disturbance agent at varying intervals. Insects and disease also play a role, on a smaller scale.

NEW REGENERATION (<1% OF PAG)

Existing Stand Condition:

The amount of this seral class is below the range of historic or desired conditions, primarily because of fire suppression and the resultant elimination of recent stand replacement fires. What little that exists is in even-aged plantations of ponderosa pine and/or Douglas-fir, occasionally containing volunteer or natural regeneration of other species from adjacent areas. Generally high shrub, grass and forb component. Usually few if any large down logs, snags, or remnant large green trees are present, unless it is a recent (since about 1985) shelterwood.

Objectives and Thresholds for Action:

Objective - Develop future late-successional stands quickly by taking advantage of the potential for regenerated stands to rapidly develop large healthy trees. Allow high stand densities to encourage the development of a dominant size class.

Threshold - usually none. Monitor for insect, disease, or predation that would remove enough young trees that an adequate stand could not develop without additional planting.

Treatment Strategies:

Base density prescriptions on adjacent stand health and the previous survival history of similar plantations.

Resulting Stand:

No significant changes prior to stands reaching seedling/sapling size class. New plantations in this PAG should include some species diversity where possible. Consider other seral species as appropriate for the plant association. Also consider varying planting densities and patterns where past history indicates good survival success.

Meeting LSR Objectives:

Plantations provide conditions conducive to development of future LS/OG stands. New plantations can be designed to enhance LS conditions by retaining or adding species diversity, variable spacing, and retaining large green trees, snags, and down logs.

SEEDLING, SAPLING, AND POLE PLANTATIONS -(17% OF PAG)

Existing Stand Condition:

The amount of this seral class is within the range of historic or desired conditions. High density of young trees, (400+ per acre) usually single species between 5" and 9" dbh, but often some variety in species from residual stand or natural regeneration; high variety of early seral shrubs, grass, and forbs. Few or no overstory trees remaining.

Objectives and Thresholds for Action:

Objective - Develop future late-successional stands quickly by taking advantage of the potential for regenerated stands to rapidly develop large healthy trees.

Threshold - The timing for precommercial-sized thinning is difficult to quantify. These stands are usually growing at rates that discourage insect and disease problems, and only develop basal areas that approach the upper management zones of the appropriate SDI at approximately 6" to 8" dbh. Desired stocking levels are generally between the upper and lower management zone for the appropriate plant association. Generally, plantations are thinned after stand densities have forced some individual trees to begin to express dominance, but before growth begins to slow down. The timing must be balanced between the desire to provide some cover via dense stands, and the need to thin before trees become so large that cover is reduced by self-pruning, growth rates slow down or stagnate, and/or the cut trees will produce an unmanageable fuel load.

Treatment Strategies:

Thin plantations to favor and develop the larger dominant and co-dominant trees. Favor seral species such as ponderosa pine, Douglas fir, and larch. Climax species such as white fir can be left for diversity, but should not comprise more than 30% of the resulting stand, and should be left in clumps rather than as individual trees. Spacing should be as random as possible given the limitations of marking and contracting feasibility. Specify several spacing regimes within a plantation, or variable spacing, e.g. untreated clumps, 16x16 average and 18x18 average.

Where plantations are surrounded by existing mortality, consider falling dead trees into the plantation to increase coarse woody debris. Balance the increased fuel load with the decreased risk of fire in the surrounding stands.

To the extent practical, thinning should be done to a stocking level that precludes the need for future entries. Higher stand densities may need to be maintained to provide short-term cover, but will require further thinning if large trees are desired in the future. Or stand densities may be lowered too much to the extent that future insect, disease, or fire mortality require interplanting to maintain desired stand structure.

Fuel treatment depends on the location of the plantation, the size and number of trees removed. Where they do not contribute significantly to the fuel profile, protect and retain shrubs, grasses, forbs, snags and large (>16" dbh x 16' long) CWD. Resulting fuel profile should not increase the overall risk to the LSR. Consider the following fuel treatments in descending order of preference for enhancing LSR characteristics, but ascending order of risk reduction:

- no fuel treatment.
- partial treatment - treat patches sufficient to reduce overall risk; pull fuel back along road to create defensible fuelbreaks; pull fuel away from leave trees and clumps; lop or lop and scatter limbs.
- prescribed underburn all or part of plantation.
- hand pile all or part of plantation; burn all or part of the piles (piles can be left for wildlife cover).
- machine pile and burn all or part of plantation.

Resulting Stand:

Thinned plantations should contain the best dominant and co-dominant pine, Douglas fir and larch. Other species should be left where they exist, but should comprise no more than 30% of the total stand. Trees are randomly scattered, in small groups, or in clumps up to several acres in size. Shrubs,

grasses, and forbs are present as are remnant large trees from the pre-regeneration stand. Snags and down wood, especially large pieces, are present, but overall fuel loads do not increase the risk of fire that would preclude the eventual development of late-successional stands.

Meeting LSR Objectives:

Thinning plantations as described above enhances Late-Successional conditions by: 1) accelerating the development of stand size and structure by taking advantage of rapid growing conditions in young stands, and 2) by retaining other elements of LS/OG forests – species diversity, soil and undergrowth productivity, untreated refugia, snags and CWD, and other remnants of the original forest.

Thinning reduces the risk to late-successional habitats by: 1) providing stand densities, species composition, and stand arrangements that are sustainable and resilient, and 2) by changing both live and dead fuel profiles to reduce the risk of fires that burn at high enough intensities to threaten LS/OG resources.

SMALL SIZE CLASS STANDS -(72% OF PAG)

Existing Stand Condition:

The amount of this seral class is greater than the range of historic or desired conditions. The overstory is primarily pine, white fir, and Douglas-fir 9-21 inch dbh, averaging 40 to 170 per acre for the representative plant associations, some stands could be as much as 20% higher. Understory is uniformly dense white fir, or rarely Douglas fir, in continuous stands of poles and saplings.

Many of these stands have significant mortality from defoliators and root diseases, averaging 30%, but locally up to 90%. Many of the remaining live trees have substantial top kill and poor vigor., and will never grow to larger sizes. Standing fuel loads are extremely high.

Objectives and Thresholds for Action:

Objective - Protect remaining healthy large trees, especially ponderosa pine and Douglas-fir, by reducing stress and fire risk. Because of the higher elevation where this PAG generally occurs, adjacent private property and rural developments are less common. However, reducing risk of high intensity fire is still an objective because of the potential for wind-driven fires to spread east into the more developed areas. Reduce risk of high intensity fire damaging core habitat areas for focal species or special and unique habitats. Reduce fuel loads and continuity.

Threshold - Stand basal areas at or exceeding the upper management zones of SDI. More than 30% of the understory contains shade-tolerant species such as white fir. Increasing levels of pine beetle, fir engraver, spruce budworm or other defoliators, especially in the understory, will result in significant change to or loss of late-successional characteristics, i.e. canopy cover, large trees or stand co-dominants. Root rot pockets are increasing in size and removing the few remaining large overstory trees. Mortality from insects and disease is more than 20% of the stand. Understory thickets may form ladder fuels that threaten large trees even in low intensity fires. In stands that have not been thinned or prescription burned, the combination of dense understory and standing and down dead fuels (especially those less than 12" dbh), will lead to fires of moderate to high intensity. These fires can only be attacked by indirect methods which limit the amount of protection that can be provided to adjacent lands and resources.

Treatment Strategies:

Stand density reduction - thin understories to reduce competition and ladder fuels, and promote development of additional and future large trees. Desired canopy closure between 40% and 60% must be balanced with the upper management zone for stocking density for the plant association. Thinning should favor seral species, with no more than 30% of the site stocked with white fir and other climax species (Douglas-fir can be climax in these associations). Remove most or all dead and dying trees less than 21" dbh; but maintain larger snags and green trees of low vigor for snag recruitment. Stands without much mortality will still benefit from understory thinning, but may not need removal of dead material to reduce fire risk.

Fuel breaks - in areas where stand manipulation is not desirable (riparian reserves, owl activity circles, sensitive soils or remnants of climatic climax habitat), or to isolate areas that won't be entered, combinations of understory thinning, pruning, interruption of dead and down fuel continuity may be used to reduce fire intensity and rate of spread, and increase the likelihood of successful suppression. Fuelbreaks should continue to exhibit some LS/OG components at the low end of the stocking range - open stands of predominately medium and large trees, 40% canopy closure or less (crowns not touching except in small clumps of 3 to 5 trees), with only scattered or clumpy understory. Large, widely distributed snags and large down logs are present, but usually less than required for 100% MPP.

Tree culturing - Thin understory thickets and/or remove sub-dominant trees larger than 9" dbh around large dominant and co-dominant pine and Douglas fir. This reduces stress on specific large trees desired for nesting, perching or roosting habitat, or can also be used where stand level treatments are not appropriate or unfeasible.

Small Group Treatments - Designed to reduce the spread of root rot and subsequent loss of late-successional conditions and natural diversity in vast areas over time by removing susceptible tree species from small (2 to 9 acre) root rot pockets. Where they exist, leave all or most (thin from below if necessary) of the trees of resistant species, e.g. pine and larch. If necessary to maintain some short-term structure, consider leaving 10 to 15 of the largest (>21" dbh) trees of root rot susceptible species, and interplant with seral, resistant species. Also, in order to create a mix of composition and structure across the landscape to benefit development and retention of late-successional conditions, small group treatments can be used to reestablish seral species where no seed source exists because of mortality or the dominance in the stand of climax species.

Remove Mortality - in stands where mortality exceeds 15 to 25% and excessive standing and down fuels pose a risk of fire at intensities that will threaten LS/OG habitat or other resources, remove most or all of the standing dead especially those less than 12" dbh. Incorporate safety and feasibility when leaving the large individual snags averaging 9 to 17 per acre. Large snags can be left for future down wood where less than desired amounts exist. Where inadequate seed sources exist or the remaining stand is not fully stocked with healthy trees, consider interplanting.

Prescribed fire - Use low intensity fire for stand density reduction and fuel profile modification. In stands that are deficit in snags and large down wood, use the prescription or low impact methods to protect the necessary amounts. In small areas (less than 10-15 acres) of high mortality or damage, consider using higher intensity prescribed fire to remove heavy fuels and create small openings for regeneration. This should be approached with the same logistical and contingency considerations as for a broadcast burn in a regeneration unit with high fuel loadings.

Resulting Stand:

Stands exhibit most of the characteristics of climatic climax LS/OG stands described under Moderate to Large size class stands below. Generally multi-storied stands, 40 to 60% canopy closure, dominated by 20-50 trees larger than 17 inch dbh. Initially, there may be few individuals over 21" dbh, but the

reduced stand densities and selection of the most vigorous large leaf trees will allow for growth. Understories contain well distributed individuals or small clumps of several species including ponderosa pine, Douglas fir, or white fir. White fir and other shade tolerant species should not comprise more than 30% of the total stand. Small openings exist, generally less than 10 acres in size, with 10 to 15 trees per acre and some large snags remaining. Large snags are present, but some stands may not have sufficient numbers to meet 100% MPP for focal species (usually about 4 snags/acre), even if all snags are retained during treatment. Large down logs are scattered throughout the stand (10 to 20 pieces per acre, distributed in size between 16" and 31"+), associated with windthrow or fallen snags.

Some of these plant associations may also have a component that is dependent on moderately frequent, low to moderate intensity fire. Generally, these stands will be located at the lower elevation range for the PAG, where precipitation is less than 30" per year, and/or on drier aspects or ridgetops. The desired condition of these stands is generally as described for Mixed Conifer Dry stands.

Meeting LSR Objectives:

Stand density reduction and tree culturing reduce risks of stress-induced mortality and moderate to high intensity fires, and develops and maintains late-successional habitats.

Small shelterwoods develop future LS/OG characteristics by converting or replacing dead, dying or root rot susceptible species with more desirable rot resistant seral species.

Removing mortality reduces the risk of high intensity fires that threaten the remaining LS/OG habitats or lengthen the time of development of LS/OG characteristics.

Prescribed low intensity fire thins understories to reduce risks as described above. Higher intensity fires could remove heavy fuel loads and allow for regeneration of new stands.

MEDIUM TO LARGE SIZE CLASS STANDS - (10% OF PAG)

Existing Stand Condition:

The amount of this seral class is within the low end of the range of historic or desired conditions. Stands generally consist of 10 to 25 large trees per acre (21+ dbh), primarily Douglas-fir and ponderosa pine, but some large white fir too. The understory is also dense, white fir or Douglas fir. Stand densities in both under and overstories are generally higher than in MCD. Canopy closures approach or exceed 60%.

The understories in these stands have mortality as described above, but local mortality above the average 30% is rare. The effects of pathogens on the large trees, particularly root rots, fir engravers, and pine beetles, is greater here than in MCD, probably because of the greater amounts of larger trees.

Objectives and Thresholds for Action:

Objective - Maintain and protect existing LS/OG habitats.

Threshold - Densities exceed the upper management zone of SDI. Stands are imminently susceptible to stand replacing insect, disease or fire mortality over areas larger than 10 acres.

Treatment Strategies:

Stand density reduction - thin clumps and remove trees less than 21", especially those that contain or surround large ponderosa pine and Douglas-fir. Reduce competition for light, water, and nutrients; remove ladder fuels; promote development of future large trees.

Remove Mortality - in stands where mortality exceeds 25% and excessive standing and down fuels pose a risk of fire at intensities that will threaten LS/OG habitat or other resources, remove most or all of the standing dead especially those less than 12" dbh. Incorporate safety and feasibility when leaving large individual snags, averaging 9 to 17 per acre. Large snags can be left for future down wood where less than desired amounts exist. Where no adequate seed sources exist or the remaining stand is not fully stocked with healthy trees, consider interplanting.

Prescribed fire - Use low intensity fire for stand density reduction and fuel profile modification. In stands that are deficit in snags and large down wood, use the prescription or low impact methods to protect the necessary amounts. In small areas (less than 10-15 acres) of high mortality or damage, consider using higher intensity prescribed fire to remove heavy fuels and create small openings for regeneration. This should be approached with the same logistical and contingency considerations as for a broadcast burn in a regeneration unit with high fuel loadings.

Resulting Stand:

Generally, multi-storied stands, with canopy closure 40-60% or greater. Stands are dominated by large ponderosa pine and Douglas-fir, western larch, white pine, lodgepole and white fir.. White fir and other shade tolerant species should not comprise more than 30% of the total stand. Understory trees are multi aged, well distributed, but may occur as dense thickets when pioneering a disturbance opening, and composed primarily of shade tolerant species. True firs are less than 30% of the stocking on any site. Snags and large down logs provide a significant amount of the structural complexity.

Meeting LSR Objectives:

Wet Mixed Conifer stands are generally moister, and on better soils than MCD; allowing for higher site productivity and greater stocking capacity. Reducing imminent susceptibility protects and maintains existing LS/OG habitat over the long term.

Removing mortality reduces the risk of high intensity fires that threaten the remaining LS/OG habitats or lengthen the time of development of LS/OG characteristics.

4. Lodgepole pine PAG (1631 acres)

DESIRED LANDSCAPE CONDITION:

Range of seral conditions:

- Grass/Forb/Shrub - 0 to 60%
- Seed/Sapling - 0 to 60 %
- Pole - 10 to 80%
- Small - 0 to 80%
- Med/Large - 0 to 2%

Landscape is a mosaic of varying textures and seral stages, but predominately containing stands of pole and small-sized trees with a few large remnants. Patch sizes in the Metolius LSR are small - no more than 300 to 500 acres, and often as small as 10 to 20 acres. These stands are usually associated with frost pockets, poor soils, or other areas that are not tolerated by other species. Ponderosa pine, white fir, spruce, or white pine may be present. Moderate to high intensity fire is the primary disturbance agent at relatively regular intervals of around 100 years. Insects and disease also play a role, especially bark beetles in stand replacement.

Existing Stand Condition:

Most of the stands (90%) are pole or small tree-sized. These stands are even-aged, dense, and often have very high fuel loading and standing mortality from age and/or normal bark beetle activity. The other 10% of the acres are primarily young stands regenerating from the last disturbance. There are a few small clearcuts replanted to lodgepole and ponderosa pine.

Objectives and Thresholds for Action:

Objective - Maintain existing lodgepole LS/OG habitats as long as possible, Develop future late-successional stands quickly by taking advantage of the potential for regenerated and thinned stands to rapidly develop large healthy trees. These habitats are relatively rare in the Metolius LSR, and provide an important niche for cavity nesting species dependent on hard snags.

Threshold - The timing for thinning is difficult to quantify. Desired stocking levels are generally between the upper and lower management zone for the appropriate plant association. The timing must be balanced between the desire to provide some cover via dense stands, and the need to thin before trees become so large that cover is reduced by self-pruning, growth rates slow down or stagnate, and/or the cut trees will produce an unmanageable fuel load.

Treatment Strategies:

Thin to favor and develop the larger dominant and co-dominant trees. Favor lodgepole pine but leave other seral species such as ponderosa pine, Douglas fir, and larch. Climax species such as white fir can be left for diversity, but should not comprise more than 5% of the resulting stand, and should be left in clumps rather than as individual trees. Natural stands are generally rather evenly distributed, so random spacing is not as important as leaving the best trees.

To the extent practical, thinning should be done to a stocking level that precludes the need for future entries. Higher stand densities may need to be maintained to provide short-term cover and require further thinning. Or stand densities may be lowered too much to the extent that future insect, disease, or fire mortality require interplanting to maintain desired stand structure.

Remove Mortality - in stands where mortality exceeds 15 to 25% and excessive standing and down fuels pose a risk of fire at intensities that will threaten LS/OG habitat or other resources, remove most or all of the standing dead especially those less than 12" dbh. Incorporate safety and feasibility when leaving the large individual snags averaging 9 to 17 per acre. Large snags can be left for future down wood where less than desired amounts exist. Where inadequate seed sources exist or the remaining stand is not fully stocked with healthy trees, consider interplanting.

Fuel treatment depends on the location, the size and number of trees removed. Where they do not contribute significantly to the fuel profile, protect and retain shrubs, grasses, forbs, snags and large

(>16" dbh x 16' long) CWD. Resulting fuel profile should not increase the overall risk to the LSR. Consider the following fuel treatments in descending order of preference for enhancing LSR characteristics, but ascending order of risk reduction: The small size of the stands can allow for slightly higher fuel loads and risk. Because they are lodgepole stands, free-use or commercial woodcutting can be an attractive method of removing undesirable trees or down wood.

- no fuel treatment.
- partial treatment - treat patches sufficient to reduce overall risk; pull fuel back along road to create defensible fuelbreaks; pull fuel away from leave trees and clumps; lop or lop and scatter limbs.
- prescribed underburn all or part of plantation.
- hand pile all or part of plantation; burn all or part of the piles (piles can be left for wildlife cover).
- machine pile and burn all or part of plantation.

Resulting Stand:

Thinned plantations should contain the best dominant and co-dominant lodgepole pine. Other species should be left where they exist, but should comprise no more than 10% of the total stand. Trees are evenly distributed with small clumps scattered through the stands. Shrubs, grasses, and forbs are present as are remnant large trees from the pre-regeneration stand. Snags and down wood, especially large pieces, are present, but overall fuel loads do not increase the risk of fire that would preclude the eventual development of late-successional stands.

Meeting LSR Objectives:

Thinning lodgepole stands as described above enhances Late-Successional conditions by: 1) accelerating the development of stand size and structure by taking advantage of rapid growing conditions in young stands, and 2) by retaining other elements of LS/OG forests - species diversity, soil and undergrowth productivity, untreated refugia, snags and CWD, and other remnants of the original forest.

Thinning reduces the risk to late-successional habitats by: 1) providing stand densities, species composition, and stand arrangements that are sustainable and resilient, and 2) by changing both live and dead fuel profiles to reduce the risk of fires that burn at high enough intensities to threaten LS/OG resources.

E. ACTIVITIES NEUTRAL TO LSR OBJECTIVES

The following recommendations address specific concerns related to the most popular Special Forest Products programs:

1. Matsutake Mushrooms. There is limited habitat for this species, and there is no known commercial harvest. The Deschutes and Winema National Forests completed a Matsutake Mushroom EA, which states, "Commercial harvest of matsutake mushrooms shall not be authorized within LSRs unless an LSR evaluation has determined that the activity will not have a significant effect on late-successional habitat. Restriction may be appropriate in some cases".

There is no information on the status of this mushroom in the LSR, therefore, this assessment does not determine the effect of commercial harvest on late-successional species. The LSR IDT recommends

that no commercial harvest of matsutake mushrooms be permitted without a specific monitoring program that includes surveys for the associate species, *Allotropia Virgata*.

2. Rare Fungi, Lichen and Moss Species. No harvest of these species is recommended within Riparian Reserves to protect rare moss and lichen species associated with riparian areas. No harvest of rare (Survey and Manage) fungi (truffles), lichens and mosses is recommended.

3. Boletes and Morel Mushrooms. There is very little information on the amount and location of mushroom picking in the MLSR. In addition, very little is known about the impacts of mushroom picking on late-successional species. An informal monitoring effort to gain information about where mushrooms are being gathered, and the potential impacts of this activity would be implemented. The monitoring thresholds that would initiate more intensive monitoring or restrictions on gathering activities would include: (1) unacceptable resource damage and (2) perceived decline in fruiting body abundance over a specified period of time.

4. Fuel-wood Gathering. The ROD (C-16) provides specific guidance for fuelwood gathering in LSRs. There are areas in the LSR where tree mortality has resulted in high levels of standing dead trees and down logs. These same areas are the highest priority for salvage activities. In addition to the acceptable fuelwood gathering situations (green trees identified for thinning, existing cull decks, blow-down blocking roads, recently harvested timber sale units) identified in the ROD (C-16), fuelwood gathering in specifically designated areas, is recommended as a tool for reducing fuel loads and the risk of high intensity fires. Specific fuel objectives should be identified prior to fuelwood gathering, and monitoring of the designated area should determine when the objectives have been met. Incidental fuelwood gathering should not be encouraged within the LSR.

5. Highway Safety Act Roads. There are an estimated 78 miles of Highway Safety Act Roads (HSA) within the LSR. The ROD (C-16) states, "Road maintenance may include felling hazard trees along right-of-ways. Leaving material on site should be considered if available coarse woody debris is inadequate. Topping trees should be considered as an alternative to felling. The HSA roads in the LSR encompass approximately 2,800 linear acres (78 miles x 300 feet wide) or 4% of the LSR. Hazard tree removal of this magnitude for safety purposes is not considered a significant impact on the LSR, especially if coarse woody debris is retained on site. The majority of HSA roads in the LSR are in scenic view allocations or have high quality scenery objectives. HSA roads also offer some of the best locations for safe and effective fuelbreaks. LSR habitat, reduction of fuels, and scenery objectives must all be considered when managing vegetation adjacent to HSA roads.

. IX . MANAGEMENT STRATEGY AREAS (MSA)

A. MSA DESCRIPTIONS AND INTEGRATED STRATEGIES

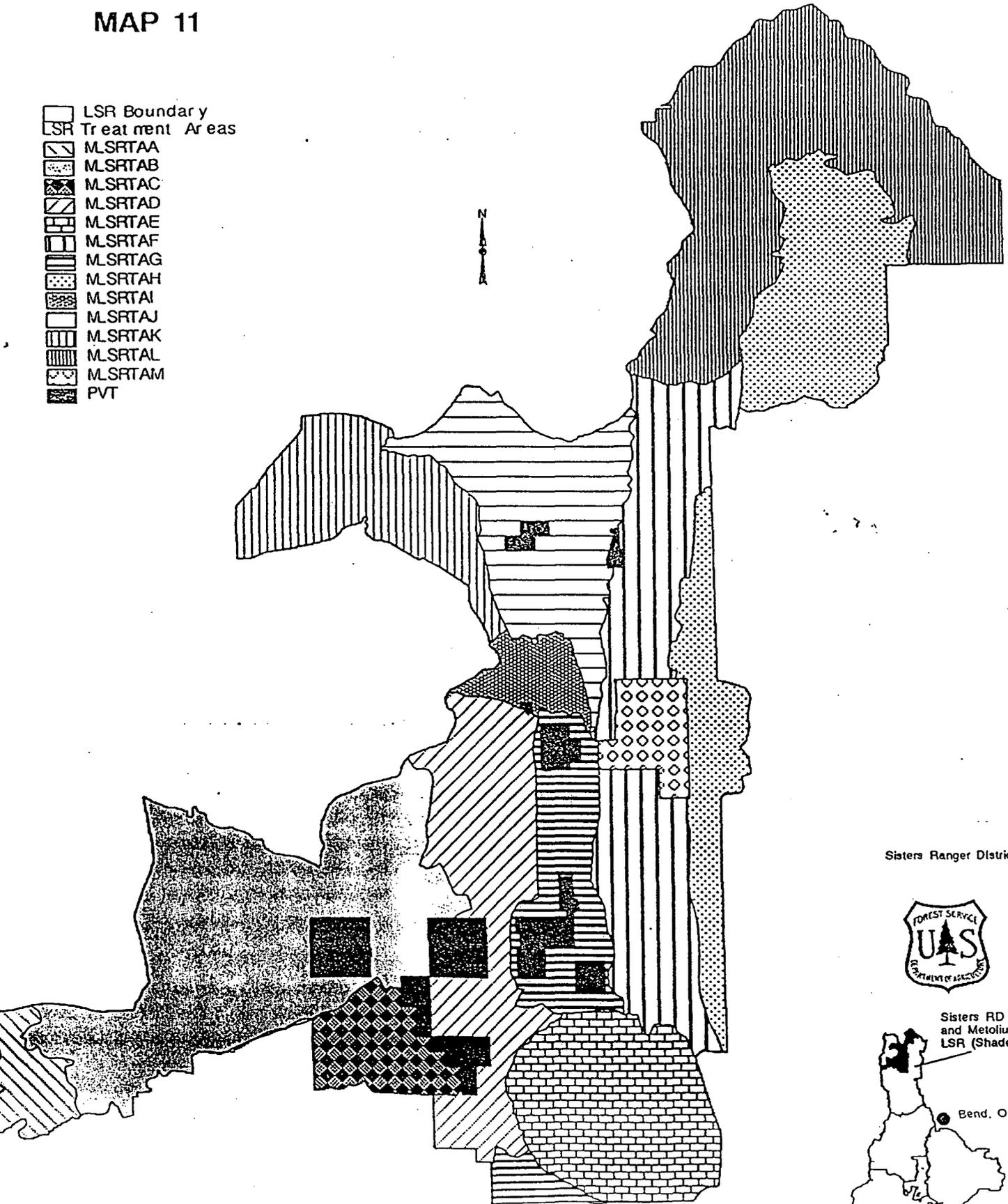
Thirteen Management Strategy Areas (Map 10) were delineated based on: (1) common plant association groups; (2) known spotted owl and other late-successional associated species sites; (3) rural interface areas; (4) common silvicultural opportunities; and (5) common fire management strategies.

While the Management Strategy Areas have been delineated as separate areas, they are strongly linked to each other by ecological processes and to adjacent habitats outside the MLSR. Activities within these treatment areas should consider the overall impacts to adjacent Management Strategy Areas and matrix lands.

Metolius LSR Management Strategy Areas

MAP 11

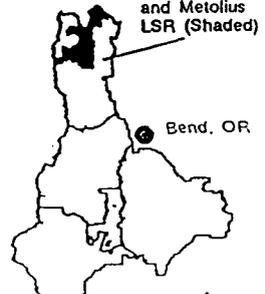
-  LSR Boundary
-  LSR Treatment Areas
-  M.SRTAA
-  M.SRTAB
-  M.SRTAC
-  M.SRTAD
-  M.SRTAE
-  M.SRTAF
-  M.SRTAG
-  M.SRTAH
-  M.SRTAI
-  M.SRTAJ
-  M.SRTAK
-  M.SRTAL
-  M.SRTAM
-  PVT



Sisters Ranger District



Sisters RD and Metolius LSR (Shaded)



B. MANAGEMENT STRATEGY AREAS

1. Management Strategy Area A

This MSA is approximately 1,430 acres (2% MLSR) in size. The MSA is bordered by the Willamette National Forest (Santiam Pass) to the west, the wilderness to the north, and administratively withdrawn lands to the south. The Highway 20 corridor bisects this MSA. The area occurs between 4,400 and 4,800 feet in elevation.

Metolius Watershed Analysis Landscape Areas: 3 and 4

Plant Association Group and Vegetative Condition:

Lodgepole Pine PAG with mixed species composition. Primarily composed of mountain hemlock overstory with dense lodgepole pine understory. Canopy closure generally 40 to 70%

Landscape Patterns:

Landscape pattern is homogeneous, comprised of even-aged stands of small trees. Stands with older trees, or with higher numbers of species such as hemlock, spruce, or white pine are found in small north slope drainages and riparian areas. A small portion of the MSA is meadow or bog.

Stand Structure:

Stands in this MSA are primarily dense pole and small timber sized trees. Older stands contain some large hemlock, white pine or spruce in the overstories, most of the larger old growth lodgepole have died out. There are no true old growth lodgepole stands remaining. The plantations have been stocked primarily with a mix of ponderosa pine and Douglas-fir, or rarely with just lodgepole pine.

Fragmentation:

This MSA is mostly intact, less than 10% having been entered for harvest and currently in an early seral or seedling stage. The MSA is bisected by Hwy. 20.

Snags and Coarse Woody Debris:

Snags and coarse woody debris loads are typically high in these plant associations, especially as they grow older. Much of the area may have higher densities than historical levels due to recent insect and disease mortality. Plantations have amounts of down woody debris sufficient for most habitat needs, but are generally deficient in large logs and snags - the 2 to 3 snags per acre left after harvest having fallen. Down logs larger than 16-18 inches dbh were probably always rare in these lodgepole stands, except for the occasional old hemlock or spruce.

Insect and Disease Condition:

Insect and disease mortality is mostly confined to the lodgepole understories where pine beetles have killed 50-90% of the trees. Other understory trees, especially white fir and spruce have been affected by defoliators and root rots. Most of the white pine overstory has died in the last 10 years from blister rust. Because of high stand densities, there continues to be medium risk of insect and disease outbreaks. Mountain pine beetle and root rots are likely to continue.

Fire Risk:

High risk of fire occurrence and moderate fuel loading, with an increasing risk of high intensity and stand replacement fires.

Focal LS/OG Terrestrial Wildlife Species:

- (a) Black-backed woodpecker - moderate to high probability of occurrence.
- (b) Wolverine, fisher and marten - low to moderate probability of occurrence for wolverine; moderate for fisher; and high for marten.
- (c) Great gray owl - Low to moderate probability of occurrence.

Focal Aquatic Species

Cascade, tailed and spotted frogs - Known occurrences and potential habitat in Link Creek and unnamed wetlands and ponds.

Focal Plant Species of Concern

Gandy Stick - moderate to high probability of occurrence in closed canopy lodgepole and hemlock stands.

Noxious Weed Conditions:

St. John's wort is present in the area, spreading along main roads.

Social Context

This MSA contains the eastern outlet of Santiam Pass - the most heavily traveled route across the Cascades. The area provides the opening view for east-bound visitors and their first impression of the Deschutes NF. The southern portion of the MSA gets light recreation use from anglers, off-road enthusiasts, and nordic skiers.

MSA Goals

Manage to restore and maintain healthy and sustainable riparian areas and forested stands with sufficient structure and canopy to provide dispersal habitat for owls across the Cascades, within the LSR and to the adjacent LSR to the south. Maintain sufficient snags and coarse woody debris for species dependent on that habitat.

Management Objectives

Short-term: Reduce stand densities and fuel loads to lower risk of further high intensity disturbance.

Long-term: Consider reducing the dominance of lodgepole pine and true firs, especially in the understories, by favoring hemlock, spruce, Douglas fir, and white pine. Provide pockets of snags and coarse woody debris. In plantations, promote the development of LS/OG habitat.

Rationale: Lodgepole pine stands, especially LS/OG stands, are rare in the watershed and LSR. These stands provide important habitat for a number of species dependent on snags and coarse woody debris. Because of the relatively short "boom and bust" life cycle of these plant associations, it is difficult, especially in an area this small, to maintain LS/OG stands for any long term. Reducing the dominance of lodgepole will make the stands more stable, while maintaining an important species and structure composition.

Management of Forested Areas:

Maintain healthy trees of all species, especially large trees in the upper 20% of their plant association site potential.

Use mechanical or hand thinning to reduce stand densities based on Cochran's SDI. Prescribed fire is not recommended for thinning these stands in the first entries.

Remove dead and down material excess to habitat requirements for 100% MPP for focal species.

Management of Regenerated Areas:

Manage plantations to accelerate growth in order to develop LS/OG stands as soon as possible.

As plantations grow, manage stand densities to maintain health and vigor, and to provide diversity of species and structure.

Consider moving large CWD into plantations from adjacent areas.

Fire Management:

Aggressive fire control recommended due to proximity to wilderness. Fuel-break opportunities along Highway 20 and other primary roads.

Because fuel-loads and arrangements allow the rapid development of high intensity fire, limited access, and the high safety risk to firefighters, the potential for fires to escape initial attack is very high. Fuel breaks and other defensible corridors should be developed to give firefighters a reasonable chance to stop fires from spreading out of the MSA, especially to the east and north.

Snags and Coarse Woody Debris:

Maintain pockets of 1/4 to several acres of snags and the largest available coarse woody debris.

Maintain snags and coarse woody debris distributed across the MSA in sufficient numbers to provide 100% MPP for black-backed woodpeckers.

Wildlife and Botanical

Habitat protection takes precedence over protection of individual plant or animal populations except for known sites of species listed in Table C-3 of the NW Forest Plan.

Control the spread of St. John's wort along roads using current noxious weed guidelines.

2. Management Strategy Area B

The MSA is approximately 12,400 acres in size (16% MLSR) and is bordered by the wilderness to the west and Matrix and Administratively Withdrawn allocations to the north and south. The area occurs between 3,000 to 4,500 feet in elevation.

Metolius Watershed Analysis Landscape Areas: Primarily 8 with small portions of 3 and 4.

Plant Association Group and Vegetative Condition:

Mixed conifer wet and dry PAG with mixed and climax species composition. Highly fragmented vegetation due to past timber harvest. Primarily small sized trees (9-20.9" dbh) and a variety of canopy closures (40-90%). Majority of stands have unsustainable tree densities.

Landscape Patterns:

Patch sizes are quite large - 100 to 1000 acres in size, but are extensively fragmented by smaller (average less than 20 acres) regenerated plantations. Ponderosa pine and Douglas fir are the dominant overstory trees, though few large specimens remain. Wet mixed conifer exists in smaller patches scattered through the matrix of dry mixed conifer, associated primarily with north slopes and drainage bottoms. These patches are smaller, usually 100 to 300 acres, and are heavily fragmented as above. About 72% of the MSA is in stands of small-sized trees. About 14% is in plantations or a few other early seral patches. About 11% of the stands have some structural components associated with LS/OG stands.

Stand Structure

Seedling, sapling and pole plantations - high density of young trees, usually single species, shrubs, grass, and forbs. Few or no overstory trees remaining.

Small size class stands - overstory primarily pine and Douglas-fir 9-21 inch dbh usually with a few larger trees, 5 to 10 per acre. Understory is uniformly dense white fir or other shade tolerant species in continuous stands of poles and saplings. Some managed stands of high density pole to small sized trees with no overstory.

Many of these stands have significant mortality from defoliators and root diseases, averaging 20%, but locally up to 80%. Many of the remaining live trees have substantial top kill and poor vigor., and will never grow to larger sizes. Standing fuel loads are extremely high. Particularly in the MCW stands, large dead and down fuel loads are very high as a result past harvest and the advanced age of the stands.

Medium to large size class - 10 to 25 large trees per acre (21+ dbh), primarily Douglas-fir and ponderosa pine, but some large white fir too. Understories are dense white fir. In MCW, stand densities in both understory and overstory are generally much higher, due to wetter, higher productivity sites. Canopy closures approach or exceed 60%.

The understories in these stands have mortality as described above, except that in MCW stands local mortality above average is rare. In addition, many of the larger overstory trees are dead or dying from combinations of insect, disease, and stress. The effects of pathogens on the large trees in MCW stands, particularly root rots, fir engravers, and pine beetles, is greater than in MCD, probably because of the greater amounts of larger trees.

Fragmentation

About 14% of the MSA is in small early seral regeneration patches. The MSA includes about 1.5 sections of private timber land, primarily in early seral condition. Hwy. 20 borders the south side of the MSA and bisects the western portion. The primary west to east drainage's all contain moderately traveled roads.

Snags and Coarse Woody Debris

Snags and coarse woody debris loads are typically high in these plant associations, especially as they grow older. Much of the area may be higher than historical levels due to recent insect and disease mortality. In MCD stands, frequent low intensity fires would have kept fuel loads at lower levels than currently exist. Plantations have amounts of down woody debris sufficient for most habitat needs, but are generally deficient in large logs and snags - the 2 to 3 snags per acre left after harvest having fallen.

Insect and Disease Condition:

High risk to the remaining large trees from stress induced root rots, beetles and fir engraver. Lower risk from western spruce budworm because a significant portion of the area has already been impacted by the defoliator, however the food source (dense conifer understory) remains and may be recovering as we enter a wet climatic cycle

Fire Risk:

Moderate and High risk of fire occurrence with high levels of large dead fuels, and high density understories. High risk of high intensity, stand-replacement fire.

Focal LS/OG Terrestrial Wildlife Species:

- (a) Northern spotted owl - 5 known nest sites. Majority of suitable habitat is in decline from spruce budworm and stress-induced root rots.
- (b) Flammulated owl - moderate to high probability of occurrence throughout the area.
- (c) Wolverine, fisher and marten - low to moderate probability of occurrence for wolverine; moderate for fisher; and high for marten.
- (d) Pileated woodpecker, white-headed, black-backed woodpeckers and Williamson's sapsucker - Known occurrences and high probability of occurrence throughout the area.
- (e) Northern goshawk - Known nest sites and high probability of occurrence throughout the area.
- (f) Northern bald eagle - Known roosting and foraging habitat in Meadow lakes basin and adjacent to Suttle lake.
- (g) Great gray owl - Low probability of occurrence due to limited habitat.
- (h) Vaux's swift - High probability of occurrence in large snags.

Focal Aquatic Species

- (a) Cascade, tailed and spotted frogs - Known occurrences and potential habitat in Link, Jack, and Davis Creeks, and unnamed wetlands and ponds.
- (b) Bull Trout - Spawning and rearing habitat in Jack Creek.
- (c) Apatania Tavalala - Potential habitat in Jack and Link Creeks.

Focal Plant Species of Concern

- (a) Rare Nitrogen Fixing Lichens- Two known sites exist which contain several species. Sites and potential habitat are closely associated with riparian areas.
- (b) Candy Stick - One known site and potential habitat exists throughout the area.
- (c) Peck's penstemon- Known sites and moderate to high probability of occurrence within intermittent and ephemeral channels in the area.

Noxious Weed Conditions:

St. John's wort is present in the area, spreading along main roads.

Social Context

This MSA contains a large portion of Hwy. 20 and the adjacent viewshed. The tributaries all get heavy dispersed camping use as well as incidental use for hunting and gathering. The poor condition of the forest along Hwy. 20 is cause for constant comment from the visiting public, the media, timber and tourist industries, and government representatives.

MSA Goals

Restore and manage sustainable LS/OG habitat for 6 pairs of spotted owls. Landscape should be a sustainable mosaic of fire and climatic climax stands. The climatic climax should be in large minimally fragmented blocks surrounded by fire climax stands. Dry mixed conifer stands are managed for sustainable densities to reduce the risk of high intensity disturbance. Areas adjacent to private property and concentrated human use are managed at the low end of the desired stocking range to reduce risk of high intensity large scale wildfire.

Management Objectives

Short-term: reduce risk of further high intensity disturbance, especially fire. Reduce stress and risk to remaining large trees and pockets of LS/OG habitat.

Long-term: develop and maintain landscape patterns, species composition and structure in MCD that is more consistent with HRV where stands were maintained by frequent low intensity fire. Restore and maintain pockets of MCW. Look for opportunities to manage some MCD sites at higher densities and greater canopy closure. These opportunities will be associated with wetter, higher productivity sites that could be incorporated into owl activity areas and home range. The rest of the MCD will function primarily as dispersal habitat and habitat for other LS/OG species.

In plantations and other younger stands promote the development of LS/OG stand structure.

Rationale: Current conditions in the MCD have developed artificially primarily as a result of fire exclusion. The combination of excessive densities and species composition provides conditions for pathogens and disturbance to be of much higher intensity than normal. Fire occurrence is high in most of this MSA, both lightning and human caused, and large high intensity fires are virtually certain to occur within the next 10 to 20 years.

The best conditions for owl habitat exist in MCW patches and a few MCD areas in higher elevations or associated with wetter, high productivity sites.

Management of Forested Areas

Silviculture opportunities: High priority for treatments because of high stand densities and mortality. Emphasize thinning from below and precommercial thinning to develop young stands into late-successional habitats. There are high mortality areas that may require regeneration. Salvage and

fuelwood gathering opportunities exist, but poor condition of the standing material is becoming a safety concern.

Maintain healthy trees of all species, especially large trees in the upper 20% of their plant association site potential.

Use mechanical or hand thinning to reduce stand densities based on Cochran's SDI. Prescribed fire is not recommended for thinning these stands in the first entries.

Remove dead and down material excess to habitat requirements for 100% MPP for focal species.

Management of Regenerated Areas

Manage plantations to accelerate growth in order to provide LS/OG stands as soon as possible.

As plantations grow, manage stand densities to maintain health and vigor, and to provide diversity of species and structure.

Consider moving large CWD into plantations from adjacent areas.

Where regeneration treatments are necessary, consider the historic range of patch sizes and shapes. Reestablish ponderosa pine, Douglas-fir, larch, and white pine.

Fire Management

Contain and confine fire control strategy recommended due to fire-fighter risk associated with aggressive control.

Develop a series of fuel breaks along primary roads, especially Road 12 and other north-south roads.

Snags and Coarse Woody Debris

Maintain pockets of 1/4 to several acres of snags and the largest available coarse woody debris.

Maintain snags and coarse woody debris evenly distributed across the MSA in sufficient numbers to provide 100% MPP for black-backed woodpeckers.

Wildlife and Botanical

Habitat protection takes precedence over protection of individual plant or animal populations except for known sites of species listed in Table C-3 of the NW Forest Plan.

Control the spread of St. John's wort along roads using current noxious weed guidelines.

Use low intensity prescribed fire to enhance habitat for Peck's penstemon in and around known populations.

3. Management Strategy Area C

This MSA is 2,160 acres in size (3% MLSR) and includes the Suttle Bald Eagle Management Area. The MSA is bordered by Matrix and private lands to the south, and private lands to the east. The area lies between 3,200 to 3,600 feet in elevation. (The map boundary shown for this MSA is incorrect. The line between LSR and Administratively Withdrawn - Intensive Recreation has been adjusted at the eastern end of Suttle Lake, reducing the LSR by approximately 100 acres.)

Metolius Watershed Analysis Landscape Areas: 3, 7 and 6.

Plant Association Group and Vegetative Condition:

Mixed conifer dry PAG with mixed species composition. Primarily small sized trees (9-20.9" dbh) with moderate (40-60%) canopy closure and unsustainable tree densities. One patch of interior climatic late-successional habitat.

Landscape Patterns:

Landscape pattern is very homogeneous, 78% of the stands are small sized trees. Another 10% is primarily in one large patch of med/large sized trees. There is only one small plantation, and few other openings.

Stand Structure:

Stands in this MSA are primarily small-sized timber dominated by a few remnant ponderosa pine and Douglas fir. Some stands associated with riparian areas have lots of larch. Understories are mostly dense white fir, much of which is defoliated or dead. There are stands of dense stagnated pole-sized ponderosa, especially along the highway.

Fragmentation:

There is very little fragmentation in this MSA, most of the harvest having been by partial cutting or early risk cutting. There is one small plantation. Hwy. 20. bisects the MSA south to north.

Snags and Coarse Woody Debris:

Much of the area may be higher than historical levels due to recent insect and disease mortality. In MCD stands, frequent low intensity fires would have kept fuel loads at lower levels than currently exist.

Insect and Disease Condition:

Medium risk to large trees from stress induced root rots, beetles and fir engraver. Low risk from western spruce budworm because significant portions of the area have already been impacted by the defoliator. Pine pole stands are at medium to high risk from bark beetles.

Fire Risk:

Primarily high risk of human fire occurrence and low to high fuel loading. High fuel loads in Suttle Lake area. High risk of high intensity stand-replacement fire.

Focal L-S Terrestrial Wildlife Species:

- (a) Northern spotted owl - No known nest sites. Primarily dispersal habitat with some suitable habitat.
- (b) Pine marten - Potential habitat and high probability of occurrence throughout area.

- (c) Pilated Woodpecker - Known occurrences and high probability of occurrence throughout area.
- (d) Northern Goshawk - High probability of occurrence in potential habitat throughout the area.
- (e) Northern bald Eagle - Known nest site and alternate nest site associated with Suttle lake.
- (f) Vaux's Swift - High probability of occurrence.

Focal Aquatic Species

- (a) Cascade, tailed and spotted frogs - moderate probability of occurrence in potential habitat associated with Lake Creek and unnamed wetlands and ponds.

Focal Plant Species of Concern

- (a) Rare Nitrogen Fixing Lichens- Potential habitat occurs associated with riparian and wetland areas.
- (b) Peck's penstemon- Known sites and potential habitat exists in intermittent and ephemeral channels and high watertable areas.

Noxious Weed Conditions:

St. Johns wort exists along roads and in old timber sale units in the area. A few knapweed plants have been found along roadsides. Other non-natives such as wood groundsel and mullein are also common in old units.

Social Context

Suttle Lake/Blue Lake complex, adjacent and surrounded by the LSR, contains 3 large campgrounds, resorts, church camps, summer camps and day use areas.

MSA Goals

Restore and manage late-successional habitat by promoting a landscape matrix of fire climax vegetation with patches of climatic climax stands. Develop and maintain large ponderosa pine and Douglas fir as nesting and roosting trees for bald eagles. Dry mixed conifer stands are managed for sustainable densities to reduce the risk of high intensity disturbance. Areas adjacent to private property and concentrated human use are managed at the low end of the desired stocking range to reduce risk of high intensity large scale wildfire.

Management Objectives

Short-term: reduce risk of further high intensity disturbance, especially fire. Reduce stress and risk to remaining large trees and pockets of LS/OG habitat.

Long-term: develop and maintain landscape patterns, species composition and structure in MCD that is more consistent with HRV where stands were maintained by frequent low intensity fire. Restore and maintain pockets of sustainable MCW. Look for opportunities to manage some MCD sites at higher densities and greater canopy closure. These opportunities will be associated with wetter, higher productivity sites that could be incorporated into owl activity areas and home range. The rest of the MCD will function primarily as dispersal habitat and habitat for other LS/OG species.

In plantations and other younger stands promote the development of LS/OG stand structure.

Rationale: Current conditions in the MCD have developed artificially primarily as a result of fire exclusion. The combination of excessive densities and species composition provides conditions for pathogens and disturbance to be of much higher intensity than normal. Fire occurrence is high in most

of this MSA, both lightning and human caused, and large high intensity fires are virtually certain to occur within the next 10 to 20 years.

Management of Forested Areas:

Maintain healthy trees of all species, especially large trees in the upper 20% of their plant association site potential.

Use mechanical or hand thinning to reduce stand densities based on Cochran's SDI. Prescribed fire is not recommended for thinning these stands in the first entries.

Remove dead and down material excess to habitat requirements for 100% MPP for focal species.

Prescribed fire possible after mechanical or hand thinning, and is particularly appropriate in the pine stands adjacent to the highway.

Silviculture opportunities: BEMA is high priority for treatments because of high stand densities, tree mortality and poor natural regeneration in BEMA. Area outside BEMA is lower priority for treatments. Emphasize thinning from below and precommercial thinning to develop young stands into late-successional habitats. Some regeneration may be necessary in high mortality areas. Salvage and fuel-wood gathering opportunities.

Thin pine pole stands to reduce susceptibility to pine beetle and to promote development of larger trees, especially in the Hwy. 20 view shed.

Management of Regenerated Areas:

Manage plantations to accelerate growth in order to develop LS/OG stands as soon as possible.

As plantations grow, manage stand densities to maintain health and vigor, and to provide diversity of species and structure.

Consider moving large CWD into plantations from adjacent areas.

Fire Management:

Aggressive control due to proximity of campgrounds, resorts, private lands and Bald Eagle Management Area.. Create and maintain fuel-breaks along Highway 20 and Road 2066.

Snags and Coarse Woody Debris:

Maintain pockets of 1/4 to several acres of snags and the largest available coarse woody debris.

Maintain snags and coarse woody debris evenly distributed across the MSA in sufficient numbers to provide 100% MPP for black-backed woodpeckers.

Wildlife and Botanical

Habitat protection takes precedence over protection of individual plant or animal populations except for known sites of species listed in Table C-3 of the NW Forest Plan.

Control the spread of St. John's wort along roads using current noxious weed guidelines.

Use low intensity prescribed fire to enhance habitat conditions for Peck's penstemon.

4. Management Strategy Area D

This MSA is approximately 6,600 acres in size (8% of MLSR) and ranges in elevation from 3,000 to 3,100 feet in elevation. There are several parcels of private land within this MSA totaling 1,200 acres. These private lands are primarily in early and mid-seral conditions. The MSA is bordered by Matrix in the northwest, private lands to the south, and the Metolius Wild and Scenic River corridor to the east.

Metolius Watershed Analysis Landscape Areas: 2, 3, and 8.

Plant Association Group and Vegetative Condition

Ponderosa pine PAG with some dry mixed conifer PAG. Pioneer species dominate area with patches of mixed species. Primarily small sized trees (9-20.9" dbh) and low (10-40%) canopy closures. Some patches of larger tree habitat.

Landscape Patterns:

Landscape pattern is very homogeneous, 88% of the stands are small sized trees. The western portion is primarily dense MCD; the eastern portion is ponderosa pine and more open with more large trees left in the overstory. There are only a few small plantations, and few other openings.

Stand Structure:

Stands in the MCD are primarily small-sized timber dominated by a few remnant ponderosa pine and Douglas fir. Some stands associated with riparian areas have lots of larch. Understories are mostly dense white fir, much of which is defoliated or dead. Ponderosa pine stands usually have 10 to 20 large pine in the overstory, rarely larch or Douglas fir. Understories are dense scattered even-aged clumps of pine, although the open spaces between the clumps are getting smaller and smaller as the clumps grow. There are a few shade-tolerant species, mostly white fir, beginning to show in the understories. Encroachment is moving slowly from west to east. There are a few stands of stagnated pine poles, especially along the highway.

Fragmentation:

This MSA has a few small plantations. Significant blocks of private timber land, mostly in early seral condition, roughly divide the MSA into 3 parcels. There are moderately used roads running east-west up most of the tributary drainages.

Snags and Coarse Woody Debris:

Much of the area may be higher than historical levels due to recent insect and disease mortality, but not as high as other stands in the LSR due to past harvest. In both MCD and pine stands, frequent low intensity fires would have kept fuel loads at lower levels than currently exist.

Insect and Disease Condition:

Low risk from stress induced root rots, beetles and engraver. Primarily a healthy forest. Pine thickets are at risk from bark beetles.

Fire Risk:

Moderate to high risk of fire occurrence. Low fuel loading due to past timber harvest activities. Moderate risk of stand replacement wildfire.

Focal L-S Terrestrial Wildlife Species:

- (a) Northern spotted owl - No known nest sites. Primarily dispersal habitat.
- (b) Pine marten - Potential habitat in mixed tree species patches.
- (c) Pileated woodpecker, white-headed, and Williamson's sapsucker - Known occurrences and potential habitat throughout the area.
- (d) Northern goshawk - Known nest site and high probability of occurrence in potential habitat throughout the area.
- (e) Flammulated owl - High probability of occurrence throughout potential habitat in area.
- (f) Vaux's swift - Moderate probability of occurrence on large snag habitat.

Focal Aquatic Species

- (a) Cascade, tailed and spotted frogs - Potential habitat in Jack, First, Davis and Lake Creek, and unmapped wetlands and ponds.
- (b) Bull Trout - Spawning and rearing habitat in Jack Creek
- (c) Apatania Tavalala - Potential habitat in Jack Creek.

Focal Plant Species of Concern

- (a) Rare Nitrogen Fixing Lichens- Potential habitat exists in riparian areas.
- (b) Candy Stick - Potential habitat exists in the western portion of the area.
- (c) Peck's penstemon- Known sites and potential habitat exists in intermittent and ephemeral channels and high watertable areas.

Noxious Weed Conditions:

Populations of diffuse and spotted Knapweed are found along Rd 14 and 1419. St. Johns wort is also found along Rd 1216

Social Context

The tributaries all get heavy dispersed camping use as well as incidental use for hunting and gathering.

MSA Goals

Develop and manage late-successional habitat as a landscape primarily dominated by sustainable fire climax vegetation with patches of climatic climax stands. Manage to provide healthy riparian and forested areas with sufficient structure to provide some dispersal habitat for spotted owls moving to and from the river corridor and along the western portion of the basin. Dry mixed conifer stands are managed for sustainable densities to reduce the risk of high intensity disturbance. In pine stands, manage understory densities to reduce stress on the larger trees and to reduce the risk from pine beetles.

Management Objectives

Short-term: reduce risk of further high intensity disturbance, especially fire. Reduce stress and risk to remaining large trees and pockets of LS/OG habitat.

Long-term: develop and maintain landscape patterns, species composition and structure in MCD that is more consistent with HRV where stands were maintained by frequent low intensity fire. Look for opportunities to manage some MCD sites at higher densities and greater canopy closure. These

opportunities will be associated with wetter, higher productivity sites that could be incorporated into owl activity areas and home range. The rest of the MCD will function primarily as dispersal habitat and habitat for other LS/OG species. In pine stands, promote stand structures and density that will allow the reintroduction of low intensity fire.

In plantations and other younger stands promote the development of LS/OG stand structure.

Rationale: Current conditions in the MCD have developed artificially primarily as a result of fire exclusion. The combination of excessive densities and species composition provides conditions for pathogens and disturbance to be of much higher intensity than normal. Fire occurrence is high in most of this MSA, both lightning and human caused, and large high intensity fires are likely to occur within the next 10 to 20 years.

Ponderosa pine stands were historically much more open, with larger trees than currently exist. Stand development was strongly, and almost exclusively influenced by frequent low intensity fire, on a very wide scale. Many LS/OG species dependent on open stands of large trees and snags may be slowly disappearing from these areas.

Management of Forested Areas:

Maintain healthy trees of all species, especially large trees in the upper 20% of their plant association site potential.

Use mechanical or hand thinning to reduce stand densities based on Cochran's SDI. Prescribed fire is not recommended for thinning MCD stands in the first entries, but would be very appropriate and feasible in pine stands.

Remove dead and down material excess to habitat requirements for 100% MPP for focal species.

Silviculture opportunities: Moderate priority for thinning primarily in the southern portion of area. Emphasize thinning from below and precommercial thinning to develop young stands into late-successional habitats.

Management of Regenerated Areas:

Manage plantations to accelerate growth in order to develop LS/OG stands as soon as possible.

As plantations grow, manage stand densities to maintain health and vigor, and to provide diversity of species and structure.

Consider moving large CWD into plantations from adjacent areas.

Fire Management:

Aggressive control due to proximity of private lands. Prescribed fire possible after mechanical or hand thinning. Create and maintain fuel-breaks along Hwy. 20, and Roads 12 and 14.

Snags and Coarse Woody Debris:

Maintain snags and coarse woody debris evenly distributed across the MSA in sufficient numbers to provide 100% MPP for focal species.

Wildlife and Botanical

Habitat protection takes precedence over protection of individual plant or animal populations except for known sites of species listed in Table C-3 of the NW Forest Plan.

Control the spread of St. John's wort and Knapweed along roads using current noxious weed guidelines.

Use low intensity prescribed fire to enhance habitat conditions for Peck's penstemon in and adjacent to known populations.

5. Management Strategy Area E

This MSA is approximately 6,100 acres in size (8% of MLSR) and encompasses Black Butte. The MSA is bordered by the owl range line and private lands to the south and east.

Metolius Watershed Analysis Landscape Area: 5

Plant Association Group and Vegetative Condition:

Ponderosa pine and dry mixed conifer PAG composed of pioneer tree species. Primarily (75%) small sized trees (9-20.9" dbh) and moderate to high canopy closures (50-70%) on the north slope of Black Butte. The south slope is more open, primarily ponderosa pine, and composed of small and pole size stands. Some small patches of larger tree habitat. Unsustainable tree densities primarily on northern slope.

Landscape Patterns:

Landscape pattern is homogeneous, comprised primarily of small sized timber. There are a few harvest related openings, as well as thinned stands that appear as openings with winter snows. Most of the summit is in an early seral stage of grasses and brush as a result of at least 3 distinct past fires. There are a couple other stands where changes to stand structure are evident as a result of relatively recent fires.

Stand Structure:

Because of its location and topography, Black Butte serves as a miniature Cascade range, containing examples of almost every elevation and aspect change in plant communities, ranging from high elevation meadow and Sub-Alpine fir, to mid elevation mixed conifer stands on the north slopes and ponderosa pine stands on the lower and south slopes. Stands are primarily small sized timber. Mixed conifer stands contain hemlock and spruce at higher elevations, Douglas-fir, true fir and larch on lower slopes. Understories are similar, but becoming dominated by white fir. Pine stands are primarily large pine overstories, clumpy pine understories, with Douglas-fir and larch mixed in on wetter sites in drainage's or on the fringes of the aspect. The few plantations were planted with pine.

Fragmentation:

This MSA is mostly intact with less than 5% in harvest-related openings. The rest of the early seral area is primarily fire-related on the summit. There are no major roads or other breaks in the landscape.

Snags and Coarse Woody Debris:

Snags and coarse woody debris loads are high in the mixed conifer stands, but most of the mortality has been in the smaller trees, so CWD is usually smaller material. The pine stands have amounts of snags and CWD that is consistent with historic levels, although understory mortality, particularly in thickets, is beginning to increase fuel-loads. In the 1981 stand replacement fire on the north slope summit, dead trees have begun to fall down so that large fuel loads are increasing as are the fine grass and shrub fuels.

Insect and Disease Condition:

Moderate risk from stress induced root rots, beetles and fir engraver. Primarily a healthy forest with some medium damage in pockets of mid elevation mixed conifer. Some of the pine thickets are approaching densities that will increase the risks of mountain pine beetles. These increased densities and other pathogens are increasing stress on the remaining large trees, particularly pine, and providing

ideal conditions for a mountain pine beetle attack. Pine beetle mortality is evident and increasing in these large trees.

Fire Risk:

Low risk of fire occurrence. Fuel loads are considered high on the north slope and low to moderate on the southern slope. Moderate risk of high intensity and stand-replacement in mixed conifer stands, primarily because of poor access and steep slopes.

Focal LS/OG Terrestrial Wildlife Species:

- (a) Northern spotted owl - No known nest sites. Primarily dispersal habitat with some suitable habitat on north slope.
- (b) Pine marten - Potential habitat primarily on north slope.
- (c) White-headed, black-backed woodpeckers and Williamson's sapsucker - Known occurrences and potential habitat throughout the area.
- (d) Northern goshawk - Potential habitat throughout the area.
- (e) Flammulated owl - High probability of occurrence throughout the area.

Focal Aquatic Species

None

Focal Plant Species of Concern

- (a) Rare truffle (*Elaphomyces anthracinus*)- Potential habitat exists in the area.
- (b) Peck's penstemon- Known sites and potential habitat exists in intermittent and ephemeral channels and high watertable areas near the base of Black Butte.

Noxious Weed Conditions:

Populations of diffuse and spotted Knapweed are found along Rd 11 and Rd 14.

Social Context:

The trail to the summit of Black Butte is heavily used because of the outstanding panoramic view and the attraction of the wide range of historic fire detection structures found there. Black Butte is also the dominant landscape element in almost all views of this portion of central Oregon.

MSA Goals

Manage for late-successional habitat that is primarily climatic climax in mixed conifer, except for the lower slopes of Black Butte. Restore fire climax habitat on lower ponderosa pine slopes. Manage for healthy and sustainable forested areas with sufficient structure to provide some dispersal habitat for spotted owls moving north and south and between the Cascades and Green Ridge. Dry mixed conifer stands are managed for sustainable densities to reduce the risk of high intensity disturbance. In pine stands, manage understory densities to reduce stress on the larger trees and to reduce the risk from pine beetles.

Management Objectives

Short-term: reduce risk of further high intensity disturbance, especially fire. Reduce stress and risk to remaining large trees and pockets of LS/OG habitat.

Long-term: develop and maintain landscape patterns, species composition and structure in MCD that is more consistent with HRV where stands were maintained by frequent low intensity fire. Look for opportunities to manage some MCD sites at higher densities and greater canopy closure. These opportunities will be associated with wetter, higher productivity sites that could be incorporated into owl activity areas and home range. The rest of the MCD will function primarily as dispersal habitat and habitat for other LS/OG species. In pine stands, promote stand structures and density that will allow the reintroduction of low intensity fire.

In plantations and other younger stands promote the development of LS/OG stand structure.

Rationale: Current conditions in the MCD have developed artificially primarily as a result of fire exclusion. The combination of excessive densities and species composition provides conditions for pathogens and disturbance to be of much higher intensity than normal. Fire occurrence is high in most of this MSA, both lightning and human caused, and large high intensity fires are likely to occur within the next 10 to 20 years.

Ponderosa pine stands were historically much more open, with larger trees than currently exist. Stand development was strongly, and almost exclusively influenced by frequent low intensity fire, on a very wide scale. Many LS/OG species dependent on open stands of large trees and snags may be slowly disappearing from these areas.

Management of Forested Areas:

Maintain healthy trees of all species, especially large trees in the upper 20% of their plant association site potential.

Use mechanical or hand thinning to reduce stand densities based on Cochran's SDI. Prescribed fire is not recommended for thinning these stands in the first entries, except in some of the low density pine stands on the lower slopes, or where fire has recently reduced densities and fuel-loads..

Remove dead and down material excess to habitat requirements for 100% MPP for focal species.

Prescribed fire possible on lower slopes after mechanical or hand thinning.

Silviculture opportunities: Limited thinning opportunities because of topography and scenic sensitivity. Emphasize management on lower slopes to maintain large tree character.

Management of Regenerated Areas:

Manage plantations to accelerate growth in order to develop LS/OG stands as soon as possible.

As plantations grow, manage stand densities to maintain health and vigor, and to provide diversity of species and structure.

Moving large CWD into plantations from adjacent areas is probably too difficult because of access and steep slopes.

Fire Management:

Aggressive control because of scenic sensitivity. Fuel-breaks opportunities along Road 14. Fire suppression on the top 1/3 of the butte and in previously burned areas should be limited to that necessary to protect structures.

Snags and Coarse Woody Debris:

Maintain pockets of 1/4 to several acres of snags and the largest available coarse woody debris.

Maintain snags and coarse woody debris evenly distributed across the MSA in sufficient numbers to provide 100% MPP for black-backed woodpeckers.

Wildlife and Botanical

Habitat protection takes precedence over protection of individual plant or animal populations except for known sites of species listed in Table C-3 of the NW Forest Plan.

Control the spread of St. John's wort along roads using current noxious weed guidelines.

6. Management Strategy Area F

This area is about 8700 acres in size (11% of MLSR) and encompasses the scarp of Green Ridge from Black Butte to Candle Creek. The Metolius River is the western extent of this MSA. The area averages between 2,500 and 4,500 feet in elevation.

Metolius Watershed Analysis Landscape Areas: 2 and 10.

Plant Association Group and Vegetative Condition:

Ponderosa pine and dry mixed conifer PAGs composed primarily of pioneer tree species. Large patch of small sized trees (9-20.9" dbh) and moderate to high (50-70%) canopy closures.

Landscape Patterns:

This MSA is primarily comprised of one large (85% of MSA) continuous patch of small sized timber. Because this is the face of the Green Ridge fault block, the aspect and slopes are very uniform and consistent from north to south. Differences in plant communities are primarily because of differences in elevation. Harvest has been limited because of steep slopes and poor access, and almost all harvest has been partial cuts or thinning.

Stand Structure:

Stands in this MSA are almost all small sized timber, composed of dry mixed conifer species dominated by ponderosa pine and Douglas-fir on the upper slopes. On the lower slopes and the flat bench adjacent to the Metolius River stands are almost pure pine with near historic numbers of large trees still existing. The top slopes are becoming dominated by true firs, which gradually decrease down the slope. Incense cedars are frequent in both under and overstories on the slopes. Larch are common in the wetter portions of the pine stands.

Fragmentation:

There are only a couple small harvest-related openings in this MSA in the southern portion, and no major roads. A fuel-break constructed in the late 70's thinned the stands adjacent to Road 1140, but is not a significant barrier or viewshed element.

Snags and Coarse Woody Debris:

Snags and CWD are locally heavy on the slopes in relation to the varying amounts of insect and disease mortality. About 1000 acres of the northern portion was thinned in the early 80's, and fine to medium fuel loads were substantially lowered. In the pine stands on the bench and lower slopes, easy access for woodcutters and partial cut harvest have reduced snags and CWD. Recent mortality in the large pine has resulted in an increase in large snags and spike topped pine, and a slight increase in CWD. Snags numbers are probably slightly less, and CWD amounts slightly more than historic conditions prior to fire exclusion.

Insect and Disease Condition:

Moderate risk from stress induced root rots, beetles and engraver. Primarily a healthy forest. Some of the pine thickets are approaching densities that will increase the risks of mountain pine beetles. White fir mortality is also increasing. These increased densities and other pathogens are increasing stress on the remaining large trees, particularly pine, and providing ideal conditions for a mountain pine beetle attack. Pine beetle mortality is evident and increasing in these large trees.

Fire Risk:

Low (Scarp) to high (Metolius River) risk of fire occurrence, and moderate fuel loading. High risk of high intensity and stand replacement fires because of steep slopes and poor access.

Focal L-S Terrestrial Wildlife Species:

- (a) Northern spotted owl - No known nest sites. Primarily dispersal habitat with limited suitable habitat. There have been some individual sightings.
- (b) Pileated woodpecker, white-headed and Williamson's sapsucker - Known occurrences and high probability of occurrence throughout potential habitat.
- (c) Northern goshawk - Known nest site and potential habitat throughout the area.
- (d) Northern bald eagle - Potential habitat along the Metolius River.
- (e) Flammulated owl - Known occurrences throughout the area.

Focal Aquatic Species

- (a) Cascade, tailed and spotted frogs - Potential habitat and moderate to high probability of occurrence along Metolius River.
- (b) Bull trout - Rearing in the Metolius River
- (c) Apatania tavalala - Known to occur in the Metolius River.

Focal Plant Species of Concern

- (a) Rare truffle (Elaphomyces anthracinus)- A known site and potential habitat exists in the area.
- (b) Peck's penstemon- Known sites and potential habitat exists in intermittent and ephemeral channels and high watertable areas near the Metolius River.
- (c) Mountain lady slipper- Potential habitat exists along the Metolius River.

Noxious Weed Conditions:

Populations of diffuse and spotted Knapweed and Dalmatian Toadflax are found along Rd 14.

Social Context

The western side of the MSA adjacent to the Metolius Wild and Scenic River corridor gets some recreational use from visitors to the river who hike or camp in dispersed undeveloped spots along the pine bench. There is some hunting used of the slopes and top of the ridge. Because of its position, the face of Green Ridge is a dominant landscape element in views from the Metolius basin and the wilderness areas to the west.

MSA Goals

Manage for late-successional habitat that is primarily sustainable fire climax vegetation with patches of climatic climax stands. Fire climax will be on lower ponderosa pine slopes. Manage for healthy and sustainable forested areas with sufficient structure to provide some dispersal habitat for spotted owls moving north and south and between the Cascades and Green Ridge. Lack of access and steep slopes make it difficult to manage densities in dry mixed conifer stands, and the risk of high intensity disturbance may best be managed by actions that limit the spread outside of the MSA. In pine stands, manage understory densities to reduce stress on the larger trees and to reduce the risk from pine beetles.

Management Objectives

Short-term: reduce risk of further high intensity disturbance, especially fire. Reduce stress and risk to remaining large trees and pockets of LS/OG habitat.

Long-term: develop and maintain landscape patterns, species composition and structure in MCD that is more consistent with HRV where stands were maintained by frequent low intensity fire. Look for opportunities to manage some MCD sites at higher densities and greater canopy closure. These opportunities will be associated with wetter, higher productivity sites that could be incorporated into owl activity areas and home range. The rest of the MCD will function primarily as dispersal habitat and habitat for other LS/OG species. In pine stands, promote stand structures and density that will allow the reintroduction of low intensity fire.

In plantations and other younger stands promote the development of LS/OG stand structure.

Rationale: Current conditions in the MCD have developed artificially primarily as a result of fire exclusion. The combination of excessive densities and species composition provides conditions for pathogens and disturbance to be of much higher intensity than normal. Fire occurrence is high in most of this MSA, both lightning and human caused, and large high intensity fires are likely to occur within the next 10 to 20 years.

Ponderosa pine stands were historically much more open, with larger trees than currently exist. Stand development was strongly, and almost exclusively influenced by frequent low intensity fire, on a very wide scale. Many LS/OG species dependent on open stands of large trees and snags may be slowly disappearing from these areas.

Management of Forested Areas:

Maintain healthy trees of all species, especially large trees in the upper 20% of their plant association site potential.

Use mechanical or hand thinning to reduce stand densities based on Cochran's SDI. Prescribed fire is not recommended for thinning the mixed conifer stands in the first entries. Most of the pine stands on the bench and lower slopes could be thinned with prescribed fire.

In the pine stands and on steep slopes do not remove dead and down material. Future insect and disease mortality may increase to the point where it is necessary to remove material excess to habitat requirements for 100% MPP for focal species.

Silviculture opportunities: Low priority for thinning treatments. High densities, but constrained by steep slopes and shallow soils. If future conditions require stand regeneration, consider historic range of patch sizes and shapes for this terrain; e.g. narrow openings running mid slope to top of ridge.

Management of Regenerated Areas:

Manage plantations to accelerate growth in order to develop LS/OG stands as soon as possible.

As plantations grow, manage stand densities to maintain health and vigor, and to provide diversity of species and structure.

Moving large CWD into plantations from adjacent areas is probably too difficult because of access and steep slopes.

Fire Management:

Aggressive control on lower slopes and the pine bench due to proximity of private lands and recreational facilities along the Metolius River. Fires that begin mid-slope or above will probably have

to be managed at the top of the ridge. There are unmaintained fuel-breaks on Road 1120 in the southern portion of the MSA and on Road 1140 and 1140-300 at the top of the ridge. These need minor thinning and brush reduction to be effective. The 1140 fuel-break could be extended into untreated portions north and south.

Snags and Coarse Woody Debris:

Maintain existing levels of snags and CWD. If future insect and disease mortality warrants treatment, maintain snags and coarse woody debris evenly distributed across the MSA in sufficient numbers to provide 100% MPP for black-backed woodpeckers.

Wildlife and Botanical

Habitat protection takes precedence over protection of individual plant or animal populations except for known sites of species listed in Table C-3 of the NW Forest Plan.

Control the spread of St. John's wort along roads using current noxious weed guidelines.

7. Management Strategy Area G

This MSA is approximately 3,750 acres in size (5% MLSR) and encompasses the rural developed areas of Camp Sherman and Metolius Meadows. Almost all of this MSA is included in the Metolius Wild and Scenic River corridor. This MSA is an important rural/forest interface area and ranges in elevation from 2,900 to 3000 feet in elevation.

Metolius Watershed Analysis Landscape Area: 2

Plant Association Group and Vegetative Condition:

Primarily ponderosa pine PAG with some dry mixed conifer PAG. Pioneer species dominate. Most of the MSA (62%) is comprised of large patches of small sized trees (9-20.9" dbh) with moderate (40-70% canopy closures). There are significant patches (26% of the MSA) of larger tree habitat (21"+ dbh) with open canopies. Tree densities vary with both sustainable and unsustainable conditions present

Landscape Patterns:

The landscape is very homogeneous, the only significantly different patches being associated with private and recreational development. There is some distinct riparian area associated with the river and lower portions of the tributaries, but in most cases upland forest vegetation types extend to within a few yards of the water. Almost all of the large tree habitat is associated with riparian areas along the river and tributaries.

Stand Structure:

Stands are almost entirely dominated by ponderosa pine. Wetter areas may have western larch and occasionally Douglas fir. White fir is beginning to dominate the understories in the western part of the MSA, otherwise understories are clumpy thickets of pine or larch. Most of the stands are small to large sized trees (88%). The stands with the smaller trees in the overstory tend to have higher canopy closure, while stands dominated by large trees tend to be more open over dense even-aged clumps of younger trees. There are a few small meadows associated with the river. About 3% of the MSA is in small regeneration units planted with pine.

Fragmentation:

The river and the associated campgrounds and rural development bisect the MSA from south to north. Approximately 1200 acres of private land in 3 large pieces provide the bulk of the early seral openings.

Snags and Coarse Woody Debris:

Easy access for woodcutters and partial cut harvest have reduced snags and CWD. Recent mortality in the large pine has resulted in an increase in large snags and spike topped pine, and a slight increase in CWD. Snags numbers are probably slightly less, and CWD amounts slightly more than historic conditions prior to fire exclusion.

Large logs and other woody debris are critical to the character of the Metolius River. Logs and jams modify and redirect the high gradient flows, providing cover and maintaining spawning gravel's. In streams as stable in flow as the Metolius, logs and jams tend to stay in place for long periods rather than flushing downstream with freshets. This stability has allowed the unique floating island habitats to develop. Wood has been removed from the Metolius in the few decades to provide boating and log drive (unsuccessful) passage, and to "clean up" the river. Additionally, the amount of riparian large tree habitat has declined (in 1953 about 86% of riparian areas in the watershed were dominated by

med/large trees. In 1991, that figure had declined to 12%). This downward trend in tree sizes will result in fewer large trees available to fall into streams and provide CWD. At present, woody debris is dominated by small sized material.

Insect and Disease Condition:

Low risk from stress induced root rots, beetles and engraver. Primarily a healthy forest, but risk is increasing due to increasing stand densities.

Fire Risk:

High risk of fire occurrence, particularly human-caused, but low fuel loading. Because of easy access and quick detection, fires will usually remain small and of low intensity. There is a moderate risk of stand-replacement fire in stands with dense understories.

Focal L-S Terrestrial Wildlife Species:

- (a) Northern spotted owl - No known nest sites. Primarily dispersal habitat.
- (b) White-headed and Williamson's sapsucker - Known occurrences and potential habitat throughout the area.
- (c) Northern goshawk - Known nest site and potential habitat throughout the area.
- (d) Northern bald eagle - Potential habitat along the Metolius river.
- (e) Flammulated owl - Known occurrences and potential habitat throughout the area.

Focal Aquatic Species

- (a) Cascade, tailed and spotted frogs - Potential habitat in Jack, First, Davis and Lake Creeks, and unmapped wetlands and ponds.
- (b) Bull trout - Spawning and rearing habitat in the Metolius River and Jack Creek
- (c) Apatania tavalala - Known to occur in the Metolius River and suspected in Jack Creek.

Focal Plant Species of Concern

- (a) Rare truffle (Elaphomyces anthracinus)- A known site and potential habitat exists in the area.
- (b) Peck's penstemon- Known sites and potential habitat exists in intermittent and ephemeral channels and high watertable areas near the Metolius River.

Noxious Weed Conditions:

Populations of diffuse and spotted knapweed and dalmatian toadflax are found along Rd 14.

Social Context

This MSA contains 8 developed campgrounds, 108 leased recreational residences and around a hundred private residences and businesses. Day use is increasing yearly; although total visitor numbers are not known. The 2 most popular sites - Head of the Metolius and Wizard Falls Fish Hatchery counted over 200,000 visitors in 1994. When asked, most visitors respond that they come to the Metolius because of the river and river-related experiences, and they come to see big trees. The Metolius, for many, satisfies their vision of an old growth forest.

MSA Goals

Manage for late-successional habitat that is primarily fire climax ponderosa pine. Manage to provide stands dominated by large pine with open understories. Develop and maintain large tree habitat adjacent to riparian areas to provide future instream CWD. Reduce the risk of high intensity fires adjacent to rural and recreational development.

Management Objectives

Short term: Reduce stand densities in the understories to lower risk of high intensity disturbance and to take pressure off the larger trees.

Long term: Develop and maintain the desired forest condition of open park-like stands dominated by large-sized trees over scattered clumps of even-aged understory. Manage vegetation under the guidelines of the Metolius Wild and Scenic River Plan to be consistent with protecting and enhancing the Outstandingly Remarkable Values.

Management of Forested Areas:

Maintain healthy trees of all species, especially large trees in the upper 20% of their plant association site potential.

Develop larger sized trees in riparian areas to provide future instream CWD.

Use mechanical or hand thinning to reduce stand densities based on Cochran's SDI. Prescribed fire could be used in many stands for thinning, but others will require mechanical or hand thinning either because of high densities or their proximity to developed areas.

Do not remove dead and down material at this time, except where necessary to reduce fire intensity adjacent to developed areas. Future insect and disease mortality may increase to the point where it is necessary to remove material excess to habitat requirements for 100% MPP for focal species.

Silviculture opportunities: Moderate priority for thinning. Emphasize thinning from below and precommercial thinning to develop young stands into late-successional habitats, to sustain large tree character and to promote fire behaviors that allow for low-intensity prescribed or natural fires.

Management of Regenerated Areas:

Manage plantations to accelerate growth in order to develop LS/OG stands as soon as possible.

As plantations grow, manage stand densities to maintain health and vigor, and to provide diversity of species and structure.

Consider moving large CWD into plantations from adjacent areas.

Fire Management:

Aggressive control due to proximity of private lands. Fuel-breaks opportunities exist along major roads and on private property boundaries. Stand modification in fuel-breaks should be limited to understory thinning to reduce densities and break up the continuity of thickets. Brush removal should target old dead and decadent Bitterbrush to reduce fuel-loads, break up fuel continuity, and rejuvenate forage.

Snags and Coarse Woody Debris:

Maintain snags and coarse woody debris evenly distributed across the MSA in sufficient numbers to provide 100% MPP for black-backed woodpeckers. Hazard trees and down logs in developed areas are managed under the guidelines of the Metolius Wild and Scenic River Plan.

Wildlife and Botanical

Habitat protection takes precedence over protection of individual plant or animal populations except for known sites of species listed in Table C-3 of the NW Forest Plan.

Control the spread of St. John's wort along roads using current noxious weed guidelines.

8. Management Strategy Area H

This MSA is approximately 8,860 acres in size (11% MLSR) and includes the top of Green Ridge. The eastern boundary is the owl line. The elevations of this MSA range from 4,300 to 4,700 feet.

Metolius Watershed Analysis Landscape Area: Majority of the area is outside the watershed boundary. A small portion near Horn of Metolius is in Landscape Area 9.

Plant Association Group and Vegetative Condition:

Mixed conifer dry and wet PAGs with mixed species composition. Primarily small sized trees (9-20.9" dbh) with 60-70% canopy closures and unsustainable tree densities. Heavily fragmented.

Landscape Patterns:

This MSA encompasses the summit and several east draining intermittent tributaries to Lake Billy Chinook. The MSA and lands to the east outside the owl line have been extensively harvested in the last 50 years, mostly in regeneration units. The remaining stands are small, scattered strips between clear-cut units or remnant stands on steep slopes or in riparian drainage's. The area is still predominately in the small timber size class (74% of the stands are 9-21" dbh), but most stands are dominated by trees on the small end of the scale, almost all of the large trees having been removed. Less than 1% of the area is in stands containing med/large trees.

Stand Structure:

Small tree size class stands are primarily wet or dry mixed conifer depending on aspect or position in a drainage. The intact stands have overstories of pine or Douglas fir, rarely larch; with few exceptions, most overstory trees are less than 21". Understories in these stands are dense true firs, occasionally pine thickets, or dense stands of mixed species including incense cedar and Douglas fir. Small sized stands that have been partial cut or thinned in the past usually have no significant overstory layer, but may have more than one distinct layer in the dense understory - typically pole-sized pine or Douglas fir over white fir reproduction. The regeneration units are typically planted to pine - some of the early units have trees 15-20 feet tall, as most of this MSA is fairly productive.

Fragmentation:

About 21% of this MSA is in regeneration units - over 1900 acres in more than 70 units. Most of these units are in the northern portion of the MSA. There are several well-traveled roads running north and south, and most of the drainage's have old roads on both sides of the creek as well on the ridge tops. There are no natural openings except Prairie Farm Meadow.

Snags and Coarse Woody Debris:

Snags and coarse woody debris loads are typically high in these plant associations, both from recent mortality and past harvest. Much of the area, especially the dry mixed conifer stands has more CWD than historical levels. Plantations have down woody debris sufficient for most habitat needs, but are generally deficient in large logs and snags - the 2 to 3 snags per acre left after harvest having fallen.

Insect and Disease Condition:

Moderate to high risk from stress induced root rots, beetles and engraver. Primarily low to medium insect and disease damage with patches of high forest damage and tree mortality.

Fire Risk:

Low risk of fire occurrence with moderate to high fuel loading. Fires will probably be high intensity, stand-replacement in nature.

Focal L-S Terrestrial Wildlife Species:

- (a) Northern spotted owl - No known nest sites. Primarily dispersal habitat with some suitable habitat.
- (b) Pileated woodpecker, white-headed, black-backed woodpeckers and Williamson's sapsucker - Known occurrences and potential habitat throughout the area.
- (c) Northern goshawk - Known nest site and potential habitat throughout the area.
- (d) Great gray owl - Limited habitat and low probability of occurrence within area.

Focal Aquatic Species

- (a) Cascade frogs - limited habitat in Alder Creek area. Low probability of occurrence.

Focal Plant Species of Concern

There are no known or potential habitat for species of concern in this area.

Noxious Weed Conditions:

There are no known noxious weed populations in this area.

Social Context

Green Ridge is a popular area for fall hunting both big game and birds. There are many dispersed campsites along the roads, but no developed facilities.

MSA Goals

Manage for late-successional habitat that is primarily sustainable fire climax vegetation with patches of climatic climax stands. Manage forested stands to provide healthy dispersal habitat and habitat for other LS/OG species. This area is the eastern most fringe of mixed conifer habitat and may be especially important to species on the edge of their normal range.

Management Objectives

Short term: Reduce stand densities and fuel loads to lower risk of high intensity disturbance, and to promote development of larger trees.

Long term: Manage plantations to develop LS/OG habitat as quickly as possible to reduce the effects of fragmentation.

Management of Forested Areas:

Maintain healthy trees of all species, especially large trees in the upper 20% of their plant association site potential.

Use mechanical or hand thinning to reduce stand densities based on Cochran's SDI. Prescribed fire is not recommended for thinning these stands in the first entries.

Remove dead and down material excess to habitat requirements for 100% MPP for focal species.

Silviculture opportunities: Emphasize thinning from below to develop young stands into late-successional habitats, and to reduce the risk of catastrophic disturbances. Some salvage and fuel-wood gathering opportunities in southern portion of area.

Management of Regenerated Areas:

Manage plantations to accelerate growth in order to develop LS/OG stands as soon as possible.

As plantations grow, manage stand densities to maintain health and vigor, and to provide diversity of species and structure.

Consider moving large CWD into plantations from adjacent areas.

Fire Management:

Aggressive control due to proximity of private lands.. Fuel-break opportunities along Green Ridge. With the exception of private timber lands, there are few resource or social values at risk in this MSA. As stand densities and fuel loads are reduced, managing natural fires should be considered as a suppression option.

Snags and Coarse Woody Debris:

Maintain pockets of 1/4 to several acres of snags and the largest available coarse woody debris. Maintain snags and coarse woody debris evenly distributed across the MSA in sufficient numbers to provide 100% MPP for black-backed woodpeckers.

Wildlife and Botanical

Habitat protection takes precedence over protection of individual plant or animal populations except for known sites of species listed in Table C-3 of the NW Forest Plan.

Control the spread of St. John's wort along roads using current noxious weed guidelines.

9. Management Strategy Area I

This MSA is approximately 1,342 acres in size (2% MLSR), 2,900 feet in elevation and encompasses the Riparian Reserve associated with the confluence of the Metolius River, Canyon Creek and Brush Creek.

Metolius Watershed Analysis Landscape Area: 2.

Plant Association Group and Vegetative Condition

Ponderosa pine PAG dominated by pioneer species. Fairly contiguous patch of small sized trees (9-20.9" dbh) and high canopied (70%) forests.

Landscape Patterns:

This MSA is relatively flat and mostly in one large patch (89% of MSA) of small sized timber. There are a few small openings, both natural and harvest related. Much of the area is riparian, with high water tables or direct stream-side influences.

Stand Structure:

Stands are predominately small sized timber, dominated by ponderosa pine and larch. Some Douglas fir is present. Overstories are dense for pine, understories are mostly scattered pine thickets beginning to be dominated by white fir. The wetter areas and stands adjacent to streams are generally denser and smaller with more fir and larch.

Fragmentation:

Fragmentation is minimal here with about 150 acres (11% of MSA) in several regeneration units. There are a few roads and one developed campsite.

Snags and Coarse Woody Debris:

Easy access for woodcutters and partial cut harvest have reduced snags and CWD. Recent mortality in the large pine has resulted in an increase in large snags and spike topped pine, and a slight increase in CWD. Snags numbers are probably slightly less, especially larch, and CWD amounts slightly more than historic conditions prior to fire exclusion, particularly in the wet riparian areas that have been avoided by woodcutters.

Insect and Disease Condition:

Low to moderate risk from stress induced root rots, beetles and engraver. Primarily a healthy forest.

Fire Risk:

Moderate fire occurrence and low fuel loads. Moderate to high risk of stand replacement wildfire.

Focal L-S Terrestrial Wildlife Species:

- (a) Northern spotted owl - No known nest sites. Primarily dispersal habitat.
- (b) Pine marten - Potential habitat associated with riparian areas.
- (c) Pileated woodpecker, white-headed and Williamson's sapsucker - Known occurrences and potential habitat throughout the area.
- (d) Northern goshawk - Potential habitat throughout the area.
- (e) Northern bald eagle - Potential habitat along the Metolius River.

- (f) Flammulated owl - known occurrences throughout area.
- (g) Vaux's swift - High probability of occurrence, because of riparian areas.

Focal Aquatic Species

- (a) Cascade, tailed and spotted frogs - Known sightings of tailed and cascade frog. Low probability of occurrence for spotted frog.
- (b) Bull trout - Spawning and/or rearing in Roaring, Canyon, and Brush Creeks.
- (c) Apatania tavalala - Known to occur in Roaring Creek and suspected in others.

Focal Plant Species of Concern

- (a) Rare Nitrogen Fixing Lichens- Potential habitat exists in riparian areas.
- (b) Candy stick - Potential habitat exists in the area.
- (c) Peck's penstemon- Potential habitat exists in intermittent and ephemeral channels and high watertable areas.

Noxious Weed Conditions:

There are no known sites in the area, but St. John's wort is likely to spread from adjacent populations.

Social Context

There are a number of trails along the streams that are heavily used by visitors to the Metolius Basin for hiking and fishing access. Canyon Creek Campground and a few dispersed sites along the creeks provide a less developed camping opportunity than is found in the rest of the basin.

MSA Goals

Manage for Late-successional habitat that is primarily climatic climax conditions. Protect the Riparian Reserves from high intensity disturbance. Develop larger trees to provide future instream CWD.

Management Objectives

Short term: Reduce stand densities in the understories to lower risk of high intensity disturbance and to take pressure off the larger trees.

Long term: Develop and maintain the desired forest condition of open park-like stands dominated by large-sized trees over scattered clumps of even-aged understory. Manage vegetation under the guidelines of the Metolius Wild and Scenic River Plan to be consistent with protecting and enhancing the Outstandingly Remarkable Values.

Long-term: develop and maintain landscape patterns, species composition and structure in MCD that is more consistent with HRV where stands were maintained by frequent low intensity fire. Look for opportunities to manage some MCD sites at higher densities and greater canopy closure. These opportunities will be associated with wetter, higher productivity sites that could be incorporated into owl activity areas and home range. The rest of the MCD will function primarily as dispersal habitat and habitat for other LS/OG species. In pine stands, promote stand structures and density that will allow the reintroduction of low intensity fire.

In plantations and other younger stands promote the development of LS/OG stand structure.

Rationale: Current conditions in the MCD have developed artificially primarily as a result of fire exclusion. The combination of excessive densities and species composition provides conditions for

pathogens and disturbance to be of much higher intensity than normal. Fire occurrence is high in most of this MSA, both lightning and human caused, and large high intensity fires are likely to occur within the next 10 to 20 years.

Ponderosa pine stands were historically much more open, with larger trees than currently exist. Stand development was strongly, and almost exclusively influenced by frequent low intensity fire, on a very wide scale. Many LS/OG species dependent on open stands of large trees and snags may be slowly disappearing from these areas.

Management of Forested Areas:

Maintain healthy trees of all species, especially large trees in the upper 20% of their plant association site potential.

Use mechanical or hand thinning to reduce stand densities based on Cochran's SDI. Prescribed fire is not recommended for thinning these stands in the first entries. Use only hand thinning in the Riparian reserves to avoid further compaction.

Entries into Riparian Reserves should be either extensive with minor treatment, or small areas of more concentrated treatment - no more than 5% per year, so that untreated refuge is are maintained.

Prescribed fire possible after mechanical or hand thinning.

Silviculture opportunities: Moderate priority for light thinning from below to develop young stands into late-successional habitats. Low priority for salvage.

Management of Regenerated Areas:

Manage plantations to accelerate growth in order to develop LS/OG stands as soon as possible.

As plantations grow, manage stand densities to maintain health and vigor, and to provide diversity of species and structure.

Consider moving large CWD into plantations from adjacent areas.

Fire Management:

Aggressive control due to proximity of private lands. Create and maintain fuel-breaks along 1200 road. There are few resource or social values at risk in this MSA. As stand densities and fuel loads are reduced, managing natural fires should be considered as a suppression option, particularly in the Riparian Reserve.

Snags and Coarse Woody Debris:

Maintain pockets of 1/4 to several acres of snags and the largest available coarse woody debris.

Maintain snags and coarse woody debris evenly distributed across the MSA in sufficient numbers to provide 100% MPP for black-backed woodpeckers.

Wildlife and Botanical

Habitat protection takes precedence over protection of individual plant or animal populations except for known sites of species listed in Table C-3 of the NW Forest Plan.

Control the spread of St. John's wort along roads using current noxious weed guidelines.

10. Management Strategy Area J

This MSA is approximately 6,460 acres in size (8% MLSR) and ranges in elevation from 3,000 to 3,600 feet. The MSA is adjacent to the Confederated Tribes of Warm Springs Reservation and wilderness to the north.

Metolius Watershed Analysis Landscape Areas: 2 and 8.

Plant Association Group and Vegetative Condition:

Dry mixed conifer PAG of mixed species composition with patches of pioneer tree species. Primarily small sized trees (9-20.9" dbh) with canopy closures of varying densities. Primarily tree densities that are sustainable. Some patches of larger tree habitat. Moderately fragmented

Landscape Patterns:

This MSA is predominately one large patch (72% of MSA) of small sized timber. Most stands are dominated by trees on the small end of the scale, almost all of the large trees having been removed. About 4% of the area is in stands containing med/large trees, but these are in very small patches.

Stand Structure:

The intact stands have overstories of pine or Douglas fir, rarely larch; with few exceptions, most overstory trees are less than 21". Understories in these stands are dense true firs, occasionally pine thickets, or dense stands of mixed species including Douglas fir. Small sized stands that have been partial cut or thinned in the past usually have no significant overstory layer, but may have more than one distinct layer in the dense understory - typically pole-sized pine or Douglas fir over white fir reproduction. The regeneration units were mostly planted to pine.

Fragmentation:

About 10% of the area is comprised of regeneration units - over 680 acres in about 30 units. Another 4% is unforested - mostly in one large lava flow on the north boundary (Jefferson Creek). The area is heavily roaded, but not frequently traveled.

Snags and Coarse Woody Debris

Snags and coarse woody debris loads are typically high in these plant associations, especially as they grow older. Much of the area may be higher than historical levels due to recent insect and disease mortality. In MCD stands, frequent low intensity fires would have kept fuel loads at lower levels than currently exist. Plantations have amounts of down woody debris sufficient for most habitat needs, but are generally deficient in large logs and snags - the 2 to 3 snags per acre left after harvest having fallen.

Insect and Disease Condition:

Moderate Low risk from stress induced root rots, beetles and engraver. Primarily a healthy forest.

Fire Risk:

Low to moderate risk of fire occurrence, but locally very high because of lightning patterns. Low fuel loading in the lower elevations, but moderate to high fuel loading in the higher elevations. High risk of stand replacement fires.

Focal L-S Terrestrial Wildlife Species:

- (a) Northern spotted owl - One known nest sites. Primarily dispersal habitat with some suitable habitat in higher elevations.
- (b) Marten - High probability of occurrence for marten in higher elevations.
- (c) Pileated woodpecker, white-headed, and Williamson's sapsucker - Known occurrences and potential habitat throughout the area.
- (d) Northern goshawk - Known nest site and potential habitat throughout the area.
- (e) Northern bald eagle - Known nest site along Metolius River.
- (f) Flammulated owl - Known occurrences within MSA and potential habitat throughout.
- (g) Vaux's swift - Potential habitat throughout area.

Focal Aquatic Species

- (a) Cascade, tailed and spotted frogs - Known occurrences of cascade frog. limited habitat for spotted, but potential habitat for tailed frog.
- (b) Bull trout - Spawning and/or rearing habitat in Jefferson, Candle, and Abbot Creeks.
- (c) Apatania tavalala - Suspected to occur in the above stream systems.

Focal Plant Species of Concern

- (a) Rare nitrogen fixing Lichens- A known site for several species and potential habitat is associated with riparian areas.
- (b) Peck's penstemon- Known sites and potential habitat exist in intermittent and ephemeral channels and high watertable areas.
- (c) Candy stick- Potential habitat exists in the area.
- (d) Mountain lady slipper- Known sites and potential habitat exists along the Metolius River.

Noxious Weed Conditions:

Individual scattered scotch broom plants are found along riparian areas. There are also scattered tansy Ragwort in old timber sale units.

Social Context

There is one small private ranch in the MSA, and some small developed recreation facilities. The area gets moderate to heavy use during hunting season. The primary access to several popular wilderness trailheads pass through the MSA.

MSA Goals

Manage for Late-successional habitat that is a mosaic of sustainable fire and climatic climax stands. Emphasize fire climax habitat in lower elevations. Develop and maintain suitable habitat for 3 spotted owl pairs in conjunction with Management Strategy Area K.

The climatic climax habitat should be in large minimally fragmented blocks surrounded by fire climax stands. Dry mixed conifer stands are managed for sustainable densities to reduce the risk of high intensity disturbance. Areas adjacent to private property and concentrated human use are managed at the low end of the desired stocking range to reduce risk of high intensity large scale wildfire.

Management Objectives

Short-term: reduce risk of further high intensity disturbance, especially fire. Reduce stress and risk to remaining large trees and pockets of LS/OG habitat.

Long-term: develop and maintain landscape patterns, species composition and structure in MCD that is more consistent with HRV where stands were maintained by frequent low intensity fire. Restore and maintain pockets of MCW for sustainable conditions. Look for opportunities to manage some MCD sites at higher densities and greater canopy closure. These opportunities will be associated with wetter, higher productivity sites that could be incorporated into owl activity areas and home range. The rest of the MCD will function primarily as dispersal habitat and habitat for other LS/OG species.

In plantations and other younger stands promote the development of LS/OG stand structure.

Rationale: Current conditions in the MCD have developed artificially primarily as a result of fire exclusion. The combination of excessive densities and species composition provides conditions for pathogens and disturbance to be of much higher intensity than normal. Fire occurrence is high in most of this MSA, both lightning and human caused, and large high intensity fires are virtually certain to occur within the next 10 to 20 years.

The best conditions for owl habitat exist in MCW patches and a few MCD areas in higher elevations or associated with wetter, high productivity sites.

Management of Forested Areas:

Silviculture opportunities: High priority for treatments because of high stand densities and mortality. Emphasize thinning from below and precommercial thinning to develop young stands into late-successional habitats. There are high mortality areas that may require regeneration. Take advantage of improving habitat and reducing risk through salvage and fuel-wood gathering opportunities. The poor condition of the standing material is becoming a safety concern.

Maintain healthy trees of all species, especially large trees in the upper 20% of their plant association site potential.

Use mechanical or hand thinning to reduce stand densities based on Cochran's SDI. Prescribed fire possible without prior treatments in some areas, but mechanical or hand thinning necessary in others.

Remove dead and down material excess to habitat requirements for 100% MPP for focal species.

Silviculture opportunities: High priority for thinning in the western portion of the area. Emphasize thinning from below and precommercial thinning to develop young stands into late-successional habitats. Some salvage and fuel-wood gathering opportunities in the western portion of the area.

Management of Regenerated Areas:

Manage plantations to accelerate growth in order to develop LS/OG stands as soon as possible.

As plantations grow, manage stand densities to maintain health and vigor, and to provide diversity of species and structure.

Consider moving large CWD into plantations from adjacent areas.

Where regeneration treatments are necessary, consider the historic range of patch sizes and shapes. Reestablish ponderosa pine, Douglas-fir, larch, and white pine.

Fire Management:

Contain and confine fire control strategy recommended due to fire-fighter risk associated with aggressive control.

Develop a series of fuel breaks along primary roads, especially Road 12 and other north-south roads.

Snags and Coarse Woody Debris:

Maintain pockets of 1/4 to several acres of snags and the largest available coarse woody debris.

Maintain snags and coarse woody debris evenly distributed across the MSA in sufficient numbers to provide 100% MPP for black-backed woodpeckers.

Wildlife and Botanical

Habitat protection takes precedence over protection of individual plant or animal populations except for known sites of species listed in Table C-3 of the NW Forest Plan.

Control the spread of St. John's wort along roads using current noxious weed guidelines.

11. Management Strategy Area K

This MSA is approximately 4,880 acres in size (6% MLSR) and includes Abbot Butte and the headwaters of Brush, Cabot and Abbot Creeks. The MSA is bordered by the wilderness to the north and west and Matrix to the south. The MSA is 3,600 to 4,500 feet in elevation.

Metolius Watershed Analysis Landscape Areas: Primarily 8 with small portion of 2.

Plant Association Group and Vegetative Condition:

Mix conifer wet and dry PAG with patches of climax, mixed and pioneer trees species composition. Highly fragmented vegetation due to past timber harvest. Primarily small sized trees (9-20.9" dbh) with a high levels (70-90%) of canopy closures. This MSA has some of the highest mortality levels over the LSR over a majority of its area.

Landscape Patterns:

This is the most fragmented portion of the LSR, having been extensively harvested in the last 50 years, mostly in regeneration units. The remaining stands are small, scattered strips between clear-cut units or remnant stands on steep slopes or in riparian drainages. The area is still predominately in the small timber size class (60% of the stands are 9-21" dbh), but most stands are dominated by trees on the small end of the scale, almost all of the large trees having been removed. About 6% of the area is in stands containing med/large trees, in scattered small patches.

Stand Structure:

Small tree size class stands are primarily wet or dry mixed conifer depending on aspect or position in a drainage. The intact stands have overstories of pine or Douglas fir, rarely larch; with few exceptions, most overstory trees are less than 21". Understories in these stands are dense true firs, occasionally pine thickets, or dense stands of mixed species including incense cedar and Douglas fir. Small sized stands that have been partial cut or thinned in the past usually have no significant overstory layer, but may have more than one distinct layer in the dense understory - typically pole-sized pine or Douglas fir over white fir reproduction. The regeneration units are typically planted to pine.

Fragmentation:

About 32% of this MSA is in regeneration units - over 1500 acres in more than 60 units. The units are clustered on mid to top slopes of most of the drainages, stream bottoms being relatively intact.

Snags and Coarse Woody Debris:

Snags and coarse woody debris loads are typically high in these plant associations, both from recent mortality and past harvest. Much of the area, especially the dry mixed conifer stands has more CWD than historical levels. Plantations have down woody debris sufficient for most habitat needs, but are generally deficient in large logs and snags - the 2 to 3 snags per acre left after harvest having fallen.

Insect and Disease Condition:

High risk from stress induced root rots, beetles and engraver. Low risk from western spruce budworm because significant portion of area has already been impacted by the defoliator. Generally low damage from insects and disease, but higher elevations with medium to high levels of mortality. This MSA has some of the highest mortality levels in the LSR - approaching 80% of the understories in many stands.

Fire Risk:

Low risk of fire occurrence and high fuel loads. High risk of high intensity, stand-replacement fire in upper elevation mixed conifer forests.

Focal L-S Terrestrial Wildlife Species:

- (a) Northern spotted owl - 2 known nest sites.
- (b) Wolverine, fisher and marten - potential habitat in higher elevations mixed conifer.
- (c) Pileated woodpecker, white-headed, black-backed woodpeckers and Williamson's sapsucker - Known occurrences and potential habitat throughout the area.
- (d) Northern goshawk - Known nest sites and potential habitat throughout the area.
- (e) Great gray owl - Low probability of occurrence due to limited high quality habitat.
- (f) Flammulated owl - Known occurrences associated with ponderosa pine dominated overstories. Potential habitat primarily in lower elevations of area.

Focal Aquatic Species

Cascade, tailed and spotted frogs - Known occurrences of Cascade frog. Limited habitat potential of spotted frog and high probability of occurrence for tailed frog

Apatania tavalala - Potential habitat.

Focal Plant Species of Concern

- (a) Rare nitrogen fixing Lichens- Potential habitat is associated with riparian areas.
- (b) Peck's penstemon- Known sites and potential habitat exist in intermittent and ephemeral channels and high watertable areas.
- (c) Candy stick- Potential habitat exists in the area.

Noxious Weed Conditions:

Tansy ragwort may occur in old timber sale units.

Social Context

The MSA is moderately used for hunting and dispersed camping. There is one small undeveloped campground.

MSA Goals

Manage for late-successional habitat that is a mosaic of fire and climatic climax stands. Fire climax emphasized in lower elevations. Develop and maintain suitable habitat for 3 spotted owl pairs in conjunction with Management Strategy Area J.

The climatic climax habitat should be in large minimally fragmented blocks surrounded by fire climax stands. Dry mixed conifer stands are managed for sustainable densities to reduce the risk of high intensity disturbance. Areas adjacent to private property and concentrated human use are managed at the low end of the desired stocking range to reduce risk of high intensity large scale wildfire.

Management Objectives

Short-term: reduce risk of further high intensity disturbance, especially fire. Reduce stress and risk to remaining large trees and pockets of LS/OG habitat.

Long-term: develop and maintain landscape patterns, species composition and structure in MCD that is more consistent with HRV where stands were maintained by frequent low intensity fire. Restore and maintain pockets of sustainable MCW. Look for opportunities to manage some MCD sites at higher densities and greater canopy closure. These opportunities will be associated with wetter, higher productivity sites that could be incorporated into owl activity areas and home range. The rest of the MCD will function primarily as dispersal habitat and habitat for other LS/OG species.

In plantations and other younger stands promote the development of LS/OG stand structure.

Rationale: Current conditions in the MCD have developed artificially primarily as a result of fire exclusion. The combination of excessive densities and species composition provides conditions for pathogens and disturbance to be of much higher intensity than normal. Fire occurrence is high in most of this MSA, both lightning and human caused, and large high intensity fires are virtually certain to occur within the next 10 to 20 years.

The best conditions for owl habitat exist in MCW patches and a few MCD areas in higher elevations or associated with wetter, high productivity sites.

Management of Forested Areas:

Silviculture opportunities: High priority for treatments because of high stand densities and mortality. Emphasize thinning from below and precommercial thinning to develop young stands into late-successional habitats. There are high mortality areas that may require regeneration. Take advantage of improving habitat and reducing risk through salvage and fuel-wood gathering opportunities. The poor condition of the standing material is becoming a safety concern.

Maintain healthy trees of all species, especially large trees in the upper 20% of their plant association site potential.

Use mechanical or hand thinning to reduce stand densities based on Cochran's SDI. Prescribed fire possible without prior treatments in some areas, but mechanical or hand thinning necessary in others.

Remove dead and down material excess to habitat requirements for 100% MPP for focal species.

Silviculture opportunities: High priority for thinning in the western portion of the area. Emphasize thinning from below and precommercial thinning to develop young stands into late-successional habitats. Some salvage and fuel-wood gathering opportunities in the western portion of the area.

Management of Regenerated Areas:

Manage plantations to accelerate growth in order to develop LS/OG stands as soon as possible.

As plantations grow, manage stand densities to maintain health and vigor, and to provide diversity of species and structure.

Consider moving large CWD into plantations from adjacent areas.

Where regeneration treatments are necessary, consider the historic range of patch sizes and shapes. Reestablish ponderosa pine, Douglas-fir, larch, and white pine.

Fire Management:

Contain and confine fire control strategy recommended due to fire-fighter risk associated with aggressive control.

Develop a series of fuel-breaks along primary roads, especially Road 12 and other north-south roads. Fuel-breaks can be designed with adequate canopy cover and CWD to meet most habitat needs for LS/OG species in the MCD stands.

Snags and Coarse Woody Debris:

Maintain pockets of 1/4 to several acres of snags and the largest available coarse woody debris.

Maintain snags and coarse woody debris evenly distributed across the MSA in sufficient numbers to provide 100% MPP for black-backed woodpeckers.

Wildlife and Botanical

Habitat protection takes precedence over protection of individual plant or animal populations except for known sites of species listed in Table C-3 of the NW Forest Plan.

12. Management Strategy Area L

This MSA is approximately 11,700 acres in size (15% MLSSR) and encompasses the lower Metolius River and the steep slopes of the Horn of the Metolius. The MSA is bordered by the Confederated Tribes of Warm Springs Reservation to the north and the spotted owl range line, Administratively Withdrawn and Matrix to the south and east. The Scenic portion (below Bridge 99) of the Metolius Wild and Scenic River is included in this MSA.

Metolius Watershed Analysis Landscape Areas: 9, 10 and 11.

Plant Association Group and Vegetative Condition:

Mixed conifer wet and dry PAG with mixed species composition. Moderately fragmented vegetation due to past stand replacement fires, naturally low site potentials and warm, dry southern aspects. Primarily patches of small sized trees (9-20.9" dbh) with varying canopy closure. Highest concentration of interior habitats.

Landscape Patterns:

This MSA is one side of the steep Metolius River canyon. Frequent intermittent drainage's running west from the top of Green Ridge create many sharp hogback ridges with distinct differences in vegetation between their opposing aspects. Many of the south facing slopes, especially near the top, are nearly barren or support only very sparse stands - about 8% of the MSA is unforested. Most of MSA is a large continuous patch of small sized trees (77% of MSA). There are several large interior patches of larger trees - another 13% of the MSA. There has been almost no harvest in this MSA, except for clearing in some small private inholdings or old homesteads. There are small meadows adjacent to the river, probably remnants of old homesteads, and several early seral patches that remain from stand replacement fires in the last century. These fire patches are mostly on the upper third of the slope, and average around 100 acres in size.

Stand Structure:

Stands are either wet or dry mixed conifer depending on proximity to water and aspect. Wet mixed conifer stands include many that are best described as distinct west side plant communities, containing plant species not frequently found east of the Cascades. MCW stands are typical here - dominated by large pine and Douglas fir, with an occasional larch or incense cedar. Understories are dense Douglas fir or pine, with some true fir beginning to appear. There is a more significant shrub component (vine maple, snowberry, ninebark) than is found in most of the Metolius MCW stands. Densities and species composition are consistent with stands near the late stage of their disturbance cycle. MCD stands are similar, more dominated by pine, and sparser. Upper south facing slopes are very open, with only scattered individual pine Douglas fir or cedar. The old burns are usually dense pole to small size stands of even-aged pine or Douglas fir.

Fragmentation:

There has been no regeneration harvest in this MSA. There are many natural openings as mentioned above, and a few clearings. The only road into the area runs right along the river and gets very little use as it is suitable only for high clearance vehicles. The preferred alternative for managing this segment of the Metolius Wild and Scenic River would eliminate most motorized access.

Snags and Coarse Woody Debris:

Snags and CWD amounts are consistent with mixed conifer stands that have had little disturbance. There is concern that the largest snags preferred by eagles and osprey are not being replaced because current stand densities preclude development of enough large pine and fir near the river.

Insect and Disease Condition:

Low risk from stress induced root rots, beetles and engraver. Generally healthy forests with patches of low insect and disease damage areas.

Fire Risk:

Low risk of fire occurrence with low to moderate fuel loads depending on slope and aspect. High risk of high intensity, stand-replacement fires. Natural fire disturbances are desired requiring a contain and confine fire control strategy for all fire intensities.

Focal L-S Terrestrial Wildlife Species:

- (a) Northern spotted owl - 1 known nest site with patches of suitable habitat. Eastern fringe of owl range.
- (c) White-headed, and Williamson's sapsucker - Known occurrences and potential habitat primarily on west facing slopes.
- (d) Northern goshawk - Known nest sites and potential habitat throughout the area.
- (e) Northern bald eagle - Known nesting roosting and foraging habitat.
- (f) Flammulated owl - Potential habitat throughout area.

Focal Aquatic Species

- (a) Cascade, tailed and spotted frogs - Potential habitat along Metolius River.
- (b) Bull trout - Rearing habitat in the Metolius River.
- (c) Apatania tavalala - Suspected habitat in Metolius River.

Focal Plant Species of Concern

- (a) Rare nitrogen fixing Lichens- A known site for several species and potential habitat is associated with riparian areas.
- (b) Mountain lady slipper- A known site and potential habitat exists in the area.

Noxious Weed Conditions:

Individual scattered scotch broom plants are found along riparian areas.

Social Context

Recreational use is limited here by poor access and few developed facilities. The area is visited by hikers and anglers and can get heavy dispersed camping use especially during holiday weekends. The Confederated Tribes of Warm Springs have expressed concerns about human impacts to this portion of the river, and are also concerned about the potential for trespass or fire on the Reservation side. There are a few small private inholding along the river that require motorized access be maintained. The Wild and Scenic Rivers Act directs that the lower river be managed to "provide a primitive recreational experience as defined in the ROS User's Guide".

MSA Goals

Manage for Late-successional habitat that provides a mosaic of sustainable fire and climatic climax stands. Maintain habitat for one pair of spotted owls. Maintain climatic climax stands adjacent to the river and on north slopes.

Management Criteria

Short term: Reduce stand densities where necessary to protect private inholdings and nesting habitat from large scale disturbance, especially fire.

Long Term: Maintain stand conditions that allow the continuation of natural disturbance processes.

Management of Forested Areas:

Maintain healthy trees of all species, especially large trees in the upper 20% of their plant association site potential.

Use mechanical or hand thinning to reduce stand densities based on Cochran's SDI. Prescribed fire is not recommended for thinning these stands in the first entries.

Silviculture opportunities: Low priority for treatments because of poor accessibility and primitive nature.

Management of Regenerated Areas:

There are no regenerated areas.

Fire Management:

Suppression should be limited to that necessary to protect private inholdings and to prevent fire from crossing the river. Fires on the upper 2/3 of the slope should be suppressed using indirect attack from the top.

Prepare Fire Management Plan in conjunction with Metolius Wild and Scenic River Plan.

Snags and Coarse Woody Debris:

Maintain existing CWD and snags

Maintain snags and coarse woody debris evenly distributed across the MSA in sufficient numbers to provide 100% MPP for black-backed woodpeckers.

Wildlife and Botanical

Habitat protection takes precedence over protection of individual plant or animal populations except for known sites of species listed in Table C-3 of the NW Forest Plan.

13. Management Strategy Area M

This MSA is approximately 1,430 acres in size (2% MLSR) and encompasses the Metolius Research Natural Area.

Metolius Watershed Analysis Landscape Areas: 2 and 10

Plant Association Group and Vegetative Condition:

Mixed conifer dry and ponderosa pine PAG. Primarily patches of small and medium sized trees with open canopy closure.

Landscape Patterns:

This MSA is primarily comprised of one large (94% of MSA) continuous patch of small sized timber. Because this is the face of the Green Ridge fault block, the aspect and slopes are very uniform and consistent from north to south. Differences in plant communities are primarily because of differences in elevation. There has been on harvest in the RNA, and there are no roads.

Stand Structure:

Stands in this MSA are almost all small to medium sized trees. On the upper slopes, they are composed of dry mixed conifer species dominated by ponderosa pine and Douglas-fir. On the lower slopes and the flat bench adjacent to the Metolius River stands are almost pure pine with near historic numbers of large trees still existing. This area may be the nearest remaining example of the historic "open park-like pine stands". The top slopes are becoming dominated by true firs, which gradually decrease down the slope. Incense cedars are frequent in both under and overstories on the slopes.

Fragmentation:

There is no significant fragmentation or natural opening in the RNA.

Snags and Coarse Woody Debris:

Snags and CWD are locally heavy on the slopes in relation to the varying amounts of insect and disease mortality. In the pine stands on the bench and lower slopes, easy access for woodcutters in the past reduced snags and CWD. Recent mortality in the large pine has resulted in an increase in large snags and spike topped pine, and a slight increase in CWD. Snags numbers are probably slightly less, and CWD amounts slightly more than historic conditions prior to fire exclusion. A prescribed burning program in place since 1990 has reduced fine and medium fuels on about 300 acres of the lower bench.

Insect and Disease Condition:

Low risk from stress induced root rots, beetles and engraver. Generally healthy forest.

Fire Risk:

Low risk of fire occurrence with low to moderate fuel loads depending on slope and aspect. Low to moderate intensity fires are likely, particularly on the upper slope.

Focal L-S Terrestrial Wildlife Species:

- (c) White-headed, and Williamson's sapsucker - Known occurrences and potential habitat throughout the area.
- (d) Northern goshawk - Potential habitat and high probability of occurrence throughout the area.

(e) Northern bald eagle - potential roosting and nesting habitat.

(f) Flammulated owl - Known occurrences

Focal Aquatic Species

None

Focal Plant Species of Concern

(a) Rare truffle (Elaphomyces anthracinus)- potential habitat exists in the area.

(b) Peck's penstemon- A known site and potential habitat exists in the area.

Noxious Weed Conditions:

no known populations exist

Social Context

There is no significant recreation use in the RNA, although visitors probably hike or hunt through here occasionally. The RNA has been an important area for fire and insect effects research. Because of its location in the Metolius Basin and the proximity to a major road, the RNA prescribed burning program has frequently been used as an example of a healthy fire climax systems and to demonstrate fire effects.

MSA Goals

Manage for Late-successional habitat that provides sustainable fire climax conditions as directed by the Metolius RNA Management Plan.

Management Objectives

Short term: Continue to implement prescribed fire program to maintain stand densities and fuel loads that prevent large scale disturbance.

Long term: Allow natural processes to continue.

Management of Forested Areas:

Maintain healthy trees of all species, especially large trees in the upper 20% of their plant association site potential.

Use fire to reduce stand densities based on Cochran's SDI. In some small areas, hand thinning may be necessary prior to prescribed burning.

Silviculture opportunities: No treatment recommended.

Management of Regenerated Areas:

There are no plantations.

Fire Management:

Aggressive suppression to protect ongoing research, especially the reference stand on the south boundary. Consider allowing low intensity fires to spread outside of the RNA before taking suppression action.

See Metolius RNA Management Plan

Snags and Coarse Woody Debris:

Unless research needs dictate otherwise, during prescribed burning protect snags and coarse woody debris evenly distributed across the MSA in sufficient numbers to provide 100% MPP for black-backed woodpeckers.

Wildlife and Botanical

Habitat protection takes precedence over protection of individual plant or animal populations except for known sites of species listed in Table C-3 of the NW Forest Plan.

X. PRIORITIES AND IMPLEMENTATION

This section identifies MSAs by priority for the primary management activities. The tables identify acres that should be considered as the starting point for additional project-level analysis for priority, prescription, and mitigation. The acres are derived from the PAG and stand structure data, which where appropriate, has been reduced by the number of acres within the Interim Riparian Reserve boundaries and by acres of slope greater than 30% (usually the effective limit for economical mechanical access). These numbers can best be used for comparison between MSAs and for broad-scale identification of project opportunities.

A. OVERALL MSA PRIORITY FOR MANAGEMENT TO PROTECT AND DEVELOP LS/OG HABITAT:

	Priority 1	Priority 2	Priority 3
Management Strategy Areas	B, L, J, K, C	A, D, E F, G, H, I, M	
Rationale for Priority Rating	MSAs containing owl activity centers ordered by amount of NRF in home ranges. C contains bald eagles	MSAs that provide dispersal habitat and/or habitat for other Focal LS/OG species	

B. PRIORITIES FOR MANAGEMENT TO REDUCE RISK OF HABITAT LOSS:

	Priority 1	Priority 2	Priority 3
Management Strategy Areas	A, B, C, J, K,	D, E, G, H,	F, I, L, M
Rationale for Priority Rating	Areas where risk is high enough to outweigh short-term habitat loss	Areas where risk reduction is necessary to protect potential habitat	

Potential Areas of Treatment to Reduce risk of Habitat Loss

PAG	Remove Dead Material				Thin Understory	
	LPP	MCD	MCW	PP	MCD	PP
MSA						
A	1370					
B		4725	2225		5050	
C		1500			1500	
D		215			215	4740
E					1080	900
F		3510	350		3510	1020
G						2150
H		1400	4085		1400	350
I						730
J		3170			3400	150
K		1505	595		1505	
L					200	1455
M					425	360
Total	1370	16025	7255	0	18285	11855

C. PRIORITIES FOR MANAGEMENT TO DEVELOP LS/OG

	Priority 1	Priority 2	Priority 3
Management Strategy Areas	A, B, C, J, K	D, E, F, G, H, I	L, M
Rationale for Priority Rating	The priority is based on the condition of existing habitat and the need for higher percentages of LS/OG		

Potential Areas of Treatment to accelerate development of young, small-sized stands into medium and large-sized LS/OG stands:

PAG	Thin Understory (acres)		
	LPP	MCD	PP
MSA			
A	1270		
B		4725	
C		1650	110
D			4740
E		935	780
F		3510	1020
G			1525
H		1400	350
I			730
J		3400	150
K		1505	
L		200	1455
M		425	360
Total	1270	17750	11220

D. PRIORITIES FOR MANAGEMENT OF SENSITIVE PLANTS

	Priority 1	Priority 2	Priority 3
Management Strategy Areas	B, C, D, E, F, G, J, K, M	A, B, D, F, I, J, K, L	H
Rationale for Priority Rating	MSAs with known populations of species that would benefit from low-intensity fire	MSAs with known populations of species that are suspected to benefit from fire and other disturbances but need more study of management effects	

*Some MSAs have species that meet both priorities

E. PRIORITIES FOR INVENTORY OF OTHER J2 BRYOPHYTES, LICHENS, AND MOLLUSK SPECIES

	Priority 1	Priority 2	Priority 3
Management Strategy Areas	B, F, G, J, L	A, C, D, E, I, K, M	H
Rationale for Priority Rating	Areas with known sites	Potential Habitat	

F. PRIORITIES FOR MANAGEMENT OF NOXIOUS WEEDS

	Priority 1	Priority 2	Priority 3
Management Strategy Areas	A, B	C, D, E, F, G, J, L, M	H, I, K
Rationale for Priority Rating	Areas with known populations of species that are likely to spread	Areas with other known populations	

G. PRIORITIES FOR FIRE SUPPRESSION

	Priority 1	Priority 2	Priority 3
Management Strategy Areas	C, D, G, L*, M*	A, B, E, I, J, K	F, H, L
Rationale for Priority Rating	Areas where life, property, or improvements are at risk	Areas with riparian zones and important habitat	

*L = local areas around private inholdings and adjacent to CTWS Reservation

*M = Metolius Research Natural Area

H. PRIORITIES FOR MANAGEMENT TO DEVELOP LS/OG IN REGENERATION AREAS

	Priority 1	Priority 2	Priority 3
Management Strategy Areas	B, H, J, K,	D, I	A, C, E, F, G, L, M
Rationale for Priority Rating	The priority is based on the amount of existing fragmentation from regeneration and the need for higher percentages of LS/OG		

Acres of regeneration areas available for management to enhance development of LS/OG stands (thinning and addition of CWM):

MSA	Acres
A	47
B	1700
C	20
D	116
E	0
F	973
G	116
H	1900
I	150
J	686
K	1542
L	235
M	0
Total	7485

I. PRIORITIES FOR UNDERBURNING

	Priority 1	Priority 2	Priority 3
Management Strategy Areas	D, G, J, M	B, C, E, F, I, K	A, H, L
Rationale for Priority Rating	MSAs that would benefit from low-intensity prescribed fire	MSAs where constraints of habitat, feasibility, and proximity to development would limit prescribed burning opportunities	

Areas available for prescribed burning:

	Acres	
	MCD	PP
PAG		
MSA		
A		
B	4725	
C	1650	110
D		4740
E		780
F		1020
G		2370
H	1400	350
I		730
J	3400	150
K	1505	
L	200	1455
M	425	360
Total	13305	12065

. XI . DATA NEEDS AND MONITORING

Plant Species Of Concern

- a. Peck's penstemon- Continue monitoring Management Treatment Studies for long term effects. Reintroduce fire in populations where possible or coincident with other resource needs.
- b. Candy Stick - Continue to inventory potential habitat with plant surveys. If opportunities arise try treating a portion of potential habitat as a management treatment study for prescribed fire.
- c. Mountain Lady Slipper- Study disturbance ecology of known site w/ monitoring .
- d. Rare truffle- *Elaphomyces anthracinus*- Survey for additional populations in potential habitat- large old pine tree habitats adjacent to the Metolius River.
- e. Rare Liverwort- *Tritomaria exsectiformis* - Monitor re-establishment of mossy mound and woody infall habitat as indicator of potential habitat recovery at known site.
- f. Aquatic liverwort- *Chiloscyphus polyanthos* - Survey streams for additional populations as indicator of very cold, clean water.

Vegetation Management and Spotted Owl Habitat Selection

Monitor the impacts of vegetation management activities on spotted owl habitat selection in the Matrix. This information will be the basis for habitat manipulation in Late-Successional Reserves.

Terrestrial and Aquatic Wildlife Inventory and Survey

Surveys and inventory should focus on focal wildlife species to determine population trends, USFWS Recovery Plan status, habitat capability and use, essential habitat, and impacts of forest management activities. Survey and inventory efforts should be coordinated with ODFW and USFWS, and should be consistent with established protocols when available.

Plant Species of Concern and Noxious Weed Inventory

Surveys and inventory should focus on high probability habitat for species of concern. Opportunities to monitor the impacts of forest management activities should be utilized .Continue aggressive weed inventory and control.

Silvicultural Treatments and Habitat Development

Monitor the development of forested stands following various silvicultural treatments, especially when late-successional habitat conditions are the desired objective.

Cavity Nester Population Potentials.

There is a need to validate the snag densities and associated maximum population potentials described in the Northwest Forest Plan.

Open Road Densities

Monitor the effectiveness of road closure methods.

Monitor the effects on wildlife disturbance and stream quality of lowering road densities of roads and other elements of transportation/access systems.

Sensitive Amphibian Populations

A population assessment for sensitive amphibian species (i.e., cascade frog, tailed-frog and spotted frog) is needed to determine population viability and persistence, and the importance of the *Metolius* populations relative to the Deschutes province.

East-side Cascade Spotted Owls

The habitat selection, home range sizes, forage base, and productivity of spotted owl pairs found in the eastern cascade province. Generally, spotted owl literature is specific to west-side spotted owl conditions, and there is a lack of east-side spotted owl information. The eastern cascade province is considered "high risk" because of the fire-dependent plant associations, yet spotted owl viability is dependent on these same associations. Specific information about spotted owl use in east-side systems is needed to address forest health and species viability concerns.

Late-successional habitats and Insect and Disease Epidemic

The current spruce budworm defoliation and other insect and disease conditions have changed the quality and quantity of late-successional habitat. However, quantitative vegetative measurements, and the impacts of these conditions on late-successional species is not clear. For example, the impacts of spruce budworm defoliation on spotted owls habitat use, population abundance and distribution is unknown.

Focal Wildlife Species

A population assessment for focal wildlife species is needed to determine population viability and persistence, and the importance of the *Metolius* populations relative to the Deschutes province.

Fire-induced versus Climatic LS/OG Stands

In general there is a lack of quantitative information describing habitat conditions under natural fire regimes. An assessment of habitat conditions and terrestrial species viability under natural fire frequencies in ponderosa pine and mixed conifer is needed. This information will help answer species viability questions when managing habitat to mimic natural fire regimes.

Data Refinements

A more site specific upper-limit Stand Density Index could be developed with use of plant association SDI's, calculated from healthy, fully stocked stands. Ecology plot data may be good for this, as plot selection was aimed at healthy, well-stocked stands. If the computerized plot data could be retrieved, it could be queried for SDI. The Eastside Assessment Team is currently entering this information into a useable database.

Since the ecology plot data only includes trees greater than or equal to 6 inches dbh, it should be noted that the resulting maximum SDI calculations do not include trees less than 6 inches dbh. The SDI's used in the prognosis growth model do include trees less than 6 inches dbh. Lacking computerized ecology plot data, existing stand examination or other data could be used for site specific calculations. The procedure being used in the draft Deschutes report, a modification of Cochran's draft procedure for the Wallowa-Snake province of the Wallowa-Whitman NF, can be further adjusted for site specific projects with additional local data. The result would be more accurate upper stocking limits, by plant association, productivity grouping, or for specific sites, for managers to use to determine when stands might be moving into potentially risky conditions.

The plant association mapping was not completed for much of the Metolius Horn MSA before this analysis. The plant association groupings from the soil resource inventory were used, and showed most of this area as PP PAG. From preliminary field observations, it is likely that some of this area will be re-typed as Mixed Conifer during the forest Eco-mapping contract, since slopes that can be seen from the river trail include Douglas-fir, ponderosa pine, and some sugar pine and incense cedar, with an understory of ocean-spray and hazelnut, and appear to be climax to Douglas-fir.

APPENDIX 1 - VEGETATION

The table below shows the maximum SDI levels that need to be maintained so larger ponderosa pine can be maintained in healthy condition.

Density Table	
Suggested Maximum Stand Density Index (SDI) for Deschutes National Forest Managed Plant Associations	
Managing for Ponderosa Pine in CW, CD Series	
Plant Association	Suggested MAX. SDI
(High Productivity)	
CW-C2-12	195
CW-S1-13	202
(Moderate & Lower Productivity)	
CW-S1-15	156
CW-S1-12	143
CW-C2-11	177
CW-C2-13	150
CW-H1-11	149
(CD Series)	
CD-S6-14	210
CD-S6-13	266
CD-S6-12	258
Managing for Douglas Fir in CD Series	
Plant Association	Suggested MAX. SDI
CD-S6-14	170
CD-S6-13	264
CD-S6-12	240

The table below shows the maximum healthy SDI levels that need to be maintained in ponderosa pine plant associations in order to manage stand densities at levels where larger and smaller ponderosa pine can be maintained in healthy condition.

Density Table	
Suggested Maximum Stand Density Index (SDI) for Deschutes National Forest Managed Plant Associations	
CP Series	
Plant Association	Suggested MAX. HealthySDI
(High Productivity)	
CP-S3-14	153
CP-S3-11	145
CP-G2-12	238
CP-S2-17	124
(Moderate Productivity)	
CP-S2-16	76
CP-S1-11	73
CP-S2-12	110
CP-S2-15	104
CP-S2-18	104
CP-S3-12	102
CP-S2-13	92
CP-S2-11	115
(Low Productivity)	
CP-S2-14	67
CP-S1-12	47

To keep stands at lower risk from catastrophic beetle attack, the lodgepole pine maximum SDI levels in the density table below can be used.

Density Table

Suggested Maximum Stand Density Index (SDI) for Deschutes
National Forest Managed Plant Associations

CL Series

Plant Association	Adjusted MAX. SDI
(High Productivity)	
CL-M3-11	119
CL-M4-11	119
CL-G4-12	119
CL-G4-11	119
CL-S2-12	119
(Moderate Productivity)	
CL-S4-12	119
CL-G3-13	119
CL-M2-11	106
CL-S2-13	106
CL-S2-14	119
CL-S9-11	109
CL-G3-14	109
CL-S2-15	98
CL-S2-11	93
CL-S2-16	119
CL-S1-12	87
(Low Productivity)	
CL-G3-11	76
CL-S3-11	71
CL-G4-13	56

Table A: The following Species of Concern are found within the LSR

Species	Common Name	Type	Status	Occurrence	Plant Assoc. Group
Penstemon peckii	Peck's Penstemon	Vascular Plant	Sensitive	SISTERS ENDEMIC*	PP, MCW, MCD
Lobelia dortmanna	Water Lobelia	Vascular Plant	Sensitive	Historic record, not recently found	Lake, river, stream
Agoseris elata	Tall Agoseris	Vascular Plant	Sensitive	PNW endemic	PP
Allotropa virgata	Candystick	Vascular Plant	S & M/ 1,2	North America	MCD, (MCW,LP?)
Cypripedium montanum	Mountain Lady Slipper	Vascular Plant	S & M/1,2	Range of PFP	MCD, PP
Elaphomyces anthracinus		Rare Truffle/Fungi	S & M/1,3	ONLY KNOWN SITE IN PFP RANGE*	PP
Calicium SP		Pin Lichen	S & M/4	N. Europe, PNW	PP
Collema SP		Riparian Lichen	S & M/4	North & South America	MCW, (Riparian?)
Lobaria halli		Rare nitrogen fixing Lichen	S & M/ 1&3	North America	PP, MCW, (MCD?)
Lobaria pulmonaria		Nitrogen fixing Lichen	S & M/ 4	PNW	MCD, (MCW ?)
Nephroma helveticum		Nitrogen fixing Lichen	S & M/4	PNW?	MCD, (MCW?)
Nephroma resupinatum		Nitrogen fixing Lichen	S & M/4	PNW?	MCD, MCW
Pseudocyphellaria anomala		Rare nitrogen fixing lichen	S & M/ 4	PNW endemic?	MCD, MCW
Pseudocyphellaria anthrapsis		Nitrogen fixing Lichen	S & M/4	PNW?	MCD, (MCW?)
Tritomaria exsectiformis		Bryophyte/ Liverwort	S & M/1,2	1 of 2 KNOWN SITES IN OR	Riparian

Stand Density Index Data for Primary Metolius LSR Plant Associations

PAG	PLANT CODE	AC	Plots	SI	SI-Range	GBA 15	GBA 15 - Range	Prod	Prod-Range	SDI - Normal	SDI - UMZ	SDI - LMZ
CINDER	LAVA	95										
LPD	CLG3-14	153										
LPD	CLG3-14	467	75	59-85	82	54-105	43	25-61	196	120	80	
LPD	CLS2-14	6919	75	65-83	83	51-133	43	27-66	224	137	92	
LPW	CLG4-11	698	81	70-96	119	86-196	74	42-108	304	170	114	
LPW	CLM4-11	1003	93	92-94	126	109-136	82	71-88	288	170	114	
MCD	CEXX-XX	123										
MCD	CWC2-11	18446	90	84-94	103	67-156	66	40-102	281	177	119	
MCD	CWC2-13	92315	81	76-86	95	77-118	54	44-65	283	150	101	
MCD	CWH1-11	975	85	68-98	91	40-117	47	22-74	259	149	100	
MCD	CWS1-12	141218/19	79	69-92	89	35-158	50	18-94	282	143	96	
MCD	CWS1-14	43977	80	74-86	77	52-85	44	28-51	232	120	80	
MCD	CWS1-15	19486	83	73-93	97	50-130	77	31-84	283	156	105	
MCD	CWXX-XX	44										
MCD	CWXX-XX	44										
MCD	CWXX-XX	44										
MCD	CWXX-XX	44										
MCW	CD56-12	16616	97	88-109	146	132-206	101	69-147	365	259	174	
MCW	CD56-13	46683	99	99-100	217	197-243	151	136-170	365	266	178	
MCW	CD56-14	66095	85	76-95	133	103-164	80	61-117	365	210	141	
MCW	CWC2-12	45227	89	81-96	114	70-191	72	41-127	315	195	131	
MCW	CWCX-XX	164										
MCW	CWS1-13	61511/13	83	75-107	165	128-207	97	76-123	365	202	135	
MDW	MD19-11	44										
MDW	MM-90	12										
MDW	MM-90	16										
MHD	MM-90	1437										
MHD	CMGX-XX	25										
MHD	CMGX-XX	17										
PPD	CPS2-11	863741/43	76	62-98	79	23-134	42	15-89	241	115	77	
PPD	CPS2-12	152831	80	69-99	70	40-151	39	20-105	208	111	74	
PPD	CPS2-13	407316/17	76	66-93	62	34-98	33	17-52	194	92	62	
PPD	CPS2-14	9237	82	77-88	42	20-62	23	11-38	123	67	45	
PPD	CPS2-15	210	83	79-87	65	32-92	38	19-54	188	104	70	
PPD	CPS2-16	4398	72	63-85	55	25-76	28	13-49	177	76	51	
PPD	CPS2-17	278213/14	71	63-81	80	38-136	40	25-63	295	124	83	
PPD	CPS2-18	123	74	66-80	72	33-102	38	15-57	288	104	70	
PPD	CPS3-12	88567	83	72-88	63	53-71	36	31-42	184	102	68	
PPW	CPG2-12	42767	92	83-101	123	96-195	79	60-132	365	238	159	
PPW	CPS3-11	447114/15	81	65-95	92	55-144	53	33-83	274	145	97	
PPW	CPS3-14	5855	84	79-86	94	82-114	55	49-63	271	153	103	
ROCK	ROCK	775										
WATER	WATER	271										
XSHB	GB-99	90										

Table B. Species of Concern that have the potential to occur within the watershed.

Species	Common Name	Type	Status	Probability of Occurrence	Plant Assoc. Group
<i>Artemisia ludoviciana estesii</i>	Estes' Artemisia	Vascular Plant	Sensitive	low / Central OR endemic	Riparian
<i>Arnica viscosa</i>	Shasta Arnica	Vascular Plant	Sensitive	moderate/ Regional endemic	Lava, High elevation forest
<i>Aster gormanii</i>	Gorman's Aster	Vascular Plant	Sensitive	moderate/ OR endemic	Lava
<i>Botrychium pumicola</i>	Pumice Grapefern	Vascular Plant	Sensitive	moderate/ Central OR endemic	Lava, High elevation forest
<i>Calamagrostis brewery</i>	Brewer's Reedgrass	Vascular Plant	Sensitive	moderate/ Regional endemic	Grassland
<i>Calochortus longebarbatus longebarbatus</i>	Long-bearded Mariposa	Vascular Plant	Sensitive	low / Regional endemic	PP
<i>Campanula scabrella</i>	Rough Harebell	Vascular Plant	Sensitive	moderate/ PNW endemic	Lava/Rock
<i>Carex livida</i>	Pale Sedge	Vascular Plant	Sensitive	moderate/ circumboreal	Riparian
<i>Castilleja chlorotica</i>	Green-tinged Paintbrush	Vascular Plant	Sensitive	low/ Central OR endemic	PP, LP
<i>Cymopterus nivalis</i>	Snowline Cymopterus	Vascular Plant	Sensitive	moderate/ North Great Basin	Lava/Rock
<i>Draba aureola</i>	Golden Alpine Draba	Vascular Plant	Sensitive	moderate/ Regional endemic	Lava/Rock
<i>Gentiana newberry</i>	Newberry's Gentian	Vascular Plant	Sensitive	high/ Regional endemic	Grassland
<i>Hieracium bolanderi</i>	Bolander's Hawkweed	Vascular Plant	Sensitive	low/ Regional endemic	Lava, High elevation Forest
<i>Lycopodium complanatum</i>	Ground Cedar	Vascular Plant	Sensitive	low/ circumboreal	Riparian
<i>Ophioglossum vulgatum</i>	Adder's Tongue	Vascular Plant	Sensitive	low /circumboreal	Grassland, riparian
<i>Alpova alexsmith</i>		Rare False Truffle/	S&M 1,3	Cascade endemic	High elevation

		Fungi			forest, TSME
Gastroboletus ruber		Rare Bolete/Fun gi	S & M/1, 3	Cascade endemic	High elevation forest
Gomphus floccosus		Chanterelle /Fungi	S & M/3	Regional	MCD
Hygrophorus caeruleus		Uncommon gilled Mushroom/ Fungi	S & M/1,3	PNW endemic	MCW, (MCD?)
Hydnothyria, Trappe#787, 792 Martellia, Trappe #5903		Rare Undescribe d False Truffles	S & M/1,3	rare local endemics	High elevation forest
Nivatogastrum nubigenum		False truffle/ Fungi	S & M/ 1,3	high/known on Sisters District/ OR & ID	LP, High elevation Forest
Rhizopogon flavofibrillosus		Rare false truffle/ Fungi	S & M/ 1,3	high/known on Sisters District/ Regional endemic	LP, High elevation Forest
Rhizopogon truncatus		False truffle/ Fungi	S & M/3	high/known on Deschutes/ N Am	High elevation Forest
Elaphomyces subviscidus		Rare truffle/Fung i	S & M/1,3	high/known on Sisters District/ Cascades & AZ	LP,
Hydrothyria venosa		Aquatic lichen	S & M /1,3	high/known on Deschutes/ N.Am	Riparian

TABLE C - FOCAL PLANT SPECIES - METOLIUS LSR

Terrestrial and Riparian/Aquatic

Species	Status	Occurrence	Habitat
Peck's penstemon Penstemon peckii	Sensitive	Known Terrestrial	Open pine forests and meadows maintained by fire. High water table areas and channels.
Vascular Plant			
Candy Stick Allotropa virgata	Survey and Manage 1,2	Known Terrestrial	Mixed conifer forests with areas of deep humus, some fire, down wood. Fungi/mycorrhizal associates.
Vascular Plant			
Mountain Lady Slipper Cypripedium monatum	Survey and Manage 1,2	Known Terrestrial	Closed canopy stream-side forests, some fire. Fungi/mycorrhizal associates.
Vascular Plant			
Elaphomyces anthracinus	Survey and Manage 1,3	Known Terrestrial	Fungi/mycorrhizal associates with mature pine Forests. Dispersal may involve rodents.
Fungi/Rare truffle			
Tritomaria exsectiformis	Survey and Manage 1,2	Known	Mossy mounds and wood in falls next to cold stable streams/springs
Bryophyte/Liverwort		Riparian	
Chiloscyphus polyanthos	No Status	Known	Growing in very cold, clean water in springs, streams
Bryophyte/Liverwort		Aquatic	

APPENDIX 2: DESIRED CONDITION FOR LATE-SUCCESSIONAL HABITATS

DESIRED LATE SUCCESSIONAL RESERVE CONDITION

6/5/96

INTRODUCTION

According to the Northwest Forest Plan, the objective for Late Successional Reserves (LSRs) is to protect and maintain late successional and old growth habitats for the species dependent or are associated with them, including the northern spotted owl. However, the functional structural elements (snags/logs, canopy cover, canopy layers, size structure and any other special features) of this habitat have not been described. These descriptions have been left to individual Forests and ID teams to develop so that they could be appropriately site specific.

For many dry eastside plant associations, the very stand characteristics that define suitable habitat conditions for climatic climax late successional old growth dependent and associated species are often unsustainable. This is because these conditions have high susceptibility to epidemic insect attack and catastrophic wildfire. Thus, "protecting and maintaining" as much of this habitat as we can in the short term leads to not being able to maintain it in the long term. Since long term maintenance of late successional old growth habitat, distributed functionally across the landscape is essential for species viability, the dilemma of maintaining habitat conditions in the short term versus a continual supply of suitable habitat for the long term needs to be addressed.

The intent of the paper is to provide information in three topic areas to assist the Deschutes National Forest Late Successional Reserve Assessment teams while addressing the above issues in their analysis efforts:

First, specific descriptions of structural elements which comprise suitable habitat (both in terms of fire climax and climatic climax) will be provided for late successional old growth dependent and associated species for plant association groups (PAGs) specific to the Deschutes NF. The intent of these descriptions for suitable habitat is to present a range of conditions that provide habitat for successful reproduction and dispersal of young. They are not meant to be minimum habitat conditions.

Second, density levels and fuel profiles for suitable habitat conditions will be compared to density levels and fuel profiles required to sustain the stand (or landscape) over the long term. The degree of overlap between these two conditions will be clearly displayed.

Third, where there is little or no overlap between suitable habitat and sustainable vegetative conditions, a process for, as well as a prototype of "desired apportioning of successional stages", by plant association group will be provided. This apportioning seems to assure, at least to the best of our ability to analyze it, a continued supply of late successional old growth habitat in our LSRs over time.

DEFINITION OF LATE SUCCESSIONAL HABITAT

If we are to manage the LSRs to protect and maintain late successional old growth forests, it is critical that we have a clear understanding of what the term "late successional old growth" means in terms of the vegetation on the Deschutes NF. In other words, what types of forest structures and associated characteristics are we labeling as suitable late successional old growth habitat? A clear definition of the desired condition will result in more effective communication and evaluation of our efforts.

In the frequent fire adapted forests of the east Cascades, we (the science team) propose that there are actually two types of late successional old growth forests: climatic climax forests and fire climax forests. These two

states are very different both in terms of the species that use them and their relative sustainability. Thus, descriptions of specific key structural characteristics need to be provided for both types of conditions.

Climatic climax forests develop in the absence of fire. These forests are characterized by dense stands dominated by climax species (true fir and Douglas-fir on mixed conifer sites), but early seral species may be dominant in the overstory for a period of time, until high densities of late seral species use most of the moisture and nutrients so the early seral species cannot survive. All size classes are usually present and understories are often very dense. This climax community takes a long time to develop, perhaps several hundred years, primarily because combinations of local weather, elevations, aspects, productivity and disturbance agents do not provide conditions for frequent community level disturbance and change. A series of low or moderate intensity fires can change these stands to a fire climax condition. However, the more typical loss of the climatic climax condition occurs with stand replacement fires, or when the stand is converted to a pole sized condition as the larger trees die and the dense stand conditions prevent growth of replacement large trees.

Conversely, fire climax forests develop with frequent light to moderate intensity ground fires. These stands are characterized by open forests dominated by large trees of early seral species (most often ponderosa pine and Douglas-fir on the mixed conifer sites on the Deschutes NF). With the absence or suppression of fires, climax species (true fir) will increase on these sites and move them towards a climatic climax condition.

SUITABLE HABITAT BY PLANT ASSOCIATION GROUP

Methods: Individual Forest plant associations groups were identified. APPENDIX I provides an updated description and discussion of these plant association groups. The major PAG groups on the Forest consist of: Mountain Hemlock, Wet Mixed Conifer, Dry Mixed Conifer, Wet Ponderosa Pine, Dry Ponderosa Pine, Wet Lodgepole Pine, and Dry Lodgepole Pine. These descriptions can be modified in individual planning areas where other groupings make more sense for clarity of analysis.

Within select PAGs, the science team felt that there were two types of late successional old growth habitats: climatic climax and fire climax. All the PAGs were considered to have climatic climax conditions with 3 PAGs also having the fire climax condition: the dry mixed conifer, wet ponderosa pine and dry ponderosa pine PAGS. These three PAGs had frequent low intensity fires that maintained the late successional old growth fire climax habitat conditions historically.

The suitable late successional old growth habitat conditions for each plant association group were based on 10 selected mammalian and avian indicator species that utilize climatic climax and fire climax habitats. These species depend on or are associated with late and old structural characteristics for primary and secondary nesting, denning, roosting and foraging. Botanical species were not used as indicators due to insufficient data on late successional old growth habitat conditions. However, in the future, using plant indicators may add a dimension that is more closely tied to soil condition and mycorrhizal habitats. We started with approximately 118 wildlife species are dependent on or are associated with climatic climax and fire climax habitat conditions. Of these, only 40 species demonstrate selection for late successional old growth structural habitat and do not utilize earlier seral stages. Then through criteria determined through research, monitoring, and evaluation of habitat characteristics that provide essential habitat components for other late successional old growth dependent or associated species, we reduced the list of 40 species to 10 species.

We then translated key habitat features into measurable habitat characteristics. Structural characteristics that describe suitable late successional old growth habitat and that can be quantified include: snags/logs, canopy cover, canopy layers, trees per acre associated with a range of structural sizes, and special features. APPENDIX II describes the 10 indicator species structural habitat characteristics by individual plant

association group. These characteristics were based on literature that best describes eastside biological habitat conditions and on Forest habitat research. Using the habitat characteristics identified for each indicator species, a suitable habitat condition table for each plant association group could be built.

TABLE I displays the suitable habitat conditions for each plant association group, using the Cultus/Sheridan LSR data as a prototype.

Results: Habitat characteristics identified for each indicator species by plant association group are displayed in TABLE I, using the Cultus/Sheridan LSR data as a prototype. It is VERY IMPORTANT to review this table carefully. This table displays a range of suitable habitat conditions. This DOES NOT mean that the low end of the range is what should be managed for. In some instances when desirable and sustainable conditions do not overlap, choosing the lower end of the range may be appropriate but it should not be used across the landscape. Landscape level considerations and site specific analysis will help make those determinations. The table will be used by each LSR Assessment team. Site specifically, the LSR Assessment teams will need to modify the contents depending on the actual plant associations that are most common within each PAG.

Climatic climax habitat featured numerous canopy layers, a high degree of snag and log accumulations, and high stand densities. Conversely, suitable fire climax habitat featured a range of single to multiple canopy layers, low amounts of snags and logs, and lower stand densities. In both of these late successional old growth types, the large trees component was a significant structural element. In fact, it was a critical structural element.

PAG's	Snags/Logs (Tons/Acre & Ft ³ /Acre)	Canopy Cover	Canopy Layers	Total Mean		Sapling	Pole	Small 1	Small 2	Med 1	Med 2	Large	Special Features and Key Tree Species
						1.0 - 4.9"	5.0 - 8.9"	9.0 - 14.9"	15.0 - 20.9"	21 - 24.9"	25 - 31.9"	≥ 32"	
MCVW (Climatic) Indicators: PWP, NSO	25 - 35 tons/ac. or 2200 - 3100 ft ³ /ac. Snags: 60% 9-16" dbh (ex. 9-17/ac), 20% 16-25 dbh (ex. 1-2/ac), 20% >25" dbh (ex. 1-2/ac) Logs : 60% 16-25" dia. (ex. 7-16/ac), 40% >25" dia. (ex. 3-6/ac)	> 70%	2 - 3	TPA	357	150	70	70	30	15	12	10	PWP - Roosts stands of white fir with > 4 TPA >20" live or dead. NSO - ≥ 40% of white fir understory > 8" dbh. Tree Species: PIPO and PSME - Large Tree component LOAC, TSME, TABR - Species diversity
				BA	270	7	19	55	53	14	51	71	
				Stand SDI	476	18	37	97	85	66	74	≥ 78	

PAG's	Snags/Logs (Tons/Acre & Ft ³ /Acre)	Canopy Cover	Canopy Layers	Total Mean		Sapling	Pole	Small 1	Small 2	Med 1	Med 2	Large	Special Features and Key Tree Species
				1.0 - 4.9"	5.0 - 8.9"	9.0 - 14.9"	15.0 - 20.9"	21 - 24.9"	25 - 31.9"	≥ 32"			
MCD (Climatic) Indicators: PWP, GGO, NG, BE, FO, BBWP	12 - 24 tons/ac. or 1100 - 2100 ft ³ /ac. Snags: 70% 12-20" dbh (ex. 3-9/ac), 30% > 20" dbh (ex. .75-2/ac) Logs: 100% > 15" dia. (ex. 5-14/ac)	ave 50%	2 - 3	TPA	218	80	50	35	20	15	11	7	PWP - Roosts stands of white fir with > 4 TPA >20" live or dead. GGO - Young owlets require dense cover and/or leaning trees to escape predation. NG - Maintain a diversity of large trees scattered through the stands, especially near small breaks in the canopy. BE - Insure large ponderosa pine and Douglas fir trees of the super canopy provide an open flight path from tree. Maintain large trees, especially snags along riparian edges that provide panoramic views and open exposure on at least one side.
				BA	218	4	13	27	35	43	47	49	
				Stand SDI	343	9	27	48	57	66	68	≥ 55	
MCD (Fire) Indicators: BE, WHWP, FO	Snags: BE 1-2 > 25" WHWP,FO 1-5 > 25" Logs: BE 1-2 > 25" WHWP,FO 1-5 > 25"	30-50%	≥ 1	TPA	35+	0-80 ± 50%	0-50 ± 50%	0-35 ± 50%	10 ± 50%	7 ± 50%	11	7	BBWP - Maintain trees with heart rot, gall rust cankers, trunk scars or mistletoe at just less than epidemic levels. Provide areas of dead or burned trees < 5 years old for foraging and roosting. Tree Species: PIPO, PSME - Large tree component PILA, LAOC, CADE3, TABR, ABMAS - species diversity
				BA	144	10 total			18	20	47	49	
				Stand SDI	195+	x	x	x	28	31	68	68	

PAG's	Snags/Logs (Tons/Acre & Ft ³ /Acre)	Canopy Cover	Canopy Layers	Total Mean		Sapling	Pole	Small 1	Small 2	Med 1	Med 2	Large	Special Features and Key Tree Species
				1.0 - 4.9"	5.0 - 8.9"	9.0 - 14.9"	15.0 - 20.9"	21 - 24.9"	25 -31.9"	≥ 32"			
PPW (Climatic) Indicators: FO, WHWP	12 - 24 tons/ac. or 500 - 2200 ft ³ /ac. Snags: 50% 18-28" dbh (ex. .5-3/ac) 50% > 28" dbh (ex. .25-1.5/ac) Logs: 100% > 20" dia. (ex. 1-9/ac)	> 40%	≥ 1	TPA	187	40	40	40	20	17	20	10	WHWP - Old growth should be maintain at > 37% over the PAG. Tree Species: PIPO - Large tree component PICO - species diversity
				BA	285	2	11	31	35	49	86	71	
				Stand SDI	433	5	21	55	57	74	124	≥ 78	
PPW (Fire) Indicators: BE, WHWP, FO	Snags: BE 1-2 > 25" WHWP, FO 1-5 > 25" Logs: BE 1-2 > 25" WHWP, FO 1-5 > 25"	30 - 50%	≥ 1	TPA	35+	0-80 ± 50%	0-50 ± 50%	0-35 ± 50%	10 ± 50%	7 ± 50%	11	7	
				BA	144	10 total			18	20	47	49	
				Stand SDI	195+	x	x	x	28	31	68	68	

PAG's	Snags/Logs (Tons/Acre & Ft ³ /Acre)	Canopy Cover	Canopy Layers	Total Mean		Sapling	Pole	Small 1	Small 2	Med 1	Med 2	Large	Special Features and Key Tree Species
						1.0 - 4.9"	5.0 - 8.9"	9.0 - 14.9"	15.0 - 20.9"	21 - 24.9"	25 - 31.9"	≥ 32"	
PPD (Climatic) Indicators: WHWP, NG	10-15 tons/ac. or 900 - 1300 ft ³ /ac. Snags: 15% 10-12" dbh (ex. 2.5-5/ac), 30% 12-20" dbh (ex. 1-2.5/ac), 25% 20-31" dbh (es. .25-.75/ac) 30% > 31" dbh (ex. .25-.5/ac) Logs: 100% > 20" dia. (ex. 7-15/ac)	ave 40%	≥ 1	TPA	180	40	40	40	20	15	15	10	WHWP - Old growth should be maintain at > 37% over the PAG. NG - Maintain a diversity of large trees scattered through the stands, especially near small breaks in the canopy. Tree Species: PIPO - Large tree component PICO - Species diversity
				BA	232	2	11	31	35	18	64	71	
				Stand SDI	394	5	21	55	57	66	93	≥ 78	
PPD (Fire) Indicators: BE, WHWP, FO	Snags: BE 1-2 > 25" WHWP, FO 1-5 > 25" Logs: BE 1-2 > 25" WHWP, FO 1-5 > 25"	30 -50%	≥ 1	TPA	35+	0-80 ± 50%	0-50 ± 50%	0-35 ± 50%	10 ± 50%	7 ± 50%			
				BA	144	10 total			18	20	47	49	
				Stand SDI	195+	x	x	x	28	31	68	68	

PAG's	Snags/Logs (Tons/Acre & Ft ³ /Acre)	Canopy Cover	Canopy Layers	Total Mean		Sapling	Pole	Small 1	Small 2	Med 1	Med 2	Large	Special Features and Key Tree Species
						1.0 - 4.9"	5.0 - 8.9"	9.0 - 14.9"	15.0 - 20.9"	21 - 24.9"	25 -31.9"	≥ 32"	
LPW (Climatic) Indicators: BBWP, GGO, NG	12 - 24 tons/ac. or 1000 - 2150 ft ³ /ac. Snags: 50% 11-20" dbh (ex. 3-8.5/ac) 50% > 20" dbh (ex. 1-3.5/ac) Logs: 50% 11-15" dia. (ex. 13-43/ac) 50% > 15" dia. (ex. 6-19/ac)	ave 60%	≥ 1	TPA	370	150	120	70	20	10			BBWP - Maintain trees with heart rot, gall rust cankers, trunk scars or mistletoe at just less than epidemic levels. Provide areas of dead or burned trees < 5 years old for foraging and roosting. GGO - Young owlets require dense cover and/or leaning trees to escape predation. NG - Maintain a diversity of large trees scattered through the stands, especially near small breaks in the canopy. Tree Species: PIEN PICO
	BA			158	7	32	55	35	29				
	Stand SDI			278	18	65	96	56	43				

PAG's	Snags/Logs (Tons/Acre & Ft ³ /Acre)	Canopy Cover	Canopy Layers	Total Mean		Sapling	Pole	Small 1	Small 2	Med 1	Med 2	Large	Special Features and Key Tree Species
						1.0 - 4.9"	5.0 - 8.9"	9.0 - 14.9"	15.0 - 20.9"	21 - 24.9"	25 -31.9"	≥ 32"	
LPD (Climatic) (High elevation Lodgepole pine plant associations including those adjacent to Mt. Hemlock) Indicators: BBWP	8 - 12 tons/ac. or 700 - 1000 ft ³ /ac. Snags: 100% ≥ 11" dbh (ex. 13-27/ac) Logs: 100% ≥ 11" dia. (ex. 34-72/ac)	ave 40%	≥ 1	TPA	360	150	170	40					BBWP - Maintain trees with heart rot, gall rust cankers, trunk scars or mistletoe at just less than epidemic levels. Provide areas of dead or burned trees < 5 years old for foraging and roosting. Tree Species: PICO ABMAS PIAL PIMO
				BA	83	7	45	31					
				Stand SDI	164	18	91	55					

PAG's	Snags/Logs (Tons/Acre & Ft ³ /Acre)	Canopy Cover	Canopy Layers	Total Mean		Sapling	Pole	Small 1	Small 2	Med 1	Med 2	Large	Special Features and Key Tree Species
						1.0 - 4.9"	5.0 - 8.9"	9.0 - 14.9"	15.0 - 20.9"	21 - 24.9"	25 -31.9"	≥32"	
LPD (Climatic) (Lower elevations of Lodgepole pine plant associations) Indicators: BBWP, GGO, NG	8 - 12 tons/ac. or 700- 1000 ft ³ /ac. Snags: 100% ≥ 11" dbh (ex. 13-27/ac) Logs: 100% ≥ 11" dia. (ex. 34-72/ac)	ave 40%	≥ 1	TPA	353	150	120	70	13				BBWP - Maintain trees with heart rot, gall rust cankers, trunk scars or mistletoe at just less than epidemic levels. Provide areas of dead or burned trees < 5 years old for foraging and roosting. GGO - Young owlets require dense cover and/or leaning trees to escape predation. NG - Maintain a diversity of large trees scattered through the stands, especially near small breaks in the canopy. Tree Species: PICO
				BA	117	7	32	55	23				
				Stand SDI	214	18	64	96	36				

PAG's	Snags/Logs (Tons/Acre & Ft ³ /Acre)	Canopy Cover	Canopy Layers	Total Mean	Sapling 1.0 - 4.9"	Pole 5.0 - 8.9"	Small 1 9.0 - 14.9"	Small 2 15.0 - 20.9"	Med 1 21 - 24.9"	Med 2 25 -31.9"	Large ≥ 32"	Special Features and Key Tree Species	
Unique Habitats (Climatic)													
Engelmann Spruce	25 - 35 tons/ac. or 2700 - 3700 ft ³ /ac. Snags: 50% 15-20" dbh (ex. 5.5-11/ac) 50% > 20" dbh (ex. 2.5-5/ac) Logs: 100% ≥ 15" dia. (ex. 21-43/ac)	50 - 100%	2 - 3	TPA	275	100	70	40	25	15	15	10	Tree Species: PIEN PICO
				BA	277	5	19	31	44	43	64	71	
				Stand SDI	418	12	38	55	69	63	89	≥ 75	
Aspen	When regeneration is no longer occurring, manipulation would occur in a mosaic pattern throughout stand.												
Meadows	When tree encroachment reaches a 30% loss of meadow when compared to 1959 photos, meadow restoration would occur.												
Willow Patches	When willow patches reach 80% decadence, treatment of 20% of the willows would occur. This would be random shrubs throughout the patch.												

COMPARISON OF SUITABLE HABITAT WITH SUSTAINABILITY

Methods: For our purposes, we defined on site vegetation sustainability as a condition that:

Is not likely to experience significant negative change in habitat quality as a result of epidemic insect or disease attack or catastrophic wildfire.

Suitable habitat (both climatic climax and fire climax) was compared with on site vegetative sustainability by individual plant association group. Stand density index and fuel profile descriptions were used as quantifiers of sustainability. These factors best determine the Deschutes NF vegetative conditions and best represent the risk of bark beetle epidemics and or extreme crown fire behavior. Bark beetle attack and high intensity wildfires were chosen as indicators since these disturbance agents are the most common cause of significant and unexpected large tree mortality (large trees are a critical element of both climatic climax and fire climax types, and also take the longest time to replace). Risk to bark beetle attack was measured using stand density index stocking guides developed by Cochran et al, 1994, for the Blue Mountains, together with adjustments and equations for plant associations groups found on the Deschutes NF but not included in Cochran's guide, (Booser et al. 1996). Fuel profiles were determined using the Morehead and Vickery model, equating tons per acre/cubic feet with wildlife habitat. Then photo series for quantifying forest residues (tons per acre) and the risk of catastrophic wildfire was displayed by plant association group.

Results: We found that suitable climatic climax habitat and densities required for on site vegetative sustainability did not overlap. For example, in mixed conifer dry, suitable climatic climax habitat is almost twice the upper management zone! Therefore, some process of cycling of the suitable habitat (habitat that is not vegetatively sustainable) and sustainable stand densities across the landscape overtime needs to be developed

TABLE II, compares suitable late successional old growth habitat (climatic climax and fire climax) conditions, with on site sustainable vegetative conditions and with existing LSR conditions by plant association groups. Suitable habitat conditions are displayed using trees per acre, the stand density index value, species composition and fuel loadings (snags and logs). These numbers are the summation of the values indicated on the suitable habitat condition table. On site sustainable vegetative conditions are defined by the Deschutes SDI values for the upper management zone (UMZ). "Sustainability" is defined by PAG and is a measure of a percent of stocking (SDI UMZ) that an individual plant association may be able to support. This SDI UMZ figure may be different than the SDI values shown in the first column for suitable habitat conditions. Remember, suitable habitat is based on species biological requirements, and sustainable forest conditions (DNF index) are based on what an individual plant association may be able to support overtime. These calculations of sustainability were intended to be a prototype since they were made using the specific vegetative conditions within the Cultus and Sheridan LSR. Existing Cultus and Sheridan LSR conditions in terms of density and fuel loading form the final column. Each LSR Assessment team will then need to adjust the range for suitable habitat based on adjustments to TABLE I and the range of sustainable forest conditions compatible with their unique mix of plant association within each PAG and the ranges in site quality of each plant association group.

It is important to note that TABLE II provides a rough comparison of suitable habitat versus sustainable forest conditions pertinent to the Cultus and Sheridan LSRs. The table does, however, represent the process we would like the LSR Assessment teams to use. Thus, each LSR Assessment team will need to modify the columns based on individual plant associations that are most common within each PAG within their specific locations, as well as the site potential of those plant association groups.

From these results, it appears that some process of cycling of the transient suitable habitat within the LSR overtime needs to be developed.

TABLE II: summary and comparison of conditions quantifiable between suitable habitat conditions, on site sustainable vegetative forest conditions and LSR existing conditions based on the best available data, using the Cultus/Sheridan LSR as a prototype.

PAG	SUITABLE HABITAT (1)			SUSTAINABLE (2)		EXISTING CONDITION (3)	
	DENSITY	FUELS		DENSITY	FUELS	SDI	TOT ACRES
	TPA	SDI	TONS/AC	UMZ (SDI)	TONS/AC		
MH	220-330	411-620	25-40 tons	256	< 40 tons	xxx	xxx
climatic MCW	284-430	365-581	25-35 tons	202	< 35 tons	xxx	4925
climatic MCD	175-261	279-405	12-24tons	156	<24 tons	xxx	9698
fire MCD	23-294	141-373	LOW	156	LOW	xxx	xxx
climatic PPW	150-224	347-535	12-24 tons	145	< 24 tons	xxx	487
fire PPW	23-294	141-373	LOW	145	LOW	xxx	xxx
climatic PPD	144-216	313-472	10-15 tons	102	< 15 tons	xxx	2802
fire PPD	8-273	27-216	LOW	102	LOW	xxx	xxx
LPW	296-444	222-353	12-24 tons	161	< 24 tons	xxx	1310
LPD	288-432	132-198	8-12 tons	80	< 12 tons	xxx	303
mid - low elev LPD	282-424	172-259	8-12 tons	161	< 12 tons	xxx	618

(1) Within the PAG, the plant association that was predominant within the LSRs is identified. This major plant association was used to identify which DNF indexes were used for the PAG. If there are several major plant associations, a range of UMZ's could be used here. For subsequent site specific project analysis, the best site specific data available will be used for density prescriptions, keeping areas below the UMZ in order to sustain or create future suitable conditions, wherever possible, while still providing current, but perhaps unsustainable habitat as well, to meet current suitable late successional old growth habitat needs.

(2) Based on Cochran et al. 1994, Joanna Booser and Jim White developed the paper "Calculating Maximum Stand Density Indexes (SDI) for the Deschutes National Forest Plant Associations", 1996, that was used in determining the above table's values. Cochran advised using the lowest plant association values within the PAGs as the index. Again, the approach here was to use the UMZ of the major plant association (or major plant associations) in the PAG, which pushes management closer to the unsustainable level, but allows leaving more short term suitable habitat. The best available site specific density values will be used when managing specific stands overtime across the landscape, not the lumped PAG value used here for broadscale planning purposes.

UMZ - For most species, the upper management zone is defined as the density level at which a suppressed class of trees begins to develop (Cochran et al. 1994). This is the point at which sufficient competition is happening between trees to cause some trees to begin to slow down in growth, even to the point of death. The primary cause is that, on any given piece of ground, there are limits to the resources available for plant growth. These resources include light, water, nutrients, and growing space. When these limits are reached, loss of plant growth and/or mortality are common elements of the stand. These conditions can be ideal for certain late successional old growth plant and animal species. However, they are often providing the ideal habitat conditions only after there has been sufficient limitations of previous density levels that allowed a large tree component to develop. Historically, these limitations were provided in drier plant associations by frequent fire intervals which tended to limit development of understories and favored growth of the forest with overstory trees.

In ponderosa pine or lodgepole pine, the UMZ is calculated somewhat differently from the other species. This was recommended by Cochran et al. 1994, to show the level above which higher levels of large tree mortality are much more likely to occur. For these tree species, the UMZ correlates to a high risk threshold for markedly increased tree mortality due to many of the forest pests which are dependent on density and lower tree growth for epidemic levels to be reached. Other factors besides density, such as species composition, must be considered for the density independent forest pests such as the fir engraver beetles and spruce budworm. However, the use of UMZ in stands which are typically not hosts to density dependent pests is still recommended if the desire is to let small trees grow to large trees more quickly and safely

especially where large trees are in short supply. This is because the presence of a suppressed class of trees would indicate average tree growth in the stand is beginning to slow down, perhaps significantly.

(3) SDI and Total Acres - These numbers only relate to the Cultus/Sheridan LSR Assessment. Each site specific LSR Assessment team will need to determine their appropriate existing vegetative conditions.

CRITERIA USED TO CYCLE AND SUSTAIN DESIRED LATE SUCCESSIONAL OLD GROWTH CONDITIONS WITHIN THE LSRs

We believe that successful management of the Forest LSRs should result in the satisfaction of two criteria: 1) minimum critical thresholds should be maintained over the short term and 2) sustaining habitat above this threshold over the long term. This section reviews whether we can simultaneously satisfy both criteria at the same time.

Methods:

Critical Minimum Thresholds:

Minimum critical habitat thresholds for the northern spotted owl (climatic climax indicator species) have been set by the U.S. Fish and Wildlife Service, USDI, 1992. These thresholds were used in determining the amount and size/structure distribution of suitable late successional old growth habitat for the owl and other dependent and associated wildlife species within the LSR. The USFWS thresholds are a measure of suitable habitat within the owl's home range radius. Calculations indicate that a minimum number of suitable climatic climax habitat acres for each LSR. The number of northern spotted owl pairs within the LSR were determined using the USDI Final Draft Recovery Plan for the Northern spotted Owl, December 1992. The minimum acres within each LSR are as follows: Davis LSR, 9,264 acres or 19 % of LSR; Metolius LSR, 10,422 acres or 14 % of LSR; and Cultus/ Sheridan LSR, 6948 acres, 13 % of LSR.

For fire climax species, like the northern bald eagle, there are no exact numbers that can be calculated. However, there are guidelines that do provide sideboards. For example, Bald Eagle Management Areas (DNF LRMP), and the US Fish and Wildlife Service recovery plan population density criteria provide specific management direction.

Historic Range of Variability was used as a frame of reference when addressing all species viability. A pivotal assumption in the use of HRV is that an element or process that is outside the range or natural variability cannot be sustained naturally (Caraher et al. 1992). Native species have adapted to the natural disturbance events of the Holocene (the past 10,000 years) environment and require those conditions for their survival (Swanson et al. 1993). Thus, through the watershed analysis process, we developed ranges of variability for our plant association groups.

Suitable habitat was examined from a spatial standpoint. Basically we were looking at quantity of , distribution and fragmentation of that habitat on a landscape level. This element was used to adjust critical habitat threshold levels above the minimum levels set by the USFWS and levels described by HRV. This was a very important element in the decision matrix since critical habitat must also be functionally distributed.

In summary, the above 4 elements were considered in and were used to develop estimated species thresholds. For example, in the mixed conifer wet plant association group, we first factored the USFWS habitat threshold for the northern spotted owl of 40 % suitable habitat within the owl's home range radius. By LSR this varies from 13 - 19 percent of the total LSR acreage, see above. We then estimated the distribution and amount of suitable habitat, without regard to land allocation, on a landscape level. This gave a picture of how suitable habitat was distributed on the Deschutes NF and adjoining Forests. Lastly using to the Historic Range of Variability, a range from 11-43 % was in either climatic climax or fire climax habitats. Thus, when these elements were factored together, along with an additional factor of how little the mixed conifer wet PAG made up of the LSR, we determined the percentage for the suitable habitat threshold.

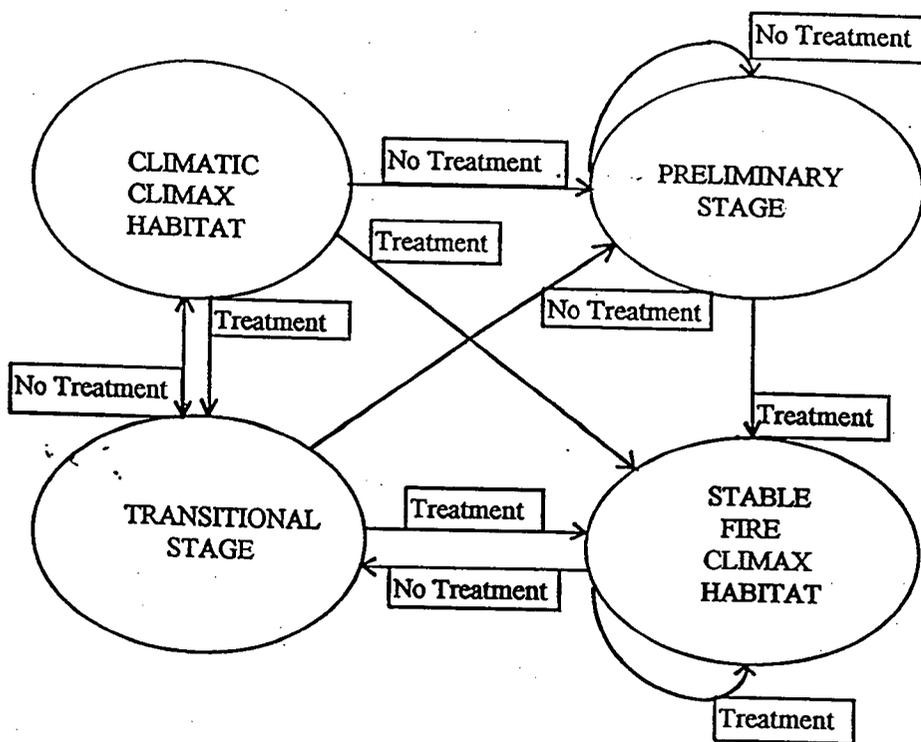
Cycling Suitable Habitat:

In order estimate how much suitable habitat could be consistently sustained in the LSR overtime, we used two approaches. First we developed a conceptual flow model to visualize how we might approach cycling of late

successional old growth habitat across the landscape, FIGURE I. In this model landscape vegetation was divided into four stages: 1) preliminary vegetation stage; 2) stable fire climax suitable habitat stage; 3) transition vegetation stage; and 4) climatic climax suitable habitat stage. Movement between the 4 vegetation stages, as a result of no management versus management (thinning to below the upper management zone) was also theorized. Rates of flow between the 4 vegetation stages were assumed based on general forest growth relationships and general forest pest behavior and impacts specific to central Oregon.

Second, we used the Historic Range of Variability to visualize how natural processes cycled the vegetation. The HRV numbers were taken from the watershed analysis for Odell and Metolius WA.

FIGURE I. Conceptual Flow Model of cycling suitable habitat in response to treatment (1) or no treatment.



(1) Treatment consists of stocking control measures that result in on site stability and this promotes the growth and retention of large tree dominated forests.

The 4 vegetation stages are described in detail as follows:

Preliminary vegetation: Stands falling into this group, do not satisfy the requirements of either climatic climax or fire climax dependent or associated species. These stands encompass a wide range of structures and densities but share the common characteristic that large trees are not prevalent.

Management of these stands should emphasized growth into the late successional old growth condition as quickly as possible. Management activities in high risk stands could move them towards this group by thinning to lower susceptibility to bark beetles so existing trees can rapidly continue their development towards large trees. It may also take the form of a prescribe burn to remove

hazardous levels of fuels. In the frequent fire adapted ecosystems, lack of management will result in cycling from other categories back to this category for many stands as a result of insect and disease attack and catastrophic wildfire.

Stable fire climax suitable habitat: Stands falling into this group of vegetation satisfy the requirements for suitable fire climax habitat and they are below the upper management zones. Without density management, or the re-introduction of fire, these stand types often progress into the unstable fire climax stage described below and may progress into unstable climatic climax suitable habitat. Continued density reduction through mechanical thinning or thinning by prescribed fire will maintain stands in this category.

Transitional vegetation: The condition that exists when stable fire climax vegetation transitions increases in density and becomes unstable fire climax but not yet suitable climatic climax. This condition is above the upper management zone but below the density levels or large tree sizes required to achieve the necessary structural attributes for climatic climax suitable habitat. Management in these stands should focus on developing the large tree component for climatic climax, developing the understory conditions needed for climatic climax when the large tree structure is already present, or density reduction to return the stand to suitable fire climax conditions.

Climatic climax suitable habitat: This group has the structural attributes necessary for climatic climax late successional old growth habitat, i.e. nesting, roosting and foraging habitat for the northern spotted owl. In most situations, this habitat cannot be managed both to retain these essential characteristics and be below the upper management zone. In some cases, however, it could be thinned, prior to some natural endemic advent, to a fire climax late successional old growth condition which is stable and could, in a relatively short period of time once again be suitable climatic climax. This action might be appropriate if there are disproportionately large amounts of climatic climax and small amounts of fire climax. Without treatment this vegetation group will revert to some variation of the preliminary vegetation stage or less likely to transitional vegetation.

Under active management and no management scenarios, it is very likely that the stand would not remain over time as climatic climax habitat. The difference would be that under active management the desired large tree structure could likely be retained over time; under no management it would likely not be retained.

Using one to several rotation cycles for each plant association group, we cycled structural stages through time, so there will be habitat on line to replace existing habitat when it no longer functions. Estimated growth, the use of the upper management zone (UMZ) to help determine levels of sustainability, and mortality rates were used to help determine realistic cycles. Suitable habitat decline will most likely be as a result of insect, and/or disease attack or wildfire.

TABLE III represents a visual display of the criteria, giving a quantitative representation to these criteria and size structure groups using percentages or a range of percentages.. Because the landscape was so fragmented and the amount of remaining suitable habitat was only found within the LSR, we found that spatial considerations were very important when determining suitable habitat thresholds. Concerns about the spatial distribution of habitat resulted in higher levels of habitat compared to the USFWS thresholds and historic levels. These concerns only applied to the mixed conifer plant association groups.

TABLE III EVALUATION CRITERIA, USING THE CULTUS/SHERIDAN LSR AS A PROTOTYPE.

SIZE STRUCTURE	SUIT HAB. THRESHOLDS. % of Acres in ea size class				CYCLING (1) % of Acres in ea size class				HRV % of Acres in ea size class				
	MCW	MCD	PPW/D	LPPW/D	MCW	MCD	PPW/D	LPPW/D	MCW	MCD	PPW/D	LPPW/D	HM
SEED/SAP (2) 0-5"	-	*	*	25	6	7	5	25	0-40 0-25	0-40*	5-50	0-80 0-60	0-3
POLE (2) 5-9"	-	*	*	25	7	7	5	25	3-30*	*	28-100*	10-80 23-80*	0-40
SMALL (2) 9-21"	40	30*	40*	50	12	15	10	50	0-32 *	32-100*	*	10-100 10-60	0-50
MEDIUM (3) 21-32"	60*	60c/10f*	5c/55f*	-	25	38	20	-	11-43*	23-90*	20-70*	0+	5-20*
LATE/OLD (3) >32"	*	*	*	-	50	33	60	-	*	*	*	-	*

(1) Different rotation lengths were used for each plant association group. These rotation lengths (until regeneration is required) are as follows: MH, 600-1200 + years; MCW, 400 years; MCD 350 years; PPW/D, 500 years and LPPW/D, 100 years. The number of years within each structural group may be calculated by multiplying the percent (as a decimal) in the table by the rotation length.

(2) These two size/structure classes represent the preliminary stage.

(3) These size/structure class represents either the stable fire climax habitat stage, transitional stage or the climatic climax habitat stage.

* - Percentage is shared between size structure classes, either up or down the size scale.

c - Climatic climax.

f - Fire climax.

Within the HRV column, note 2 sets of numbers. These represent figures from the Cascade Lakes and Odell Watershed Analysis.

Results: TABLE IV represents the integration of the above criteria to achieve a proposed distribution of vegetative conditions by plant association group across the landscape. Vegetation conditions are divided into 4 groups: 1) Preliminary vegetative conditions that are not large tree dominated. It recommended that these preliminary stage stands be managed below the upper management zone to hasten the development of large; 2) Suitable habitat – fire climax; 3) Vegetative conditions that are above the upper management zone but are less than suitable habitat and is transitional stage in Figure I; and 4) Suitable habitat– climatic climax. We propose that if the four conditions are well distributed in the displayed proportions across the LSR, that with management, a continual supply of suitable habitat can be maintained over the long term.

These percentages, since they are derived from integration of the species and tree growth data specific to each LSR, will vary somewhat based on the plant associations that make up the majority of each PAG, and the wildlife species that use these habitats.

TABLE IV: DESIRED AMOUNTS OF 4 TYPES OF VEGETATIVE CONDITIONS

PAG (1)	PRELIMINARY STAGE (2)	SUITABLE HABITAT % FIRE (3)	TRANSITIONAL STAGE (4)	SUITABLE HABITAT % CLIMATIC (5)
MH	15 (0-30)	NA	15 (0-30)	70 (40-70)
MCW	30 (20-40)	NA	10 (0-20)	60 (50-70)
MCD	25 (20-30)	10 (5-10)	25 (20-30)	40 (30-50)
PPW/D	20 (10-30)	55 (40-70)	20 (10-30)	5 (0-10)
PPW/D FORESTED LAVAS	20 (10-30)	5 (0-10)	20 (10-30)	55 (40-70)
LPW/D	40 (20-60)	NA	10 (0-20)	50 (30-70)

DESCRIPTION OF THE COLUMNS

(1) Plant Association Groups - are the combinations of plant associations, described by Volland, 1988, grouped according to productivity and growth potential. All plant association groups are the groupings defined by the science team meeting of February 22, 1996. Those groupings match the groupings in the WEAVE document with a few changes/exception as noted in the notes from the February 22 meeting. It should be noted that while PAGs work well as guidelines for landscape analysis, specific plant associations or individual stand measurements where available, must be used for site specific prescriptions to best meet long term habitat objectives

(2) vegetative conditions that are below the upper management zone, thus, sustainable. See figure I, this column relates to the preliminary stage. UMZ defines the point at which a suppressed class of trees begins to develop or high risk threshold of density related insect - indexed mortality for large pines is reached. In other words, the stand can maximize growth with little or no threat from insect attack. When prescribing management in these stands, consideration should be given to the conifer species and diameter mix desired to move these stands towards late successional old growth suitable habitat conditions.

(3) Suitable habitat – fire climax conditions - as quantitatively described in TABLE I. See figure I, this column relates to the stable fire climax habitat stage.

(4) vegetative conditions that are above the upper management zone but are less than suitable habitat, describes a range of conditions between these two quantitative points. See figure I, this column relates to the transitional stage.

(5) Suitable habitat – climatic climax conditions - as quantitatively described in TABLE I. See figure I, this column relates to the climatic climax stage.

It is important for readers to understand that the objective of all management within the LSRs, is to provide suitable late successional old growth habitat for the long term. Stands in column 5 (less than the UMZ) must be managed to provide big trees of long-lived species like ponderosa pine and Douglas fir in a short period of time. Wise management of these stands will set the stage for moving into column 4 (above the UMZ) where these stands should meet the large tree criteria of suitable habitat. Stands in column 4 should continue to be managed to encourage development of large tree structure to replace loss of habitat in column 1 over time.

The mixed conifer dry PAG generated the most discussion and discomfort with relative percentages generated for columns 2-4, both in terms of suitability and sustainability.

The minimum critical thresholds of suitable habitat were the base starting point in building the desired condition table for late successional old growth habitat conditions. It is very important to note that the LSR should not be managed for the minimums but rather as optimal habitat for late successional old growth habitats for those dependent or associated species.

Estimated time frames for how long those late successional old growth conditions might last and how long it would take to grow those conditions back from a regenerated stand were considered for various structural stages and the length of time in each of those stages.

In mixed conifer dry, it was estimated that it would take 250 to 350 years to grow late successional old growth conditions from a regenerated stand (if managed).

Depending upon the plant association group, it was estimated that the suitable habitat conditions would last in the mixed conifer wet PAGs approximately 60 years and within the mixed conifer dry PAGs approximately 30 years.

It was also determined that on a 300 year rotation, you could only have 1/6 (about 17%) of the land area in suitable habitat on a sustainable basis.

With management, stands in the mixed conifer PAGs could have the species mix kept to a fairly resistant mix for defoliators, and could allow manageable losses of bark-beetle susceptible trees. This might then let us get up to 40% of the PAG in a fairly sustainable suitable habitat connotation, with replacement stands coming along in the appropriate structural conditions.

SUMMARY

Several important conclusions may be drawn as a result of this paper. First, in order to effectively manage our LSRs, we must be able to define what the late successional old growth suitable habitat conditions are for both climatic climax and fire climax forests. The definition must make ecological sense, and must be measurable and practical on the ground. TABLE I provides the framework to fully describe suitable habitat conditions for the plant association groups on the Deschutes NF, based on the characteristics of the major plant associations within those groups. Each LSR Assessment team will need to adjust the contents of TABLE I to fit the actual plant associations that are most common within their LSR, for each plant association group.

Second, most of our suitable climatic climax habitat conditions within our LSRs are often not sustainable for any period of time. Meeting suitable climatic climax habitat conditions for late successional old growth species and keeping the stands below the upper management zone are not compatible as clearly displayed in TABLE II.

Lastly, a strategy of rotating late successional old growth habitat through several vegetative structural stages and across the landscape through management seems to be appropriate. It also appears doable using the USFWS minimum thresholds and historic range of variability. However, it may not be achievable at this time due to quantity of -, distribution and fragmentation of the suitable mixed conifer late successional old growth habitats on a landscape level that currently exists within our LSRs. An aerial view of our landscape shows that almost all of our late successional old growth habitat is within our LSRs. Even inside our LSRs, the landscape is heavily fragmented. The balance of the landscape is also heavily fragmented with few residual stands of late successional old growth habitat.

Most of the plant association groups on the Forest and in general, eastside forests, are not able to provide large sustainable contiguous blocks of suitable northern spotted owl habitat, i.e. climatic climax habitat. Historically, on the Deschutes NF it is believed that owl habitat was limited to the wet mixed conifer and moist north aspect dry mixed conifer PAGs. The pattern of this habitat was in a mosaic distribution, intermixed with earlier seral stages. The number of owls on the Forest probably varied significantly through time depending on the amount of available habitat. Currently, the Deschutes NF has 34 owl pairs utilizing fragmented habitat, of which only a few are reproductively successful on an annual basis. This number may be the highest density of owls the Deschutes NF has yet experienced and may not be sustainable overtime. Never-the-less, this plan is designed to provide enough suitable habitat for all current owl pairs within the LSRs. The consequence of this strategy is that a large percentage of several PAGs are in an unstable condition which means that they are at high risk of epidemic insect and disease attack and catastrophic wildfire. In the short term this may not be a problem because there is an excess amount of habitat in the Transitional and Suitable Climatic Climax Habitat Stage (TABLE IV). Therefore, it will take several years of vegetative treatments just to get these PAGs down to the upper limits displayed in TABLE IV. In the long term, however, the Forest will need to evaluate the risks of maintaining large portions of the Forest in an unstable condition. This may result in a lowering of the percentages of various PAGs in the unstable categories. This, in turn, will result in a re-calculation of the number of northern spotted owls the Forest can support.

!Author, Mike Gerdes, Forest Wildlife Biologist, 6/5/96

Signature 

!Author, Helen Maffei, Area 4 Pathologist, 6/5/96

Signature 151 Kim Johnson for Helen Maffei

!Author, Joanna Booser, Forest Silviculturist, 6/5/96

Signature Joanna Booser

!! Concur, Bill Queen, Restoration Team Leader, 6/5/96

!! Concur, David Summer, Chair Exective Team, 6/5/96

Team Members:

- Jim Stone
- Sherri Chambers
- Don Wood
- Carol Morehead
- Phil Jahns
- Rod Bonacker
- Richard Pastor

Additional Support:

- Chuck Vickery
- Lorri Heath
- Rock Gerke
- Bob Marsh

Reviewers:

- Maret Pajutee
- Katie Gernier
- Kim Johnson
- Don Pederson
- Karen Shimamoto
- Bill Queen
- Greg Riegler
- Team & Support individuals

Appendix I -- Plant Association Groups and Data Sources for Vegetative Information

Plant Association Groups	Plant Associations	Eco-class	Prod Class
Meadows	* MW Wet Meadow	MW	7
	* MM Moist (Hairgrass) Meadow	MM	7
	* MM Moist (Bluegrass) Meadow	MM	7
	MD Dry Meadow	MD	7
Xeric Shrublands	SD Low sagebrush/Idaho fescue	S1	7
	SD Big sagebrush/bunchgrass	S1	7
	SD Big sagebrush/needlegrass	S1	7
	SD Big sagebrush-bitterbrush/bunchgrass	S1	7
	SD Buckwheat Flats	BF	7
	GB Bluegrass Scabland	G1	7
Mesic/Wet Shrublands	* SW22 Associations within forest zone or one topographic positions such as flood plains and canyons which accumulate subsurface moisture... Stands have either alder, willow, or spirea as dominant woody vegetation; could be forest lands if fire has been suppressed.	SW	
	* SW11 Associations within riparian areas with standing or running water. Soils imperfectly drained through much of the growing season. Shrubs commonly alder, willows huckleberries or spirea.	SW	
Alpine Shrublands	SS15-11 High elevation; above timberline; soils imperfectly drained early in the growing season or well drained.		
Subalpine/Alpine Meadows	MS21 Associations dominated by sedges and occurring at high elevations; soils imperfectly drained-moist into summer		
Juniper Woodlands	CJ-S3-11 Juniper/bitterbrush/bunchgrass	J1	7
Ponderosa Dry	CP-S1-12 Ponderosa pine/bitterbrush-big sage/squirrel tail	PS	7
	CP-S2-17 Ponderosa pine/bitterbrush-manzanita/fescue	P3	6
	CP-S2-12 Ponderosa pine/bitterbrush/needlegrass	P5	6
	CP-S2-15 Ponderosa pine/bitterbrush/sedge	P1	6
	CP-S2-18 Ponderosa pine/bitterbrush/squirrel tail	PN	6
	CP-S3-12 Ponderosa pine/bitterbrush-snowbrush/sedge	P4	6
	CP-S2-13 Ponderosa pine/bitterbrush-manzanita/needlegrass	P2	6
	CP-S2-16 Ponderosa pine/bitterbrush/bluebunch wheatgrass	P8	6
	CP-S1-11 Ponderosa pine/bitterbrush-big sage/fescue	P8	6
	CP-S2-11 Ponderosa pine/bitterbrush/fescue	P1	6
CP-S2-14 Ponderosa pine/bitterbrush-manzanita/sedge		6	

Plant Association Groups	Plant Associations	Eco-class	P C.	
Ponderosa Wet	CP-S3-14 Ponderosa pine/bitterbrush-snowbrush/fescue	P3	6	
	CP-S3-11 Ponderosa pine/bitterbrush-snowbrush/needlegrass	P7	6	
	CP-G2-12 Ponderosa pine/sedge-fescue-peavine	PF	4	
Lodgepole Dry	CL-G3-11 Lodgepole pine/needlegrass basins	L6	7	
	CL-G4-13 Lodgepole pine/sedge-needlegrass basins	L6	7	
	CL-S2-14 Lodgepole pine/bitterbrush/fescue	L3	6	
	CL-S9-11 Lodgepole pine snowbrush-manzanita	P2	6	
	CL-G3-14 Lodgepole pine/needlegrass-lupine	L7	6	
	CL-S2-15 Lodgepole pine/gooseberry-bitterbrush/needlegrass	L5	6	
	CL-S2-11 Lodgepole pine/bitterbrush/needlegrass	L5	6	
	CL-S2-16 Lodgepole pine/bitterbrush (rhyolite)	L9	6	
	CL-S1-12 Lodgepole pine/big sage (rhyolite)	L0	6	
	CL-S1-11 Lodgepole pine/big sage/fescue	L		
	CL-G3-13 Lodgepole pine/needlegrass-lupine-linanthastrum	L7	6	
	CL-S4-12 Lodgepole pine/grouse huckleberry	L8	5	
	CL-S3-11 Lodgepole pine/pinemat manzanita	L6	7	
	Lodgepole Moist/Wet	CL-M4-11 Lodgepole pine/beargrass	M2	5
		CL-G4-12 Lodgepole pine/sedge-penstemon-lupine	M1	5
CL-G4-11 Lodgepole pine/sedge-lupine		L8		
CL-M2-11 Lodgepole pine/bearberry		L2		
CL-S2-12 Lodgepole pine/bitterbrush/sedge		L4	5	
CL-S2-13 Lodgepole pine/bitterbrush/forb		L2	6	
CL-M1-11 Lodgepole pine/sedge-grass wetland		L1	5	
* CL-M1-12 Lodgepole pine/kentucky bluegrass				
* CL-M1-13 Lodgepole pine/widefruit sedge				
* CL-M1-15 Lodgepole pine/tufted hairgrass				
* CL-M3-11 Lodgepole pine/grouse huckleberry/forb wetland		L1	5	
* CL-M3-12 Lodgepole pine/bog blueberry/widefruit sedge				
* CL-M3-13 Lodgepole pine/Douglas spirea/forb				
* CL-M3-14 Lodgepole pine/Douglas spirea/widefruit sedge				
* CL-M9-11 Lodgepole pine-Engleman spruce/few flowered spikerush				
Mixed Conifer Dry	CR-S1-11 Mixed Conifer/Manzanita			
	CW-H1-11 CW/snowbrush-chinkapin	W2	6	
	CW-S1-14 CW/snowbrush	W1	5	
	CW-S1-12 CW/snowbrush-manzanita	W1	5	
	CW-C2-11 CW/snowbrush-chinkapin/bracken fern	W3	5	
	CW-C2-13 CW/snowbrush/sedge-bracken fern	W5	5	
	CW-S1-15 CW/snowbrush/sedge	W6	5	
Mixed Conifer Wet	CW-C2-12 CW/snowbrush-chinkapin/pinegrass	W3	5	
	CW-S1-13 CW/manzanita-snowbrush/sedge-penstemon	W0	4	
	CD-S6-13 CW/snowberry/forb	W8	3	
	CD-S6-12 CW/snowberry/twinflower flatlands	W9	4	

Plant Association Groups	Plant Associations	Eco-class	Prod. Class
	CD-S6-14 CW/snowberry/elk sedge	W7	4
	* CW-S9-11 Englemann spruce bottom lands	E1	4
	* CW-F4-31 White fir/queencup beadlily		
	* CW-M2-22 Engleman spruce/queencup beadlily		
	* CE-M3-11 Engleman spruce/bog blueberry/forb		
	* CE-M3-12 Engleman spruce/bog blueberry/widefruit sedge		
	* CE-M1-11 Engleman spruce/widefruit sedge		
	* CE-M2-21 Engleman spruce/common horsetail-twisted stalk		
Mountain Hemlock +	CM-S1-11 Mt. hemlock/grouse huckleberry	M1	5
Whitebark pine	Zones above Mt. Hemlock		
Riparian	HQ-S2-21 Quaking aspen/common snowberry/blue wildrye		
	HQ-M1-21 Quaking aspen/blue wildrye		
	HQ-M4-11 Quaking aspen-lodgepole pine/Douglas spirea/widefruit		

* Plant associations marked with * can be found adjacent to streams and can be included in the riparian plant association group for mapping ecological units.

DATA SOURCES FOR VEGETATIVE INFORMATION

- a. Data Sources for Potential Natural Vegetation (Plant Association Groups)
 1. Timber stand exam field verified plant associations
 2. 1976 Soil Resource Inventory Ecoclass Map, 2"/mi. USGS Topographic Maps
 3. Vegetation Resource Survey (Forest Timber Type Mapping from 1982)
 - Photo typing was completed on 1981 resource photos
 - TRI/GIS Database includes stratification codes on ecotype codes which correspond to the 4"/mi. GIS stand maps.
 - SO Timber Inventory has original 4"/mi, Orthophoto Stand Maps
 4. Aerial Photo Interpretation
 5. Ecology Plots, Inventory Plots, Managed Stand Survey Plots
 6. Forest Ecomapping Contract (Available at the end of 1995)
 7. Local Knowledge
 8. 1908/1916 Timber Type Map located in 1908/1916 Fire Records.
- b. Data Sources for Current Vegetation
 1. Timber stand exam information -- Stand data base
 2. PMR
 3. Aerial Photo Interpretation (complete set of 1989 infra-red available).
 4. Activity data and mapping since 1988 to update PMR
 - Stand database and IADB
 - Harvest Layer
 - Reforestation Layer
 - Timber Stand Improvement Layer
 - Fuels Layer
 5. Fires since 1988 to update PMR
 6. Forest Decline Layer

c. Data Sources for Historical Vegetation Patterns

1. Forest Ecologist, Bill Hopkins
2. Forest Fire Atlas Maps which date back to the early 1900's
3. Cadastral survey notes which date mid to late 1800's
4. Historic literature
5. Forest fire lookout panoramic photos taken in the 1930's
6. 1943 and 1959 aerial photos
7. Stand reconstruction field data
8. Fire History studies and analysis (see Appendix E)

APPENDIX II: HABITAT STRUCTURE CHARACTERISTICS FOR THE 10 INDICATOR SPECIES.

Habitat Structure Characteristics Summary Sheet

Species	PAG's	Snags	Logs	Canopy Cover	Canopy Layers	Trees Size/ Trees per Acre	Basal Area	Home Range	Special Features
American Marten (AM)	MH	*18 > 31" 13' tall (E), *class 2 & 3 (G) * 20-35/ac (H) *>20" at rest sites >31" at den sites (C)	*8-20/ac (H) * > 31" and 33' (E) 16/acre >20" at rest sites >31" at den sites Intermediate decay class (C)	*40-60% at rest and forage sites Avoids stands <30% (F) *71% ave 83% (G)	*2-3	*Rest Sites >20" dbh - 50% *>39" dbh - 50% (C) *20-30" dbh (G) Den Sites *>31" dbh (C) *31-49" dbh (I)	*131-262 ft ² /ac (D), *126-252 ft ² /ac (I) *167-192 ft ² /ac (G)	Female *3.9 mi ² (C), *1.8-9.6 mi ² (D), *1 mi ² (H) Male * 6.7 mi ² (C), *4.4-21.2 mi ² (D), *2-4 mi ² (H) *1-2 mi ² (I)	*w/in 1-5 mi ² retain ≥50% of forest stand in mature/OG for linkage, blocks of mature/OG must be linked to provide connectivity (H) *Needs at least 160 acre blocks of suitable habitat (E)
Boreal owl (BO)	MH	*2-3 > 15" 1-7/acre >15" at nest sites 2.4/acre >15" at roost sites (J)		*30-63% *Roosting-Winter-58% Summer-63% 44% average at roost sites 26-34% at nest sites (J)	*2-3	Nest Sites *23 (± 6) TPA >15" 1-9" (161± 66 TPA)) *Roosts: Winter 656 TPA 1-9":67 TPA >9" Summer 1060 TPA 1-9" 84 TPA >9" Combined 6 tpa >15" (J)	*78 (± 14) ft ² /ac Roosting-Winter 113 ft ² /ac Summer 130 ft ² /ac (J)	Winter *5.6 mi ² , Summer 4.5 mi ² (J)	
Pileated Woodpecker (PWP)	MCW & MCD	*≥3/ac >20" (K) *Forage >12" (I)	*Recommended 40/ac ≥ 15" (K) *Mean density 117/acre ≥ 15"	*≥ 60% (K)	*2-3	*28", roosts (L) *8" >20", roost >9", foraging >21", nest tree (I)		*1.6 mi ² (K) *543 acres/pair (I)	*Roost stands of Grand fir >4/ac > 20" live & dead (L)

Species	PAG's	Snags	Logs	Canopy Cover	Canopy Layers	Tree Size/ Trees per Acre	Basal Area	Home Range	Special Features
Northern Spotted Owl (NSO)	MCW	*8/ac \geq 16" (M) * >5/ac (>25") >6/ac (16-25") 16 >25" (N) * >16/ac (9-16") 12/ac >15" (O)	*15/ac \geq 10" (M) * >8/ac (16-25") >5/ac (>25") (N) *15/ac >15" (O)	*60-65% (M) *70-100% 63-67% (N) *75% (O)	*2-3	*OS - \geq 8 TPA \geq 21" 2L - \geq 82 TPA \leq 21" (M) *70-90 tpa (5-9") 50-70 (9-16") 20-30 (16-25") 12-19 (>25") (N) * OS -22 TPA \geq 25" 2L - 280 TPA (O)	*180-210 ft ² /acre (Range 135-350) (N)		* >40% white fir understory > 8". Patch size, 40-200 acres of suitable habitat (M)
Bald Eagle (BE)	MCD			*OS <20% (Range 20-40%) 2L-20-40% Overall - 20-40% (<70%) (R)	*1-2 (R)	*OS- 8.5 TPA >44"(Range 1-30 TPA) 2L - 40 TPA 20" (R)		*10-15 mi ² Distance between occupied nests .6-2 miles (Q)	*Nest tree has open flight path and panoramic view, Perching w/in 165' of H2O, typically in snags, tallest tree along shoreline w/panoramic view & open exposure on at least one side (Q)
Flammulated Owl (FO)	PPW MCD	* > 28" dbh (S) * 22 \pm 4.7", 28 \pm 5.7" 11.8 - 22.8, nests in snags(J)		* <50% (T) *35-70% (J)	* >1 Roosts >2 (J)	*28" dbh, nest trees 134 \pm 59 TPA, 238 \pm 182 TPA Roosts - 800 TPA (J) >19.6" dbh (S) *7.8-19.6" surrounding stand (T)	*103 \pm 84.6 ft ² /ac Roosts - 562 ft ² /ac (J)	Male * 25 acres (I)	*Roost- select PP w/in MC stands, avoids pure PP (J)

Species	PAG's	Snags	Logs	Canopy Cover	Canopy Layers	Tree Size/ Trees per Acre	Basal Area	Home Range	Special Features
White-headed Woodpecker (WHWP)	PPW PPD	<p>Nests</p> <ul style="list-style-type: none"> * >31" (V) * > 18" (Range 9-39), nests(I) * 1 snag/ac, 26" nests, (W) <p>Roosts</p> <ul style="list-style-type: none"> * >24" (V) * 45/100 ac 10", 82/100 ac 12", 45/100 ac 20" (X) * Decay Class 2-4 (V) 		<ul style="list-style-type: none"> * Nest < 26% (W) * 24%(mean) Roosts, 44% (V) 	* > 1 (W)	<ul style="list-style-type: none"> * Nest Areas ≤166 TPA (X) * Foraging > 20" (I) * 10 TPA > 21" or 2 TPA > 31" >24" dbh, forage nest av. 26" ,range, 8-31" (W) * Mean 31" dbh, nest 24" dbh, roost 29" dbh, forage (V) 	<ul style="list-style-type: none"> * ≥ 40 ft²/ac lg trees Nest sites, 15-22 ft²/acre (V) 	<ul style="list-style-type: none"> *.8-1.3 mi² In contiguous stands, 524 acres (V) *1.7 mi² (0.18-3mi²) 261 acres in pur OG stands (W) 	<ul style="list-style-type: none"> * home ranges should contain > 37% OG (V) * Forages in live trees, secondarily use snags (W)
Black-backed Woodpecker (BBWP)	LPW LPD MCD	<ul style="list-style-type: none"> * >11" dbh (I) * >60% mpp (Y) 		<ul style="list-style-type: none"> * Nest - mean in uncut stands, 24% Roost - mean >40% (Y,Z) 		<ul style="list-style-type: none"> * Mean 11" dbh of nest trees; Mean 8" stem size at nest sites (Y,Z) Mean 14.6", nest (Y) * Mean forage stands, 10"; all trees used for foraging, 15"; lpp used for foraging, 14"; roost trees, 11" > 4" -503 TPA,(Z) 	<ul style="list-style-type: none"> * Mean roost sites, 115 ft²/acre Forage Sites -mixed conifer, 363 ft²/acre; mixed conifer dominated by lpp, 413 ft²/acre; lpp, 411 ft²/acre; Nest sites -lpp, 79-112 ft²/acre; mixed conifer dominated by lpp, 136 ft²/acre (AD) 	<ul style="list-style-type: none"> *1.5 mi² 956 acre/pair (Y) *Mean 430 acres (I) 	<ul style="list-style-type: none"> *Roosts in gall rust cankers, trunk scars, or mistletoe (I), Nests in snags dead < 5 years, Heart rot critical key factor in nest selection (Y)

Species	PAG's	Snags	Logs	Canopy Cover	Canopy Layers	Tree Size/ Trees per Acre	Basal Area	Home Range	Special Features
Great Gray Owl (GGO)	LPW LPD MCD		* >8" dia. w/in forage sites (AC)	*Foraging - 11-50% (I) *Nesting > 60% (range 52-99%) (J) *11-59%, males at forage & roost sites (AC, J) *Juveniles, 50%, ≥60% (AC)		*Mean dbh of stick nests, 23" Mean dbh of broken top nests, 31" (L,AC) *Perch and forage trees, 10" (AC)		Adults *11.6 mi ² (J) *30 mi ² (I), *26 mi ² (AB) Juvenile *60 mi ² (I) *61 mi ² (AB)	*Owlets need dense cover or leaning trees (I) Openings *Nests w/in 0.2 mi of opening (I) * Size range 15-247 ac (AA) *Plant height averages 8", grass dominated (AC)

Species	PAG's	Stings	Logs	Canopy Cover	Canopy Layers	Tree Size/ Trees per Acre	Basal Area	Home Range	Special Features
Northern Goshawk (NG)	LPW LPD MCD	*25-75/acre, 8-10", pine forest type 5-15/acre, 7-12", pine/fir forest type 5-70/acre, 6-20", fir forest type (U)	*50-85/acre, 9-10", pine forest type 65-70/acre, 9-11", pine/fir forest type 40-190/acre, 5-9", fir forest type (U)	Nesting *44-85% (AD) *>40% (AF) *79%, good (AG) *≥70% Recommend >90% (AE) *49-74%, pine forest type 71-91%, pine/fir forest type 70-94%, fir forest type (U)	* > 1 (AK, AL)	*Nest Stands Mean dbh, 11" 526 TPA (AD) *Nest Area Mean nest tree dbh 12.4 (7-20") Mean nest tree, 29" Mean nest area, 13" 53.8 tpa (AD) *Ave dbh on the east side, 14" (AE) *Ave. stand size, 17" (AF) *MC, >25/acre >20", good nesting habitat (AG) *2.5-4.9", 86tpa 4.9-8.9", 225 tpa 8.9-15.9", 192 tpa >15.9", 7 tpa (AD) *Nest dbh pine forest type, 20-33"; pine/fir forest type 28-39"; fir forest type, 19-39" TPA pine forest type >11", 30-40; >20", 10-25; TPA pine/fir forest type >11" 45-110, >20", 20-25; TPA fir forest type >11" 35-110, >20", 20-45	*217 (range 148-283) ft ² /ac 221 ft ² /acre in nest areas (AD) *30-92 ft ² /ac, live trees (AF) *152-179 ft ² /acre, live & dead, pine forest type 116-181 ft ² /acre, l & d, pine/fir forest type 143-262 ft ² /acre, l&d, fir forest type Pine forest type, 1-4.9", 20-25; 5-8.9", 95-160; 9-14.9", 15-20; 15-20.9", 0-10; 21-24.9", 10-20; 25-31.9", 5-10; 32"+, 0-10 Pine/fir forest type, 1-4.9", 25-35; 5-8.9", 30-95; 9-14.9", 55-105; 15-20.9", 10-35; 21-24.9", 0-10; 25-31.9", 5-10; 32"+, 0-15 Fir forest type 1-4.9", 5-45; 5-8.9", 25-70; 9-14.9", 5-115; 15-20.9", 5-40; 21-24.9", 5-20; 25-31.9", 5-25; 32"+, 0-10(U)	*6-15 mi ² (AE, AF) *0.8 mi ² if there is a lot of suitable habitat (AE)	*Nest tree is usually the largest w/in the stand and near small breaks in canopy (I) *Fully suitable stands contain 2 alternate nest stands within 0.6 miles of each other >20 acres (AG)

Literature References

- A. USDA, Forest Service. 1994. American Marten, Fisher, Lynx, and Wolverine in the United States. General Technical Report RM-254. Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado.
- B. Ingram, Rod. 1973. Wolverine, Fisher, and Marten in Central Oregon, Central Region Administrative Report No. 73-2. Oregon State Game Commission, Bend, Oregon.
- C. Jones, Larry and Martin Raphael. 1992. Unknown title, a study conducted on the Mt. Baker-Snoqualmie N.F. PNW Lab, Olympia, Washington.
- D. Martin, Sandra. 1989. Report on Ecology and Habitat Requirements of Marten.
- E. Martin, Sandra, and Reginald Barrett. 1991. Resting Site Selection By Marten At Sagehen Creek, California. Northwest Naturalist, 72:37-42.
- F. Spencer, Wayne, Reginald Barrett and William Zielinski. 1983. Marten Habitat Preferences in the Northern Sierra Nevada. Journal of Wildlife Management. 47(4):1983.
- G. Jones, Lawrence. 1990. Ecology and Management of Marten in Fragmented Habitats of the Pacific Northwest. Pacific Northwest Research Station, Olympia, Washington.
- H. Stuff from Lew Becker's notes.
- I. Marshall, David. 1992. Sensitive Vertebrates of Oregon. Oregon Department of Fish and Wildlife, Portland, Oregon.
- J. Hayward, G.D. and J. Verner, tech. editors. 1994. Flammulated, boreal, and great gray owls in the United States: A technical conservation assessment. General Technical Report RM-253. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station.
- K. Bull, Evelyn, and Richard Holthausen. 1985. Habitat use and Management of Pileated Woodpeckers in Northeastern Oregon. Journal of Wildlife Management 57(2):335-345(1993).
- L. Bull, Evelyn, and Richard Holthausen. 1992. Roost Trees Used By Pileated Woodpeckers in Northeastern Oregon. Journal of Wildlife Management, 56(4):786-793.
- M. Gerdes, Michael. 1991. Suitable Spotted Owl Habitat Definitions, Deschutes National Forest.

- N. Gerdes, Michael. 1995. Deschutes National Forest Northern Spotted Owl Habitat Study on Upper Canyon Creek. On file at the Deschutes National Forest Supervisor's Office and the Bend/Ft. Rock Ranger District. (On Sisters Ranger District, habitat is the lower end of MCW PAG)
- O. USDA. 1995. Deschutes National Forest Late Successional Reserves. USDA, Pacific Northwest Region.
- P. Call, Mayo. 1978. Nesting Habitats and Surveying Techniques for Common Western Raptors, Technical Note TN-316. USDI BLM, Denver Service Center, Denver, Colorado.
- Q. Stalmaster, Mark. 1987. The Bald Eagle. Universe Books, New York, New York.
- R. Lehman, Robert. 1980. An Analysis of Habitat Requirements and Site Selection Criteria for Nesting Bald Eagles in California. Wilderness Research Institute, Arcata, California.
- S. Bull, Evelyn L., Anthony L. Wright, and Mark G. Henjum. 1990. Nesting habitat of flammulated owls in Oregon. *Journal of Raport Res.* 24(3):52-55.
- T. Goggans, Rebecca. 1985. Habitat use by flammulated owls in northeastern Oregon. MS thesis, Oregon State University. 54 p.
- U. Gerdes, Michael. 1993. Deschutes National Forest Northern Goshawk Reproductive Nest Site Study. On file at the Deschutes Supervisor's Office and the Bend/Ft. Rock Ranger District.
- V. Dixon, Rita. 1995. Density, Nest-Site and Roost-Site Characteristics, Home-Range, Habitat-Use, and Behavior of White-Headed Woodpeckers: Deschutes and Winema National Forests, Oregon. Nongame Project Number 93-3-01. Oregon Department of Fish and Wildlife, USDA Deschutes and Winema National Forests.
- W. Blair, Glen, and IDFG. 1993. Species Conservation Plan for the White-Headed Woodpecker. USDA, Forest Service (R-1), Nez Perce National Forest and Idaho Department of Fish and Game (R-II).
- X. Frederick, Glenn, and Teresa Moore. 1991. Distribution and Habitat of WHWP (*Picoides albolarvatus*) in West-Central Idaho. Idaho Department of Fish and Game, Boise, Idaho.
- Y. Marshall, David. 1992. Status of the BBWP in Oregon and Washington. Audubon Society, Portland, OR.

- Z. Goggans, Rebecca, Rita Dixon, and Claire Seminara. 1988. Habitat Use By TT and BB Woodpeckers, Deschutes National Forest, Oregon. Nongame Project Number 87-3-02. Oregon Department of Fish and Wildlife, and the USDA Deschutes National Forest.
- AA. Bryan, T. and Eric Forsman. 1987. Distribution, abundance, and habitat of great gray owls in southcentral Oregon. *The Murrelet* 68:45-49.
- AB. Bull, Evelyn L., Mark Henjum and Ronald Rohweder. 1988. Home range and dispersal of great gray owls in northeastern Oregon. *J. Raptor Res.* 22(4): 101-106.
- AC. Bull, Evelyn L., Mark Henjum and Ronald Rohweder. 1988. Nesting and foraging habitat of great gray owls. *J. Raptor Res.* 22(4): 107-115.
- AD. Squires, John R., and Leonard F. Ruggiero. 1996. Nest-site preference of northern goshawks in southcentral Wyoming. *J. Wildl. Manage.* 60(1): 170-177.
- AE. Unknown author. DocID 3378C/161A. Info from the Gifford Pinchot NF.
- AF. 1988. Goshawks As Indicators of Mature Forest Types, Gifford Pinchot National Forest, Washington.
- AG. Crocker-Bedford, D.C., and B. Chaney. 1988. Characteristics of goshawk nesting stands. pp 210-217 In R.L. Glinski et al (eds.). *The Proceedings of the Southwest Raptor Symposium*. The Nat. Wildl. Fed. Washington, D.D. 395 pp.

. APPENDIX 3 - BIBLIOGRAPHY

- Agce, J. K. 1990. The historical role of fire, p. 25-38. In Walstad, J. D. et. al. (eds.), Natural and prescribe fire in Pacific Northwest forests. Oregon State Univ. Press, Corvallis, OR.
- Barbour, M.G., J.H. Burk, and W.D. Pitts. 1987. Terrestrial Plant Ecology. Cummings Publishing Co., Menlo Park, CA.
- Cochran, P.H., J. Geist, D. Clemens, R. Clausnitzer and D. Powell, Suggested Stocking Levels for Forest Stands in Northeastern Oregon and Southwestern Washington. 1993 Draft.
- Franklin, J.F., and C.T. Dymess. 1973. Natural Vegetation of Oregon and Washington. Gen. Tech Rep. PNW-GTR-8. USDA Forest Service, PNW Research Station, Portland, OR
- Graham, R. et al. 1994. Review Draft - Recommendations for Managing Coarse Woody Debris in Forests of the Northern Rocky Mountains. USDA Forest Service. Intermountain Research Station, Moscow ID.
- Hessburg, P.F., R.G. Mitchell, and G.M. Filip. 1994 Historical and Current Roles of Insects and Pathogens in Eastern Oregon and Washington Forested Landscapes. Gen. Tech. Rep. PNW-GTR-327. USDA Forest Service, PNW Research Station, Portland OR
- McCammon, B.P. 1983. Hydrologic Investigation of the Effects of Timber Harvesting and Road Construction within LSRs Tributary to the Metolius River, USDA Forest Service, Deschutes National Forest.
- Oliver, C. D., C.W. Harrington, (and others). 1991. Silvicultural Systems for Douglas-fir, western hemlock, and other Mixed Conifer Stands. Report to the Northern Spotted Owl Recovery Team.
- Simon, S. A. 1991. Fire history in the Jefferson Wilderness Area east of the Cascade Crest. U.S.D.A. Forest Service, Deschutes National Forest. Unpublished.
- Thomas, J.W., E.D. Forsman, J.B. Lint, and others. 1990. A Conservation Strategy for the Northern Spotted Owl: a report of the Interagency Scientific Committee. USDA Forest Service; USDI Bureau of Land Management, Fish and Wildlife Service, and National Park Service. Portland OR
- U.S. Fish and Wildlife Service. 1992. Recovery Plan for the Northern Spotted Owl. USDI, Portland, OR.
- U.S. Forest Service. 1990. Record of Decision and Final Supplemental EIS on management of Habitat for Late-Successional and Old Growth-related Species within the Range of the Northern Spotted Owl. USDA Forest Service, Pacific NW Region. Portland, OR
- U.S. Forest Service. 1990 Deschute National Forest Land and Resource Management Plan. USDA Forest Service, Deschutes NF, Bend OR.
- U.S. Forest Service. 1993 Bibliography of Selected Literature Regarding Management of Cavity Excavators in Eastern Habitats of Oregon and Washington. USDA Forest Service, Pacific NW Research Station, LaGrande OR.
- U.S. Forest Service. 1995 Winema National Forest. Late Successional Reserve Assessment on the Klamath Ranger District. USDA Forest Service, Winema NF, Klamath Falls, OR

Volland, L. A. 1982. Plant Associations of the Central Oregon Pumice Zone U.S.D.A Forest Service, Pacific Northwest Region. R6-ECOL-104-1982.

APPENDIX 4 FIRE MANAGEMENT PLAN

FIRE MANAGEMENT ASSESSMENT

METOLIUS LATE-SUCCESSIONAL RESERVE

SISTERS RANGER DISTRICT

INTRODUCTION: PURPOSE AND NEED

Fire management planning is a critical component of Late-Successional Reserve Assessments. This planning effort is especially significant in LSR's located east of the Cascade Mountains (ROD, C-11) where fire plays an important role in the development and maintenance of the landscape. The ROD and USFWS Final Draft Recovery Plan (December, 1990) identified considerable risk to late-successional habitat from large-scale disturbances, such as fire or insect and disease damage in the Late-Successional Reserves of Washington and Oregon Eastern Cascades (ROD, B-7, B-8 and C-12). Large scale disturbance events have the potential to eliminate old growth, late-successional habitat, and future late-successional habitat on hundreds or thousands of acres. The alteration or elimination of fire as a disturbance process in fire-dependent ecosystems, including the Metolius Late-Successional Reserve, is known to threaten the existence of species adapted to such conditions and to put the entire ecosystem at risk of large-scale disturbances.

Fire management planning, as identified in Appendix B8 of the FEIS on Management of Habitat for Late-Succession and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl, includes activities such as fire suppression, wildfire hazard reduction and prescribed fire use.

Fire management planning and activities will be conducted in a manner compatible with the overall goals and objectives for the Metolius LSR. The goals for fire management planning and the Fire Management Assessment for the Metolius LSR are:

1. Sustain late-successional habitats on the east side of the Cascade Mountains and in the Metolius LSR.
2. Reduce the current high risk of late-successional habitat loss from large-scale, high intensity wildfires.
3. Reintroduce fire into fire adapted ecosystems.

The objectives for the Metolius Late-Successional Reserve Fire Management Assessment are:

1. Develop fire suppression strategies that protect human life and property while sustaining late-successional habitats and protecting other resource values.
2. Identify fire hazard reduction activities that will reduce the potential for large-scale, high intensity wildfires.
3. Recommend activities that facilitate the reintroduction of fire into fire adapted ecosystems.

This Fire Management Assessment does not include site-specific prescriptions. Additional analysis will be required for all site-specific projects and before prescribed natural fire can be implemented in the LSR.

HISTORIC CONDITIONS AND FIRE REGIMES

Fire is an important natural process that has played a significant role in shaping the landscape of the Metolius LSR. Early visitors to Central Oregon described the conditions they found here. Frederick

Coville's 1898 report, "Forest Growth and Sheep Grazing in the Cascade Mountains of Oregon", reveals that forest composition was quite different a century ago. He described the general forest types as "the yellow pine forests, and the heavy west slope forests." Describing the yellow pine forests, he wrote "the principal species is the yellow pine, *pinus ponderosa*. The individual trees usually stand well apart, and there is plenty of sunshine between them". He also recognized the role of fire. "The scant grass and underbrush do not make a destructive burn, while the bark of the yellow pines is so thick and so nearly devoid of resin that only under exceptional circumstances is a mature tree killed. The saplings, however, up to an age of fifteen or twenty years are readily killed by fire."

Colville also seemed to recognize the differences in the mixed conifer zone. "At their upper elevations the yellow pine forests are denser, and often contain a considerable amount of Douglas spruce (*Pseudotsuga macronata*) and California white fir". He also recognized the difference in fire's role in these areas. Colville writes, "In this zone, in the higher elevations of the yellow pine zone, where there is a large admixture of white fir and Douglas spruce, the underbrush is thicker. A forest fire is often extremely destructive to the timber, and is followed by a very dense growth of shrubs".

Fire regimes are based upon historic conditions. A fire regime is a generalized description of the role fire historically played in an ecosystem and is an effective way to classify the effects of fire on vegetation (Agee, 1993). The fire regime identifies potential fire effects and historic size, frequency and intensity of fires within the vegetation types of the Metolius Late-Successional Reserve. Fire regimes in this assessment will be described by the plant association groups used in the Metolius Watershed Analysis.

Ponderosa Pine Plant Associations:

Approximately 25,120 acres or 32% of the Metolius LSR is included in the ponderosa pine plant association group.

Little fire regime research has been completed in the ponderosa pine of the Metolius LSR, but information from proximate sites with similar vegetation and weather conditions has been compiled. The Warm Springs Indian Reservation is adjacent to the LSR, to the north. The historic fire return interval for ponderosa pine forests on the Warm Springs Indian Reservation is 11 to 16 years (Weaver, 1959). In 1985, Bork found an average fire return interval of 16 years on sites near Cabin Lake and Pringle Falls on the Deschutes National Forest. Bill Hopkins, Area 4 Ecologist, estimates fire return intervals of 8 to 12 years for low intensity fires and 150 years for stand replacement fires. Hopkins estimates stand replacement fires to be 150 acres in size while the Deschutes NF Watershed Evaluation and Analysis for Viable Ecosystems (WEAVE) estimates them to be 100 to 1,000 acres in size.

Low intensity fire sizes are difficult to estimate because the fires left little evidence. "The area covered by individual fires in ponderosa pine forests was probably large, because continuous fine fuel was available on the forest floor: long-needled pine litter and extensive cured grass in the understory." (Agee, 1992).

Historically, fires were of low intensity, rarely scorching the crowns of the mature trees. This can be inferred from the pattern of scarring found on residual trees and from early accounts of wildfires in the ponderosa pine. 'Ordinarily, a fire in yellow-pine woods is comparatively easy to check. Its advance under usual conditions may be stopped by a patrolman on a fire line a foot or so wide, either with or without backfiring. The open character of the woods makes the construction of fire lines relatively easy, and in many cases horses may be used to plow them.' (Munger, 1917)

"Frequent underburns killed most of the small understory trees which colonized the sites during brief fire-free intervals, maintaining an open, park-like appearance." (Agee, 1992) These open and park-like stands had substantial grass and forb cover. (Wickman, 1992) Frequent, light burning allowed bunchgrasses and most forbs to recover rapidly, so the herbaceous vegetation dominated the understory. The natural landscape pattern was a seemingly unbroken parkland of widely spaced tree clumps and continuous herbaceous understory. (Agee, 1992) "The stable patch dynamics were largely a result of frequent, low intensity fire. Disruption of this pattern occurred as small scales when trees in patches became senescent

or when mistletoe infested trees torched. Of all the Eastside forest vegetation types, the *Pinus Ponderosa* type was the most stable in landscape pattern." (Agee, 1992)

"The dynamic process leading to stand replacing fire events in ponderosa pine is complex. It is often facilitated by some other event such as insect mortality, diseases, wind events, drought, or by natural fire exclusion allowing time for ladder fuels to accumulate to the extent necessary to either sustain a crown fire over a large area or to generate sufficient intensity and duration to reach inside bark temperatures capable of killing a normally fire resistant mature tree." (WEAVE, 1994)

Fuels were rarely at high levels because the frequent fires consumed forest floor fuels and pruned residual trees. Fine fuels were produced by needlefall or understory vegetation. (Agee, 1993) "In presettlement stands, downed logs were probably clumped at the same scale as the live tree components from which they were created, as such clumps contributed to local increases in fire behavior. It is doubtful that logs remained long on the forest floor to provide wildlife habitat, rooting media for seedlings, or sites for nitrogen fixation by microorganisms, as they were probably consumed by the next several frequent fires on the site". (Agee, 1993)

In the Metolius LSR, from 1902 to 1994, there have been 5 large fires in the the ponderosa pine plant association. These fires were primarily stand replacement and their average size was 1,705 acres. They range in size from 600 acres to 2,964 acres.

Mixed Conifer Plant Associations (Wet and Dry)

Approximately 48,503 acres or 62% of the Metolius LSR is included in the mixed conifer plant association group. There are 31,915 acres or 41% of the LSR in Mixed Conifer Day (MCD) and 16,588 acres or 21% in Mixed Conifer Wet (MCW).

"The most complex set of forest types in the Pacific Northwest includes those called mixed-conifer They differ in their specific mix of species, their fire regime, and the successional patterns likely after disturbance.... Ponderosa pine as a seral species and Douglas-fir as a seral or climax species can be found in each type, although not at every site." (Agee, 1993)

Historically, the mixed conifer forests show the most frequent fire activity of all Eastside forests, although cooler, wetter sites have longer fire return intervals (Agee, 1992). The dry mixed conifer plant associations would have the shorter fire return interval while the wet mixed conifer plant associations would have the longer fire return intervals. More frequent fires in the mixed conifer-dry plant associations are presumably due to the higher productivity found on these sites than in the ponderosa pine plant associations. The elevation and weather conditions would be similar in the dry mixed conifer and the ponderosa pine but mixed conifer sites would produce more vegetation (trees and shrubs). Once a fire started, the mixed conifer sites would have more fuel to allow the fire to continue to burn and increase in size. The fires would not generally be as large as fires in the ponderosa pine as there are wetter sites in the mixed conifer that would slow the fires and keep them at a smaller size. After a fire, the fine dead fuels needed to carry fire are more rapidly replaced in the mixed conifer. This would allow fires to burn more frequently. In the wet mixed conifer plant associations, the fire return intervals would be longer than in the dry mixed conifer. These sites have wetter, more productive site conditions that allow vegetation to grow rapidly but also retards the effects of fires. The wetter soils and fuel conditions reduce the spread and intensity of fires on these sites. The conditions on these sites would increase the length of time between fires on the same site, thereby increasing the fire return interval.

Combining the dry and wet mixed conifer plant associations produces a complex fire regime that is quite variable. The average fire return intervals between ponderosa pine and mixed conifer plant associations may appear similar but the variability within the mixed conifer fire regime is much greater and produces significantly different effects on the vegetation. For example, if the fire return interval is 15 years and the fires occurrence is fairly predictable, the effects on the vegetation and site can be predicted with some

degree of certainty. With the same fire return interval and a high degree of variability, the fire effects on the vegetation will be quite different and in the long term, the sites will appear quite different.

Less variable fire return (Scenario 1)	Variable fire return (Scenario 2)
Fire burns in 1900	Fire burns in 1900
Fire burns in 1920	Fire burns in 1910
Fire burns in 1940	Fire burns in 1950
Fire burns in 1960	Fire burns in 1960.

In both instances there are 4 fires in 60 years, so the average fire return interval is 15 years. In Scenario 1, the fires occur every 20 years. The effect on the vegetation on this site is quite predictable and should be similar in most instances because the vegetation is in a similar condition each time the fire burns. In Scenario 2, the fires burn 10 years, 40 years and 10 years after the previous fire. With this large variation in length between fire occurrence, the condition of the vegetation will be quite different when the fire burns through it. How the vegetation responds or does not respond to the fire will also be quite variable. Fire regimes in the mixed conifer plant associations are more like Scenario 2 than Scenario 1 in the Metolius LSR.

Fire return intervals were estimated by Bork (1985) at 9 to 25 years while Hopkins (1995) estimates them to be 30 to 50 years in the lower elevations (1500 to 4000 feet) and 50 to 80 years in the higher elevations (4000 to 5000 feet) of the mixed conifer on the east side of the Oregon Cascades. McNeil and Zobel (1980) found an increasing fire-return interval with elevation. The average fire return interval was 9 to 42 years along an elevation gradient. The average fire size for low intensity fires ranged from 50 to 150 acres and that stand replacement fires were 100 to 1,000 acres in size. Fire return intervals for mixed conifer plant associations are quite variable and a specific fire regime for the entire Metolius LSR is difficult to determine.

Historical fire intensities and frequencies ranged from frequent, low intensity fires to infrequent, high intensity fires. This is a moderate severity fire regime with a mix of low, moderate and high intensity fires all common. Most mixed conifer plant associations were more open in appearance than they are today and were dominated by ponderosa pine. "Frequent, low intensity fires kept such sites open so that they were less likely to burn intensely even under severe fire weather." (Agee, 1993) As these low intensity fires burned they removed understory ladder fuels and consumed debris on the forest floor. Fires that occurred after an extended fire-free period were generally more intense and consumed more trees and forest floor debris (fuels). These fires created patches and openings where 70 to 80 percent of the overstory trees were killed. The openings varied in size based on the weather, fuel and vegetative conditions on the site at the time of the fire.

In the Metolius LSR, from 1902 to 1994, there have been 8 large fires in the the mixed conifer plant associations. These fires were primarily stand replacement. Of the 8 fires, 3 of them also burned in the adjacent wildernesses. In the mixed conifer of the LSR; 4,679 acres have burned since 1902 and the total number of acres burned in these fires is 7,900 acres. In the LSR, the average fire size is 585 acres but the average of the total fires is 988 acres. Fire size in the LSR range from 100 acres to 1,415 acres. The range of fire sizes, including the wilderness, is 114 acres to 2,968 acres.

High Elevation Forest Plant Associations (Mountain Hemlock)

Approximately 5 acres or .01% of the Metolius LSR is included in the high elevation forest plant association group.

Within the Metolius watershed, the high elevation forest has the coolest temperatures, the shortest growing season, and the longest fire-return intervals. Hopkins (1995) estimates fire-return intervals of 100 to 300 years with fire sizes of 5 to 10 acres. Regeneration in this forest type occurs after stand replacement fires that may be 50 to 100 acres in size.

Fire is the primary large-scale disturbance in the high elevation forest. Most other disturbances operate at the tree or small stand scale. Because the major tree species of these forests are not fire resistant, most fires are stand replacement fires. The estimation of fire intensity in high elevation forests is complicated by the erratic, often weather-driven nature of these fires. (Agee, 1993) Crown fires occur when foliar moistures are low and may be aided by lichen draped within the canopy.

The high elevation forest of the Metolius watershed is characterized by mountain hemlock as a major component of the overstory vegetation. Subalpine fir, Pacific silver fir, white bark pine and lodgepole pine are all found in the overstory and understory.

"All subalpine plant associations will burn, but not under all conditions. In the *Tsuga mertensiana* zone, closed or parkland forest has the highest probability of burning, because of the dead fuel loads that can be desiccated during east wind events and the presence of flammable lichens in crowns low to the ground (Agee and Smith, 1994)." Fire has been an important factor in the creation of subalpine meadows (Kuramoto and Bliss, 1970). "Subalpine forests exist in a marginal environment for tree establishment and growth, so a fire disturbance that kills most or all of a stand can create almost permanent meadows or open parklands that persist for decades to centuries." (Agee, 1993) "Drier subalpine meadows, such as those dominated by *Festuca* spp., have burned frequently ... (Kuramoto and Bliss, 1970). Little is known about fire effects and fire-return intervals in wet subalpine meadows.

"Subalpine fires tend to be erratic and unpredictable. Although they are infrequent in most Pacific Northwest subalpine forests, fires have been important in shaping the landscapes we see today. Many subalpine meadows bordering forest were created by fire, ... The fire suppression period during the twentieth century so far has not had much impact on landscape structure in subalpine zones because of the fairly long fire-return intervals." (Agee, 1993)

No large fires have occurred in the high elevation forests of the Metolius LSR from 1902 to 1994.

High Elevation Lodgepole Pine Plant Association

Approximately 1,633 acres or 2% of the Metolius LSR is included in the high elevation lodgepole pine plant association. Lodgepole pine is usually present as a persistent early seral pioneer where climax hemlock and/or fir have been removed by fire or other disturbance. The lodgepole plant association group is the early successional stage of the high elevation forest, due to fire or other major disturbance patterns. Typically these stands persist in locations of poor soils or cold air pockets that other species cannot tolerate, and become, essentially, the climax species.

The normal fire regime is a high intensity, stand replacement fire associated with dry late summer conditions, high winds, and lightning. The fire return interval is 100-150 years. Pine beetles often intervene and cause extensive mortality, followed by stand replacement fire. After a pine beetle attack or in older stands with lots of large dry wood on the ground, even low intensity fires can cause extensive mortality as fire creeps from log to log damaging roots and tree boles. Patch sizes are usually small, 10 to 100 acres. Lodgepole regenerates easily on these burned sites, and the cycle begins anew. At lower elevations, ponderosa pine or true firs may slowly intrude into these even-aged lodgepole stands due to moderating changes to microsite or climate. Lower intensity fires may favor these species and allow further development, but usually they are lost in the next high intensity fire.

No large fires have occurred in the high elevation lodgepole pine plant association in the Metolius LSR from 1902 to 1994.

CURRENT CONDITION

Fire exclusion has had significant impacts to the historic fire regimes of forests on the east side of the Cascade Mountains and within the Metolius LSR. The fire return intervals across the entire LSR have increased, except in the high elevation forests. The expected fire intensities for ALL fires in the LSR have also increased due to increases in fuel loadings and ladder fuels.

As fire intensities increase, the risks to firefighters and public safety increase significantly. Firefighters spend an increased amount of their time suppressing high intensity wildfires, which contain dangerous fire conditions. With firefighters busy with high intensity fires, public safety becomes a more critical component of fire suppression. High intensity fires move more quickly, have longer spotting distances and more severe consequences than low intensity fires. This allows less time for firefighters to evacuate homes and recreation facilities in the area of the fire. The risk to public safety from wildfires has increased significantly in the Metolius LSR.

There have been 13 large fires in the Metolius LSR from 1902 to 1994. A total of 13,104 acres have burned in the LSR, in large fires, in the last 93 years. That is 17% of the LSR. The average fire size is 1,008 acres. There is no trend to show that there has been a decrease in acres burned in large fires in the last 93 years.

Large fires in the Metolius LSR generally burn from west to east or down the Metolius River. This is due to the generally westerly prevailing winds. The highest concentration of large fires can be found along the Metolius Horn. Sixty percent of the fires requiring suppression action occur in July and August, generally under the driest conditions of the year. There is no indication that this trend will change through time.

As fuel loadings and fire intensities have increased across the LSR, the amount of smoke produced by wildfires has and will continue to increase correspondingly. Smoke produced by one acre of high intensity wildfire generally contains 10 to 100 times as much particulate matter as the same acre burned under low intensity conditions. The current vegetation in the Metolius LSR, when burned under wildfire conditions, will produce significantly high levels of particulate matter than under historic conditions.

The cost of fire suppression has also increased significantly over historic suppression costs. High intensity wildfire suppression costs can reach a million-dollars or more, depending upon the difficulty of suppression and risk to wildland/urban interface. The wildland/urban interface of the Metolius LSR, associated with increasing recreational use and the development of the Camp Sherman and Suttle Lake areas, has increased significantly from historic times. The increased risk, from wildfire, to the public who live and recreate in this LSR and the increased cost of fire suppression will continue. Fire suppression in the wildland/urban interface is the most hazardous suppression situations that wildland firefighters face.

Ponderosa Pine Plant Associations

In ponderosa pine forests, where the historic fire-return interval was 8 to 12 years for low intensity fires and 150 years for stand replacement fires, fire exclusion has increased the fire return interval and increased the expected fire intensities. "The landscape development pattern of clumped groups of even-aged trees was interrupted by fire protection (Morrow 1985), allowing regeneration to survive not just in openings but under mature clumps. A wide-spread, fire-protection age of ponderosa pine trees has colonized across the landscape. This colonization has created dog-hair thickets of pine trees in many areas, ... This dense understory has created stress on the older trees.... Where once-frequent surface fires

were carried through pine stands by needle litter and grass, they are now carried by needle and branch fuels. The vertical continuity of fuelbeds is also higher than historically, which allows surface fires to develop into understory or crown fires under less severe weather conditions. At the same time that average fire intensity, due to fuel buildup, is increasing, average fire tolerance of stands has dramatically decreased as a function of overstocking and stagnation." (Agee, 1992)

The fire regime has been converted from a frequent, low severity fire regime to a less frequent, moderate to high severity fire regime. Historically fires in this plant association would have been 90% low intensity fires and 10% high intensity fires. Currently fires are approximately 30% low intensity and 70% moderate to high intensity. The percentage of low intensity fires in the ponderosa pine have significantly decreased. As the fire intensities increase, the percentage of large ponderosa pine and late-successional habitat that will be killed or destroyed by a wildfire increases.

Fire behavior predictions for the ponderosa pine plant associations in the Metolius LSR, using 90th percentile weather (not the most extreme conditions), were calculated. These predictions used 10% slope as an average, knowing that many places have higher slope percentages.

A 5-hour and 12-hour burning period were used to estimate fire size. Most fires on the Deschutes National Forest, that escape initial attack, are one burning period fires. Fire suppression efforts during that first burning period are minimally effective. The 5 and 12 hour burning periods were developed due to the reduced suppression forces available on the Sisters Ranger District and the Deschutes National Forest. The number and availability of fire suppression resources have decreased significantly in the last 5 years.

This significantly increases the probability that a fire will escape initial attack. A complicating factor for estimating response times for resources is the nature of the lightning storms that produce approximately 50% of the fires in the Metolius LSR. Most commonly, lightning storms reach the south end of the Deschutes National Forest and work their way north. As resources are assigned to existing fires, the amount of resources available for fires on the Sisters District decrease. If resources are available and dispatched to fires in the Metolius LSR, the 5-hour burning period will represent the approximate final fire size. If resources are not available due to higher priority fires or more fires than resources are available to suppress, the 12-hour burning period final fire size will be representative of fires in the ponderosa pine plant associations of the LSR.

A combination of fuel model 9 (60% of the area) and fuel model 6 (40% of the area) was used to predict fire behavior. Fuel model 9 represents the pine needle litter that is found under most mature ponderosa pine stands where concentrations of dead-woody debris are found that contribute to torching, spotting and crowning of trees. Fuel model 6 was used to represent the shrub component (bitterbrush, manzanita and ceanothus) that is found in many of the open canopy ponderosa pine stands. Fires in these stands will carry through the shrub component rather than the pine litter.

A wildfire in these fuel types would be approximately 2,600 acres in 5 hours and approximately 10,000 acres in 12 hours. Flame lengths would vary from 6 to 12 feet in height. With this type of fire behavior, direct attack by hand crews or equipment (dozers) would not be effective or safe. Once flame lengths exceed 8 feet, direct tactics cannot safely be employed. Indirect attack using retardant, dozer lines and backfiring techniques would be the tactics used for suppression. Indirect attack is more dangerous to firefighters than direct attack and it significantly increases the acreage burned. Many hundreds of acres are generally burned in backfires to stop the spread of the main fire. Spotting under these conditions is also a concern. Spotting can occur from one-quarter to three-quarters of a mile in front of the main fire. As the fire intensities increase, the percentage of large ponderosa pine and late-successional habitat that will be killed or destroyed by wildfires will increase.

For the development and long-term maintenance of late-successional habitat in the Metolius LSR, the use of prescribed fire should be encouraged. Harvesting, thinning and other vegetation treatments should be designed to encourage the use of prescribed fire. Mechanical treatments may be necessary in some locations, prior to the use of prescribed fire; due to high stand densities, small tree sizes or heavy fuel loadings. The use of prescribed fire to reduce fuel loadings, reduce ladder fuels, reduce high intensity

wildfires and maintain the late-successional conditions desired in the Metolius LSR will be the most successful in the ponderosa pine plant associations.

Mixed Conifer Plant Associations

In the mixed conifer forests there has also been a change in the fire regime. The structural changes occurring in the ponderosa pine plant associations have also occurred in the mixed conifer plant associations. The increase in understory trees (ladder fuels) has also been accompanied by a shift to more shade-tolerant species in that understory. There has also been a significant increase in the brush component of these stands. The fire regime has changed from a complex fire regime of frequent low, moderate and high intensity fires to one of less frequent, high intensity fires. There has been a significant decrease in low and moderate intensity fires.

The dry mixed conifer plant associations have changed the most from their historic condition. In most dry mixed conifer forests, effective fire exclusion resulted in all of the growing space being filled by trees by about 1960 (McNeil and Zobel 1980). These sites have had the largest increase in fuel loadings of any plant association in the LSR. This can be attributed to the high quality sites that produce great amounts of ladder fuels (understory vegetation) and a brush component that enables ground fires to move into the canopy and increase fire intensities. Frequent low to moderate fires in the past would remove some of this material periodically so that the large buildup of fuels that we have today, did not occur in the past. The high level of mortality in this area also increases expected fire intensities. The combination of increased fuel loadings, increased brush component and high stand mortality have combined to significantly change the fire regimes and expected fire intensities in dry mixed conifer plant associations.

In the wet mixed conifer plant associations, which historically had a moderate severity fire regime, the proportion of low intensity fires has declined (Agee, 1992). Small, low intensity fires have been effectively controlled. The only fires capable of having a landscape impact are those burning under severe fire weather where initial attack by fire suppression forces has failed. High intensity fires are now the dominate severity level found. "This represents a shift from a complex historic moderate fire severity regime to one of high fire severity." (Agee, 1992)

In the healthy mixed conifer stands, using 90th percentile weather and 10% slope, fire behavior was predicted assuming no treatments had occurred. A ratio of 51% fuel model 10 (timber litter and understory) and 49% fuel model 2 (grass understory) predicts a 4,000 acre wildfire in 5 hours and a 9,000 acre wildfire in 12 hours. Flame lengths would range from 9 feet to 13 feet. The flame lengths and rates of spread produced by this wildfire would not allow direct attack with handcrews or equipment. Only indirect suppression tactics could safely be used.

In the high mortality stands and no treatment assumed, fire behavior was also predicted using 90th percentile weather and 10% slope. A combination of 60% fuel model 12 (medium logging slash) and 40% fuel model 2 was used. A fire would be approximately 4,000 acres in 5 hours and 15,000 acres in 12 hours. Flame lengths would be 12 to 15 feet. Only indirect suppression tactics could be safely used and the probability of them being successful is low. This type of fire behavior has the power to overpower its environment and go in any direction or all directions at one time. Models cannot accurately predict this type of fire behavior. When the weather conditions change significantly, there would be opportunities to suppress this type of fire. The consequences associated with this type of fire behavior are irreversible for decades. The area would be "nuked". Spotting distances would be from one-quarter to one-mile in front of the fire. If the fire reaches "blow-up" conditions, there is no way to estimate the distance or direction of the spotting. Spotting will pose safety hazards for all firefighters and the public.

Protection of the riparian zones in the mixed conifer plant associations is the most difficult due to the high fuel loadings, narrow riparian zone effects, high mortality in the surrounding stands and steep canyon walls. As the mortality increases and the dead trees continue to fall to the ground, our abilities to protect riparian areas will continue to decrease.

The consequences associated with a stand replacement fire are the most severe in the mixed conifer plant associations. The heavy fuel loadings, high mortality, steep slopes, and ladder fuels all contribute to these effects. High fuel loads, burned under high intensity wildfire conditions, consume so completely that soil damage should be expected. Soil damage to be expected under these conditions include hydrophobic soils (soils that are water-repellent and do not allow rain to soak into the ground); increased erodibility of clay soils due to changes in soil physical properties; altered nutrient cycling and soil productivity; increased soil temperatures due to the death of understory and overstory vegetation; and oxidation of soil nutrients. The highest potential for detrimental soil effects generally occur under each large log or concentration of slash that consumes in the fire. Wildfires in heavy fuel loadings can also have serious detrimental effects on riparian vegetation. Rather than decreasing intensity as the fire enters the wetter riparian areas, the fires may burn with higher intensities due to the heavier fuel loadings generally found in riparian areas. The high mortality found in many stands contribute to the high fuel loadings as the dead trees fall to the ground. While the trees are standing, they increase the safety concerns for firefighters in the area and may make it unsafe for suppression actions to occur in some stands. If it is unsafe for firefighters, they will need to move to a location where it is safe to attack the fire. With this action comes additional acres burned under high intensity conditions. Steep slopes increase the rate of spread of a fire, which increases the fire size before it can be suppressed. Steep slopes will also increase the spotting distances of the fire. Spotting can significantly increase the size of the fire and the hazards to the firefighters who must be concerned about not getting trapped between the main fire and the spot fires. Under some conditions, as the main fire builds in intensity, the spot fires have the potential to begin interacting with the main fire. Personnel working near the main fire could quickly and easily be cut off from their escape routes. As spot fires intensify and grow back to the main fire, the overall intensity of both fires increase, spotting increases and the cyclical interaction of the two fires make attack on the fires, from any location, dangerous. Ladder fuels also contribute to the severity of a wildfire by moving the fire from the ground up into the crowns of the trees. Fires that move along the ground are less difficult to suppress, generally have lower intensities and fire behavior, and can more accurately be predicted. As fires move into the crowns of the trees, fire intensities increase exponentially. Crown fires are difficult to predict as they are able to move in any direction without regard to environmental conditions such as wind direction or changes in temperature. Crown fires can produce their own weather. This allows them to move in any direction, until they run out of fuel to burn. Crown fires are dangerous for firefighters, the public and all resources that come in contact with them.

Fire Management Concerns For The Future In The Mixed Conifer Plant Associations:

The current conditions in the mixed conifer plant associations on the west side of the Metolius watershed and in the Metolius LSR are the farthest from their "historic range of variability" of any of the plant associations in the Metolius LSR. Under the current conditions, these stands are not sustainable in the long term. Many of these stands have high mortality now. The highest level of mortality is in the white fir that is the primary component of the "many storied" stands that are most suitable for spotted owls and other late-successional species. Stand densities are high in all areas of the Metolius LSR. In the mixed conifer plant associations, where the mortality is high, the snags create a significant fire hazard as well as a firefighter and public safety hazard.

The Deschutes National Forest Wildlife Tree and Log Implementation Strategy states that all species of snags will fall within 6 to 12 years of creation. The 10 to 12 inches DBH trees fall in 6 years while the 20+ inch DBH trees fall within 12 years. (All species have the same standing longevity according to the wildlife tree guide.) The trees in the western portion of the LSR have been dying since the early 1990's but the majority of them died in 1993. Using 1993 as the starting point, most of the snags in those stands will be on the ground in the next 4 to 10 years. The smaller snags will fall in the next 2 to 3 years, assuming the smaller snags fall before the larger ones.

The type of fire behavior and fire sizes to be expected, once the trees begin to fall to the ground, was estimated earlier in this section. It is the description of the fire behavior in the high mortality stands. As the amount of "climatic climax" conditions increase within the Metolius LSR, the amount of fire

suppression resources needed to maintain that condition will increase. On the east side of the Cascades, the most effective method of creating climatic climax conditions is aggressive fire control. The opportunities to use prescribed fire and confine or contain suppression strategies on low intensity fires decrease as climatic climax increases.

For the development and maintenance of long-term late-successional habitat in the Metolius LSR, the use of prescribed fire should be encouraged. Harvesting, thinning and other vegetation treatments should be designed to encourage the use of prescribed fire. Mechanical treatments will be necessary in some locations, prior to the use of prescribed fire; due to high stand densities, high mortality and high fuel loadings. Prescribed fire is an important tool for returning east side forest ecosystems to their historic range of variability.

High Elevation Mountain Hemlock and Lodgepole Pine Plant Associations

There appear to be few changes to the fire regimes for the high elevation and lodgepole pine plant associations due to their high elevations and long fire-return intervals. "The changes of the last century have been least significant, of all the elevation zones, in the Eastside high elevation forests.... Although a fire exclusion policy has been in effect for almost a century, the naturally long fire return intervals have resulted in little noticeable change in these ecosystems at the stand level. At the landscape level, the absence of fire has probably resulted in a slight shift towards later seral communities and away from earlier seral communities." (Agee, 1992) The high elevation forests of the Metolius LSR have not been effected by the fire exclusion that has occurred in the last 90 years. These forests are in a condition that represents the "natural" end of their fire cycle and stand replacement fires should be expected in these plant associations.

HAZARD/RISK ANALYSIS

A hazard/risk analysis was completed for the Metolius LSR to be used for identification of fire management strategy areas. This was a landscape level analysis based upon the best information available at the time. Specific stands within the LSR were not evaluated but the entire area was looked at on a large-scale basis. Within each of the rating areas, there will be stands that do not fit that rating. As project level analysis is completed, these stands can be identified. The ratings of Low, Moderate and High were based upon the relative conditions within the LSR and did not consider conditions outside the LSR.

Information used for this analysis included:

1. Fuel loadings. Fuel loading information was gathered through fuels inventories completed in association with stand exams. Photo series information was used to estimate fuel loadings and the information was collected in the late 1980's.
2. Fire occurrence information from 1982 to 1994.
3. Personal knowledge of district employees who have extensive knowledge of the Sisters Ranger District and fire suppression.

On August 17 and 18, 1995, Ron Archuleta, Dave Priest, Mark Rapp, John Holcomb and Lorri Heath completed the Risk/Hazard Analysis for the Metolius LSR.

HAZARD RATING:

The hazard rating developed for the Metolius LSR was based upon fuel loadings, current stand conditions and the existence of mortality in some portions of the LSR. This classification rates the difficulty of fire suppression.

Fuel loading is a measure of the down, dead woody debris on a site. Fuel loadings were given a rating of low, medium or high based on the tons per acre of debris existing on the ground now.

Fuel loadings: Low = 5 to 15 tons per acre

Medium= 15 to 25 tons per acre

High= 25+ tons per acre

Current stand conditions were also given ratings of Low, Medium or High. Low was defined as open (widely spaced), 1-storied, and/or healthy stands. These stands would be the least complicated in terms of ease of fire suppression. Medium rated areas generally contained 2-storied, healthy stands where ladder fuels will have some impact on ease of suppression but will not be the primary concern. High hazard areas are locations with 2 to 3-storied stands, many ladder fuels present and there is some level of stand mortality.

Mortality was rated by the stand or brush component within the stand. For example, a high percentage of frost-killed manzanita in an area would move it into a moderate or high rating just as if the stand had that same level of mortality. The criteria for Low, Medium and High mortality was based on the level of mortality that begin to effect suppression capabilities and not silvicultural or other resource concerns. A Low rating was given to areas with generally low mortality (less than 20% in most stands). A Medium rating was given to areas with mortality of 20 to 40%. Any area with levels or mortality greater than 40% were given a High rating. All three of these criteria were combined to give a final rating of Low, Medium or High Fire Hazard within the Metolius LSR.

The ponderosa pine flats of the Metolius Basin and the Horn of the Metolius River have a Low Fire Hazard. Fuel loadings generally range from 5 to 15 tons per acre. The northern portion of the top of Green Ridge, along the Scarp, and in the high elevation lodgepole pine areas the Fire Hazard is classified as Moderate. Fuel loadings generally range from 15 to 25 tons per acre. The most eastern portion of the LSR (on top of Green Ridge), the northern slopes of Black Butte and the mixed conifer portions of the LSR (around Abbot Butte and Round Lake) have a High Fire Hazard rating. Fuel loadings in these areas range from 25 to 45 tons per acre, with concentrations of higher fuel loadings. The southern slopes of Black Butte are rated as Low Plus Fire Hazard. Where Jefferson Creek comes out of the Wilderness, the Fire Hazard is rated as Moderate Plus. A map was developed to identify the Fire Hazard Ratings.

RISK RATING:

The Risk Rating for the Metolius LSR is a rating of the chance of a fire occurring and when one does occur, what values are at risk from that fire. The Risk Rating was based upon recreational use, urban interface, lightning fire occurrence, and human-caused fire occurrence. Within all areas with assigned Risk Ratings, there will be some areas that do not meet that rating. This was a landscape level rating and not all stands were looked at individually. As project level analysis is completed, these areas that do not meet the rating they were assigned, can be identified.

Ratings of Low, Medium and High were given to areas with low, moderate and high recreational use during fire season. For example, Suttle Lake and the surrounding recreational facilities (both public and private) have the highest concentration of visitors to the Sisters Ranger District during the summer months. This area was given a Risk Rating of High. Lower levels of summer recreational use were compared within the LSR to develop the Risk Rating.

The amount of urban interface (subdivisions, developments, private lands with residences and recreational facilities) in an area was given a relative rating of Low, Medium and High. Urban interface is a high priority for suppression forces during fire suppression. Human life and property is threatened, to the greatest degree, in the wildland/urban interface. These areas have the highest values at risk from a wildfire. Areas with no intermixed private lands were given a risk rating of Low. The areas around developments and subdivisions, Camp Sherman, Suttle Lake and surrounding recreational facilities and the developments on Blue Lake and Dark Lake were given a Risk Rating of High. There are a large number of people who recreate or live in these areas. A wildfire would present a high risk situation for these people as there are potential threats to their lives as well as their property. A Moderate Risk Rating was given to areas with small amounts of private lands intermixed with federal lands and in areas that did not fit into the Low or High Risk category.

Human and lightning caused fire occurrence was also used to evaluate Fire Risk. Areas of low numbers of human-caused fires were given a Risk Rating of Low. Areas of High numbers of human-caused fires were given a Risk Rating of High and other areas "fell" into the moderate category. The number of fire starts in an area were compared just within the LSR and did not consider human-caused fire starts outside of the LSR. This is a comparison within the LSR only. The lightning caused fire occurrence was assumed to be evenly distributed across the LSR, except in the Metolius Horn area. The Metolius Horn appears to have a higher number of lightning caused fires than other parts of the LSR. The lightning occurrence here moved the Risk Rating for the Metolius Horn area from a Low rating, in all other categories, to a Moderate rating.

Between 1982 and 1994, the LSR has had 135 fire starts that required suppression actions. Of the 135 starts, 47% were human caused and 50% were caused by lightning. Three of the fires had an "unknown" cause. The LSR averages 11 fires per year. Over the last 12 years there have been 1.7 fires per 1,000 acres in the LSR. The LSR has a relatively high fire occurrence for both human and lightning caused fires.

Black Butte, the Scarp, the top of Green Ridge and the area around Abbot Butte have a Low Fire Risk rating. These areas have a low level of recreational use and are not near urban interface areas. On Black Butte, the majority of use occurs on the trail and the top of the butte so the recreational use is concentrated in a small area on the butte. Lightning occurrence is evenly distributed across the LSR except on the Horn of the Metolius which gets relatively more lightning than the rest of the LSR. The Horn of the Metolius has a Moderate Fire Risk rating due to the high number of lightning fires it gets, even though it has minimal recreational use. The ponderosa pine flats east of the 12 Road have a Moderate Fire Risk rating due to recreational use, especially dispersed camping, occurring in this area. The corridor along the Metolius River, including Camp Sherman, Metolius Meadows, Head of the Metolius and all the campgrounds along the Metolius River have a High Fire Risk rating. These areas have a high recreational use (camping, day use, and fishing) as well as being classic examples of urban interface. There are summer homes, subdivisions, and the town of Camp Sherman that increase the fire risk to "High". The other location of High Fire Risk rating occurs around Suttle Lake, Dark Lake, Blue Lake, Round Lake and Corbett Sno-Park. These areas have high summer recreational use and a high fire occurrence as compared to the rest of the LSR.

FIRE INTENSITIES:

Fire intensities within the LSR were predicted. Fire intensity predictions were based upon the following criteria:

- A. Existing fuel loadings and stand conditions.
- B. The fire is assumed to occur in July or August under average summer weather conditions (90th percentile weather).
(60% of the fires in the Metolius watershed occur in July and August.)

- C. The presence of ladder fuels and their potential to move the fire from the ground into the crowns of the trees.
- D. The presence and species of a brush component.

The categories used to describe potential, predicted fire intensities were Low, Medium and High. An area with a Low Fire Intensity rating would burn under July and August conditions, as described above, with 2 to 4 foot flame lengths. Moderate Fire Intensity describes potential, predicted flame lengths of 4 to 8 feet. A High Intensity rating describes predicted flame lengths of 8 or more feet.

Actual fire behavior predictions were not calculated for this analysis. The experience of the people who were completing the analysis and had experienced fire behavior in this LSR was used. There will be locations within all the predicted rating areas that will not meet the rating they were assigned in this analysis. As project level analysis is completed, these areas can be identified.

The areas with a Low Fire Intensity rating are located along the Scarp of Green Ridge, from the Metolius RNA north to where Mariel Creek flows into the Metolius River, and north of the 1292 Road where the area is primarily a lava flow. Moderate Fire Intensity is expected along the Horn of the Metolius to the top of Green Ridge and in the ponderosa pine plant associations in the flatlands of the Metolius Basin. The area north of Black Butte, along the Scarp to the RNA, is also classified as Moderate Fire Intensity. The rest of the LSR has a High Fire Intensity rating, based on the above criteria.

FIRE MANAGEMENT STRATEGIES

Based upon common Hazard/Risk Analysis ratings, urban interface conditions, Late-Successional Reserve objectives and resource needs and values; a Fire Management Strategy was identified for the Management Strategy Areas of the LSR. The Fire Management Strategies (FMS) include fire suppression strategies; fire hazard reduction opportunities and recommendations to protect and sustain late-successional habitats; and recommendations to enhance other resource values within the LSR.

All fire management suppression strategies are based upon the principle that firefighter safety is the highest priority during all wildfire suppression activities. This principle is not stated in each discussion of suppression strategies. Any suppression strategy selected must consider firefighter safety as the highest priority.

Aggressive control strategies in some locations may be necessary to protect known Proposed, Threatened, Endangered or Sensitive species habitat or reproductive sites. Generally, the protection of habitat is a priority over the protection of individual reproductive sites, however, consultation with the USFWS should be conducted when Proposed, Threatened and Endangered species are involved.

The objectives for the Metolius Late-Successional Reserve Fire Management Assessment:

1. Develop fire suppression strategies that protect human life and property while sustaining late-successional habitats and protecting other resource values.
2. Identify fire hazard reduction activities that will reduce the potential for large-scale, high intensity wildfires.
3. Recommend activities that facilitate the reintroduction of fire into fire adapted ecosystems.

MANAGEMENT STRATEGY AREA -A-

TOTAL ACRES: 1,438

LOCATION BY NEAREST LANDMARK: Circle Lake, south of Highway 20

ADJACENT MANAGEMENT STRATEGY AREAS: B

SPECIAL AREAS OF CONCERN: Highest potential for endangering firefighter and public safety during wildfire suppression. High fuel loadings and high levels of stand mortality. Stand replacement fires to be expected.

PLANT ASSOCIATION GROUPS: High elevation lodgepole pine, mixed conifer (wet/dry).

FIRE HAZARD RATING: Moderate

FIRE RISK RATING: High

FIRE INTENSITY RATING: High

FIRE SUPPRESSION STRATEGIES/PRIORITIES:

PRIORITY 1: PROTECT FIREFIGHTER AND PUBLIC SAFETY

Along Highway 20, aggressively suppress fires along the roadside that may threaten public safety or become high intensity wildfires. Follow the Deschutes LRMP standards and guidelines for fire suppression in the Scenic Views allocation.

Control all wildfires. The use of indirect tactics are preferred in areas of high snag densities or where firefighter safety may be jeopardized. Larger numbers of acres burned are acceptable to protect firefighters. It is acceptable to "back off" from a fire and catch it when it moves into areas with lower fuel loadings, lower snag numbers and where there are opportunities to "take a stand". Caution should be used on every fire response to assure that firefighters have escape routes and safety zones that are easily accessible and effective. Aggressive control is not emphasized unless it can be accomplished without jeopardizing firefighter or public safety.

PRIORITY 2: ALL OTHER RESOURCES

Long Term Suppression Strategy: Once vegetation treatments have been completed, use Highway 20 as a natural barrier and a place to "take a stand" during stand replacement fires. It could be used as an anchor point for burn-out operations when suppressing high intensity wildfires.

HAZARD REDUCTION RECOMMENDATIONS:

1. Salvage harvest as much of the dead and dying material as needed to provide firefighter safety and long term late-successional habitat. Salvage material could be removed through timber sales or firewood programs (commercial, personal use or free-use).
2. Develop a fuelbreak along Highway 20 that can be used as an anchor point during burn-out operations and as a place to "take a stand" during high intensity (stand replacement) wildfires. The fuelbreak should be designed to act as an anchor point as well as to meet visual quality objectives. The Scenic Views allocation describes large, old trees with openings in the stand. A shaded fuelbreak could be designed that would meet both of these objectives.
3. Reduce fuel loadings, ladder fuels and brush components through the use of mechanical treatments. There are limited opportunities for the use of prescribed fire.

4. Design the fuelbreak along Highway 20 to include thinning and removal of ladder fuels and reduction of brush. Mechanical treatments and the use of prescribed fire are acceptable tools for fuelbreak development. A combination of mechanical and prescribed fire treatments may be necessary. Both methods are acceptable in the Scenic Views allocation.
5. Once a fuelbreak has been developed, it must be maintained. Maintenance of the fuelbreak will be as important as developing it. Prescribed fire and mechanical treatments can be used to maintain them. If maintenance does not occur, the fuelbreak will be ineffective within a relatively short period of time.
6. Aggressive control of fires is the only method of creating and protecting climatic climax stand conditions. Fire control is not always successful. This area is late in its "natural" fire regime and a stand replacement wildfire should be the next disturbance expected.

MANAGEMENT STRATEGY AREA -B-

TOTAL ACRES: 12,402

LOCATION BY NEAREST LANDMARK: Round Lake, First Creek, West of Road 12.

ADJACENT MANAGEMENT STRATEGY AREAS: A, C and D

SPECIAL AREAS OF CONCERN: Round Lake campground, Round Lake Youth Camp, Private property, and high mortality areas. This management strategy area has levels of mortality that have the highest potential for endangering firefighters of any area in the LSR.

PLANT ASSOCIATION GROUPS: High elevation lodgepole, Mixed conifer (wet/dry), ponderosa pine (dry) and riparian.

FIRE HAZARD RATING: High

FIRE RISK RATING: Low, Moderate and High depending upon location in MSA.

FIRE INTENSITY RATING: High

FIRE SUPPRESSION STRATEGIES/PRIORITIES:

Priority 1: Protect firefighter and public safety.

Control all high intensity wildfires. The use of indirect tactics will be necessary in most areas within this MSA. This is the preferred tactic under the existing conditions, without treatments. Areas of high snag densities have the potential to jeopardize firefighter and public safety. Larger numbers of acres burned are acceptable to protect firefighters. It is acceptable to "back off" from a fire and catch it when it moves into areas with lower fuel loadings, lower snag numbers and where there are opportunities to "take a stand". Caution should be used on every fire response to assure that firefighters have escape routes and safety zones that are easily accessible and effective. Aggressive control is not emphasized unless it can be accomplished without jeopardizing firefighter or public safety.

Along Highway 20 and Road 12, aggressively suppress fires along the roadside that may threaten public safety or become high intensity wildfires. Follow the Deschutes LRMP standards and guidelines for fire suppression in the Scenic Views allocation.

Priority 2: Aggressive control of all wildfires that may threaten private land.

Priority 3: Aggressive control of all wildfires that may threaten "core areas" for late-successional species or spotted owl nest sites and stands.

The district wildlife biologist will map these sites and make this information available to the initial attack forces and the district Fire Duty Officer.

Priority 4: Consider the use of confine and contain suppression strategies for low intensity fires.

This decision would be based upon weather conditions, predicted fire behavior, suppression resource availability, fire location and "other resource" values and needs. Use roads and other natural barriers for firelines. Burning out from these natural barriers is acceptable. This may only be possible in a small portion on the east side of this MSA, east of the 12 road.

HAZARD REDUCTION RECOMMENDATIONS:

1. Salvage harvest as much of the dead and dying material as needed to provide firefighter safety and long term late-successional habitat. Salvage material could be removed through timber sales or firewood programs (commercial, personal use or free-use).
2. Develop a fuelbreak along Highway 20 and the 12 Road that can be used as an anchor point during burn-out operations and as a place to "take a stand" during high intensity (stand replacement) wildfires. The fuelbreak should be designed to act as an anchor point as well as to meet visual quality objectives. The Scenic Views allocation describes large, old trees with openings in the stand. A shaded fuelbreak could be designed that would meet both of these objectives.
3. Design fuelbreaks to protect "core areas" and spotted owl nest sites and nest stands. The purpose of these fuelbreaks will be late-successional habitat protection, not visual quality or big game enhancement.
4. Once fuelbreaks have been developed, they must be maintained. Maintenance of the fuelbreaks will be as important as developing them. Prescribed fire and mechanical treatments can be used to maintain them. If maintenance does not occur, the fuelbreaks will be ineffective within a relatively short period of time.
5. Reduce fuel loadings, ladder fuels and brush components through the use of mechanical treatments and prescribed fire. High mortality and high stand densities will generally require the use of mechanical treatments prior to the use of prescribed fire. Prescribed fire can be used to maintain the late-successional conditions once they are created through mechanical treatments.
6. Fire control at the smallest size possible, with limited available resources, is the only method of protecting climatic climax stand conditions. Fire control is not always successful. The inability to protect these stands through their life cycle should be considered as part of other decisions made in the LSR.

OPPORTUNITIES:

1. Use prescribed fire, where possible, to establish and maintain fire climax conditions. Prescribed fire can be used to maintain and increase ponderosa pine, western larch, Douglas fir and other fire tolerant species.
2. Coordinate prescribed burning for hazard reduction with habitat improvement for peck's penstomen, rare truffles and other species associated with fire dependent ecosystems.

MANAGEMENT STRATEGY AREA C

TOTAL ACRES: 2,157

LOCATION BY NEAREST LANDMARK: Suttle Lake, Suttle Lake Bald Eagle Management Area, and Highway 20.

ADJACENT MANAGEMENT STRATEGY AREAS: B and D

SPECIAL AREAS OF CONCERN: Suttle Lake campgrounds, Suttle Bald Eagle Management Area, and Highway 20.

PLANT ASSOCIATION GROUPS: Mixed conifer (wet/dry), ponderosa pine (dry) and riparian.

FIRE HAZARD RATING: High

FIRE RISK RATING: High

FIRE INTENSITY RATING: High

FIRE SUPPRESSION STRATEGIES/PRIORITIES:

Priority 1: Protect firefighter and public safety.

Aggressive control of all wildfires.

This is an area of high recreational use during fire season. The potential is great for a wildfire to threaten public safety as well as firefighter safety in this area.

Priority 2: Protect private property and public improvements such as campgrounds and special use permit structures.

Priority 3: Protect Bald Eagle nest sites, nest stands and habitat.

Consultation with the USFWS should be conducted when Endangered Species are threatened.

Priority 4: Consider the use of confine and contain suppression strategies for low intensity fires.

This decision would be based upon weather conditions, predicted fire behavior, suppression resource availability, fire location and "other resource" values and needs. Use roads and other natural barriers for firelines. Burning out from these natural barriers is acceptable. This will only be possible if there is no risk to firefighter safety, public safety, TES species or other sensitive resources.

HAZARD REDUCTION RECOMMENDATIONS:

1. Modify fuels to generate low intensity wildfires (flame lengths less than 4 feet) under all weather conditions. Mechanical treatments and/or prescribed fire could be used to reduce fuel loadings, ladder fuels and brush components.
2. Develop and maintain fuelbreaks to reduce the risk of high intensity wildfires moving from private lands and high recreation areas into the Bald Eagle Management Area and the surrounding forest stands.

3. Modify fuels and stand conditions to promote desired habitat for Bald Eagle. This will reduce stand densities, reduce fuel loadings and improve conditions for suppressing wildfires before they become high intensity fires that threaten public safety, firefighter safety or Bald Eagle habitat.
4. Develop a fuelbreak along Highway 20 that can be used as an anchor point during burn-out operations and as a place to “take a stand” during high intensity (stand replacement) wildfires. The fuelbreak should be designed to act as an anchor point as well as to meet visual quality objectives. The Scenic Views allocation describes large, old trees with openings in the stand. A shaded fuelbreak could be designed that would meet both of these objectives.
5. Once the fuelbreaks have been developed, they must be maintained. Maintenance of the fuelbreaks will be as important as developing them. Prescribed fire and mechanical treatments can be used to maintain them. If maintenance does not occur, the fuel breaks will be ineffective within a relatively short period of time.
6. Increase homeowner and forest recreational user prevention education efforts to reduce the number of human caused fire starts. Include discussions of forest fire ecology with the prevention messages.

MANAGEMENT STRATEGY AREA -D-

TOTAL ACRES: 6,600

LOCATION BY NEAREST LANDMARK: Metolius Basin flatlands, Lake Creek and Jack Creek.

ADJACENT MANAGEMENT STRATEGY AREAS: B, C, E, G, and I

SPECIAL AREAS OF CONCERN: Areas adjacent to private property, Roads 12 and 14, dense stands of ponderosa pine reproduction.

PLANT ASSOCIATION GROUPS: Mixed conifer (wet/dry), ponderosa pine (wet/dry) and riparian.

FIRE HAZARD RATING: Low

FIRE RISK RATING: Moderate

FIRE INTENSITY RATING: Moderate and High

FIRE SUPPRESSION STRATEGIES:

Priority 1: Protect firefighter and public safety. Aggressive control of high intensity wildfires.

Priority 2: Aggressive control of all wildfires that threaten private lands.

Priority 3: Aggressive control of all wildfires that may threaten "core areas" for late-successional species or spotted owl nest sites and stands.

The district wildlife biologist will map these sites and make this information available to the initial attack forces and the district Fire Duty Officer.

Priority 4: Aggressively control wildfires along Road 12, Road 14 and Highway 20 that may threaten public safety or become high intensity wildfires.

Follow the Deschutes LRMP standards and guidelines for fire suppression in the Scenic Views allocation.

Priority 5: Aggressive control for areas that will be managed for climatic climax.

This information will be compiled and mapped by the district silviculturist and wildlife biologist. Once mapped, the information will be made available to the initial attack forces and the district Fire Duty Officer.

Priority 6: Consider the use of confine and contain suppression strategies for low intensity fires.

This decision would be based upon weather conditions, predicted fire behavior, suppression resource availability, fire location and "other resource" values and needs. Use roads and other natural barriers for firelines. Burning out from these natural barriers is acceptable.

HAZARD REDUCTION RECOMMENDATIONS:

1. Reduce fuel loadings, ladder fuels, brush components and fire intensities through the use of mechanical treatments and prescribed fire. High density stands may require the use of mechanical treatments prior to the use of prescribed fire. Use prescribed fire as much as possible. Prescribed fire can be used to maintain or increase the amount of ponderosa pine and western larch in the stands in this MSA.
2. Develop and maintain fuelbreaks around "core areas", spotted owl nest sites and spotted owl nest stands identified by the wildlife biologist as important for late-successional species. The purpose of these fuelbreaks will be late-successional habitat protection, not visual quality or big game enhancement.
3. Develop fuelbreaks along Road 12, Road 14 and Highway 20 that can be used as anchor points during burn-out operations and as a place to "take a stand" during high intensity (stand replacement) wildfires. The fuelbreaks should be designed to act as an anchor point as well as to meet visual quality objectives. The Scenic Views allocation describes large, old trees with openings in the stand. A shaded fuelbreak could be designed that would meet both of these objectives.
4. Once the fuelbreaks have been developed, they must be maintained. Maintenance of the fuelbreaks will be as important as developing them. Prescribed fire and mechanical treatments can be used to maintain them. If maintenance does not occur, the fuel breaks will be ineffective within a relatively short period of time.
5. Fire control at the smallest size possible, with limited available resources, is the only method of protecting climatic climax stand conditions. Fire control is not always successful. The inability to protect these stands through their life cycle should be considered as part of other decisions made in the LSR.

OPPORTUNITIES:

1. Coordinate prescribed burning for hazard reduction with habitat improvement for Peck's penstemon, rare truffles and other species associated with fire dependent ecosystems.
2. Use prescribed fire as much as possible. It can be used to reduce fuel loadings, reduce ladder fuels, reduce brush, reduce fire intensity, and maintain or increase the amount of ponderosa pine and western larch in the stands.

MANAGEMENT STRATEGY AREA -E-

TOTAL ACRES: 6,090

LOCATION BY NEAREST LANDMARK: Black Butte

ADJACENT MANAGEMENT STRATEGY AREAS: D, F, G

SPECIAL AREAS OF CONCERN: Black Butte lookout tower and other facilities located on the top of Black Butte.

PLANT ASSOCIATION GROUPS: Mixed conifer (wet/dry) and ponderosa pine (wet/dry).

FIRE HAZARD RATING: Low plus and High

FIRE RISK RATING: Low

FIRE INTENSITY RATING: High

FIRE SUPPRESSION STRATEGIES/PRIORITIES*:

Priority 1: Protect firefighter and public safety.

Priority 2: Use the Deschutes National Forest Land and Resource Management Plan (LRMP) Fire Suppression Standards and Guidelines for the Metolius Black Butte Scenic allocation.

Priority 3: Aggressively control all wildfires unless they are low intensity wildfires that will not affect the overstory trees or impact the visual quality.

***All suppression efforts will use minimum impact methods.**

HAZARD REDUCTION RECOMMENDATIONS:

No hazard reduction treatments are recommended at this time due to steep slopes, visual quality concerns, and generally healthy stands.

MANAGEMENT STRATEGY AREA -F-

TOTAL ACRES: 8,696

LOCATION BY NEAREST LANDMARK: West face of Green Ridge

ADJACENT MANAGEMENT STRATEGY AREAS: E, G, H, I, J, L,

SPECIAL AREAS OF CONCERN: Metolius Research Natural Area, Metolius River, Metolius River campgrounds, Wizard Falls Fish Hatchery, Bridge 99.

PLANT ASSOCIATION GROUPS: Mixed conifer (wet/dry), ponderosa pine (wet/dry), and riparian.

FIRE HAZARD RATING: Moderate

FIRE RISK RATING: Low

FIRE INTENSITY RATING: Low and Moderate

FIRE SUPPRESSION STRATEGIES/PRIORITIES*:

Priority 1: Protect firefighter and public safety.

Priority 2: Aggressive control for all wildfires that threaten private property, Wizard Falls Fish Hatchery, and public improvements such as campgrounds.

Priority 3: Aggressive control for wildfires that threaten goshawk nest sites.

The district wildlife biologist will map these sites and provide a copy of the map to the district Fire Duty Officer.

Priority 4: Consider the use of confine and contain suppression strategies for low intensity fires.

This decision would be based upon weather conditions, predicted fire behavior, suppression resource availability, fire location and "other resource" values and needs. Use roads and other natural barriers for firelines. Burning out from these natural barriers is acceptable. This will only be possible if there is no risk to firefighter safety, public safety, TES species or other sensitive resources.

Priority 5: Control all moderate and high intensity wildfires with tactics commensurate with the values at risk.

*All suppression actions should consider the use of minimum impact suppression tactics in the Metolius Wild and Scenic River corridor.

HAZARD REDUCTION RECOMMENDATIONS:

1. Modify fuels in high recreation areas or areas adjacent to private property, to generate low intensity wildfires (flame lengths less than 4 feet) under all weather conditions. Mechanical treatments and/or prescribed fire could be used to reduce fuel loadings, ladder fuels and brush components.

2. Develop and maintain fuelbreaks to reduce the risk of high intensity wildfires moving from private lands and high recreation areas into the surrounding forest stands.
3. Thin understory trees to reduce ladder fuels. Mechanical treatments and prescribed fire are both appropriate tools. In heavily stocked stands, mechanical treatments will generally be required. In less heavily stocked stands, prescribed fire can be used to thin understory trees. This decision must be made on the ground after viewing the specific location.
4. Develop a fuelbreak along Road 14 that can be used as an anchor point during burn-out operations and as a place to "take a stand" during high intensity (stand replacement) wildfires. The fuelbreak should be designed to act as an anchor point as well as to meet visual quality objectives. The Scenic Views allocation describes large, old trees with openings in the stand. A shaded fuelbreak could be designed that would meet both of these objectives.
5. Once the fuelbreak has been developed, it must be maintained. Maintenance of the fuelbreak will be as important as developing it. Prescribed fire and mechanical treatments can be used to maintain it. If maintenance does not occur, the fuel break will be ineffective within a relatively short period of time.
6. Consider the use of the free-use and charge permit firewood cutting program to remove ladder fuels prior to the use of prescribed fire or other mechanical treatments. Commercial firewood use is encouraged.
7. Once understory thinning and fuel loading reductions have occurred, use natural barriers and roads for firebreaks when suppressing low intensity wildfires.

OPPORTUNITIES:

1. Coordinate prescribed burning for hazard reduction with habitat improvement for peck's penstemon and other species associated with fire dependent ecosystems.
2. Rare truffles are found in this fire strategy area. They are found in association with mature ponderosa pine. There is currently no management strategy for them. Explore opportunities to use prescribed fire in a portion of the truffle habitat to monitor the effects.

MANAGEMENT STRATEGY AREA -G-

TOTAL ACRES: 3,755

LOCATION BY NEAREST LANDMARK: Camp Sherman, Metolius River, Lake Creek.

ADJACENT MANAGEMENT STRATEGY AREAS: D, E, F, I, and M

SPECIAL AREAS OF CONCERN: Camp Sherman, Metolius Meadows, Head of the Metolius, Metolius River, Metolius River campgrounds, Wizard Falls Fish Hatchery, House on the Metolius, and Summer Tract Homes.

PLANT ASSOCIATION GROUPS: Lodgepole pine, Mixed conifer (wet/dry), ponderosa pine (wet/dry) and riparian.

FIRE HAZARD RATING: Low

FIRE RISK RATING: High

FIRE INTENSITY RATING: Moderate

FIRE SUPPRESSION STRATEGIES/PRIORITIES*:

Priority 1: Protect firefighter and public safety.

Aggressive control of all wildfires.

This is an area of high summer recreational use and urban interface. This area has the greatest potential for threatening public safety and private developments compared to any other location in the LSR. This area has the highest fire risk in the LSR.

Priority 2: Protect private property (Camp Sherman, Metolius Meadows, House on the Metolius, etc), summer home tracts (special use permits), and Metolius River campgrounds and day use area.

***All suppression actions should consider the use of minimum impact suppression tactics in the Metolius Wild and Scenic River corridor.**

HAZARD REDUCTION RECOMMENDATIONS:

1. Modify fuels to generate low intensity wildfires (flame lengths less than 4 feet) under all weather conditions. Mechanical treatments and/or prescribed fire could be used to reduce fuel loadings, ladder fuels and brush components.
2. Develop and maintain fuelbreaks to reduce the risk of high intensity wildfires moving from private lands and high recreation areas into the surrounding forest stands or fires on public lands moving into the wildland/urban interface.
3. Reduce fuel loadings and brush components to reduce fire intensities. Use prescribed fire and/or mechanical treatments. Reduced fire intensities will improve abilities to suppress wildfires before private property of facilities become threatened.
4. Develop a fuelbreak along Road 14 that can be used as an anchor point during burn-out operations and as a place to "take a stand" during high intensity (stand replacement) wildfires. The fuelbreak should be designed to act as an anchor point as well as to meet visual quality objectives. The Scenic

Views allocation describes large, old trees with openings in the stand. A shaded fuelbreak could be designed that would meet both of these objectives.

5. Once the fuelbreak have been developed, it must be maintained. Maintenance of the fuelbreak will be as important as developing it. Prescribed fire and mechanical treatments can be used to maintain it. If maintenance does not occur, the fuel break will be ineffective within a relatively short period of time.
6. Increase homeowner and forest recreational user prevention education efforts to reduce the number of human caused fire starts. Include discussions of forest fire ecology with the prevention messages.

MANAGEMENT STRATEGY AREA -H-

TOTAL ACRES: 8,866

LOCATION BY NEAREST LANDMARK: Top of Green Ridge

ADJACENT MANAGEMENT STRATEGY AREAS: E, F, L and M.

SPECIAL AREAS OF CONCERN: Adjacent private property.

PLANT ASSOCIATION GROUPS: Mixed conifer (wet/dry), ponderosa pine (wet/dry), and riparian.

FIRE HAZARD RATING: Moderate and High

FIRE RISK RATING: Low

FIRE INTENSITY RATING: High

FIRE SUPPRESSION STRATEGIES/PRIORITIES:

Priority 1: Protect firefighter and public safety.

Priority 2: Aggressive control for all fires that threaten private lands.

Priority 3: Aggressive control for wildfires that threaten goshawk nest sites.

Priority 4: Consider the use of confine and contain suppression tactics for low intensity wildfires.

This decision would be based upon weather conditions, predicted fire behavior, suppression resource availability, fire location and "other resource" values and needs. Use roads and other natural barriers for firelines. Burning out from these natural barriers is desirable.

Priority 5: Aggressive control for moderate and high intensity wildfires.

HAZARD REDUCTION RECOMMENDATIONS:

1. Thin understory trees to reduce ladder fuels. Reduce fuel loadings and brush components to reduce fire intensities. Mechanical treatments and prescribed fire are both appropriate tools. The decision about which tool to use to meet objectives for an area, must be made on the ground after viewing the specific location.
2. Encourage the use of the free-use and charge permit firewood cutting program to remove ladder fuels and fuel loadings prior to the use of prescribed fire or other mechanical treatments. Commercial firewood use is encouraged.
3. Once understory thinning and fuel loading reductions have occurred, use natural barriers and roads for firebreaks when suppressing low intensity wildfires.

OPPORTUNITIES:

1. Coordinate prescribed burning for hazard reduction with habitat improvement for peck's penstomen and other species associated with fire dependent ecosystems.

MANAGEMENT STRATEGY AREA I

TOTAL ACRES: 1,314

LOCATION BY NEAREST LANDMARK: Confluence of Canyon Creek, Brush Creek and the Metolius River.

ADJACENT MANAGEMENT STRATEGY AREAS: D, G, F, J, and K

SPECIAL AREAS OF CONCERN: Adjacent private property, Metolius River, and riparian areas.

PLANT ASSOCIATION GROUPS: Mixed conifer (dry), ponderosa pine (wet/dry) and riparian.

FIRE HAZARD RATING: Low

FIRE RISK RATING: Moderate

FIRE INTENSITY RATING: Moderate to High

FIRE SUPPRESSION STRATEGIES/PRIORITIES:

Priority 1: Protect firefighter and public safety.

Aggressive control of high intensity wildfires.

Priority 2: Aggressive control of all wildfires that threaten private lands.

Priority 3: Aggressive control of all wildfires that may threaten "core areas" for late-successional species or spotted owl nest sites and stands.

The district wildlife biologist will map these sites and make this information available to the initial attack forces and the district Fire Duty Officer.

Priority 4: Aggressively control wildfires along Road 12 that may threaten public safety or become high intensity wildfires.

Follow the Deschutes LRMP standards and guidelines for fire suppression in the Scenic Views allocation.

Priority 5: Aggressive control for areas that will be managed for climatic climax.

This information will be compiled and mapped by the district silviculturist and wildlife biologist. Once mapped, the information will be made available to the initial attack forces and the district Fire Duty Officer.

Priority 6: Consider the use of confine and contain suppression strategies for low intensity fires.

This decision would be based upon weather conditions, predicted fire behavior, suppression resource availability, fire location and "other resource" values and needs. Use roads and other natural barriers for firelines. Burning out from these natural barriers is acceptable. All suppression actions should consider the use of minimum impact suppression tactics in the Metolius Wild and Scenic River corridor.

HAZARD REDUCTION RECOMMENDATIONS:

1. Reduce fuel loadings, ladder fuels, brush components and fire intensities through the use of mechanical treatments and prescribed fire. Areas adjacent to private property should be given priority treatment. The emphasis here should be to reduce the potential fire intensity on these sites. High density stands may require the use of mechanical treatments prior to the use of prescribed fire. Use prescribed fire as much as possible. Prescribed fire can be used to maintain or increase the amount of ponderosa pine and western larch in the stands in this MSA.
2. Develop and maintain fuelbreaks around "core areas", spotted owl nest sites and spotted owl nest stands identified by the wildlife biologist as important for late-successional species. The purpose of these fuelbreaks will be late-successional habitat protection, not visual quality or big game enhancement.
3. Develop a fuelbreak along Road 12 that can be used as an anchor point during burn-out operations and as a place to "take a stand" during high intensity (stand replacement) wildfires. The fuelbreak should be designed to act as an anchor point as well as to meet visual quality objectives. The Scenic Views allocation describes large, old trees with openings in the stand. A shaded fuelbreak could be designed that would meet both of these objectives.
4. Once the fuelbreaks have been developed, they must be maintained. Maintenance of the fuelbreaks will be as important as developing them. Prescribed fire and mechanical treatments can be used to maintain them. If maintenance does not occur, the fuel breaks will be ineffective within a relatively short period of time.
5. Fire control at the smallest size possible, with limited available resources, is the only method of protecting climatic climax stand conditions. Fire control is not always successful. The inability to protect these stands through their life cycle should be considered as part of other decisions made in the LSR.

OPPORTUNITIES:

1. Coordinate prescribed burning for hazard reduction with habitat improvement for peck's penstemon, rare truffles and other species associated with fire dependent ecosystems.
2. Use prescribed fire as much as possible. It can be used to reduce fuel loadings, reduce ladder fuels, reduce brush, reduce fire intensity, and maintain or increase the amount of ponderosa pine and western larch in the stands.

MANAGEMENT STRATEGY AREA -J-

TOTAL ACRES: 6,460

LOCATION BY NEAREST LANDMARK: Jefferson Creek, Candle Creek, Abbot Creek, Metolius River, Dahl Ranch and Bridge 99. Warm Springs Indian Reservation to the north.

ADJACENT MANAGEMENT STRATEGY AREAS: F, G, I and K

SPECIAL AREAS OF CONCERN: Warm Springs Indian Reservation to the north, Dahl Ranch, Metolius River and riparian areas.

PLANT ASSOCIATION GROUPS: Mixed conifer (wet/dry), ponderosa pine (wet/dry), and riparian.

FIRE HAZARD RATING: Low

FIRE RISK RATING: Moderate and Moderate Plus.

FIRE INTENSITY RATING: High and Low

FIRE SUPPRESSION STRATEGIES/PRIORITIES*:

Priority 1: Protect firefighter and public safety.

Priority 2: Aggressive control of all wildfires that threaten private lands.

Priority 3: Aggressive control of all wildfires that may threaten "core areas" for late-successional species or spotted owl nest sites and stands.

The district wildlife biologist will map these sites and make this information available to the initial attack forces and the district Fire Duty Officer.

Priority 4: Aggressive control for areas that will be managed for climatic climax.

This information will be compiled and mapped by the district silviculturist and wildlife biologist. Once mapped, the information will be made available to the initial attack forces and the district Fire Duty Officer.

Priority 5: Consider the use of confine and contain suppression strategies for low intensity fires.

This decision would be based upon weather conditions, predicted fire behavior, suppression resource availability, fire location and "other resource" values and needs. Use roads and other natural barriers for firelines. Burning out from these natural barriers is acceptable.

***All suppression actions should consider the use of minimum impact suppression tactics in the Metolius Wild and Scenic River corridor.**

HAZARD REDUCTION RECOMMENDATIONS:

1. Reduce fuel loadings, ladder fuels, brush components and fire intensities through the use of mechanical treatments and prescribed fire. Areas adjacent to private property should be given priority for treatment. High density stands may require the use of mechanical treatments prior to the use of prescribed fire. Use prescribed fire as much as possible. Prescribed fire can be used to maintain or increase the amount of ponderosa pine and western larch in the stands in this MSA.
2. Develop and maintain fuelbreaks around "core areas", spotted owl nest sites and spotted owl nest stands identified by the wildlife biologist as important for late-successional species. The purpose of these fuelbreaks will be late-successional habitat protection, not visual quality or big game enhancement.
3. Use prescribed fire as much as possible. It can be used to reduce fuel loadings, reduce ladder fuels, reduce brush, reduce fire intensity, and maintain or increase the amount of ponderosa pine and western larch in the stands.
4. Fire control at the smallest size possible, with limited available resources, is the only method of protecting climatic climax stand conditions. Fire control is not always successful. The inability to protect these stands through their life cycle should be considered as part of other decisions made in the LSR.

OPPORTUNITIES:

1. Coordinate prescribed burning for hazard reduction with habitat improvement for Peck's penstemon, rare truffles and other species associated with fire dependent ecosystems.

MANAGEMENT STRATEGY AREA -K-

TOTAL ACRES: 4,883

LOCATION BY NEAREST LANDMARK: Abbot Butte

ADJACENT MANAGEMENT STRATEGY AREAS: I and J

SPECIAL AREAS OF CONCERN: High mortality around Abbot Butte, and Warm Springs Indian Reservation to the north.

PLANT ASSOCIATION GROUPS: Mixed conifer (wet/dry), Ponderosa pine (wet) and riparian.

FIRE HAZARD RATING: High

FIRE RISK RATING: Low

FIRE INTENSITY RATING: High

FIRE SUPPRESSION STRATEGIES/PRIORITIES:

Priority 1: Protect firefighter and public safety.

The use of indirect tactics are preferred in areas of high snag densities or where firefighter safety may be jeopardized. Larger numbers of acres burned are acceptable to protect firefighters. It is acceptable to "back off" from a fire and catch it when it moves into areas with lower fuel loadings, lower snag numbers and where there are opportunities to "take a stand". Caution should be used on every fire response to assure that firefighters have escape routes and safety zones that are easily accessible and effective. Aggressive control is not emphasized unless due to safety concerns.

Priority 2: Aggressive control of all wildfires that may threaten "core areas" for late-successional species or spotted owl nest sites and stands.

The district wildlife biologist will map these sites and make this information available to the initial attack forces and the district Fire Duty Officer. If a fire threatens these areas, the wildlife biologist will be notified, but suppression tactics will not be changed unless there it can be accomplished without risk to firefighter or public safety.

Priority 3: Aggressive control for areas that will be managed for climatic climax.

This information will be compiled and mapped by the district silviculturist and wildlife biologist. Once mapped, the information will be made available to the initial attack forces and the district Fire Duty Officer.

HAZARD REDUCTION RECOMMENDATIONS:

1. Salvage harvest as much of the dead and dying material as needed to provide firefighter safety and long term late-successional habitat. Salvage material could be removed through timber sales or firewood programs (commercial, personal use or free-use).
2. Reduce fuel loadings, ladder fuels and brush components through the use of mechanical treatments and/or prescribed fire. At the present time, There are limited opportunities for the use of prescribed fire. Removal of the dead and dying material, reduction of fuel loadings, reduction of ladder fuels and reduction of the brush component will be required before prescribed fire can successfully be used in this area.

3. Develop and maintain fuelbreaks around "core areas", spotted owl nest sites and spotted owl nest stands identified by the wildlife biologist as important for late-successional species. The purpose of these fuelbreaks will be late-successional habitat protection, not visual quality or big game enhancement.
4. Once a fuelbreak has been developed, it must be maintained. Maintenance of the fuelbreak will be as important as developing it. Prescribed fire and mechanical treatments can be used to maintain them. If maintenance does not occur, the fuelbreak will be ineffective within a relatively short period of time.
5. Fire control at the smallest size possible, with limited available resources, is the only method of protecting climatic climax stand conditions. Fire control is not always successful. The inability to protect these stands through their life cycle should be considered as part of other decisions made in the LSR.

OPPORTUNITIES:

1. Once mechanical treatments have been completed, coordinate prescribed burning for natural fuels reduction and maintenance of fire climax conditions with habitat improvement for peck's penstomen and other species associated with fire dependent ecosystems.

MANAGEMENT STRATEGY AREA -L-

TOTAL ACRES: 11,702

LOCATION BY NEAREST LANDMARK: North end of Green Ridge, Horn of the Metolius River.

ADJACENT MANAGEMENT STRATEGY AREAS: F, H, and J

SPECIAL AREAS OF CONCERN: Metolius River, intermixed private property, Horn of the Metolius. Much of the area is inaccessible.

PLANT ASSOCIATION GROUPS: Mixed conifer (wet/dry), ponderosa pine (wet/dry), and riparian.

FIRE HAZARD RATING: Low and Moderate

FIRE RISK RATING: Low and Moderate

FIRE INTENSITY RATING: Moderate

FIRE SUPPRESSION STRATEGIES/PRIORITIES*:

Short term:

Priority 1: Protect firefighter and public safety.

Priority 2: Aggressively control all wildfires that threaten private property.

Priority 3: Aggressive control of all wildfires that threaten bald eagle nest sites and stands.

Use the Deschutes National Forest Land and Resource Management Plan (LRMP) Fire Suppression Standards and Guidelines for Bald Eagle Management Area to protect Bald Eagle nest sites and nest stands.

Priority 4: Aggressive control of all wildfires that threaten spotted owl nest sites.

The district wildlife biologist will map these sites and make this information available to the initial attack forces and the district Fire Duty Officers.

Priority 5: Aggressive control of all wildfires that threaten spotted owl habitat.

The district wildlife biologist will map these sites and make this information available to the initial attack forces and the district Fire Duty Officers.

Priority 6: Consider the use of confine and contain suppression strategies for low intensity wild fires that do not threaten life, private property, Bald Eagle nest sites, spotted owl nest sites, or spotted owl habitat.

The use of confine and contain strategies will be the exception, not the rule, based upon the need for habitat protection. This decision will be based upon weather conditions, predicted fire behavior, suppression resource availability, fire location and "other resource" values and needs. Use roads and other natural barriers for firelines. Burning out from these natural barriers is acceptable. Involve the District Ranger and district wildlife biologist in any decision to select a confine or contain suppression strategy.

Priority 7: Protect rare lichen from fire suppression activities.

They do not require protection from fire. The district ecologist will provide a map of lichen locations to the initial attack forces and the district Fire Duty Officers.

***All suppression efforts will use minimum impact methods.**

Long Term:

A Fire Management Plan should be developed for this area. This plan will be a site specific plan that can be used to allow fire "to play a more natural role in this ecosystem." This plan should be integrated with the Fire Management Plan identified in the Metolius Wild and Scenic River Plan. Fire management planning in this area should consider the use of prescribed natural fire.

Items to be considered during the development of the Fire Management Plan:

1. Fire suppression standards and guidelines for spotted owl nest sites and habitat conflict with the fire management strategy of allowing fire to play a "more natural role" in this area. Until a Fire Management Plan is completed for this area, aggressive control will be necessary in owl nest sites and stands.
2. The historic range of variability for the Horn subwatershed identifies that approximately 30% of this area was in an early seral condition. This is the desired future condition. Historic fires were 2,000 to 3,000 acres in size. Within the fire perimeter there was a "mosaic" of low, moderate and high fire intensities.
3. Size of openings created by stand replacement fires should not exceed 1,000 continuous acres.
4. Fire will be the primary tool used to maintain sustainable tree densities and canopy cover.
5. The use of prescribed fire is not a high priority here. The area has a moderate fire risk, primarily from lightning. With the use of confine and contain suppression strategies and prescribed natural fire, fuels reduction and ecosystem sustainability objectives should be met.
6. The objectives of "spotted owl habitat protection" and "development of a fire climax condition where fire is allowed to play a more natural role" is inconsistent. The Fire Management Plan must resolve these inconsistencies.

Modified suppression strategies and the use of prescribed natural fire will be the hazard reduction methods used to reduce fuel loadings and reduce the risks of loss due to high intensity wildfires.

MANAGEMENT STRATEGY AREA -M-

TOTAL ACRES: 1,429

LOCATION BY NEAREST LANDMARK: Metolius Research Natural Area

ADJACENT MANAGEMENT STRATEGY AREAS: F, G, H and I

SPECIAL AREAS OF CONCERN: Metolius Research Natural Area

PLANT ASSOCIATION GROUPS: Mixed conifer (wet/dry) and ponderosa pine (wet/dry)

FIRE HAZARD RATING: Moderate

FIRE RISK RATING: Low

FIRE INTENSITY RATING: Low to Moderate

FIRE SUPPRESSION STRATEGIES/PRIORITIES:*

Priority 1: Protect firefighter and public safety.

Priority 2: Follow the standards and guidelines identified in the Metolius Research Natural Area Fire Management Plan.

An update of the Fire Management Plan is recommended. Once this is completed, consider the use of confine and contain suppression strategies for low intensity fires. This decision would be based upon weather conditions, predicted fire behavior, suppression resource availability and fire location. Use natural barriers and areas within the RNA that have been previously underburned as confine and containment lines. Burning out from these natural barriers is acceptable.

***Suppression efforts should use minimum impact tactics in this MSA.**

OPPORTUNITIES:

1. Continue the prescribed burning that has been started in the RNA. Use this area as a location to provide the public and other agencies information and a visual representation of the effects of prescribed fire.