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Forest Service

Pacific Northwest Region

1997

Surveyors Ridge LSR Assessment

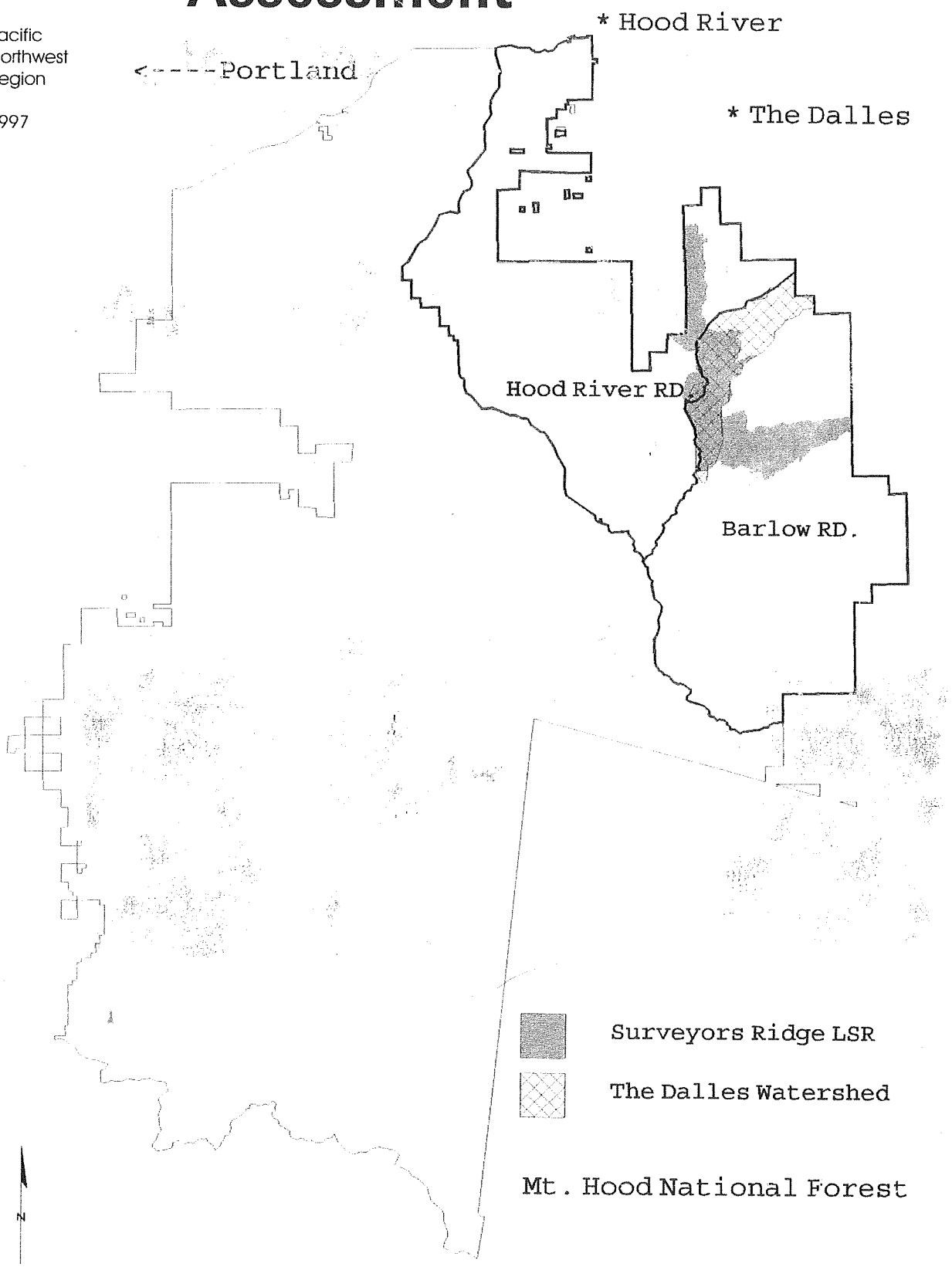


TABLE OF CONTENTS

List of Tables

List of Figures

Part I Executive Summary

In 1994 the Pacific Northwest Forest Plan initiated a Regional "Late Seral" network to help maintain the viability of species associated with older forest, also to assess the connectivity and functionality between LSR's.

Surveyors Ridge Late-successional Reserve (LSR) is located in North Central Oregon, east of Mt. Hood. It sits in Part on the eastern crest of the Cascade Mountain Range and runs east down to the Forest boundary (L-shaped). The LSR encompasses all three climate zones for this area. Elevations range from just above 6500 ft down to 2400 ft. Growing conditions created by the extremes of climate and terrain support vegetation as varied as stands of subalpine fir and ponderosa pine/Oregon white oak. The terrestrial and aquatic habitats are just as varied. High elevation grassy meadows dot the landscape along the ridge from Lookout Mountain to the area north of the power line on Surveyors Ridge. The headwaters of many streams begin in the upper elevations. Aquatic creatures, terrestrial wildlife, and humans are dependent on the quality and quantity of the water.

This LSR includes a steep environmental gradient, a rapid change in temperature and precipitation regimes between the highest and lowest elevations. Just east of the LSR boundary, the gradient levels off. There are also sharp aspect differences at lower elevations in Fifteenmile creek and along Surveyors Ridge. This gradient results in rapid changes in vegetation types and characteristic fire regimes.

Climate zones that will be referred to frequently in this document are as follows; Crest, Transition, Eastside. The crest zone has conditions more typical of those found west of the Cascade crest. The eastside zone consist of very dry conditions more typical of environments found in eastern Oregon. The transition zone is intermediate between the crest and the eastside. Most of the LSR lies in the transition zone, which is also the most productive zone. Growth rates fall off in the crest zone due to cold and in the eastside zone due to the lack of moisture.

History, Past to Present

The past and present conditions of Surveyors Ridge do provide us clues about the future of this LSR. Understanding what those clues are and how they came to be, will ultimately lead us to opportunities we can take advantage of now, and ensure that the late-successional characteristics that we hope to develop, maintain, and protect will progress towards the desired future condition.

The prehistoric use was primarily subsistence oriented with people living, hunting, and gathering in a seasonal use pattern (staying in a small area for a short time while utilizing the available resources, then moving onto a new area as resource needs were met or changed). Concentrated use of the area probably began during 3000 to 500 BC, and continued into historic times.

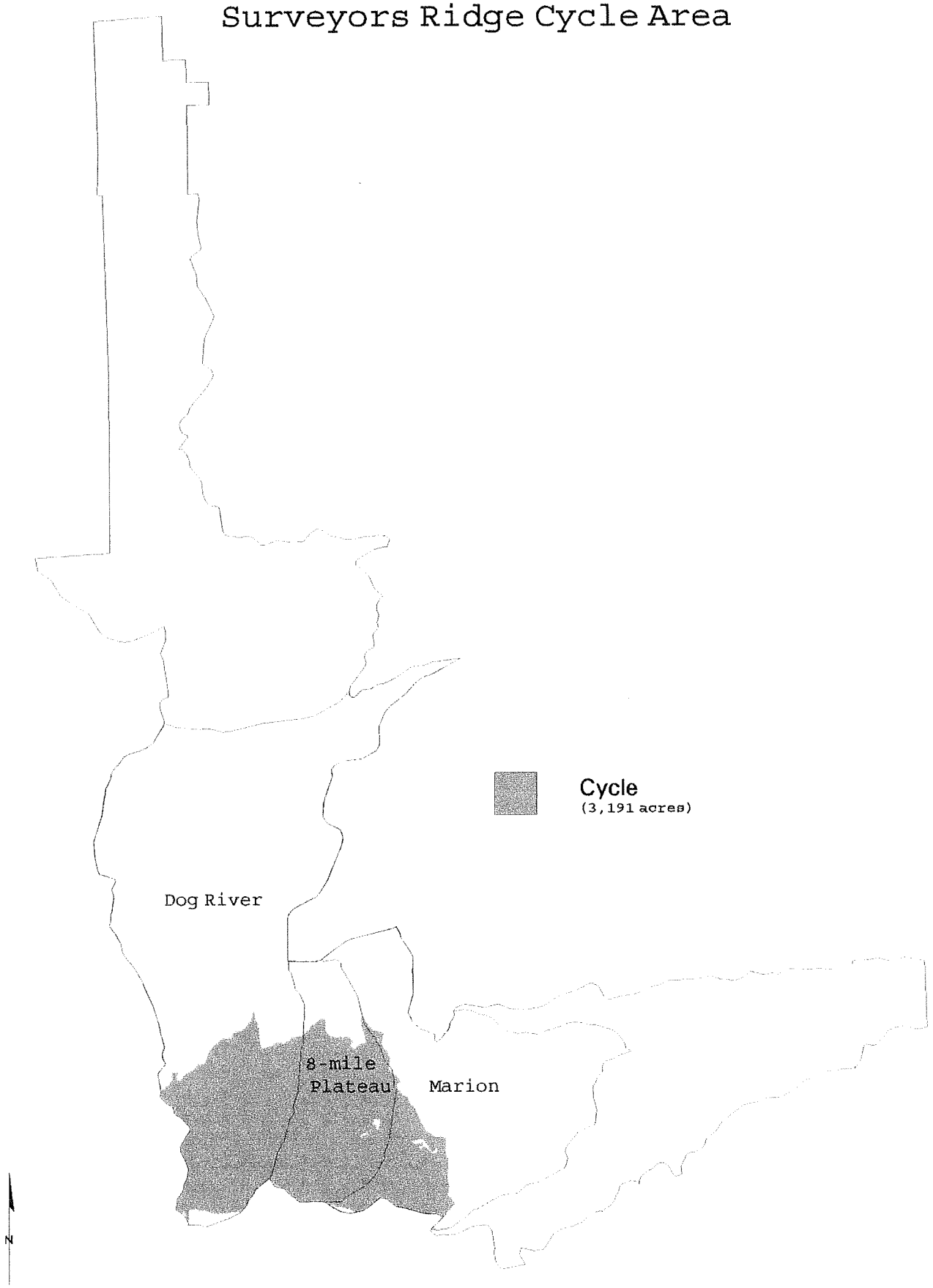
Pre-1900 in general, we believe that the local tribal groups burned the area frequently for a variety of purposes, such as maintaining travel ways and promoting the growth and abundance of culturally important plants. This type of activity has been documented throughout the western United States and we can find no reason why it would not have happened here, though we have nothing specifically documented in the Surveyors Ridge LSR.

Some effective fire control began as early as 1906 in the crest zone. Early diary entries for Forest Service personnel mention fighting fires in this area. Guard camps or lookouts were mentioned at Eightmile meadows, High Prairie, and Lookout Mountain. Other camps were probably established in high meadow areas since the meadows provided pasturage for the horses and mules.

With immigrants, mostly of European descent settling this area, the LSR was used for little except hunting. By the late 1800's a few cabins were present in the LSR, and early logging activity had begun. Sheep and cattle grazing were dominant in the area in the 1920's and 1930's.

Figure (1)

Surveyors Ridge Cycle Area



Modern day use was dominated by logging activity from the 1960's to the mid 1980's. In more recent years logging activity has stopped, due to the designation of the area listed as a Late Successional Forest (LSR) in 1994 via the Northwest Forest Plan, and pending the outcome of this LSR assessment. The final outcome may provide some limited logging activities back into the area, to maintain the health and viability of the LSR.

Eighty years ago the Barlow Ranger District signed a memorandum of understanding with the city of The Dalles, which is still going strong to this day. This relationship is the sum total of many relationships developed over the years with hard work. The memorandum covers the whole watershed which is the main domestic water supply for the city. The head waters for the streams feeding into crow creek dam, where the city stores its water, originate in the LSR. The quality of the water that comes from this watershed is important to all who drink it.

Today the highest use for 1/3rd of the LSR is the management for the protection of water quantity and quality for the city of The Dalles Municipal Watershed. While the other 2/3rds is recreation (i.e. hunting, mountain biking, hiking, OHV travel, horse use, pleasure driving, camping, etc). Recreational use for the whole LSR is on the rise, and expected to continue to grow into the future, as more people discover and appreciate the natural beauty of the area.

Current Conditions

A. Vegetation. Most of the stands in the Pacific Silver fir series have either a late seral multistory structure or mature stem exclusion structure. In the Subalpine fir-Mountain Hemlock series most uncut stands are in the mature stem exclusion stage generally and high density stagnating stage specifically. In the Moist Grand fir series those stands that are in the Late Seral Multistory structure type have not experienced a major disturbance in over 200 years, nor has most late seral multistory structure stands in the Pacific Silver fir series. In the Subalpine fir-Mountain Hemlock series several stands have begun to move into the collapsing stage. Spruce budworm has affected many subalpine firs and mountain pine beetle is beginning to hit the lodgepole pine. For the Pacific Silver fir series the combination of fuel loadings and time since disturbance suggest that stands in the late seral multistory stage may soon experience a stand replacing fire. In the Moist Grand fir series spruce budworm, fir engraver beetle, and root disease are very active and downed woody loadings have begun to increase dramatically. Some stands have natural loadings of over 50 tons per acre. Stand conditions suggest that much of this area is set up for a large stand replacing fire. Remaining uncut stands in moist grand fir fall into the mature stem exclusion stage. The densest stands lie physically along Surveyors Ridge itself and many have been mapped as high density stagnating. Spruce Budworm, fir engraver beetle, and root disease are the most active in this area of any spot in the LSR.

The information that we received for insect infestations showed that every acre within the LSR, since 1980, had recorded some insect infestation. The insects along with other agents have created a lot of mortality and windthrow susceptible trees.

In the Eastside zone and the dry grand fir series of the Transition zone, western pine beetle is successfully attacking several individual large ponderosa pines each year, which are scarce in number throughout the LSR and adjacent lands. Further lose of this habitat is significant to late successional wildlife species. (ex. white-headed woodpecker)

We believe the cycling area (see figure 1), located in the southern portion of Dog River and Eightmile Plateau landscape units (LUs), does not move past the maturation stage. It is a special case, particularly since it involves a process and not a particular structural stage. Based on the species present and vegetation changes after regeneration harvesting, we believe that this area does not produce old growth stands or late-successional forest between stand replacing disturbances. At best it makes it only to the mature stem exclusion stage, moves into the high density stagnating, and then collapsing. The cycling area last burned in 1898. Many uncut stands are starting to collapse from the

combination of insect and disease related mortality, snow and wind. Once insects and disease kill a significant number of trees, snow and wind combine to accelerate the collapse.

B. Terrestrial. If what we suspect about the cycle area is true, then it does not provide habitat for late-successional associated species typically found in lower subalpine forest, but probably provides some marginal habitat, particularly around the edges, and dispersal habitat. The forest in this area has never been, nor will it be, nesting, foraging, and roosting habitat for spotted owls. The stands here are starting to collapse. The majority of the Landscape units (LUs) (see figure 7 on page 37) produce some spotted owl habitat with the exception of the cycling area.

A species of concern but not well represented is the white-headed woodpecker. Being represented by the TMGG (medium home range, generalist for all stages) guild which can use any structural class seems to over predict habitat for this mostly large ponderosa pine dependent species, therefore it will be addressed separately and as a representative of any other species that may need the open multistory and open park-like stands of ponderosa pine/oak, ponderosa pine, and ponderosa pine/Douglas fir associations that are virtually absent from the landscape. Another set of species not well represented are any that need interior habitat.

The white-headed woodpecker and pigmy nuthatch are found foraging, and nesting (almost exclusively) in Ponderosa pine or Douglas fir, while the flammulated owl may utilize any cavity that is large enough within the drier habitats of the ponderosa pine zone.

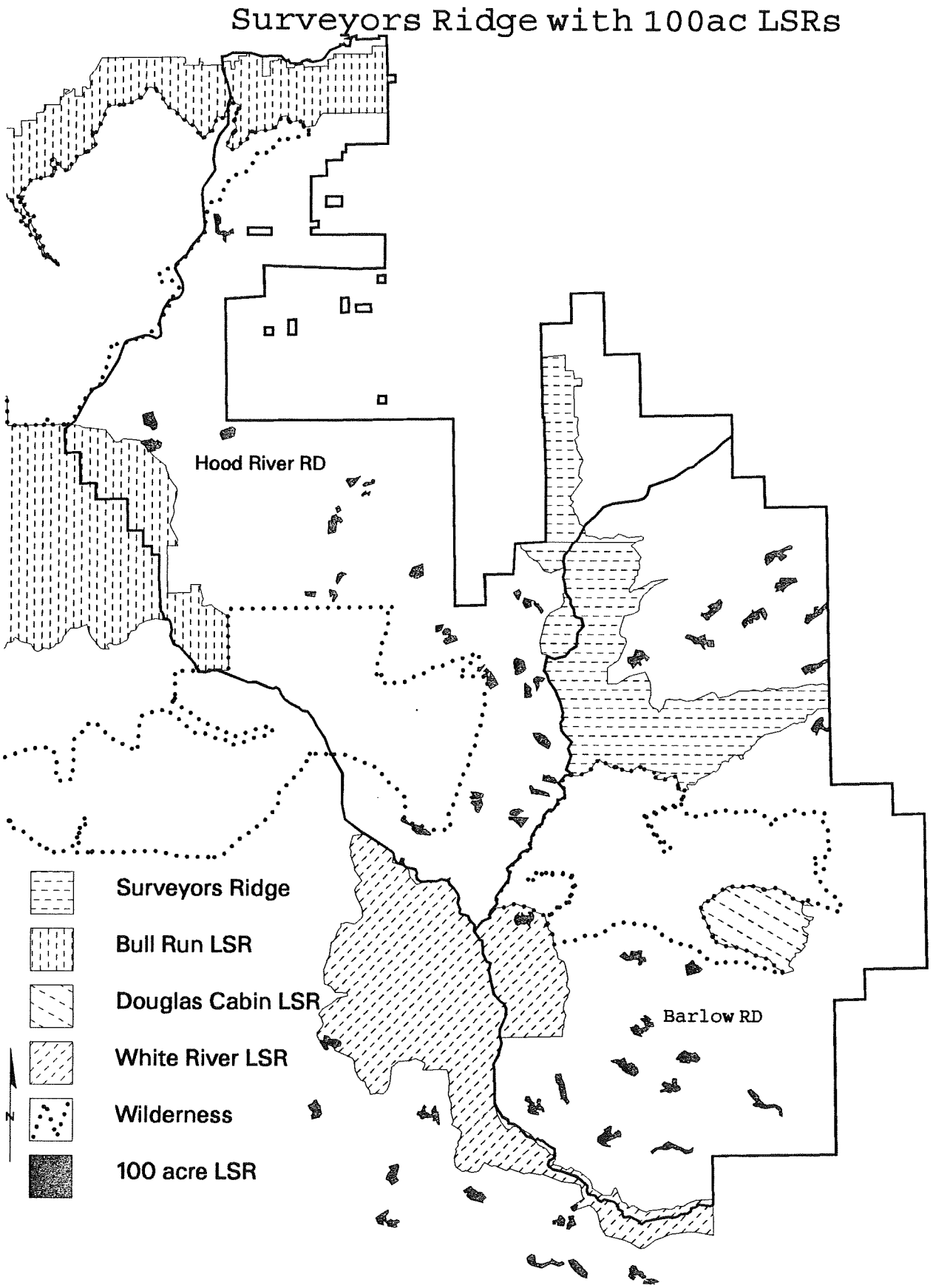
The black-backed woodpecker is the only other species of management concern identified with conflicting habitat needs that conflict with late-successional LSR objectives.

Within the terrestrial, (Guild--large home range, large tree, mosaic (TLMLT) and Guild-- medium home range, large tree mosaic (TMMLT)) are the; Northern goshawk, pileated woodpecker, wolverine, marten, fisher, northern spotted owl, and barred owl, all of which are known residents, or suspected to occur with a high likelihood of presence. Total available habitat for this group of wildlife within the LSR is low to very low. Habitat availability is still not good when using the structural stages identified as suitable habitat for eastside conditions. Late-successional habitat currently represents 16 percent of the landscape and in 100 years is expected to be 39 percent of the landscape. Currently these patches in general exceed 40 acres in size and generally have poor connectivity north and south, and relatively good connectivity east to west across the LSR. In 100 years we are predicting better connectivity north-south (with a major gap in Eightmile plateau and south Dog River LUs) and improved east-west connectivity.

Within the ponderosa pine zone, the present mix of large trees and understory generally meet the needs of such species as the spotted owl, however natural mortality is already killing many of the larger overstory. The end result with no intervention will likely be catastrophic loss of large areas of habitat from insects or fire, with virtually no large trees remaining. In other words "just letting them grow" will probably not result in maintenance or development of large trees or late-successional habitat . Returning such stands to open park-like or open multi-story condition would protect the existing large ponderosa pine and Douglas fir within them, virtually eliminating the potential for catastrophic lose and should enhance habitat for the white -headed woodpecker, pygmy nuthatch and flammulated owl, while returning the landscape to a more natural condition.

Outside the Surveyors Ridge LSR, but within the analysis area, interior forest habitat is much more fragmented. Probably none of the interior forest habitat blocks outside the LSR are large enough to be considered refugia for the TLMLT and TMMLT guild or provide much recruitment for populating other areas except for the west edge of Mill Creek landscape unit. The best late-successional habitat will occur in the Marion, 15-mile South and portions of Dog River, Mill Creek Buttes, plus Surveyors Ridge LUs. The southeastern area of the Surveyors Ridge LSR could become an excellent example of "eastside" open park-like fire climax vegetation favorable to white-headed woodpeckers and similar species. Due to elevation and climate, gaps of interior habitat will remain in the cycling area. The current functioning of the Critical Habitat Unit (CHU OR-1) should remain intact with some minor gaps of

Figure (2)


Surveyors Ridge with 100ac LSRs
Hood River RD
Barlow RD
Surveyors Ridge
Bull Run LSR
Douglas Cabin LSR
White River LSR
Wilderness
100 acre LSR
N

connectivity within the Surveyors Ridge LSR. The Surveyors Ridge LSR not only functions as refugia for late-successional dependent species, but it appears to be a center within the White River-Surveyors Ridge-Douglas Cabin LSR-Badger Creek Wilderness area complex.

C. Connectivity. The Douglas Cabin LSR, and the east half of the Badger Creek Wilderness, and the lower elevations of Surveyors Ridge LSR are relatively dry and are more conducive to an open forested structure such as open multistory or open park -like dominated by ponderosa pine or ponderosa pine/Oregon white oak plant associations. The connection between these two LSRs is marginal due to deteriorating stand conditions inside the wilderness. Much of the area has densities of grand fir and Douglas fir in the middle and understory layers that are creating high competition for moisture and a high risk of catastrophic loss due to fire or insect epidemic, with significant mortality already occurring, thereby reducing the functional aspects of the connectivity for this area.

Due to the East Fork of Hood River and Highway 35 (a two lane road) we expect connectivity between Surveyors Ridge LSR and Bull Run LSR to only exist for large mobile animals, such as northern spotted owls. We believe that no connections exist for smaller, less mobile animals, such as mollusks and salamanders, and most plants and fungi listed on the C-3 table (ROD 1994).

The connection from Mill Creek Buttes to Surveyors Ridge LU may have already collapsed for smaller animals and many plants and fungi, primarily due to spruce budworm and root disease mortality. Grand fir is the most common species affected. The LU also contains many rock outcrops and talus slopes, but we believe these are too small and well scattered enough to stop movement through the landscape.

Connectivity between the LUs inside the LSR and outside the LSR is tenuous at best, some barely exists, if at all. External connectivity depends on land allocations, either under the Northwest Forest Plan or the Mt. Hood National Forest Plan, that function as intended.

The strongest external connection is between Surveyors Ridge LSR and White River LSR along the East Fork Hood River. The expected connection through Badger Creek Wilderness is only barely functioning. Functioning connections through Riparian Reserves only exist along perennial streams. Riparian Reserves along intermittent streams presently do not provide a good connecting function and probably never will. The 100 acre LSRs (see figure 2) were designated around the best available habitat, so are functioning presently, but probably will not in the future. Several of these LSRs include sites that cannot sustain the present stand densities.

Beyond site capability, the biggest problem with the land allocations expected to provide connectivity is location and orientation of these allocations. Large mobile animals and plants or fungi with airborne propagules that can reach the free air winds, both currently have and will maintain genetic connections across the area. Smaller, less mobile animals and plant or fungi whose propagules cannot reach the free air winds, currently have and are expected to have, little or no genetic connections across the area. In short, Surveyors Ridge LSR is relatively isolated at present and portions of it will remain isolated in the future.

Providing north-south connections across the eastside zone and the lower edge of the transition zone is virtually impossible for species that depend on closed canopy forest. South aspects are typically dry and open, capable of supporting only open park-like stands, woodlands, or savannas. All connections end at the forest boundary due to changes in landowner management, both timber and agriculture, and vegetation type.

D. Aquatic. The Fifteenmile Creek subbasin steelhead are a state of Oregon stock of concern, and on the sensitive species list, interior redband trout are also listed. Resident redband trout inhabit Eightmile Creek and are likely the resident trout species present in Fifteenmile and Cedar Creeks as well. Cutthroat trout are the predominate resident trout within other streams in the LSR. Fifteenmile Creek harbors the easternmost run of wild winter steelhead trout in the Columbia River drainage as well as resident rainbow, and cutthroat trout. Resident rainbow trout may be of the subspecies redband, but this has not been verified. There are no known populations of C3 aquatic mollusk species within the LSR.

E. Riparian. Surveyors Ridge LSR is divided into 5 hydrologic units for ease of description. Overall the riparian condition within the LSR is good. Three of the units, Dog River, Mill Creek, and Fifteenmile Creek are headwaters for municipal water supplies. Of these 5 units, the Dog River riparian area is at the greatest risk of loss and the most likely cause would be to a wildfire event.

F. Botany. Many of the sensitive plant species found in this LSR area do not reside under the canopies of late-successional forest. They prefer more of the special habitats such as rock outcrops and/or wet and dry meadows. Those botanical species that prefer late-successional forest are some of the fungi's, bryophytes, valerian, and boletes. Some of these botanical species can be found to exist in this LSR.

Desired Conditions and Trends

In order to move towards desired conditions , we needed some indications of what the LSR might look like in the future in order to evaluate the "distance" between current conditions and desired conditions. We created a map of stand structures (see figure 15) we believed would exist 100 years into the future. We do not consider this map to depict the desired stand structures, since DFC conditions are timeless and a map must represent a particular point in time. One hundred years is an arbitrary time point, but one commonly used in land management planning. In some landscape units we will not reach the desired conditions in 100 years. This belief is based on the assumption that current insect and disease problem areas will not reach their characteristic old growth structure in 100 years, whether we treat them or not. Our desired future conditions would be to have each landscape unit in as much of a late-successional forest as the natural environmental factors will allow, with a low risk of loss of habitat and late-successional forest.

The desired conditions for the road and motorized trail system within the LSR is 37.15 miles of open roads and 22.90 miles of motorized trails. This equates to 1.60 miles of road per square mile. The bulk of the reductions would occur in the Dog River and Marion LUs.

"Triggers"

We identified seven triggering mechanisms for the initiation of activities. They are as follows:

- Downed Woody Loadings.
- Extent of Ladder Fuels.
- Stand Density, expressed as both trees per acre and basal area per acre.
- Percent Mortality.
- Interior Habitat.
- Access and Travel.
- Noxious Weeds.

These factors are based on protecting older forest from stand replacing events and promoting faster growth in younger stands. Reaching a trigger does not necessarily mean that a management action will be taken. Rather, it indicates a need for further analysis to determine if a problem is significant and what types of treatments are appropriate. Based on the number of these triggers tripped at any given time we were able to prioritize the landscape units where activities to reduce the risk could be used. Mill Creek Butte LU was the highest priority for treatment, tripping 5 of the 7 triggers.

The main concerns are the areas from Northern Dog River LU and into Surveyors Ridge LU where we have heavy insect, disease, and blowdown problems, that do pose a risk of lose to the entire LSR due to fire and continual spreading of insect and root disease problems. The cycle area, south Dog River and Eightmile Plateau LU (see figure 1) areas where stands are collapsing and entering the end of the cycle period have the potential for a large scale catastrophic fire event to occur. Should this happen it would split the LSR in half and reduce or eliminate connectivity in this area for some time into the future.

Proposed Projects and Boundary Changes.

The following projects have been brought forward as they need immediate consideration. The projects are as follow:

- Boundary Change to the LSR.
- Risk Reduction.
- Replacement of Water Pipeline for the City of The Dalles.
- Environmental Assessment for Long Prairie Range Allotment.
- Firewood gathering.
- Fifteenmile, OHV Motorized Trail System.
- Precommercial Thinning.
- Commercial Thinning.
- Flood restoration projects with ERFO/Hatfield dollars.

Boundary Change. Late-successional reserves were created to provide areas where the habitat needs of plants and animals dependent on older forest will be met. The boundaries of Surveyors Ridge were drawn with this objective in mind. In analyzing the lands within the current boundary, we noted two main problems, one involves fragmentation and the other involves the risk of catastrophic loss for wildfire in the central portion of the LSR. To address both problems we proposed adjusting the boundary of the LSR.

Salvage. There is an estimated 1000 acres of salvage work needed, primarily in the Mill Creek Butte and Dog River LUs. The areas are collapsing due to years of disease and insect infestations. The fuels buildup is such that a catastrophic fire risk does appear to exist, as does further spread of the insect and disease problems.

Dog River Pipe. The city of The Dalles currently diverts water from Dog River to the reservoir behind Crow Creek Dam. The water behind the dam is the main municipal water supply for the city. The diversion/aqueduct is a wooden structure built in the 1920s. The city is proposing replacing this structure with a 30 to 36 inch underground pipe in 1998. The pipe would be laid adjacent to the existing structure doubling the width of the current corridor to 60 feet. The new pipe would improve water transport efficiencies and reduce evaporation that is currently taking place.

Range Allotment. The Long Prairie Range Allotment is expecting to begin a new Environmental Assessment (EA) the latter part of this year. The use by cattle within the LSR is low to minimal. We have concerns about the portion of the allotment that lies within the LSR but, currently they are minimal. The EA process will enable us to look more closely at the use by cattle in this area and address specifically any concerns that we have.

Firewood. There appears to be ample opportunity to provide the public firewood within the LSR. The demand for firewood opportunities by the public continues to increase and supply continues to decrease. The public often tells us that they are looking for areas with easy to moderate access of the wood. The Surveyors Ridge, Mill Creek Butte, and northern Dog River LUs have a lot of blowdown trees on the ground already next to roads. Other options will be explored for use of this wood (i.e. look for areas where we are deficit down woody and place and scatter logs in these areas) .

Fifteenmile OHV Motorized Trail Project. A proposal to designate a fifty mile motorized trail system for OHV (motorcycle, three and four-wheelers) use, is planned to use existing roads, and skid trails, and would connect to proposed OHV areas to the south. This trail system would eliminate cross-country/ride "anywhere -use -patterns", which currently exist and remove motorized trail use from along Fifteenmile Creek to less sensitive areas. Resource needs would be considered as they apply to OHV travel within Late-successional Reserves.

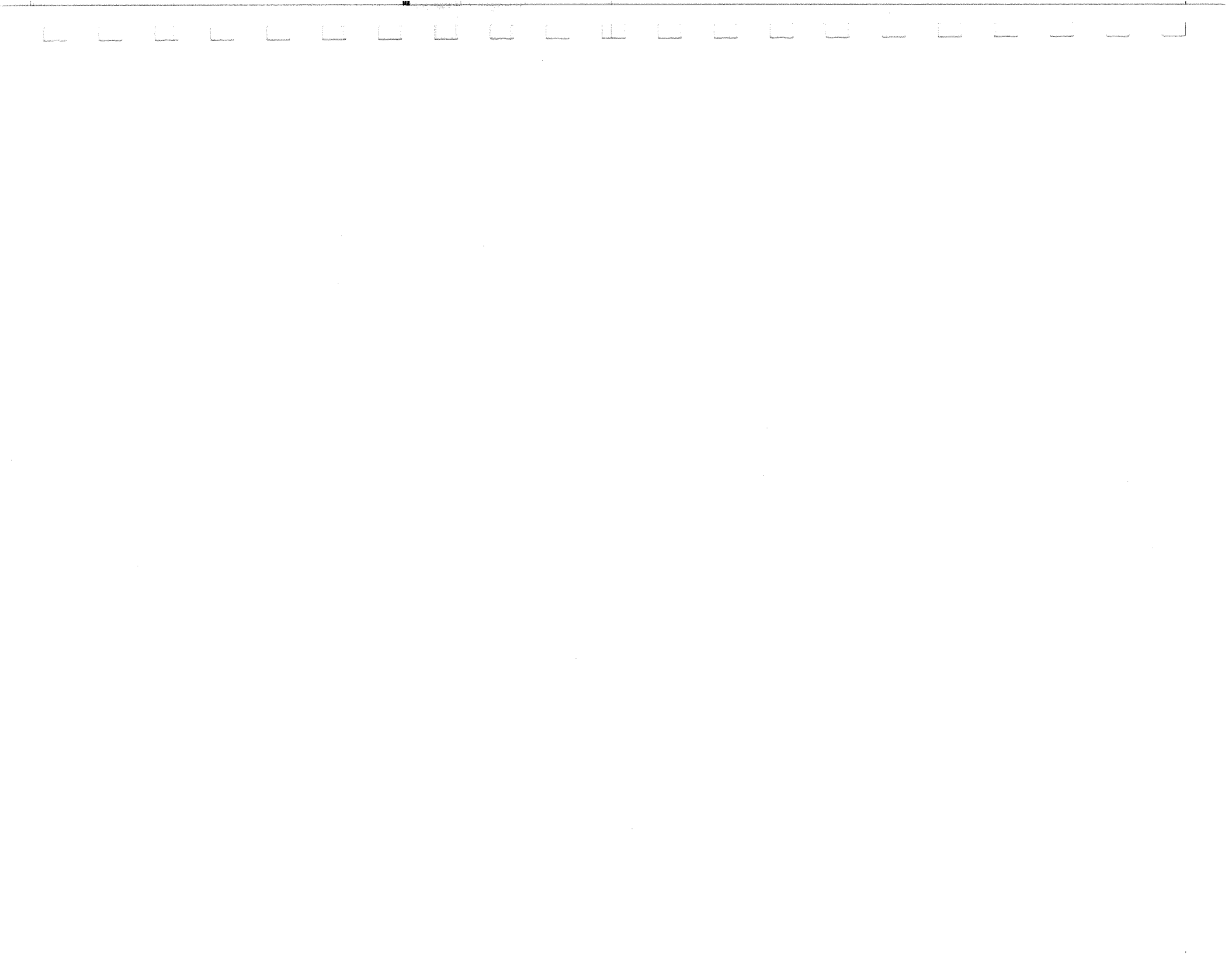
Precommercial Thining. Projects for precommercial thinning could begin at anytime, pending the availability of funding to do the projects. Guidelines for such projects would be in accordance with the criteria outlined in the REO exemption letter dated May 9th, 1995. (see appendix H)

Commercial Thinning. Commercial thining is more uncertain than precommercial thinning, as the stands we are dealing with are either very young or very old, with very little in-between. Guidelines for such projects would be in accordance with the criteria outlined in the REO exemption letter dated July 26th, 1996. (see appendix H)

Erfo/Hatfield Flood Projects. These are projects that will take place from FY97 through FY99 when the funding for these projects runs out. The work is only in those areas damaged by distructive storms that hit the area in 1996. A list of the proposed projects is on page 87 in Chapter VI.

A fire management plan is included as the last chapter in this assessment. It gives the history and current status of the LSR by landscape unit. The plan also prescribes the type of suppression efforts that could occur under certain circumstances with consideration given to the role fire plays as part of the Late-successional ecosystem.

Fire occurrence rates are low for the entire LSR, generally .097 fires per 1000 acres. Although the rates in general are low, we have identified the Cycle area, the Mill Creek Butte and Dog River LUs, as posing a high risk of large scale fire occurring. We are also proposing salvage and firewood gathering as opportunities (except in the cycle area, where it would be unlikely we could break the cycle) to reduce the risk that exist, as part of the maintenance and protection of late-successional functions and processes currently going on in the Surveyors Ridge LSR.



PART I I INTRODUCTION

In 1994 the Pacific Northwest Forest Plan initiated a Regional "late seral" network to help maintain the viability of species associated with older forest. Our objective is to assess how well Surveyors Ridge Late Successional Reserve (LSR) is functioning, as well as the network that connects it with the other LSR's on the Forest. Like monitoring, assessment is a continuous process. This report is a first approximation ; it will be revised as we learn more and as conditions and needs change. Previous analyses pertinent and contributory to this assessment are:

- **Mt. Hood National Forest Plan -** as amended by the Northwest Forest Plan.
- **Mile Creeks Watershed Analysis** 1994-Analyzed the Mile Creeks sub-basin as a Tier 1 Key Watershed under the Northwest Forest Plan.
- **Mile Creeks Stewardship Area Landscape Analysis and Design** (LAD)1996- Reviewed the Watershed Analysis and applied along with local information specific desired conditions for Mile Creeks Stewardship Area portion of Surveyors Ridge . Where applicable and to the extent possible we applied local information to the East Fork Hood River portion of the LSR as well. (East Fork Hood River Watershed Analysis is currently in progress, and is in consultation with this LSR assessment.)
- **White River Watershed Analysis** 1995-Analyzed the White River sub-basin as a Tier 2 key watershed under the Northwest Forest Plan.
- **Eastside Partnership(the 3 Districts-Barlow, Bear Springs, and Hood River) Access and Travel Management Plan** 1995- Eastside ATM plan.

The area used for analysis is roughly the LSR and its immediate environs. We used a forest wide scale to study interior habitat connectivity among neighboring Mt. Hood National Forest Late Successional Reserves.

The Surveyors Ridge LSR (RO202) lies partially within the Mile Creeks Stewardship area and partially within the East Fork Hood River Stewardship. The LSR is comprised of 23,759 acres. Nine 100 acre LSRs are known to exist within the Mile Creeks stewardship area and 11 are known to exist in the East Fork stewardship area. These areas will be assessed when we look at connectivity and interior habitats.

OUR OBJECTIVES

The objectives of the assessment are the following:

- To validate and refine the desired conditions for Surveyors Ridge LSR as described in the Mile Creeks Watershed Analysis and the yet to be published East Fork Hood River Watershed Analysis, and the Mile Creeks Landscape Analysis and Design (still being more fully developed).
- To assess the quality of ecosystem function as pertains to the goals of late successional reserves in the Northwest Forest Plan. We used three major indicators to analyze existing and potential function as an LSR: 1) Stand Conditions, 2) Connectivity, and 3) Riparian conditions.
- To prioritize management action where improvement of function is possible through management while indicating necessary mitigation, design parameters and monitoring needs.
- To categorize present and future social use in terms of site specific interpretation of the standards and guidelines of the Northwest Forest Plan.
- To develop triggers for landscape-level reassessment.

Context of surveyors ridge

Surveyors Ridge is a very diverse LSR. It encompases all three of the climate zones for this area (Eastside, Transition, and Crest). Elevations within the LSR range from just above 6500ft to where 15-mile creek exits the forest boundary at approx. 2400ft. Growing conditions created by the extremes of climate and terrain support vegetation as varied as subalpine fir on high elevation moist sites to dry ponderosa pine/Oregon white oak stands on the lower elevation south facing canyon slopes of 15-mile creek. The terrestrial and aquatic habitats encompassed within this landscape are just as varied. High elevation grassy meadows dot the landscape along the ridge from Lookout Mountain to the area north of the powerline on Surveyors Ridge. These areas provide their own unique habitats. The head waters of several streams and one river (Dog River) begin within the LSR area. Aquatic and terrestrial wildlife and humans are dependent upon the quality and quantity of this water supply. The city of The Dalles has an old wooden pipe that crosses through the LSR. Through the pipeline passes the main supply of water to Crow Creek Dam, which is a major source for the city's water supply. On the Northern fringe of the LSR, a major powerline coorridor crosses through the LSR. The power line breaks the continuty of the LSR into 2 sections. The effects this has on the LSR will be descibed in this assessment.

PARTICIPANTS

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Figure (3)


Surveyors Ridge Climate Zones
Transition
Eastside
Crest
Transition
N

Part III Existing Conditions

This opening section discusses the historical and the existing condition of Surveyor's Ridge LSR Vegetation has been stratified in a hierarchical manner. The first stratification is Climate Zone, followed by vegetation series, current stand conditions, and characteristic old growth structure.

Climate Zone is intended to help display the effects of the temperature and precipitation regimes on potential and current vegetation. The major forest series displays, on a coarse scale, potential vegetation. Current stand conditions displays the existing forest structure. The characteristic old growth displays the potential of the landscape to produce different types of large tree dominated stands considered relatively stable (capable of persisting for several decades). The downed wood section discusses changes in the downed wood recommendations made in Miles Creek Watershed Analysis based on actual conditions and studies more appropriate to the area than the one used in watershed analysis.

Climate Zones

Climate zone is intended to help display the effects of different precipitation amounts and patterns and temperature regimes on the location and extent of the vegetation series. The **Crest** Zone has conditions more typical of those found west of the Cascade crest. The **Eastside** Zone consists of very dry conditions more typical of eastern Oregon. The **Transition** Zone is intermediate between the Crest and Eastside zones. Most of the LSR lies in the Transition Zone, which is also the most productive zone. Growth rates fall off in the Crest Zone due to cold and in the Eastside Zone due to lack of moisture.

Figure 3 depicts the approximate boundaries for each climate zone. The actual boundaries vary in time and can be fairly broad. This LSR includes a steep environmental gradient, a rapid change in temperature and precipitation regimes between the highest and lowest elevation within the area. Just east of the LSR boundary, the gradient levels off. There are also sharp aspect differences at the lower elevations in Fifteenmile Creek and along Surveyor's Ridge. This gradient results in rapid changes in potential vegetation and characteristic fire regime. Since these aspects of vegetation are intertwined, Table III-1 displays the vegetation series, Fire Groups, and plant associations potentially found in each climate zone.

The plant associations shown by series and Fire Group may not align as expected. The Douglas-fir series includes a grand fir association and the ponderosa pine-Oregon white oak series includes a Douglas-fir association. These "overlaps" occur since the given associations in each series tends to react to climate and disturbance in a similar manner. In other cases, such as the western hemlock association shown in the moist grand fir series, the plant association listed is atypical of the area in general and represents a semi-disjunct community. Such communities tend to occupy what we consider a special habitat for the eastside of the Forest, most often unusually moist or cool locations for the general area. For example, western hemlock is a riparian associated species on Barlow Ranger District, found only along perennial streams or near springs, seeps, and other wet areas. Many of these sites would not be mapped as special habitats in much of the Forest based on the overstory vegetation.

In addition, this LSR contains at least two unclassified plant associations. The first occurs in the Crest Zone, encompassing subalpine fir plant associations. No plant association guide has been formally published for the subalpine fir series. The draft association guide is based on plots taken around Mt. Hood and do not appear to include any subalpine fir plant associations that may be found elsewhere on the Forest. The draft subalpine fir associations do not appear to fit those found in Surveyor's Ridge LSR; more than one unclassified association may be present.

The second unclassified association occurs in the Transition Zone on Surveyor's Ridge. Ponderosa pine is not a common species on this ridge. Douglas-fir appears to fill the same co-dominant role with Oregon

white oak as ponderosa pine does elsewhere on the eastside. As far as we know, Douglas-fir-Oregon white oak associations do not occur anywhere else on the Forest. Douglas-fir and Oregon white oak grow with each other on several sites on the westside, but these are all western-hemlock-Douglas-fir plant associations, as far as we know.

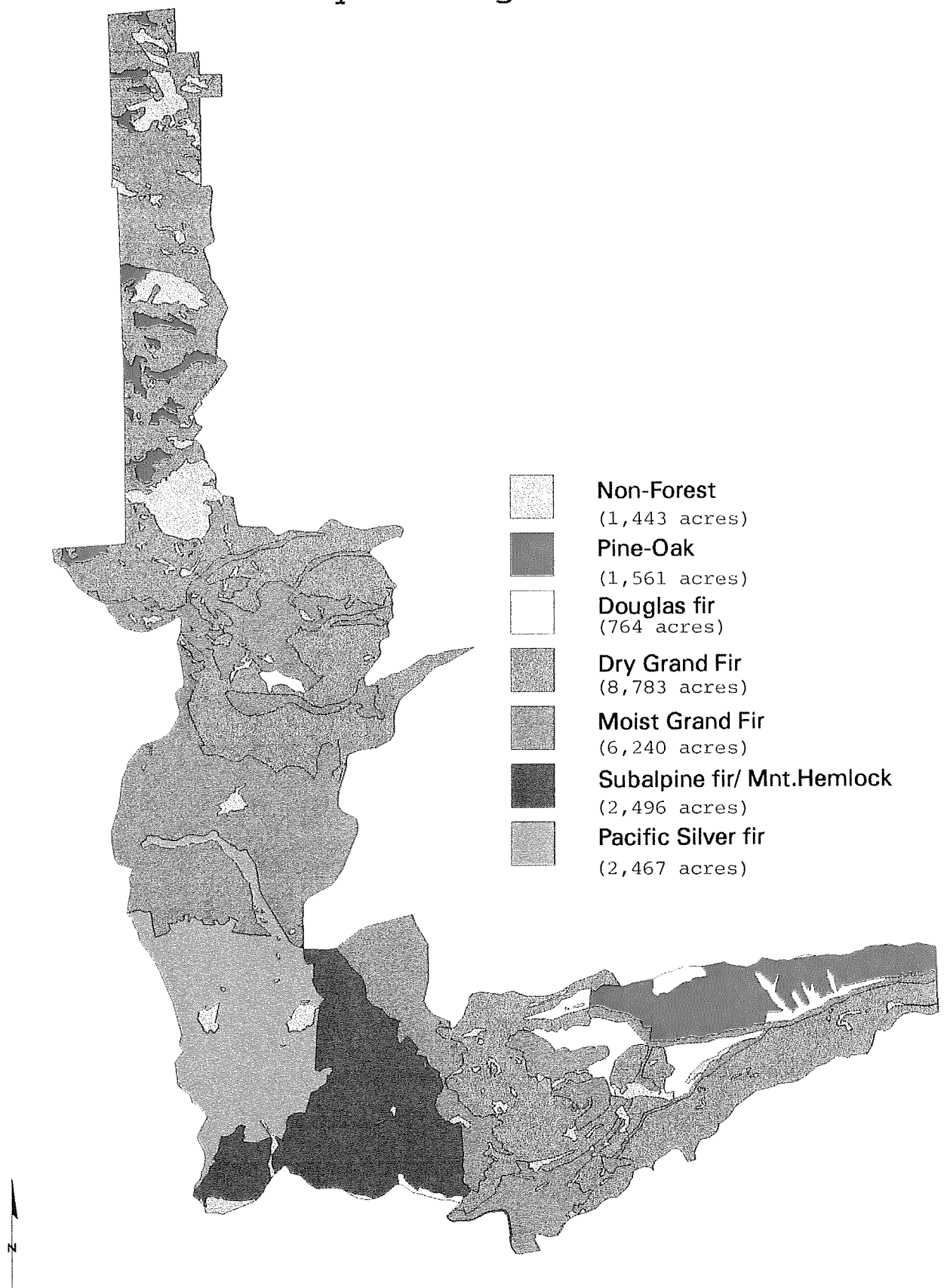
See figure 21 in the Fire Management Plan section for a description of the fire groups.

Table III-1. Vegetation series within each climate zone.

Climate Zone	Vegetation Series	Fire Group	Plant Associations
Crest	Pacific silver fir	6	Pacific silver fir/big huckleberry/queencup beadlily
			Pacific silver fir/big huckleberry/beargrass
	subalpine fir-mountain hemlock	5	mountain hemlock/big huckleberry/beargrass
			other unclassified associations
Transition	moist grand fir	4	western hemlock/vanillaleaf
			western redcedar-grand fir/vanillaleaf
			western hemlock-grand fir/queencup beadlily
			grand fir-Engelmann spruce/starry solomonplume
			grand fir/skunk-leaved polemonium
			grand fir/chinkapin
			grand fir/vanillaleaf
			grand fir/vine maple/vanillaleaf
	dry grand fir	3	grand fir/twinflower
			grand fir/starflower
			grand fir/snowberry
			grand fir/oceanspray
Eastside	Douglas-fir	2	grand fir/elk sedge
			Douglas-fir/common snowberry
			Douglas-fir/pinemat manzanita
			Douglas-fir/oceanspray/elk sedge
			Douglas-fir/western fescue
	ponderosa pine-Oregon white oak	1	Douglas-fir/elk sedge
			ponderosa pine-Oregon white oak/antelope bitterbrush
			ponderosa pine-Oregon white oak/arrowleaf balsamroot
			unclassified Douglas-fir-Oregon white oak association(s)

Figure (4)

Surveyors Ridge Plant Series



Vegetation Series and Current Vegetative Condition

Surveyor's Ridge LSR contains the three major forest series characteristic of the eastside of the Mt. Hood National Forest that have been classified (Topik et al. 1989) as well as one forest series more characteristic of the westside (Pacific silver fir) and an unclassified subalpine series. The Surveyor's Ridge portion of the LSR also contains at least one unclassified Douglas-fir-Oregon white oak association. Doug-fir is occupying the same sites we expect to find pine-oak. Therefore, we assume that Doug fir-oak is providing the same ecological functions as pine-oak. This association has been lumped in with the ponderosa pine-Oregon white oak series in any discussions and mapping. The plant series include (Figure 4):

1. ponderosa pine-Oregon white oak,
2. Douglas-fir,
3. grand fir,
4. Pacific silver fir, and
5. subalpine fir-mountain hemlock.

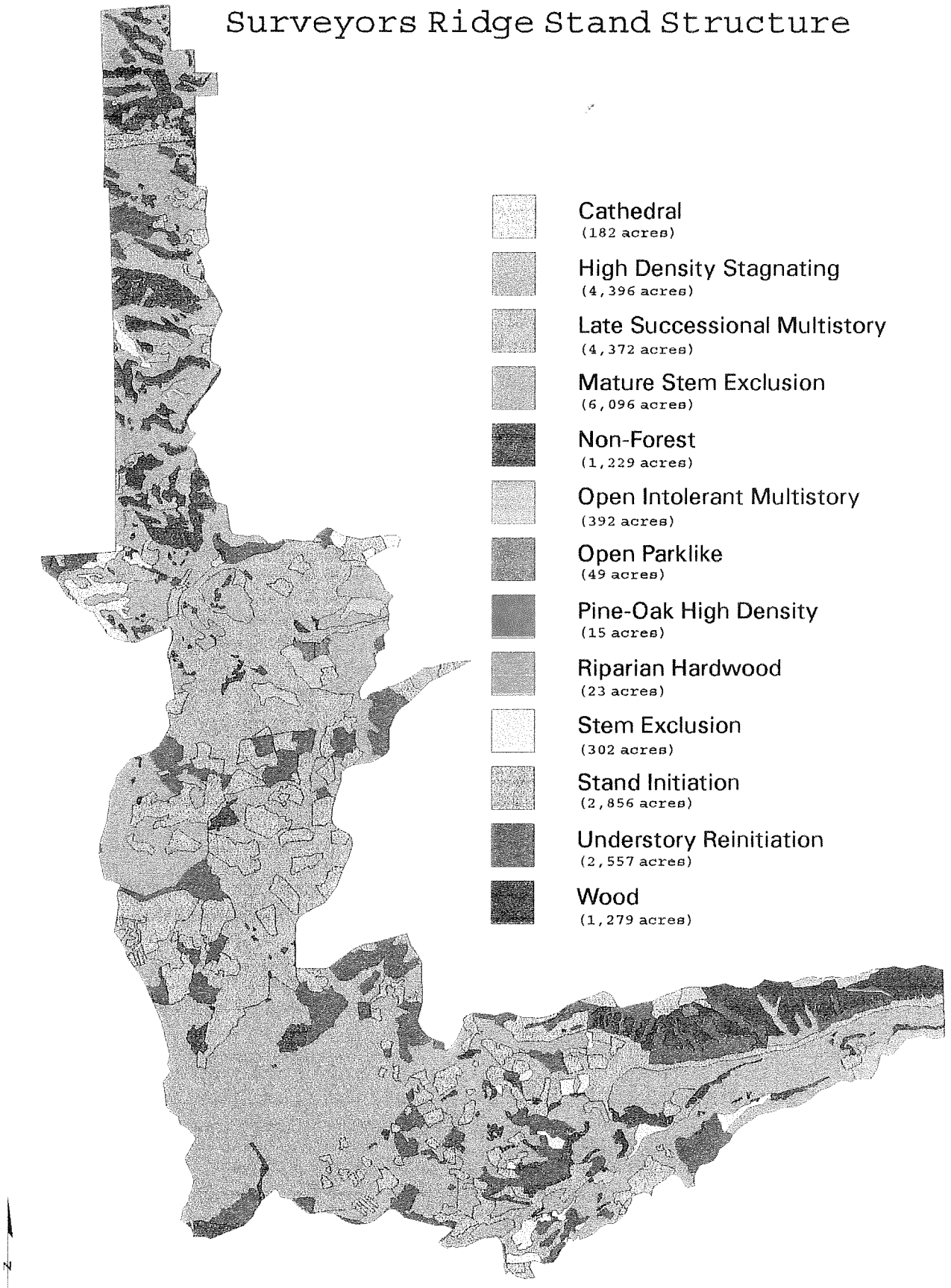
The subalpine fir-mountain hemlock series has not been classified. The LSR contains numerous areas of non-forest in the form of wet and dry meadows, rock outcrops and talus slopes, and woodlands.

Table III-2. Associations by vegetative series documented in stand exams for Surveyor's Ridge LSR.

Series	Plant Association	Number of stands
Pacific silver fir	Pacific silver fir/big huckleberry/queencup beadlily	8
subalpine fir-mountain hemlock	mountain hemlock/big huckleberry/beargrass	7
	Unclassified	31
moist grand fir	western hemlock/vanillaleaf	2
	western redcedar-grand fir/vanillaleaf	4
	western hemlock-grand fir/queencup beadlily	4
	grand fir-Engelmann spruce/starry solomonplume	7
	grand fir/skunk-leaved polemonium	15
	grand fir/golden chinkapin	5
	grand fir/vanillaleaf	12
	grand fir/vine maple/vanillaleaf	9
dry grand fir	grand fir/twinflower	26
	grand fir/snowberry	25
	grand fir/oceanspray	36
Douglas-fir	grand fir/elk sedge	10
ponderosa pine-Oregon white oak	Douglas-fir/elk sedge	11
	ponderosa pine-Oregon white oak/arrowleaf balsamroot	1

Table III-2 lists all the plant associations documented by stand exams within the LSR the stand exam info is our best current vegetation data at this time. Many stands have not been examined since the plant association guide for the eastside of the Mt. Hood National Forest was published. The stands without a documented plant association are not shown in Table III-2. In addition, we believe several stands on the Eightmile plateau were misclassified as Pacific silver fir. We show these stands as unclassified subalpine fir-mountain hemlock associations.

Figure (5)


Surveyors Ridge Stand Structure
Cathedral
(182 acres)
High Density Stagnating
(4,396 acres)
Late Successional Multistory
(4,372 acres)
Mature Stem Exclusion
(6,096 acres)
Non-Forest
(1,229 acres)
Open Intolerant Multistory
(392 acres)
Open Parklike
(49 acres)
Pine-Oak High Density
(15 acres)
Riparian Hardwood
(23 acres)
Stem Exclusion
(302 acres)
Stand Initiation
(2,856 acres)
Understory Reinitiation
(2,557 acres)
Wood
(1,279 acres)
N

We developed several descriptors of stand structure designed to deal with the existing vegetative condition and the potential variation between plant series and climate zone. The Glossary contains detailed descriptions of each structure type. Figure 5 displays where the various structure types occur as determined from aerial photography interpretation and some ground-truthing. There are five basic structure types, based on the paradigm described by Oliver and Larsen (1990):

- Stand Initiation
- Stem Exclusion
- Understory Reinitiation
- Mature Stem Exclusion
- Late Seral Multistory

Oliver and Larsen described only four types. However, we believe that a fifth stage, the Mature Stem Exclusion stage, occurs between Understory Reinitiation and Late Seral Multistory. The Mature Stem Exclusion stage can occur in two ways:

1. A stand can reach the Stem Exclusion stage and never self-thin sufficiently to allow the Understory Reinitiation stage to develop. Instead, the stand remains very dense and slowly increases in height. "Dog-hair" stands in the Crest Zone can move into the Mature Stem Exclusion stage in this manner.
2. A stand thins and moves into the Understory Reinitiation stage. Shade tolerant species tend to dominate the regeneration and grow rapidly in the shelter provided by the overstory. Eventually the understory canopy catches up with the slower growing overstory, creating a multi-aged single story stand or a weakly two-layered stand. Many stands in the Transition and Eastside zones have moved into the Mature Stem Exclusion stage following fire exclusion in this manner.

Within these basic types are several variations which we have described and named. These are considered diagnostic of specific conditions. They include:

- High Density Stagnating--can occur in the Stem Exclusion, Mature Stem Exclusion, and Late Seral Multistory structure types.
- Collapsing--same as High Density Stagnating.
- Cathedral--special case in either the Mature Stem Exclusion or Understory Reinitiation stages; a disturbance dependent old growth structure found primarily in the Transition Zone.
- Pine-Oak High Density--usually occurs in the Stem Exclusion stage in the ponderosa pine-Oregon white oak series; a stagnating stand.
- Open Intolerant Multistory--special case in the Mature Stem Exclusion and Understory Reinitiation stages in the lower Transition Zone; usually created by a combination of fire exclusion and selective harvesting.
- Open Parklike--special case in the Understory Reinitiation stage; a disturbance dependent old growth structure found primarily in the Eastside Zone.
- Woodland--special case in the Understory Reinitiation stage; open stands dominated by Oregon white oak that cannot support denser stands or many conifers and usually found at the lower limits of tree growth in the Eastside Zone.

These descriptors do not cover the riparian zone very well, the riparian hardwood stands are narrow usually not more than 1 to 2 tree heights wide, making them difficult to map at 1;24000 (see section describing riparian condition in this chapter). As a result at least two structure types present on the landscape are not mapped well if at all. These include:

- Riparian Hardwood--riparian stands dominated by hardwood species such as alder and cottonwood. Cottonwood trees can be very large, but depend on disturbances such as flooding and beaver ponding to persist on the landscape.
- Riparian Mix--riparian stands dominated by conifers in the overstory and hardwoods in the understory. Typical understory species include alder and vine maple; most often an old growth structure type found in very wet and productive sites.

The third type of riparian stand, Riparian Conifer, is generally covered by the upland stand types described above. Most riparian stands in Surveyor's Ridge do not support the Riparian Mix stand type. The Riparian Mix stand type as an old growth structure may occur in the headwaters of Dog River and Eightmile Creek, and to a lesser degree, upper Fifteenmile and Cedar creeks.

Pacific silver fir series (2465ac). These forests typically contain a high diversity of tree species, particularly in the early and mid-seral stages. Typical species include all four true fir species found on the Mt. Hood, Douglas-fir, western larch, western white pine, lodgepole pine, ponderosa pine, Engelmann spruce, and mountain hemlock. Lodgepole pine often occurs in nearly pure small patches. Ponderosa pine, grand fir, western white pine, and mountain hemlock are minor species.

The environment in this area is cold and dry, though moister than the adjacent subalpine fir-mountain hemlock series. Deep snow packs develop in winter, but summers are often very dry. Snow often begins accumulating in November. Summer precipitation is slightly more than the adjacent series due to the influence of the East Fork Hood River valley. The understory may contain very few plants. What understory is present is dominated by forbs, grasses, and sedges typical of cool environments. Shrubs are not common. Major disturbances include infrequent fire, wind, snow, and insects. Disease and timber harvesting are moderate disturbances. Flooding is a minor disturbance.

Current Condition. All of this series lies within the boundaries of The Dalles City Watershed, the primary source of domestic water for the city. A Memorandum of Understanding between the Forest Service and The Dalles limits harvesting in city watershed to 10% of the area per decade. Upper Dog River remains essentially untouched. Most harvesting in the city watershed is concentrated near road 44 below the diversion point on Dog River.

Most stands within this zone have either a Late Seral Multistory structure or Mature Stem Exclusion structure. Many stands could also be classified as High Density Stagnating within either general category. Stands otherwise in the Late Seral Multistory category have not experienced a major disturbance in over 200 years. The combination of fuel loadings and time since disturbance suggest that stands in the Late Seral Multistory stage may soon experience a stand-replacing fire.

Stands otherwise in the Mature Stem Exclusion stage are younger, but are very dense and dominated by tall thin trees highly susceptible to snow and wind breakage and windthrow. Spruce budworm and root disease appear to be the main agents of tree mortality. As the stands begin to open, many of the individual stems cannot support the typical snow pack and become bent or broken during winter. Stands adjacent to clearcuts and road edges show signs of snow breakage as well as windthrow, particularly along the lower half of road 4410. Much of upper Dog River apparently burned in 1898. Downed woody fuel loadings are beginning to increase rapidly in the High Density Stagnating stands. Some stands in the Mature Stem Exclusion stage would also burn in the same event as the Late Seral Multistory stands. The event may even originate in the younger stands if they move fully into the Collapsing stage. The probability of such an event increases during extended drought.

Clearcutting, shelterwood harvest and some thinning have occurred in recent years. Most regeneration harvests are still in the stand initiation stage. These young stands are monitored closely as they tend to

become overstocked due to natural seeding from the fringe forest around them. Many of these units have been thinned. The units to keep a close eye on are those in the "cycle" area as we can do a lot to bring conditions to what we think is appropriate while treatment cost and fuel levels are relatively low.

Subalpine fir-mountain hemlock series (2496ac). Occupies a similar environmental position as the Pacific silver fir series, but receives less summer moisture. As such, the most common tree species present include subalpine fir, mountain hemlock, lodgepole pine, Engelmann spruce, western larch, and Douglas-fir. Western white pine, ponderosa pine, grand fir, and Pacific silver fir are minor species. Noble fir apparently is absent in this series. Mountain hemlock is more common in the southern half of the series.

The understory often contains few plants. The species present are those typical of cool and relatively dry subalpine environments. Shrubs are somewhat uncommon, but more frequent than in the Pacific silver fir series. The disturbance types and levels are similar to the Pacific silver fir series, although timber harvesting has been more common.

Current Condition. This series lies just north of High Prairie and along the Eightmile Creek plateau south of road 44 and west of 4420, adjacent to the Pacific silver fir series. It is quite flat and prone to frost.. Once air drainage becomes better, the vegetation changes to either the moist grand fir or Pacific silver fir series. Virtually all of this series burned in 1898. Lodgepole pine and subalpine fir seeded in quite heavily and although several species are present, these two species dominate the stands. Lodgepole pine is a relatively short-lived conifer species, averaging only 80-100 years in closed canopy stands. Subalpine fir can live much longer, up to 250 years on average, but many trees die much earlier due to root and stem disease in dense stands.

Most uncut stands within this series are in the Mature Stem Exclusion stage generally and High Density Stagnating stage specifically. Several have begun to move into the Collapsing stage. Individual trees are mostly very thin and tall, similar to stands in the Pacific silver fir series. Spruce budworm has affected many subalpine firs and mountain pine beetle is beginning to hit the lodgepole pine. The largest snags are western larch and Douglas-fir, survivors of the 1898 event which eventually succumbed to other factors.

Clearcutting and thinning have been the most common harvest techniques in this series. Clearcuts have naturally seeded to lodgepole pine, sometimes quite heavily, but generally remain in the Stand Initiation stage. Thinned stands have moved into the Understory Reintiation stage with a variety of species regenerating. Lodgepole pine and western larch are most common.

Moist grand fir series (6238ac). This series consists of the moister half of the grand fir series from the grand fir/vine maple/vanillaleaf association through the grand fir-Engelmann spruce/starry solomonplume association. It also includes the western hemlock-grand fir/queencup beadlily and western redcedar-grand fir/vanillaleaf plant associations (Topik et al. 1988) and the western hemlock/vanillaleaf plant association (Halverson et al. 1986). These three associations only occur in riparian areas. The moist grand fir series is very diverse. Typical overstory trees include grand fir, Douglas-fir, western white pine, ponderosa pine, lodgepole pine, and western larch. Stands in wet areas also contain Engelmann spruce, western redcedar, western hemlock, and bigleaf maple. Cold spots may also have noble fir or mountain hemlock.

The understory can also be very diverse in stands with canopy gaps or young stands. Shrubs are relatively common, but forbs tend to dominate. Frequently encountered shrub species include vine maple, Douglas maple, Oregon grape, prince's-pine, little pipsissewa, baldhip rose, spirea, and Oregon boxwood. Typical forbs are those associated with moist conditions such as vanillaleaf, queencup beadlily, pathfinder, Oregon anemone, rattlesnake plantain, starry solomonplume, and trillium. Closed canopy stands often have little or no understory vegetation. Fire, insects, and disease are major disturbances. Timber harvesting has been a major disturbance outside The Dalles City Watershed. Wind and flooding are moderate disturbances. Snow is a minor disturbance factor.

Current Condition. This series lies north and east of the Crest Zone and along all perennial streams. Even though the climate zone boundaries cross the streams, the riparian areas within the Eastside Zone fall within this series. They frequently support western redcedar, western hemlock, and western white pine well into what is mapped as the Eastside Zone. Western redcedar, for example, grows along Fifteenmile Creek well east of the Forest boundary.

Late Seral Multistory stands are found between road 44 and the base of Mill Creek Buttes in The Dalles City Watershed and in the upper portion of Fifteenmile Creek. Although not mapped as such, most of these stands north of road 44 would also fall into the High Density Stagnating category. As with the Pacific silver fir series, stands in the Late Seral Multistory stage have not experienced a major disturbance in over 200 years. Grand fir dominates the understory and middle layer and is beginning to dominate the overstory. Spruce budworm, fir engraver beetle, and root disease are very active and downed woody loadings have begun to increase dramatically. Some stands have natural loadings of over 50 tons per acre. Stand conditions suggest that much of this area is set up for a large stand-replacing fire.

The remaining uncut stands fall into the Mature Stem Exclusion stage. The densest stands lie along Surveyor's Ridge and many have been mapped as High Density Stagnating. Spruce budworm, fir engraver beetle, and root disease are most active in this area of any spot in the LSR. Many of the stands in the Mature Stem Exclusion category sitting between roads 4420/2730 and just west of road 4450 had the overstory removed in the 1960s. Spruce budworm, fir engraver beetle, and root disease are present, but have not caused the high levels of mortality and damage seen north of road 44. Douglas-fir bark beetle is also active, but not epidemic. Mountain pine beetle has begun to kill most lodgepole pine patches.

Other than harvesting, the disturbance history of this series is largely unknown. We have no records of large fires since the late 1800s. A major stand-replacing fire burned sometime before 1900 (date unknown) along the Hood River valley face from just south of Shellrock Mountain to just north of Rimrock. The southern tip of this burn lies in the moist grand fir series.

Much of the western white pine was selectively removed from this series as a response to white pine blister rust. Scattered individual trees persist throughout the area. We do not know if these trees are naturally resistant to blister rust or have simply escaped infection to date. The alternative hosts (*Ribes* spp.) are relatively common.

In the last 15 years, most harvesting in this series has been clearcutting and thinning. Some shelterwoods are present. Most recent regeneration harvest units were planted to ponderosa pine, Douglas-fir, and rust resistant western white pine. Older units were planted almost exclusively to ponderosa pine. Species found in the surrounding stands have seeded in naturally. These stands are mostly in the Stand Initiation stage, although some older units have reached the Stem Exclusion stage. Thinned stands are in the Understory Reinitiation stage.

Dry grand fir series (8772 ac). This series contains the drier half of the grand fir series from the grand fir/oceanspray association through the grand fir/twinflower association (Topik et al. 1988). This group is less diverse in the overstory than the moist grand fir series, but more diverse in the understory. Typical overstory trees are grand fir, Douglas-fir, and ponderosa pine. In moister locations, western white pine, western larch, Engelmann spruce, lodgepole pine, and bigleaf maple may appear. If present, these species appear as scattered individuals often in association with seeps, springs, and similar situations. Oregon white oak becomes an increasingly more common component as conditions become drier.

Shrubs are very common in the understory. Typical species include oceanspray, vine maple, serviceberry, Oregongrape, baldhip rose, snowberry, spirea, golden chinkapin, California hazel, and manzanita. Snowbrush ceanothus can dominate on severely burned or very harsh sites. The most common forbs are those typical of dry sites and graminoids are common understory components. Since this series cannot support the high stand densities and canopy closures found in the moist grand fir series, understory vegetation is always evident. Timber harvesting, insects, and disease are major

disturbances throughout the series. Wind is a major disturbance along Surveyor's Ridge and minor elsewhere. Fire is a moderate to minor disturbance factor under current fire management practices. Flooding is usually a minor disturbance factor, but can be a major factor in riparian areas during rain-on-snow events and high density thunderstorms.

Current Condition. This series is found along most of Surveyor's Ridge, in Deadman's Gulch, and south of Fifteenmile Creek from the edge of the riparian zone to the canyon rim. It occupies the most area of any vegetation series within the LSR. Most stands are in the Mature Stem Exclusion stage, some may also fall into the High Density Stagnating stage. Fifteenmile canyon and Surveyor's Ridge itself have been left pretty much intact. The rest of the LSR has been shaped by harvesting. Much of Surveyor's Ridge burned sometime before 1900.

Harvesting is the main disturbance factor shaping current stand conditions in this series. Overstory removals occurred in almost every stand accessible by road during the 1960s. Several stands along the crest of Surveyor's Ridge were thinned in the late 1970s and early 1980s. If the dominant and co-dominant trees were slightly larger, several of these thinnings could meet the Cathedral definition. Small pockets of Cathedral stands occur on spur ridges off Surveyor's Ridge, but most are too small to map.

Harvesting since the mid-1970s has been a combination of clearcutting, shelterwooding, and thinning. Conditions within these units are very similar to the moist grand fir series with recent units still in the Stand Initiation stage, a few older units in the Stem Exclusion stage, and thinnings in the Understory Reinitiation stage. Some older clearcuts were fall burned with fairly severe fires. As a result, snowbrush ceanothus dominates many of these openings, delaying movement into the Stem Exclusion stage.

Several insects and diseases are active in this series, but the effects on stand health have been very mixed. The most common insect pests include spruce budworm, fir engraver beetle, Douglas-fir bark beetle, and western pine beetle. Spruce budworm and fir engraver beetles have mostly affected tree growth and form on grand fir, causing some top-kill and scattered mortality. Douglas-fir bark beetle has successfully attacked Douglas-fir in the denser stands. Western pine beetle is successfully attacking several individual ponderosa pines each year. Western pine beetle is the insect of most concern since large diameter ponderosa pine are scarce throughout the LSR and adjacent lands.

Root diseases have affected mostly Douglas-fir and grand fir, but has not resulted in the widespread mortality seen in the moist grand fir series. Dwarf mistletoe is probably of greater concern, mostly affecting Douglas-fir. Dwarf mistletoe is at a higher level than we believe was typical before 1870, primarily due to fire exclusion. Before Euro-American settlement, frequent fire would have pruned affected lower branches and killed heavily infected individual trees as well as maintained more open stand conditions. We believe the net result was lower levels of dwarf mistletoe infection both in area affected and degree of individual tree infection. The current levels of dwarf mistletoe contribute to an increased stand-replacing fire risk by increasing the extent of ladder fuels and the fine woody fuel loadings.

Reforestation of these areas can be challenging. Some units in this area have had several reforestation efforts made which include the use of shade cards, and gopher control. However, the amount of grass competition and the tenacity of the gophers keep stocking levels low. Natural regeneration is an important component if these units are to be successfully regenerated. Grand fir is the most likely species to seed itself into these areas. It is not the most desired species, due to the fact it tends to over stock an area using the limited resources that are available , creating stands that are susceptible to risk factors, such as insect and disease, and thereby building up the fuel loadings, creating a risk of large scale fire. Grand fir also modify the micro climate and improve the stocking levels of the units, making them available for other plants and several types of wildlife to use, that would not likely use these areas in there present condition.

Douglas-fir series (764ac). This group is generally limited to dry sites at mid- and lower elevations. Sites at mid-elevations tend to be rocky or cobbly with well drained soils. If not for the poor soil moisture

holding capacity, such sites would usually support the dry grand fir series. At lower elevations, it typically occurs on sites with slightly more moisture or better moisture holding capacity than adjacent sites. Characteristic locations in this case are intermittent streams and sheltered draws on south and west aspects. This series can occur on all aspects. The primary overstory conifers present are Douglas-fir and ponderosa pine. Moister sites can support grand fir. Young stands or more open stands contain Oregon white oak.

The understory is similar to the dry grand fir series in terms of species composition. Grasses become an important understory component, mostly consisting of fescues, elk sedge, pinegrass, and bromes. Common forbs include miner's lettuce, sweet-cicely, bigleaf sandwort, penstemons, yarrow, and hawkweeds. Shrubs tend to be less common than in the dry grand fir series, consisting mostly of snowberry, baldhip rose, oceanspray, Oregongrapes, serviceberry, greenleaf manzanita, and ceanothus. Insects are the major disturbance factor acting in this series at present. All other disturbance factors tend to be minor. See flooding comments in dry grand fir.

Current Condition . Much of this series occurs as stringers in intermittent streams north of Fifteenmile Creek, a fringe along the eastern edge of the Transition Zone and the Fifteenmile Creek canyon rim and road 4421-131. The only documented disturbances affecting entire stands have been timber harvested. All stands along the rim and most, if not all, stands along the edge of the Transition Zone had the overstory removed in the 1960s. The stringer stands have not been harvested at all and have been mostly affected by fire exclusion. Only a few stands have been clearcut or thinned within the last 15 years.

This series is a mix of Open Intolerant Multistory, Mature Stem Exclusion, and Understory Reinitiation. Recent clearcuts fall into the Stand Initiation stage, the one or two older clearcuts into Stem Exclusion, and thinnings into Understory Reinitiation. Some stringer stands were underburned in the early 1980s, pushing them into Understory Reinitiation. These stands may also fall into the Cathedral structure, but must be ground-verified.

Insect and disease problems in this series are similar to those in the dry grand fir portion of the Transition Zone. Western pine beetle is probably the main insect of concern, due to loss of large diameter ponderosa pine. Dwarf mistletoe in Douglas-fir is probably the main disease on concern.

Ponderosa pine-Oregon white oak series (1561ac). This group is found at and near lower timberline (Grass/Forbs). Conditions are very harsh and only two tree species are typically found: ponderosa pine and Oregon white oak. In some areas, even ponderosa pine cannot grow except as scattered individuals. We call these areas oak woodlands. Douglas-fir can appear in moister microsites. On Surveyor's Ridge, Douglas-fir apparently replaces ponderosa pine in this series, resulting in an association similar to what is found in the Willamette Valley. We believe this association is considerably drier than the Willamette Valley association. We do not understand the lack of ponderosa pine on these sites.

Shrubs are common but tend to be limited. Typical species are those associated with dry environments such as deerbrush ceanothus, mahalia mat, antelope bitterbrush, and mazanita species. Snowbrush ceanothus and Oregon white oak apparently do not grow together, so this species is virtually absent. The understory in this series tends to be dominated either by antelope bitterbrush or forbs and grasses. Typical forbs include yarrow, arrowleaf balsamroot, hawkweeds, taper-tip onion, lupines, lomatiums, shootingstars, and blue-eyed grasses. Common grasses include various bromes and fescues, prairie Junegrass, bottlebrush squirreltail, wildrye, bluegrasses, and needlegrass. Dense, overstocked stands of young ponderosa pine may contain only needles and scattered remnants of the grass forb understory. In extreme cases, the trees have stopped growing. This series also tends to contain the highest populations of non-native plants such as thistle, knapweeds, and cheatgrass. The disturbance factors at present are similar to the Douglas-fir series.

Within each series, stand exams show that one to four plant associations tend to dominate. For example, within the moist grand fir series the grand fir/vine maple/vanillaleaf and grand fir/vanilla leaf

appear most often. In the dry grand fir series grand fir/oceanspray, grand fir/snowberry, grand fir/elk sedge, and Douglas-fir/elk sedge are most common. In the ponderosa pine-Oregon white oak series only the ponderosa pine-Oregon white oak/arrowleaf balsamroot association is found.

Current Condition. This series falls mostly north of Fifteenmile Creek between the Forest boundary and road 4450. It also occurs as a special habitat in other climate zones. Along Surveyor's Ridge, the stands are Douglas-fir-Oregon white oak. This series occurs on very harsh sites, so most stands fall into the Woodland structural stage. Denser stands at the heads of intermittent streams and an occasional small stand may fall into the Pine-Oak High Density stage. More of this series occurs just beyond the edge of the LSR north and south of Fifteenmile Creek. These stands within the LSR have had little or no harvesting; most are classified as unsuitable for timber management.

Root disease and dwarf mistletoe are present, but only of minor concern. Mountain pine beetle may attack smaller diameter ponderosa pine in some high density stands, but no specific problems have been identified within the LSR. Western pine beetle is the main insect of concern, due to the scarcity of large diameter ponderosa pine within both the LSR and adjacent lands.

Footnote: Most of the LSR has had some vegetation management recently or in the past. The Dalles City Watershed and Surveyor's Ridge have had the least amount of timber harvesting. In general, portions of the Eastside Zone were harvested first during the settlement era to construct homes, outbuildings, and fences. Well before 1900, several sawmills were built either within or close to the LSR.

Old Growth Structure

Chapter B of the Northwest Forest Plan Record of Decision contains a section titled Ecological Principles for Management of Late-Successional Forests (ROD 1994). This section describes the typical structure and composition, ecological processes, and ecosystem functions of old Douglas-fir forests. Only some of the most general descriptions apply to Surveyor's Ridge LSR and mostly to the Crest Zone and moist grand fir series of the Transition Zone.

We identified three characteristic old growth structures within the LSR:

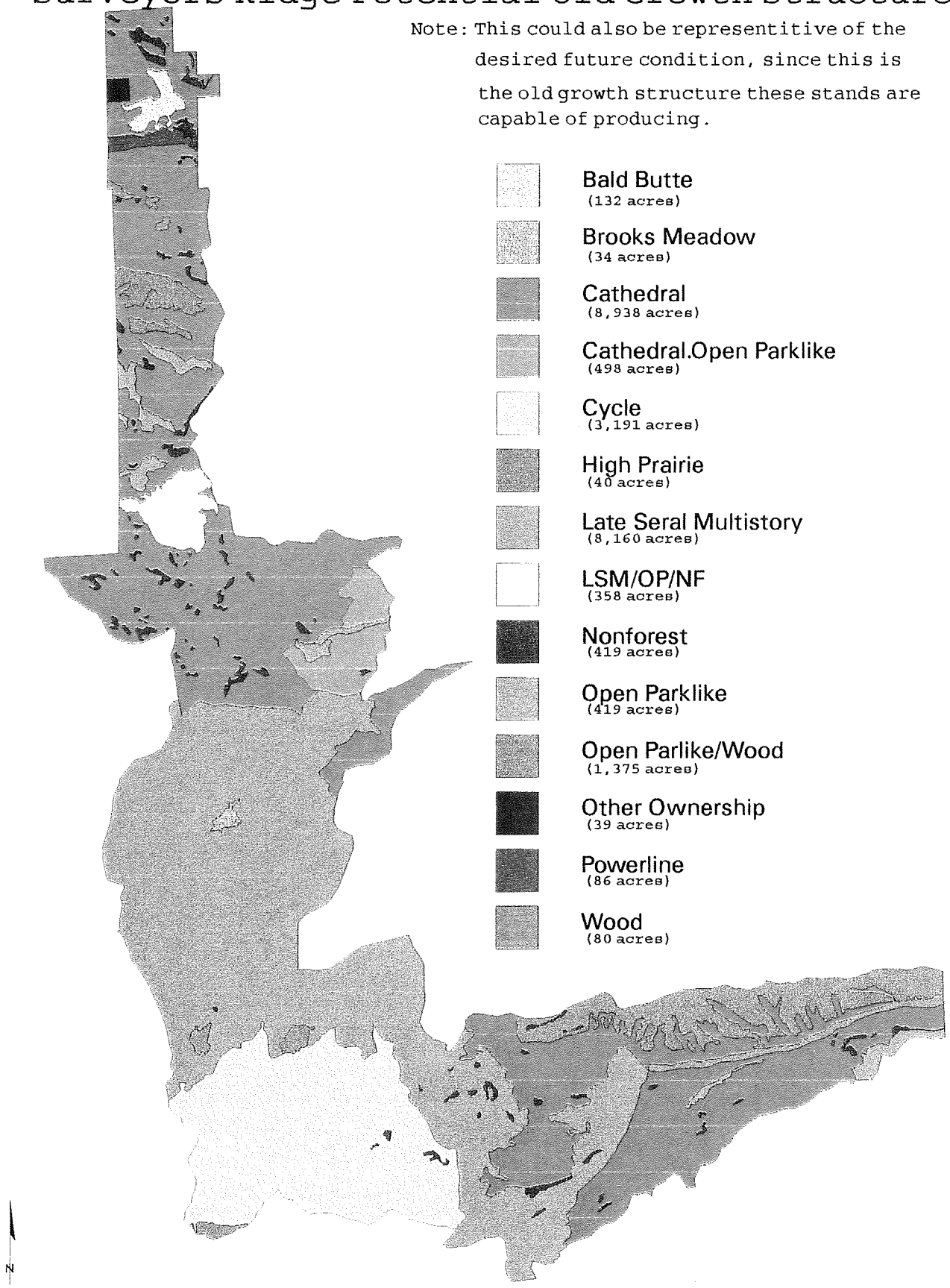
Late Seral Multistory - Two and three-layered stands dominated by shade intolerant species in the top canopy. Total canopy closure ranges from 60-100%. Overstory layer consists of a mix of shade intolerant and shade tolerant species usually greater than 20" DBH with a canopy closure of 50-80%. Midstory layer consists mostly of shade intolerant species 5-19" DBH with a canopy closure of 10-30%. The understory tree layer consists of mostly shade tolerant species less than 5" DBH with a canopy closure of 10-30%. Stand is somewhat broken with small openings that support tree regeneration, shrubs, and forbs. Sun flecks common. Large downed wood loadings variable but can be quite high with numerous large downed logs and trees. Dependent on endemic levels of insect and disease to create. Primarily found in the Crest Zone and in the moist grand fir series in the Transition Zone.

Cathedral - Semi-open to semi-closed stands dominated by large, widely spaced trees. Overstory trees are mostly shade intolerant and fire resistant species and 20" DBH or greater. Tree crowns nearly touching to just overlapping. Canopy closure ranges from 40-80%. Canopy either single layered or weakly two-layered and vertically stratified. If tree regeneration is present, then composed of a mix of shade intolerant and shade tolerant species generally less than 5" DBH and canopy closure less than 25%. Understory dominated by grasses, forbs, or shrubs. Dependent on semi-frequent underburning to persist. Primarily found in the Transition Zone and may be found in the Douglas-fir series in the Eastside Zone.

Open Parklike - One or two-layered multi-aged stands with a canopy closure of less than 40%. Dominated by ponderosa pine in Mile Creeks and Mill Creek watersheds and Douglas-fir on Surveyor's Ridge. If Oregon white oak is present, then stand is considered two-layered. Grand

Figure (6)

Surveyors Ridge Potential Old Growth Structure



fir may be present, but no other conifer species. Stands consist of even-aged clumps of conifers and clumps to scattered individual conifers and oak of varying ages and sizes. All age classes/structure types of conifer are present, but large trees (20" DBH and greater) appear to dominate. Understory of grass and forbs, or grass, forbs, and shrubs. Very light downed wood loadings and few large downed logs or trees. Dependent on frequent underburning to persist. Primarily found in the Eastside Zone and around balds on Surveyor's Ridge.

Figure 6 depicts where we expect these old growth structures would typically occur. In addition to non-forest areas, the figure also shows Woodlands and Cycle. Woodlands are areas dominated by Oregon white oak that are not dense enough or tall enough to be considered forest in the usual sense. Canopy closure varies by season, since Oregon white oak is deciduous. If a conifer is present, maximum canopy closure is usually less than 25%. If only Oregon white oak is present, maximum canopy closure is less than 40%.

The Cycle area is a special case, particularly since it involves a process and not a particular structural stage. Based on the species present and vegetation changes after regeneration harvesting, we believe that this area does not produce an old-growth stand between stand-replacing disturbances. The Cycle area last burned in 1898. Many uncut stands are starting to collapse from the combination of insect and disease related mortality, snow, and wind. Once insects and disease kill a significant number of trees, snow and wind combine to accelerate the collapse. Once a stand collapses and opens, the downed wood and duff dry out earlier in the summer. Enough fine fuels are present to allow a fire to start and spread. Most clearcuts have naturally seeded in with lodgepole pine, a short-lived species. Subalpine fir is also a major stand component. While a long-lived species in open stands; in closed stands subalpine fir usually succumbs to insects and disease at an early age. The area is setting up to support another stand-replacing fire.

Based on the current conditions and ecologically similar areas elsewhere in the Intermountain West, we suspect this area burns every 100-125 years. Some trees of all species obviously survive the fire to provide seed for the next stand. Western larch and Douglas-fir may be able to survive more than one cycle, based on the size of snags and fire scars. Stand-replacing fires rarely burn everything in their path. Instead unburned islands and stringers often remain and even individual trees of all species survive at least long enough to cast seed.

If what we suspect is true, then the Cycle area does not produce old growth or late successional forest. At best, it makes it only to the Mature Stem Exclusion stage, moves into the High Density Stagnating stage, and then Collapsing. As such, the Cycle area does not provide habitat for late successional associated species typically found in lower subalpine forests. It probably provides some marginal habitat, particularly around the edges, and dispersal habitat. A 100-125 year burn cycle may also partially explain the low levels of noble fir in the Cycle area. The probable fire return interval may not be long enough to allow noble fir to establish much beyond the edge of the Cycle area due to its heavy seed and slow rate of spread.

Ecological Processes

The Northwest Forest Plan briefly discusses the ecological processes believed to lead to the development and maintenance of late successional and old growth forests. Five stages leading to old growth Douglas-fir forests are described and Late Successional Reserves are intended to focus on the last three stages--maturation, transition, and shifting gap. The stages described best fit in the Crest Zone and somewhat fit in the moist grand fir series of the Transition Zone where Late Seral Multistory stands form the characteristic old growth structure. The differences are that the time scale involved is much reduced and little time is spent in the shifting gap stage before the next stand replacement event. We believe the Cycle area does not move past the maturation stage.

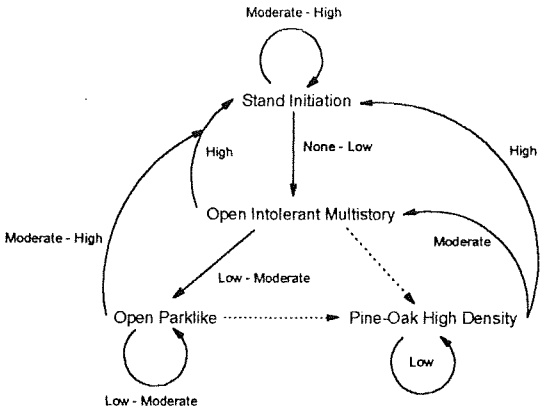
These processes, as described, do not fit the Transition and Eastside zones where the characteristic old growth structure is either Cathedral or Open Parklike. We believe that before Euro-American settlement

these areas typically did not experience stand replacing events. Therefore the stages described, with the exception of shifting gap, are stages of individual tree or small group development rather than stand development. The stages described also presume a closed canopy forest. Cathedral stands vary in canopy closure, with the possibility of a closed canopy stand increasing as available moisture increases. Thus Cathedral stands tend to be more open canopy at the dry end of the Transition Zone (i.e. in the grand fir/oceanspray plant association) and more closed canopy at the moist end (i.e. grand fir/chinkapin plant association).

Figures X1-X4 depict the general successional pathways of various parts of Surveyors Ridge LSR. Dashed lines indicate which structure types follow another in the absence of large-scale disturbance. Solid lines indicate the probable pathway following a disturbance of a certain intensity, or severity. In these diagrams the adjectives low, moderate, and high relate to the amount of live basal area removed or reduced by the disturbance, although these amounts have not been quantified.

Figures X5-X8 depict how we think the numbers of large snags and large downed logs change over time across the landscape. These are conceptual diagrams based on observations in several different areas over a number of years by a number of people involved in this analysis. As far as we know, there is no research to support these diagrams. The diagrams actually depict how snag numbers change; however, downed logs come from the snags and should reflect this same general pattern offset in time. It is important to recognize that these diagrams represent landscape level patterns. The numbers of large snags and downed logs can fall to zero for an unknown period of time on any given acre or stand at any point in time. A mean number of snags and downed logs theoretically could be calculated from these diagrams. However, the fluctuation, or variation, around that mean is very different, with high variation in Late Seral Multistory and Cycle systems, and low variation in Open Parklike systems.

Figure X-1

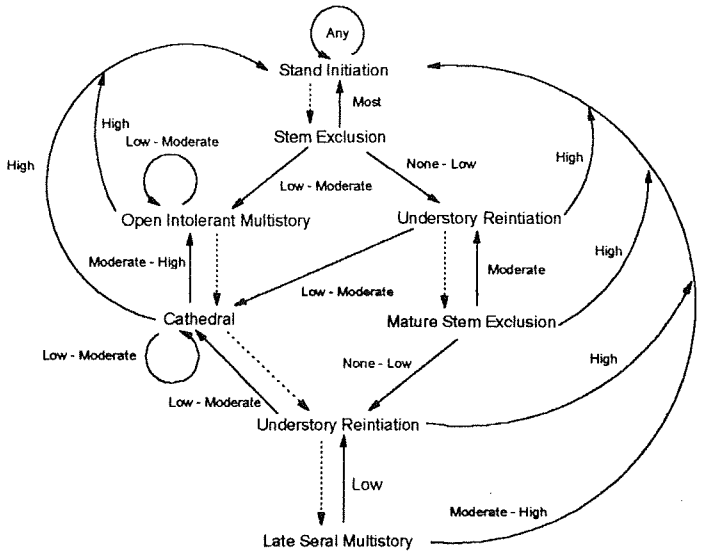


Expected Successional Pathways: Open Parklike

Pathway with no disturbance

Pathway with specified intensity of disturbance

Figure X-2

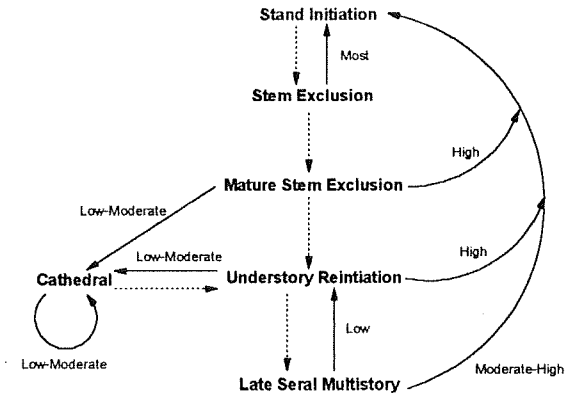


Expected Successional Pathways: Cathedral

Pathway with no disturbance

Pathway with specified intensity of disturbance

Figure X-3

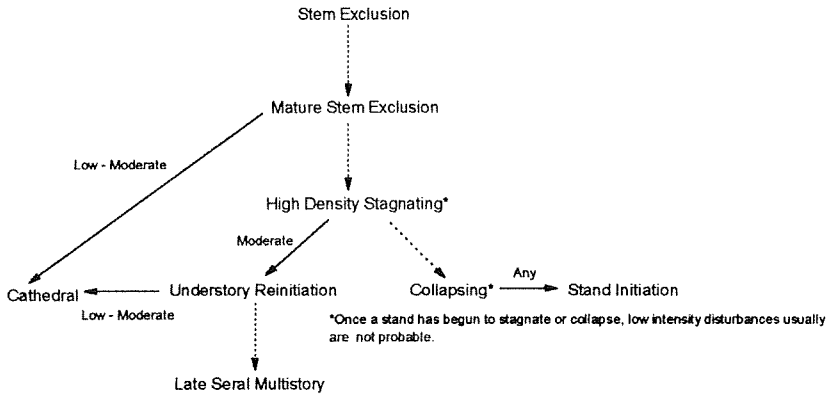


Expected Successional Pathways: Late Seral Multistory

Pathway with no disturbance

Pathway with specified intensity of disturbance

Figure X-4



Expected Successional Pathways: Cycle Area

Pathway with no disturbance

Pathway with specified intensity of disturbance

Figure X-5

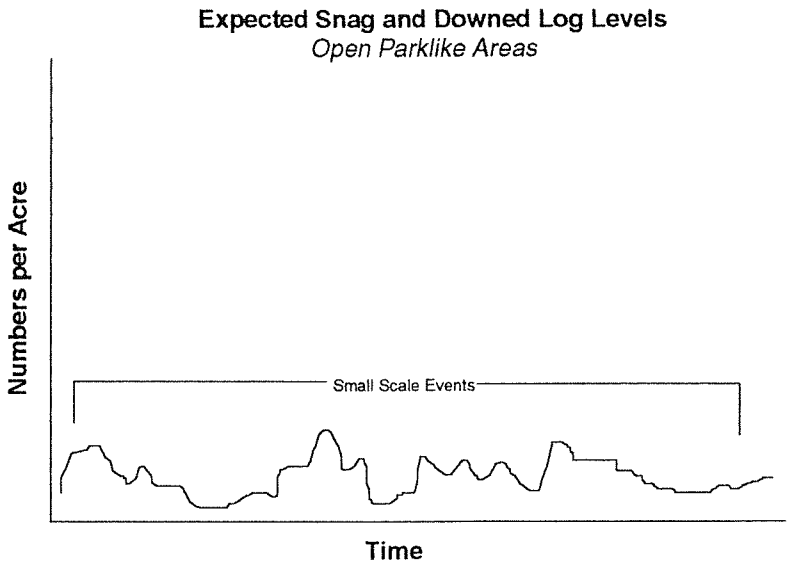


Figure X-6

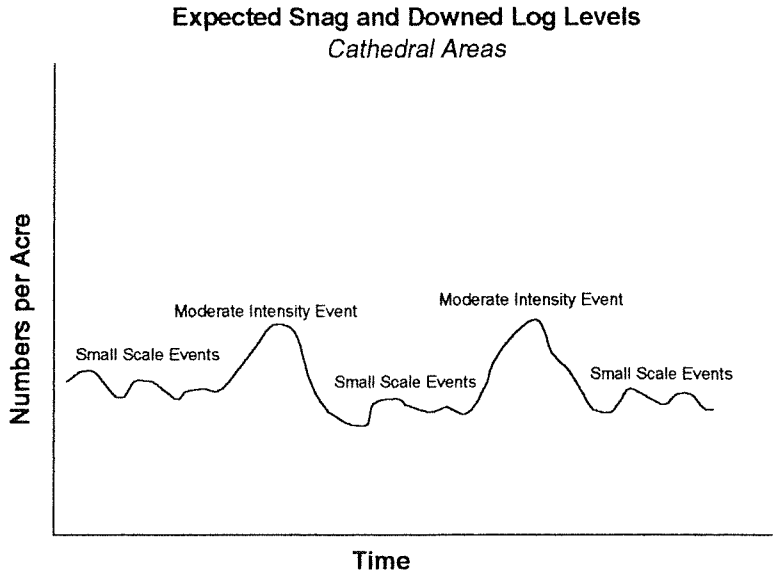


Figure X-7

Expected Snag and Downed Log Levels

Late Seral Multistory Areas

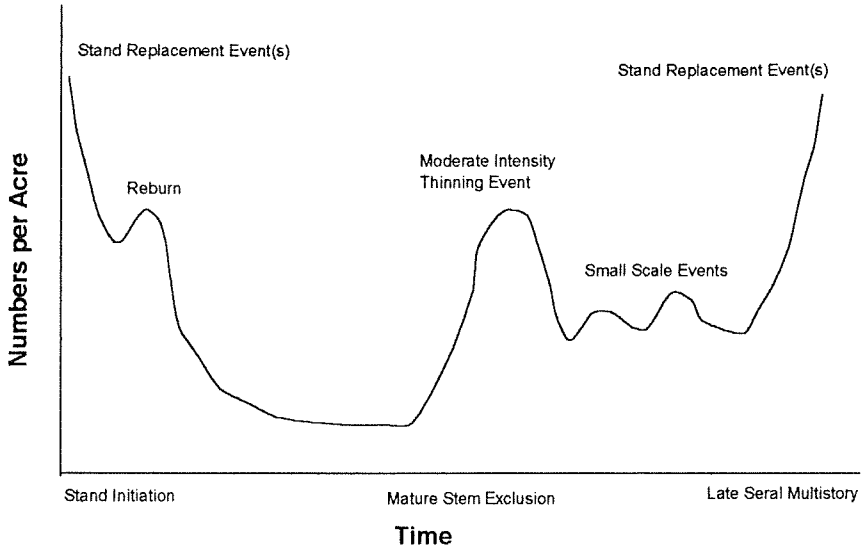
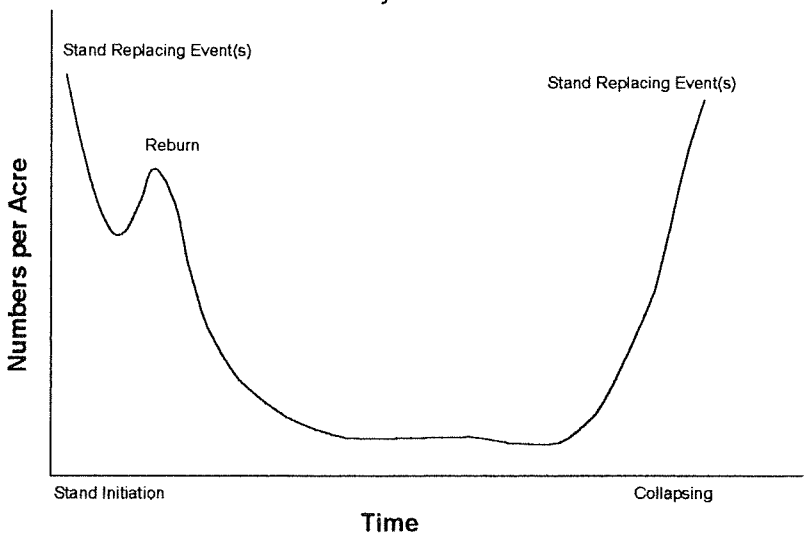


Figure X-8

Expected Snag and Downed Log Levels

Cycle Area



Down Wood

Coarse woody debris, or downed wood, is a very important component in any ecosystem, as has been recognized by the land management plans governing this area. Unfortunately, the downed wood recommendations and requirements vary greatly by plan and discipline and often use inconsistent units of measure. The Northwest Forest Plan states that province-level plans will establish appropriate levels of downed wood and decay rates and that levels will be "typical" and not require retention of all material where it is highly concentrated or too small to contribute to the downed wood functions over long periods of time. Surveyor's Ridge falls in the Deschutes Province. No province level plan is available.

In the absence of a province level plan, we examined the standards and guidelines and recommendations for the Mt. Hood Forest Plan, Northwest Forest Plan-Matrix lands, and Miles Creek Watershed Analysis (Tables III-3 and III-4). The Northwest Forest Plan recommendations for downed wood apply only if the Forest Plan standards and guidelines require less material than the Northwest Forest Plan. The Northwest Forest Plan also states that the standards and guidelines within it are interim guidance. Further refinement for specific areas, if derived from planning based on watershed analysis and the adaptive management processes, is allowed and encouraged (ROD pg C-41).

It is hard to determine whether the Mt. Hood Forest Plan or the Northwest Forest Plan provides for the greater amount of downed wood. The Northwest Forest Plan recommends a larger number of logs while the Mt. Hood Forest Plan requires larger sized logs. The various measure cannot be compared directly, particularly since the point of measure for diameter is not specified in the Northwest Forest Plan. The resulting log size and weight can vary greatly if the specified diameter is on the small end verses the large end.

The downed wood recommendations in Miles Creek Watershed Analysis are greater than either the Mt. Hood Forest Plan or the Northwest Forest Plan. However, these recommendations are based on data taken primarily on the westside. The eastside does not produce logs of the sizes and amounts specified except in very productive locations. Further, the series lumped under the Mixed Conifer category vary tremendously in their productive capability. In addition, studies in the Northern Region (Montana and Idaho) have shown that stand size class, a substitute for stand age, is a poor predictor of the number of downed logs to expect (Brown and See 1981). Few or no logs may occur for some period of time in any age class/stand size.

While not specifically stated, the Northwest Forest Plan does appear to recognize that downed wood input into the ecosystem is usually episodic in nature, rather than continual. We believe that downed wood input is more episodic in the Crest Zone and the moist grand fir series of the Transition Zone and more continual, but at low levels in the dry grand fir series of the Transition Zone and in the Eastside Zone.

Table III-3. Downed wood recommendations from forest planning documents.

Source	Amount	Specifications	Remarks
NW Forest Plan	120 lineal feet per acre	At least 16" diameter and at least 16 ft long; Decay classes 1 and 2; should reflect species mix of original stand	Approximately 8 logs per acre and 3 tons per acre. Existing debris should be retained and protected as much as possible from disturbance due to stand treatment.
Mt. Hood Forest Plan--Soils	15 tons per acre; or at least 80% of naturally occurring levels on sites incapable of producing 15 tons		Evenly distributed, includes material of sufficient size to meet wildlife specifications
Mt. Hood Forest Plan--Wildlife	At average of 6 logs per acre	At least 20" diameter at small end and 40 cubic ft in volume (ex. 20" by 16 ft); Decay classes 1, 2, and 3 preferred. Decay classes 4 and 5 may be substituted if sounder classes are not available.	Smaller sized logs allowed only if stand incapable of producing specified size or stand is too young to have 20" trees. No area greater than 2 acres in size and capable of growing sufficient trees should be without at least 2 logs.
Miles Creek Watershed Analysis	Varies by vegetation series.	At least 21" diameter and 16 ft long, Decay classes 1, 2, and 3	
White River Watershed Analysis.	Eastside zone: 3-13 tons per acre. Transition zone: 10-20 tons per acre. Crest zone: 25-50 tons per acre.	Eastside zone: at least one tree-length log per acre. Transition zone: at least three tree-length logs per acre. Crest zone: at least five tree-length logs per acre.	We are assuming in all zones trees are 20" DBH and at least 100' long.

Where downed wood is more episodic, its creation tends to occur at certain times (see figures X5-X8). The first episode occurs during and immediately after stand replacement from fire, insect and disease epidemics, major windstorms, and so forth. A portion of this input may be lost in the event of a reburn, which may be necessary in order to allow adequate restocking of the replacement stand. In the event of a reburn, another episode or downed wood input happens, but since this material is typically smaller in diameter and contains more sapwood, it rots more quickly than much of the downed wood created in the original event.

The next episode may occur in the Stem Exclusion stage, primarily due to direct competition for moisture, nutrients, and light. This competition reduces individual tree's ability to resist insect and disease attack, potentially allowing an epidemic to occur. Again, this material tends to be small in diameter and contains a high proportion of sapwood, so does not persist. Some surviving legacy trees from the stand replacement event may also begin to die in the Stem Exclusion stage. Since these logs would be from large diameter trees of species more subject to brown cubical rots and with a low proportion of sapwood, they can persist on the landscape for many decades. Another episode of downed wood input may occur in the Mature Stem Exclusion stage, from similar reasons as in the Stem Exclusion stage. However, since more of the dying trees are larger diameter with a low proportion of sapwood, these snags and logs will tend to persist. The final episode occurs in the Late Seral Multistory stage as the entire stand begins to break up and a new stand replacement event begins.

Where downed wood input is more continual, its creation is related more to frequent fire and endemic levels of insects and disease. Frequent fire serves to maintain spacing between trees of both the same and different species, reducing competition. In these areas, below ground competition for moisture and nutrients is probably more intense and critical than above ground competition for light. Occasionally fire, insects, or disease will kill individual trees or small groups, resulting in snags and downed logs over time. However, the frequent fire also means than downed wood often does not persist, rather it eventually burns up.

On Barlow Ranger District, almost no soil wood is found in the ponderosa pine-Oregon white oak series and little is found in the Douglas-fir series. Soil charcoal is abundant in the Douglas-fir and dry grand fir series and less so in the ponderosa pine-Oregon white oak series. The moist grand fir series and Pacific silver fir series tend to contain significantly more soil wood than soil charcoal. The subalpine fir/mountain hemlock series tends to be more of a half-and-half mix of soil wood and soil charcoal.

Fire Groups

Fire Groups similar to those developed for the Intermountain West have also been described for the Mt. Hood National Forest. Each group is intended to reflect a particular fire regime, which incorporates average fire return interval, characteristic fire behavior and fire type before Euro-American settlement, and vegetation response along with several other factors. The Fire Groups present correspond to the vegetation series described (see Table III-1). The Fire Management Plan discusses Fire Groups in detail.

Function Within the LSR Network for Dispersal, Recruitment, and Refugia, and Relations to Adjacent Lands

The availability of data limits landscape level discussions between LSRs to data provided through the "HABSCAPES" -- Interpreting Landscape Patterns: A Vertebrate Habitat Relationships Approach, model created by Kim Mellen, Mt. Hood/Gifford Pinchot National Forests, wildlife ecologist; Mark Huff, Pacific Northwest Research Station, wildlife/forest ecologist; and Rich Hagestedt, Mt. Hood National Forest, forest analyst.

Within the model, species are assigned to species guilds based on expected responses to different amounts and distributions of habitat across the landscape. Specifically, home range size, patch configuration use, and general habitat use (stand scale) were used to group species. The guilds are then linked to the vegetation database for the Mt. Hood National Forest.

The "HABSCAPES"model uses vegetation structure components of open, small tree, large tree and contrast. The Surveyor's Ridge LSR vegetation analysis consists of components such as stand initiation through late-seral tolerant multistory. The vegetation criteria used to determine large tree habitat within "HABSCAPES" [TSPLT, TMMLT and, TLMLT. See appendix K] appears to be similar to the older forest

[MSE - Mature Stem Exclusion, C - Cathedral, LS - Late Seral Multistory] used within the analysis area. Discussions with other biologists on the Mt. Hood National Forest indicates this information seems reasonably accurate for areas west of the Cascade Mountain's crest but does not fit east of the crest where the habitat availability and use by late-successional species might be under predicted. Within the analysis area, vegetation was assigned to various structural stages from stem initiation through late-seral tolerant multi-story. The actual structural stages used to determine habitat suitability were based upon known occupancy of such habitat by many of the late-successional associated species within the analysis area. **Appendix A** lists the species, their guild and structural stages they are considered to occupy within the analysis area.

Of the 18 terrestrial guilds listed, only three, TSPLT, TMMLT, AND TLMLT; are closely tied to the large tree habitat (late-successional) habitat. A species of some concern, which is not well represented by guild categories is the white-headed woodpecker. Being represented by the TMGG guild which can use any structural class, seems to over predict habitat for this mostly large ponderosa pine dependent species, therefore it will be addressed separately and as a representative of any other species that may need the open multi-story and open park-like stands of ponderosa pine/oak, ponderosa pine, and ponderosa pine/Douglas fir associations that are virtually absent from the landscape. Another set of species not well represented within the HABSCAPES guilds are any that may need interior forest habitat. Review of the analysis area, shows the TLMLT guild is a relatively close match of the amount of interior forest habitat available, however our site specific interior habitat map is more accurate to the specific location within the LSR. Therefore interior forest habitat will be addressed separately within the analysis area, and the TLMLT guild will be used to address interior forest habitat outside the analysis area and connectivity issues.

1. The TSPLT (terrestrial, small home range, large tree patch) guild represents the northern flying squirrel, shrew-mole and red tree vole of which only the flying squirrel is a known resident. These species typically have their primary or secondary use is in only 1 major structural category; or their primary use is in only 1 major structural category and secondary use in just 1 other major structural category. Home range size is considered 52 acres for this guild with at least 50% of the home range in large tree patches of at least 4.8 contiguous acres. In general, these species do not easily cross openings or other habitats not meeting late-successional criteria.

Total availability of habitat for TSPLT species within the LSR is relatively well distributed according to the "HABSCAPES" analysis and when using the structural stages identified as suitable habitat for eastside conditions (see vegetation criteria previously discussed following the guide classification), except for west Marion (as part of the cycle area), Dog River, and Eightmile Plateau landscape units (LUs) . However, major refugia exist within all the other landscape units, with over 50 percent of the landscape with patches exceeding 4.8 acres in size and with good connectivity north-south and east-west across the LSR. There are some connectivity gaps especially in Surveyor's Ridge LU where the habitat is in strips, and in Marion, Dog River, and Eightmile Plateau LUs where little habitat is available. The 15 Mile North and 15 Mile South LUs are all within plant associations that naturally would be dominated by ponderosa pine and Douglas fir in an open multi-story to open park-like structural condition. Active management (or long term natural fire frequency) in these drier LUs to reduce the high stocking of understory white fir and/or Douglas fir would not produce stands suitable for the TSPLT guild. However, such species as the white-headed woodpecker would be greatly benefited by such "management".

Outside the LSR, but within the analysis area, habitat is much more fragmented with the Mosier, Neal, Rameight and 5 Mile LUs exhibiting the greatest fragmentation and least habitat (figure 7). However, even within these, there is fair connectivity of habitat. Riparian corridors account for a significant portion of the habitat and connectivity within these fragmented landscape units, therefore the corridors are often narrow and occasionally have small gaps. As much as we know the riparian corridors are in relatively good-condition and functioning as corridors. Riparian Habitat conditions are discussed later in this chapter.

Only the "HABSCAPES" model is available for analysis of the adjacent LSRs and reserved areas and is expected to underestimate late-successional habitat availability east of the Cascades. However general

Figure (7)

Landscape Units For Miles Creek Watershed and Surveyors Ridge

knowledge of the adjacent LSRs and reserved areas is used to supplement the HABSCAPES information.

The Badger Creek Wilderness area lies immediately to the south of the LSR (see figure 10), this might be expected to be a connecting link and additional late-successional habitat for the White River-Douglas Cabin-Surveyors Ridge LSR complex which skirts the east side of Mt. Hood. However, the majority of late-successional habitat in the Badger Creek Wilderness is found in the east half which functions as a connecting link to the Douglas Cabin LSR. The Douglas Cabin LSR and the east half of the Badger Creek Wilderness and the lower elevations of the Surveyors Ridge LSR are relatively dry and are more conducive to open forested structure such as open multi-story or open park-like dominated by ponderosa pine or ponderosa pine-Oregon white oak plant associations. Much of that area has high densities of grand fir and Douglas fir in the middle and understory layers, creating high competition for moisture and a high risk of catastrophic loss due to fire or insect epidemic, with significant mortality already occurring. The most direct connecting link between the White River LSR and the Douglas Cabin LSR is the Threemile Creek riparian corridor within matrix lands just south of the Badger Creek Wilderness area. Another less direct link, also exist through the Douglas Cabin LSR.

TSPLT guild will occasionally use a denser stand until a fire or other natural conditions change it and the critters move on. The Surveyors Ridge LSR has some drier landscape units (LU) such as 15 Mile North and portions of 15 Mile South. These LUs are not capable of sustaining stand densities associated with the TSPLT guild through time. Open multi-story and open park-like stand structure are probably about the most dense stand structures that nature will allow over the long term within these two landscape units. The south half of Dog River and Eightmile Plateau are in a cycle mode where vegetation is relatively short lived (<150 years old) before starting over again. The best connecting link between the Surveyor's Ridge and White River LSR's, (and virtually the only contiguous habitat) for TSPLT species is the highway 35 corridor along the west edge of the Badger Creek Wilderness area. This area is "protected" by a scenic viewshed corridor with habitat very similar to that found in the White River LSR which it ties directly into. This corridor has had minimal harvest activity. The plan is to maintain it as a natural appearing landscape.

Connectivity of the White River LSR with the Roaring River LSR, appears to be mostly through two "corridors". A narrow and somewhat fragmented link appears to follow the Salmon River connecting the Roaring River LSR with the Salmon River Wilderness area. The most contiguous link with the Roaring River LSR/Salmon River Wilderness/Still Creek LSR complex appears to be through the White River LSR mostly associated with riparian habitat , and scenic allocations associated with the highway 26 corridor, views from Timberline Lodge, or Frog and Clear Lakes. This "link" connects with habitat associated with Little Crater Lake and Timothy Lake and bald eagle management areas associated with Timothy Lake. A third corridor may also exist through the White River LSR and the Still Creek LSR, but it is at relatively high elevation and appears to have some significant breaks and fragmentation associated with the Government Camp recreation complex. A potential link also occurs through the Warm springs Indian reservation through the White River LSR to habitat within the Stony creek drainage south via habitat surrounding Clackamas and Timothy lakes. Suitability of the habitat within the reservation is not well known, but review of the selected allocations within their management plan and general knowledge of the area in question, indicates this link probably does exist, but is somewhat fragmented.

2. The TMMLT (terrestrial, medium home range, large tree mosaic) guild represents the black-backed woodpecker (known resident) and three-toed woodpecker (suspected resident). Woodpeckers are opportunistic as you get mortality in the stand. The TLMLT (terrestrial, large home range, large tree mosaic) guild represents the northern goshawk, pileated woodpecker, wolverine, marten, fisher, northern spotted owl and barred owl, all of which are known residents, or suspected to occur with a high likelihood of presence. These species typically use the same structural classes as the TSPLT guild. However, home range size is considered from 500 to 3000 acres for these guilds with at least 50% of the home ranges in large tree patches of at least 20 to 40 contiguous acres. In general, these species do cross openings or other habitats not meeting late-successional criteria, although some form of cover may be

necessary to provide a degree of security for such species as the marten, fisher and northern spotted owl.

Total availability of habitat for TMMLT and TLMLT guild species within the LSR is low to very low according to the "HABSCAPES" analysis, with connectivity (dispersal) poor. However, somewhat fragmented refugia exist within the Mill Creek Buttes, north half Dog River, 15 Mile South and portions of Surveyor's Ridge LUs for both guilds.

Habitat availability for TMMLT and TLMLT species within the LSR is still not good when using the structural stages identified as suitable habitat for eastside conditions. Late-successional habitat currently represents 16 percent of the landscape and in 100 years is predicted to have 39 percent of the landscape. Currently these patches generally exceed 40 acres in size and generally have poor connectivity north-south and relatively good connectivity east-west across the LSR. In 100 years we are predicting better connectivity north-south (with a major gap in 8 Mile Plateau and south Dog River LUs) and improved east-west connectivity. The 15 Mile North and 15 Mile South LUs are all within plant associations that naturally would be dominated by ponderosa pine and Douglas fir in an open multi-story to open park-like structural condition. Active management (or long term natural fire frequency) in these drier LUs to reduce the high stocking of understory white fir and/or Douglas fir will not produce stands suitable for members of these guilds, such as northern goshawk, marten, northern spotted owl or the barred owl. The black-backed and three-toed woodpeckers do not now inhabit these drier LUs except on an occasional basis. However, species such as the white-headed woodpecker would benefit by activity management (i.e. Thinning, Underburning) which will open up the stand. The southern portion of Dog River and 8 Mile Plateau LUs are in the cycle vegetation zone. These two LUs will not supply late successional habitat now or in the future. (See cycle under old growth structure section.)

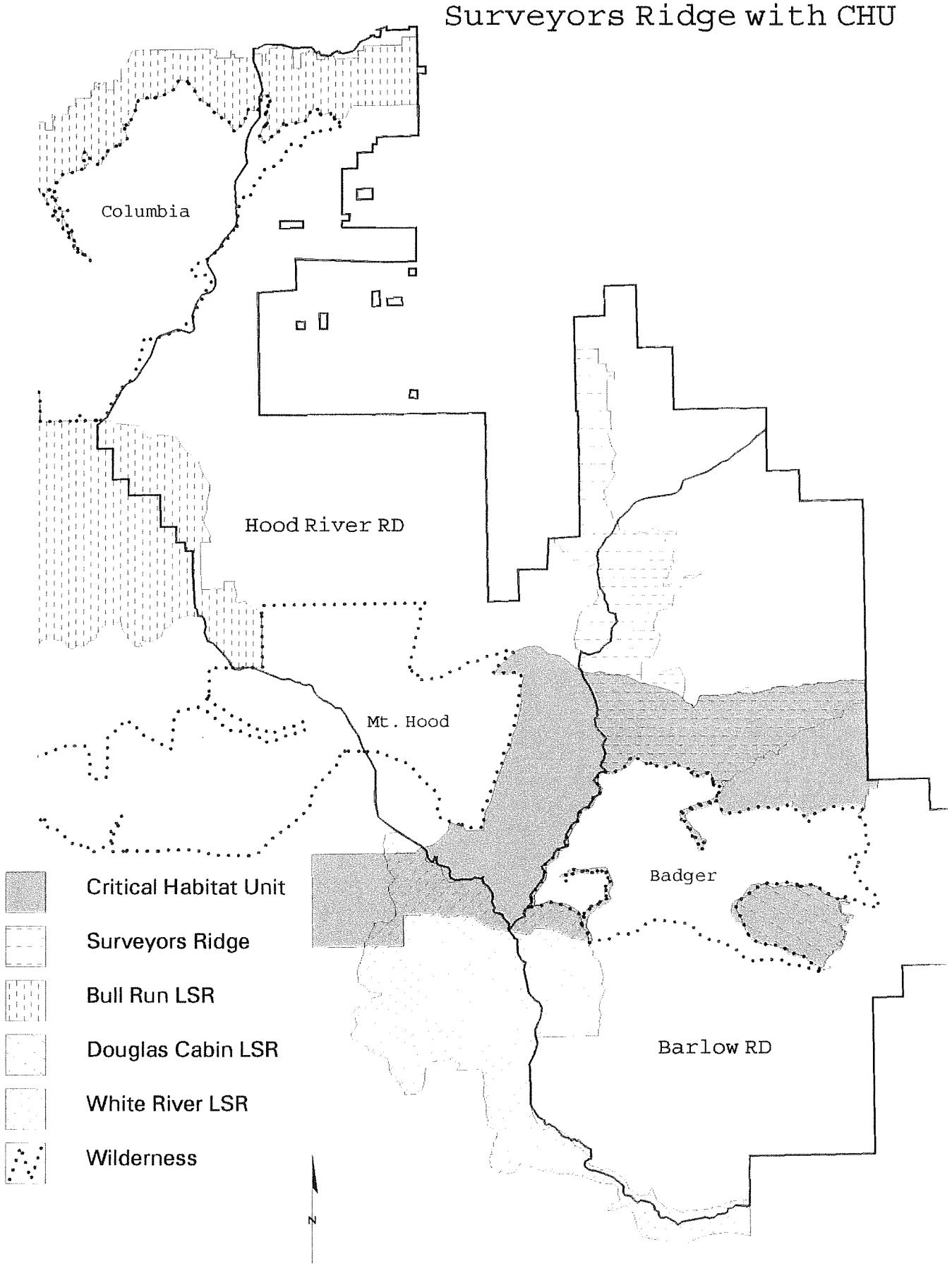
Outside the LSR, but within the analysis area, habitat is much more fragmented with the Mosier, 5 Mile and Rameight LUs exhibiting the greatest fragmentation and least habitat. However, even within these, there is fair connectivity of habitat and over 50 percent spotted owl dispersal habitat. Riparian corridors account for a substantial portion of the habitat and connectivity within these fragmented landscape units.

As an index of late-successional habitat within the analysis area, there are 14 northern spotted owl activity centers within the Surveyor's Ridge LSR, only four having less than 1186 acres (USFWS minimum), these have 627, 737, 448 and 932 acres respectively. The majority of the landscape units produce some suitable habitat with the exception of the southern portion of Dog River and and 8 Mile Plateau LUs. Outside the LSR but within 1.2 miles of the LSR area there are 4 spotted owl activity centers. All the LUs outside the LSR provide suitable habitat for an activity center or one within 1.2 miles of their perimeter, but of the 4 activity centers, two do not have 1186 acres of habitat within 1.2 miles (745 and 748 acres).

The relationship of the Surveyor's Ridge LSR to the adjacent LSR's for the TMMLT and TLMLT guilds is virtually identical to that of the TSPLT guild already described with the following notable exceptions. By their very nature (mosaic guilds) the TMMLT and TLMLT guilds are better able to disperse across the landscape than the more restricted patch guilds. Connectivity that runs North-south is patchy and which is found through riparian areas, which run east-west. Dispersal gaps and barriers for some species occur within portions of the Dog River, 8 Mile Plateau and Surveyor's Ridge LUs'.

The Surveyor's Ridge LSR is intersected by a portion of USFWS Critical Habitat Unit (CHU) OR1 for spotted owls (Figure 8). OR-1 CHU is located at the south portion of the LSR and includes most of the Maron, Eightmile Plateau, 15 Mile North, 15 Mile South LUs and about one half of Dog River LU. The Surveyor's Ridge portion of the OR-1 CHU provides some late succesional nesting, roosting, foraging (NRF) habitat, although fragmented. The stands in south Dog River and 8 Mile Plateau are starting to collapse. These stands currently provide dispersal habitat, but have never been, nor will develop into NRF habitat. Sufficient NRF and dispersal habitat remain to provide over 1186 acres of NRF habitat for four of the five activity centers in the LSR (one has 627 acres and adjoins private land with no habitat). Connecting corridors of NRF and dispersal habitat (over 50% of the area within each landscape unit)

Figure (8)


Surveyors Ridge with CHU
Columbia
Hood River RD
Mt. Hood
Badger
Barlow RD
Critical Habitat Unit
Surveyors Ridge
Bull Run LSR
Douglas Cabin LSR
White River LSR
Wilderness
N

exist north-south and east-west across the CHU. Sometime in the future, much of the existing NRF habitat will be lost within the 15-Mile North and southwest side of 15-Mile South LU's of the LSR. It appears that much of this NRF habitat can be maintained in at least marginal condition (less than 70% canopy closure. Currently conditions are at about 50 to 60%) for the next 20 years through selective thinning, while conditions improve at the more moist elevations where NRF habitat would naturally have occurred.

3. The white-headed woodpecker, pigmy nuthatch, and flammulated owl are examples of species that guild protocol in the HABSCAPES model may not properly address. The white-headed woodpecker and pigmy nuthatch are found almost exclusively foraging and nesting in ponderosa pine or Douglas fir, while the flammulated owl may utilize any cavity that is large enough within the drier zones of the eastside . (Note: The only known nesting pair of flammulated owls on the east side of the Mt. Hood National Forest is in a large oak cavity within a ponderosa pine/oak stand between the Badger Creek Wilderness area and the Surveyors Ridge LSR.). Within the ponderosa pine zone, the relatively frequent occurrence of low intensity fires, naturally resulted in open stands (open multi-story and open park-like) of very large ponderosa pine, ponderosa pine/Oregon white oak or ponderosa pine/Douglas fir. The frequency of fire in this "dry" zone prevented significant buildup of understory within these open stands. Presently there is virtually no representation of these stand conditions on the east side of the Mt. Hood National Forest. The high densities of understory within the late-successional habitat in this zone is resulting in moisture stress related mortality within the few very large ponderosa pine and Douglas fir that remain.

Although the present mix of large trees and understory generally meet the needs of such species as the spotted owl, natural mortality is already killing many of the larger overstory. The end result with no intervention will likely be catastrophic loss of large areas of habitat from insects or fire, with virtually no large trees remaining. In other words, "just letting them grow" will probably not result in maintenance or development of large trees or late-successional habitat in this zone. Returning such stands to open park-like or open multistory condition would protect the existing large ponderosa pine and Douglas fir within them, virtually eliminate the potential for catastrophic loss and should enhance habitat for the white-headed woodpecker, pigmy nuthatch and flammulated owl, while returning the landscape to a more natural condition.

Natural forces do not provide for 100% biological potential of any species except for very short periods of time. Almost all the time, species are somewhere below 100% of their potential population due to natural events, competition, predation, and so forth.

The present standard of 100 percent population potential for white-headed woodpecker for snags (60/100 acres) over 15 inches dbh will probably be difficult to achieve. Achieving this level of soft snags is dependent upon the ability of a hard snag to achieve soft snag characteristics then remain standing long enough to be usable. The R6 snag simulator model indicates that unless the snag is at least 19 inches diameter it probably would not develop the soft snag character, and then could only be expected to stand about a decade. Field reconnaissance and eastside experience indicates the snag simulator predictions for decay of hard snags to soft snags and their longevity probably may not be far from the truth. Also, the snag simulator model also indicates that if we are starting from year zero (today), in the first 30 years almost 4 snags per acre greater than 19" diameter must be saved or created naturally or otherwise to reach the 0.6 per acre (60/100 ac), needed for the 100 percent population potential. In addition natural or other mortality will have to continue to create about 0.6 snags per acre every decade for as far as the model is run to maintain the soft snag levels.

Ponderosa pine grown in this zone take close to 150 years to reach 19 to 20 inches diameter. Over a 150 year period, up to 11.20 snags per acre would have to be generated. At an expected basal area of from 80 to 120 square feet per acre, typical of healthy open park-like to open multistory stands; only 12 to 18, live 20 inch, (less if larger), trees would be present per acre. Even if the longevity was twice that predicted, the impacts of maintaining the .6 snags per acre, do not appear to be within any expected range of natural variability at the landscape scale. Saving fewer larger diameter hard snags (30"+ randomly distributed) should greatly reduce the total number needed to be generated, since their longevity could be expected to be much greater than for the smaller soft snags. Whether such a strategy

would be able to meet the 100 percent population potential while remaining within the range of natural variability has not been determined for this analysis. Further study of snag generation, decay and longevity rates, and viability standards for the white-headed woodpecker are needed.

4. It has been recognized that microenvironmental conditions change as you move into late-successional forest and away from openings. These changes are probably most important to some of the fungi, lichens, bryophytes, vascular plants, amphibians, mollusks, and arthropods, and least important to birds and mammals. Within the animal kingdom, the microinvertebrates and invertebrates (with the exception of many of the flying insects) are probably most closely tied to microenvironmental conditions because of their limited mobility. So little is known about invertebrates in the forested environment in terms of the species present, their needs or their function; that it is probably wise to protect interior forest habitat where practicable until more is learned.

Interior forest habitat is most closely represented by the TLMLT HABSCAPES guild. The TLMLT guild does not represent interior habitat within the analysis area as accurately as desired, although for general discussions of connectivity and analysis of relations between LSRs, it appears to be accurate enough. Existing interior forest habitat within the analysis area was mapped using a GIS program to create a 135 meter buffer around the edge of all recorded openings. Any late-successional habitat that was further than 135 meter distance from an opening was then recorded as interior forest habitat. Stands such as stem exclusion were not considered an opening in this context as they do reduce wind velocity and do provide some shading into adjacent stands.

There was no patch size and shape threshold to consider for interior habitat. Within the LSR, the existing interior forest habitat is patchy with some significant gaps (see Figure 9). The Surveyor's Ridge LU has bands of interior habitat running east and west. Within the Mill Creek Buttes LU the interior habitat is concentrated on the the south and eastern edge of the LU. The Dog River LU contains some interior habitat in the north quarter of the landscape unit. The majority of the 8 Mile Plateau LU is in interior habitat, however the stands are starting to collapse. The Marion LU has isolated patches of this habitat. Within the 15 Mile South LU, the interior habitat is concentrated along 15 Mile Creek and the lower reaches of Cedar Creek. 15 Mile North LU does not contain any interior habitat.

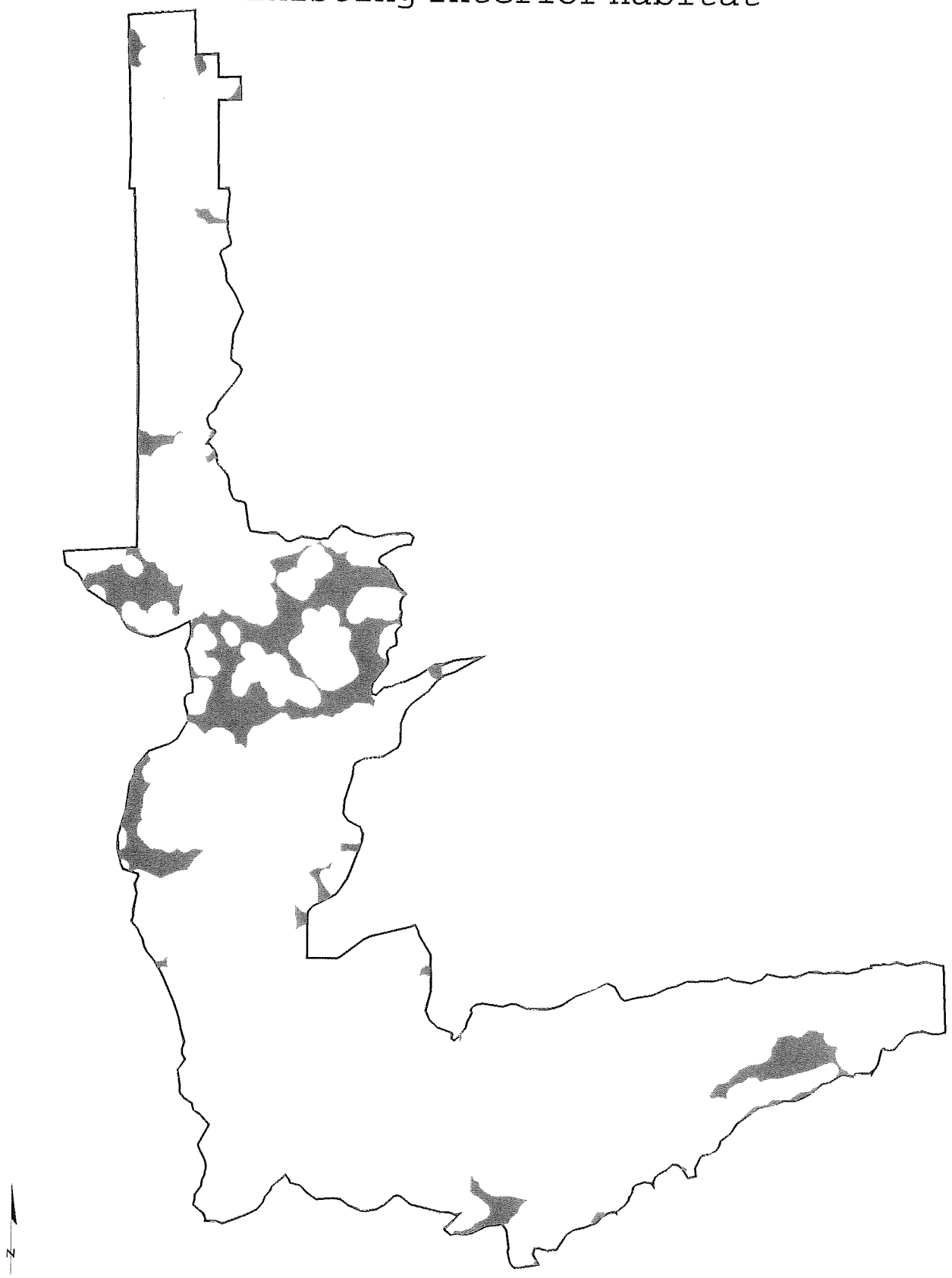
The predicted interior habitat in 100 years for the Surveyors Ridge LU will be similar to existing conditions with some larger patches. The Mill Creek Buttes LU will still have the majority of the interior habitat in the east and south edges, however we anticipate in 150 years that the majority of this LU will be interior habitat. The Dog River LU should have the northern two thirds in this habitat type with the lower third in a cycle vegetation zone. The 8 Mile Plateau LU will not have interior habitat (cycling vegetation zone). The majority of the Marion LU will be interior habitat. The 15 Mile South LU will have a little less interior habitat in the upper elevation of Cedar Creek. The 15 Mile North LU still will not have habitat.

Connectivity of interior forest habitat to the south with the White River LSR appears to be excellent along the highway 35 corridor. Connectivity with the Roaring River LSR-Salmon River Wilderness complex is quite fragmented but does exist through the White River LSR and habitat near Little Crater and Timothy lakes. The Salmon River corridor may also provide a link with the Salmon River Wilderness although existing data does not support this. Connectivity with the Mt. Hood Wilderness lies on the north side of Mt. Hood and connecting the highway 35 corridor. Connectivity with the Douglas Cabin LSR is best through the Badger Creek Wilderness but only marginal in more direct routes along the Threemile creek drainage.

Outside the Surveyor's Ridge LSR but within the analysis area, interior forest habitat is much more fragmented. Probably none of the interior forest habitat blocks outside the LSR are large enough to be considered refugia or to provide much recruitment for populating other areas except for the west edge of the Mill Creek LU. More site specific information for areas outside the analysis area is needed to accurately evaluate connectivity. (See connectivity section for more complete information on function and condition of the areas considered suitable for connectivity.)

Figure (9)

Existing Interior Habitat



(1096 acres)

Summary of Terrestrial

In summary, the Surveyor's Ridge LSR not only functions as a refugia for late-successional dependent species, but it appears to be a center for recruitment of late-successional species within the White River-Surveyors Ridge-Douglas Cabin LSR/Badger Creek Wilderness area complex. The best late-successional habitat will occur in the Marion, 15 Mile South and portions of Dog River, Mill Creek Buttes plus Surveyor's Ridge LUs'. The southeastern tail of the Surveyor's Ridge LSR could become an excellent example of "eastside" open multistory and open park-like fire climax vegetation favorable to white-headed woodpeckers and similar species. Due to elevation and climate, gaps in interior habitat will remain in the cycle vegetation areas. The current functioning of the OR-1 CHU should remain intact with some minor gaps of connectivity within the Surveyor's Ridge LSR.

L-S Vertebrate Species Likely Extirpated From the LSR but Which Could Inhabit it Under Natural Conditions

The lynx, wolf and grizzly bear likely inhabited the LSR under natural conditions but are considered extirpated (Appendix A).

1. Lynx *(Felis canadensis)* probably once inhabited the analysis area and the Surveyor's Ridge LSR. Although categorized as a late-successional species, the lynx is heavily dependent upon snowshoe hare for survival, tending to occupy higher elevations and deeper snow conditions than the similar but common bobcat. Although the snowshoe hare is a generalist in it's use of habitat , the most favorable habitat for snowshoe hare (and therefore lynx) seems to be found in the earlier successional conditions often provided by stem initiation, stem exclusion and stem reinitiation vegetation structural conditions. Within the LSR these conditions would naturally most likely have occurred within the crest zone where moderate frequency (50-200+ year interval) large scale fires often resulted in regeneration of stands before cathedral or late-successional tolerant multistory conditions were achieved. Provision of this type of habitat was probably cyclical in nature, with relatively large blocks (500-2000 acres) of habitat available for 50 to 100 years then little being available for similar periods of time. Currently some of the best habitat in this condition is found in the Marion and Dog River landscape units. On a vast landscape scale (such as the province scale) such habitat was probably relatively constant through time.

In the future, the most likely areas to support lynx within the LSR are areas with a desired future condition of cycle where stands are allowed to reach the mature stem exclusion stage but are returned to the stem initiation or stem reinitiation stages to simulate the effects of natural fire within the ecosystem. These stands would then be allowed to progress back through the stem exclusion phase to the mature stem exclusion condition then be recycled again. Thinning of some level would likely occur within the stem exclusion and mature stem exclusion phases but the stem densities would be maintained to provide the highest stem densities consistent with preventing imminent mortality or catastrophic loss of large portions of the landscape. Rapid tree growth in diameter or height would not be the objective for those stands.

Some such habitat is being provided in matrix lands but in a very fragmented way which may not be suitable to the lynx. Also the thinning regime is geared more to improving tree growth than to providing a dense canopy condition. The generally heavy winter recreation use in the LSR and adjacent matrix lands may prevent re-occupancy of otherwise suitable habitat by the lynx.

2. The grey wolf *(Canis lupus)* was officially extirpated from Oregon in 1946. However, since that date persistent reports of wolf sightings have occurred throughout the Cascade Range. Several sightings of wolves in Crater Lake National Park have occurred from the 1960's through 1980's by park personnel (review of files of Crater Lake National Park). There have been photographs of individuals in the late 1980's within the Siskiyou Mountains (Rogue River National Forest files), conclusions of presence of wolves on the Rogue River National Forest in the early 1970's (forest supervisors letter in Rogue River National Forest files) as well as numerous other reports of sightings by less reliable sources have occurred up to the present. Actual information within or adjacent to the LSR has been limited to

unconfirmed reports of a "wolf" crossing highway 26 near Blue Box Pass and a report of "sighting of a wolf" near Mt. Hood, the exact location being unknown.

Although the likelihood of native wolves still occupying the Cascade Mountain Range in Oregon is quite slim, potentially suitable habitat conditions do appear to remain within Oregon and within the LSR. Two factors appear to be the most important in providing for viable wolf populations. Healthy and relatively abundant deer and elk populations are necessary as a food source and lack of human interference seem to be critical. The latter seems to be provided when there are relatively large unroaded areas (such as Yellowstone National Park, or the vast wilderness areas of north and north central Idaho), and or other limited access to the public such as road densities of 1 mile per square mile or less over relatively large areas. Since the LSR is not sufficiently large to provide all the needs of even one wolf pack, adjacent areas would also have to be in a favorable condition. In general, deer and elk populations are probably at or near their peak at this time. Being dependent upon grasses, shrubs and forbs for forage, their populations will likely decline as the early seral stages become less abundant on the LSR and matrix lands both within and adjacent to the analysis area. Although their populations will likely decline, they probably would not be a limiting factor in preventing occupancy of habitat by wolves within the analysis area. Therefore, without further limiting use by humans, disturbance would likely be the limiting factor to habitat occupancy by wolves.

3. Grizzly bear *(Ursus arctos)* undoubtedly occupied the analysis area and LSR under natural conditions but has been extirpated from the Cascade Range in Oregon, although it is present in parts of the Cascade Range in Washington.

There is probably sufficient forage and shelter within and adjacent to the LSR to support some number of grizzlies, but the high level of human use throughout the year from mushroom pickers to skiers and hunters to snowmobilers and the extremely large area needed to provide security from such disturbance, probably precludes a viable population from occupying the habitat successfully.

Species of Management Concern Identified and Conflicting Habitat Needs Identified.

See **Appendix B** for a list of the amphibian, bird and mammal species of concern within the LSR.

Most of the species of concern listed in Appendix B will have their habitat maintained or improved through management to achieve late-successional habitat. The white-headed woodpecker, pigmy nuthatch and flammulated owl (not in Appendix B) have already been addressed, as has the lynx.

The black-backed woodpecker is the only other species of concern identified that may have needs that conflict with late-successional LSR objectives. The standards of 0.12 hard 17+ inch snags per acre plus the other cavity-nesting species snag requirements amounts to about 4 snags per acre in the first 30 years plus about 2.8 per decade thereafter. At about 100 years to grow a 20 inch tree and with healthy basal areas of from 160 to 200+ square feet per acre in the mixed conifer types, meeting the snag requirements would require a maximum of 25 percent of the standing basal area. Considering growth occurs constantly within the stands, leaving larger trees can mean leaving fewer (and potentially less of the basal area) because of their greater longevity, and the relatively high productivity within the **Transition zone**, (shown in figure 1) these snag retention standards appear to be within the potential range of natural variability on the landscape level. Although lodgepole pine rarely reaches a 17 inch diameter, the standard of "...or largest available..." (ROD C-46), and the fewer species that use lodgepole pine stands results in a much lower snag number that is also achievable. The recommendations for "...beetle infested trees for foraging..." (ROD C-46) are not clear, (i.e. "...some such trees should be provided in appropriate habitat...") and can not be evaluated with respect to potential management or desired future conditions within the LSR. However, if future information (the ROD recommends gathering more for this species), indicates a need for lodgepole pine stands for this species; it would be in conflict with the stated late-successional objectives for LSR's. Within the Surveyor's Ridge LSR, there has been a history of large scale stand replacing fires that often generate

and perpetuate the cycle stands. One such area exists in the south half of Dog River and 8 Mile Plateau Lus and western edge of Marion Lu. The **cycle** area of the LSR could be managed for lodgepole pine and associated species, which would remain consistent given the ecological history of the LSR.

Specific Late-successional Structure and Functions for Associated Species or Groups of Species Identified.

See the existing vegetation write-ups for descriptions of structure and **Appendix A** for associated groups of species.

Introduced Wildlife Species

The only known introduced non-native birds and mammals in the LSR are: wild turkey, starling, English sparrow, and Virginia oppossum. The effect of the starling and English sparrow on native late-successional species is thought to be minimal. These species tend to be most closely associated with human disturbance, buildings, cities, and towns; therefore would not be expected to have major effect upon late-successional species.

The wild turkey (both Merriam's and Rio Grande strains) has been introduced into the analysis area including the LSR. Within the LSR, they are known to occur in 15 Mile North and 15 Mile South LUs. Outside the LSR they occupy the 5 Mile, Mosier, Rameight and Mill creek LUs. The principal effect of this species seems to be consumption of mast (mostly acorns, hazel nuts and pine seeds during the majority of the year and ground dwelling insects in the spring). Competition for mast could affect the western gray squirrel but that species is not considered a late-successional associate. Pigmy and flammulated owls also forage upon insects in the spring and potentially could be affected by competition with the wild turkey but this seems unlikely. Turkey nesting requirements (brush, slash or other cover) do not appear to conflict with any native species. No late-successional species would be in competition for food with the wild turkey.

The Virginia oppossum could inhabit virtually all of the LUs within the analysis area. However, it is not likely to be found in any other than the lower elevation LUs such as 15 Mile North, 15 Mile South, and Surveyor's Ridge LUs within the LSR, and in the Mill Creek , Rameight , and 5 Mile LUs. Within those LUs it is most likely to be found associated with perennial riparian zones. The most likely impact of the oppossum would be upon eggs and nesting birds. Therefore, virtually any late-successional bird species found within these LUs could have it's eggs or young fall prey to the oppossum, although for species such as medium to large owls, or hawks which tend to not leave the nests unattended and have the ability to defend the nest successfully, the risks are probably quite small. There is no evidence that oppossum occur in significant numbers in the analysis area or that their effect can be measured.

Appendix C lists all the late-successional associated vertebrates known or suspected to occur in Surveyors Ridge LSR. **Appendix D** displays known locations of any late-successional species known to occur in the LSR.

Connectivity

We examined three different types of connectivity: 1) connectivity between Surveyors Ridge LSR and other mapped LSRs (see figure 10), 2) connectivity within Surveyors Ridge LSR, and 3) connectivity between Surveyors Ridge LSR and the adjacent Matrix lands. The Northwest Forest Plan assumes that elements contributing to connectivity include Riparian Reserves (see Figure 11 for Interim Riparian Reserves and the recommended riparian reserves from the Mile Creeks Watershed Analysis), 100 acre LSRs (see figure 2), Wilderness, and retained management areas for pileated woodpeckers and pine martens (B5 land allocation under the Mt. Hood Forest Plan). These elements provide connections

between the mapped LSRs (See Figure 10). Figure 10 shows the quality and condition of the connections.

Surveyors Ridge LSR and Bull Run LSR

The connection between these two LSRs depends on the 100 acre LSRs, Riparian Reserves, and retained B5 areas. The 100 acre LSRs and retained B5 areas provide late seral habitat for the most part. Riparian Reserves vary greatly in their stand condition. Of particular concern is the ability for late successional dependent species to cross the East Fork Hood River. Glacial outwash floods and major landslides in tributary streams greatly influence stand conditions in the river floodplain. It contains large stretches with no late seral conditions. Due to ownership patterns and the objectives of the other land owners, we anticipate that the primary connection will occur across National Forest lands near Cooper's Spur Ski Area. In addition, the late successional species must be able to cross Oregon Highway 35, a two lane paved highway.

Due to these factors and current stand conditions, connectivity between Surveyors Ridge LSR and Bull Run LSR exists only for large, mobile animals, such as the northern spotted owl. We believe that no connections or, at best, very tenuous connections exist for smaller, less mobile animals, such as mollusks and salamanders, and most plants and fungi listed on the C-3 table. Plants and fungi able to disperse propagules higher into the air may be able to maintain a genetic connection, however, the prevailing westerly winds means that most of the connection will be from west to east.

Surveyors Ridge LSR and White River LSR

The connection between these two LSRs depends on the Riparian Reserve along East Fork Hood River and the Highway 35 Scenic Viewshed (B2 land allocation). A tenuous connection currently exists through Badger Creek Wilderness, via the headwaters of Fifteenmile, Tygh, Pen, and Little Badger creeks and up Badger Creek to the headwaters of Boulder Creek. This connection is fading due to mortality associated with spruce budworm, Douglas-fir bark beetle, and root disease. This is a natural change of events for the western half of the Badger Creek Wilderness. We expect within the next 20 years a major fire. There is nothing we can do to prevent this fire from occurring. Many stands in the upper half of Badger Creek have collapsed due to mortality associated with a western spruce budworm outbreak approximately 1982-1993. Since we do not have any site specific stand information, the exact cause of the mortality in the wilderness is unknown. Likely suspects include Douglas-fir bark beetle, fir engraver beetle and root disease. Spruce budworm has been active in recent years along the East Fork Hood River, but mortality levels have been considerably lower than in Badger Creek Wilderness due to more favorable moisture conditions.

Surveyors Ridge LSR and Douglas Cabin LSR

The connection between these two LSRs depends on the Badger Creek Wilderness. A connection currently exists, but is marginal due to deteriorating stand conditions inside the wilderness. Western spruce budworm and western pine beetle are known to be active. Douglas-fir bark beetle, mountain pine beetle, fir engraver beetle, and root disease probably are also present. In addition, these same agents have been active in Douglas Cabin LSR. The south aspects in Pen, Tygh, and Little Badger creeks below 3500 feet elevation are often open, scabby slopes and woodlands, providing minimal or no connecting links. Douglas Cabin LSR is not capable of providing high levels or high quality habitat for species dependent on closed canopy forest.

ESTIMATED CONNECTIVITY TO ADJACENT LSRS

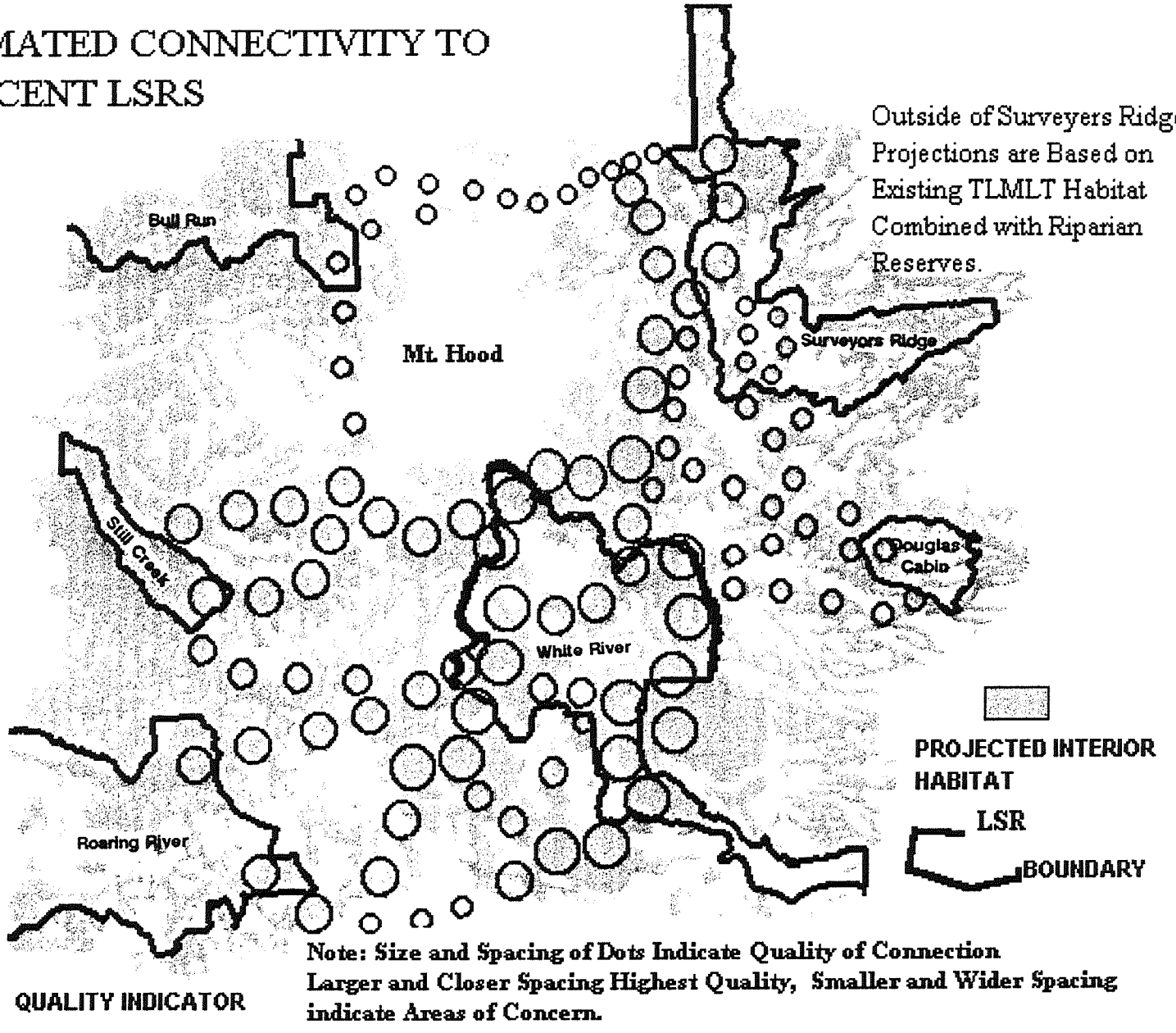


Figure (10)

Figure (11)

Connections within Surveyors Ridge LSR

Surveyors Ridge LU

Internal connections are limited by natural fragmentation. This LU consists of banded vegetation, with large natural openings, woodlands, and parklike areas on south and west aspects and closed canopy forest on north aspects and along the main ridge crest. There are no significant east aspects. Additionally, the LU contains many large rock outcrops and talus slopes on all aspects. Spruce budworm and root disease have been very active along the main ridge crest and are present in all closed canopy stands. Grand fir has been the primary species affected. Connections still exist for large, mobile animals throughout the LU and between this LU and Mill Creek Buttes LU. We doubt adequate connections exist for small, non mobile animals, and many vascular plants and fungi. However, the internal connection in this LU probably has always been tenuous at best.

Mill Creek Buttes LU

Internal connections still exist across this LU and between it and Dog River LU. The connection to Surveyors Ridge LU may have already collapsed for smaller animals and many plants and fungi, primarily due to spruce budworm and root disease mortality. Grand fir is the most common species affected. The LU also contains many rock outcrops and talus slopes, but we believe these are too small and well scattered enough to stop movement through the landscape. We also believe that this LU did not provide the recent high levels of connectivity before Euro-American settlement. The Cathedral stands may not have been dense enough to provide the type of habitat that has existed for the last 50 years. The primary connection with Dog River LU is provided by the Riparian Reserve along an unnamed tributary to South Fork Mill Creek. This tributary also contains the gauging station and outflow point for the Dog River Aqueduct.

Dog River LU

Internal connection across this LU still exists, but is tenuous due to timber harvesting, windthrow, and mortality associated with root disease, spruce budworm, and mountain pine beetle. Little or no interior habitat remains in between roads 44 and 1720. Connections still remain in the riparian zones along perennial streams.

Interior habitat exists in the southern part, south of road 44, but is beginning to collapse in the Cycle area (see figure 1 for location of cycle area). The interior habitat in the Cycle area provides habitat primarily for subalpine species dependent on closed canopy forest dominated by small diameter trees (less than 20" DBH). The Cycle area serves as a critical link for species to move from Surveyors Ridge LSR to White River and Bull Run LSRs and adjacent lands along the East Fork Hood River. It provides this function for approximately half of the 100-125 year cycle. The remaining years of the cycle area are in a state of collapsing and recovering from the collapse.

Eightmile Plateau LU

This LU is in similar condition as Dog River with the southern 2/3s collapsing in the Cycle area and the northern 1/3 harvested. Little or no interior habitat remains along the eastern edge with Marion LU due to harvesting.

Marion LU

Connections across this LU exist primarily for large, mobile animals and little else. The LU contains little or no interior habitat, mostly due to timber harvesting. The connections still appear to function along Fifteenmile Creek and Deadman's Gulch and may still function along Bulo Creek. Insect and disease

activity has been noted, but does not appear to have significantly affected the unharvested stands at present. Much of Marion LU is very productive, so it has some resiliency to insect and disease attack.

15- Mile North LU

This LU cannot provide much interior habitat. Any species dependent on closed canopy forest must be able to use the denser stringer stands along intermittent streams. Stands along Fifteenmile Creek appear healthy, maintaining a connection to 15-Mile South and Marion LUs.

15- Mile South LU

Connectivity across this LU remains high at present. Interior habitat exists across the north aspects into Fifteenmile and Cedar creeks. Interior habitat along the eastern edge, in the recently acquired lands, does not exist. The stands on the flats between the canyon rim and road 4421-131 are collapsing due to western pine beetle, Douglas-fir bark beetle, fir engraver beetle, mountain pine beetle, and root disease.

Connectivity Between Surveyors Ridge LSR and Adjacent Lands

Surveyors Ridge LU

Connectivity to the north, east, and west are broken by timber harvesting and by agriculture along Highway 35. Lands to the west and north as well as to the east of the northern tip are not National Forest lands. Many of these areas have been recently harvested or have been traded with harvest by the new owners planned. Before Euro-American settlement, connections between the bands of vegetation within the LU probably depended on riparian areas leading to the East Fork Hood River to the west and in the headwaters of Neal Creek to the east. Existing riparian areas provide some connectivity to the west, although the protected corridors narrow on lands managed under the State Forest Practices Act. The riparian areas in Neal Creek LU, on National Forest lands, probably are not functioning as intended under the Northwest Forest Plan. Further east and north, connectivity does not exist, and probably never existed, in the drier vegetation types.

Mill Creek Buttes LU

Connectivity to the west is mostly broken by timber harvesting on both National Forest lands and other owners. Some connection to the lower parts of Dog River and East Fork Hood River still exists along Puppy Creek. North and east of the LU, connectivity exists primarily in Riparian Reserves along perennial streams to the Forest boundary, although south aspects are broken by banded vegetation patterns. Beyond the Forest boundary, little or no connectivity exists due to the transition into drier vegetation types and into agriculture. Two 100 acre LSRs lie east of Mill Creek Buttes LU. However, these 100 acre LSRs lie in stringer stands where the LSR shape is very intricate and the quality of habitat within the LSR is questionable.

Dog River LU

Connections to adjacent lands exist primarily in Riparian Reserves along perennial streams. The connections along Dog River and South Fork Mill Creek are probably the best. A connection exists along North Fork and Middle Fork of Fivemile Creek to the Forest boundary, although there are some gaps. The unharvested areas of the north aspects along these two streams also help provide the existing connections. The connection along South Fork Fivemile Creek is broken below the Football Fire area (1982) by a combination of the fire and timber harvesting. Many timber sales along South Fork Fivemile left only minimal riparian buffers. The north aspects along Fivemile Creek provide at least temporary refugia for late successional dependent species, with two 100 acre LSRs designated below the Football Fire area. However, we believe that the stand conditions within these LSRs are not sustainable and eventually they will collapse. Mountain pine beetle has been very active in lodgepole pine in the

headwaters of Fivemile Creek, with high levels of mortality since 1990. South aspects along all three forks of Fivemile Creek are dry and often open.

A deteriorating connection exists between the southern edge and the headwaters of Fifteenmile Creek in Badger Creek Wilderness. Some mortality associated with spruce budworm activity has been noted within the wilderness, but this part has not collapsed as in Badger Creek. The Cycle area within the LU is collapsing and will break what connections exist within the next 10-20 years.

Eightmile Plateau LU

The connection to the north down Eightmile Creek remains relatively good at present, although gaps exist. The north aspects aid in connectivity with three 100 acre LSRs designated. As along South Fork Fivemile Creek, forest health is declining, stand conditions within the 100 acre LSRs are not sustainable, and they will eventually cease to provide this function. South aspects are dry and often open. As with Dog River LU, a tenuous but declining connection still exists into the Fifteenmile Creek portion of Badger Creek Wilderness, where habitat conditions are still relatively good.

Marion LU

Connection south into the Badger Creek Wilderness is relatively good along Fifteenmile Creek. Connection north into Ramsey and Eightmile Creeks is poor. Many stands along Ramsey Creek are collapsing due to past timber harvesting (inadequate prescriptions and poor logging techniques in the 1960s and early 1970s), root disease, and insect activity. A connection presently exists, but is of low quality and declining. The connection into Eightmile Creek may not be functioning at all due to timber harvesting and Road 44.

15-North LU

This LU does not provide connectivity except along Fifteenmile Creek. Species crossing this LU must be able to tolerate very open stand conditions. None of the intermittent streams able to support denser forest connect to the denser stands along the canyon rim between Fifteenmile and Ramsey creeks. The connection along Fifteenmile Creek ends at the Forest boundary due to changes in ownership and vegetation types and the beginning of agriculture.

15-South LU

The connection south into Larch Creek (actually an intermittent stream) is limited. Further, these lands are not capable of providing strong connections. West of Frailey Point, only a tenuous connection exists to Jordan Creek due to timber harvesting, insect activity, and naturally open south aspects.

Summary of Connectivity

In summary, there is nothing we can do to change the connectivity because of factors beyond our control, such as, land ownership, natural openings, and highway 35. External connectivity depends on land allocations, either under the Northwest Forest Plan or the Mt. Hood Forest Plan, that function as intended. The strongest external connection is between Surveyors Ridge LSR and White River LSR along the East Fork Hood River. The expected connection through Badger Creek Wilderness is only barely functioning. Functioning connections through Riparian Reserves only exist along perennial streams. Riparian Reserves along intermittent streams presently do not provide a good connecting function and probably never will. The 100 acre LSRs were designated around the best available habitat, so are functioning presently, but probably will not in the future. Several of these LSRs include sites that cannot sustain the present stand densities.

Beyond site capability, the biggest problem with the land allocations expected to provide connectivity is the location and orientation of those allocations. Large, mobile animals and plants or fungi with airborne propagules that can reach the free air winds both currently have and will maintain genetic connections

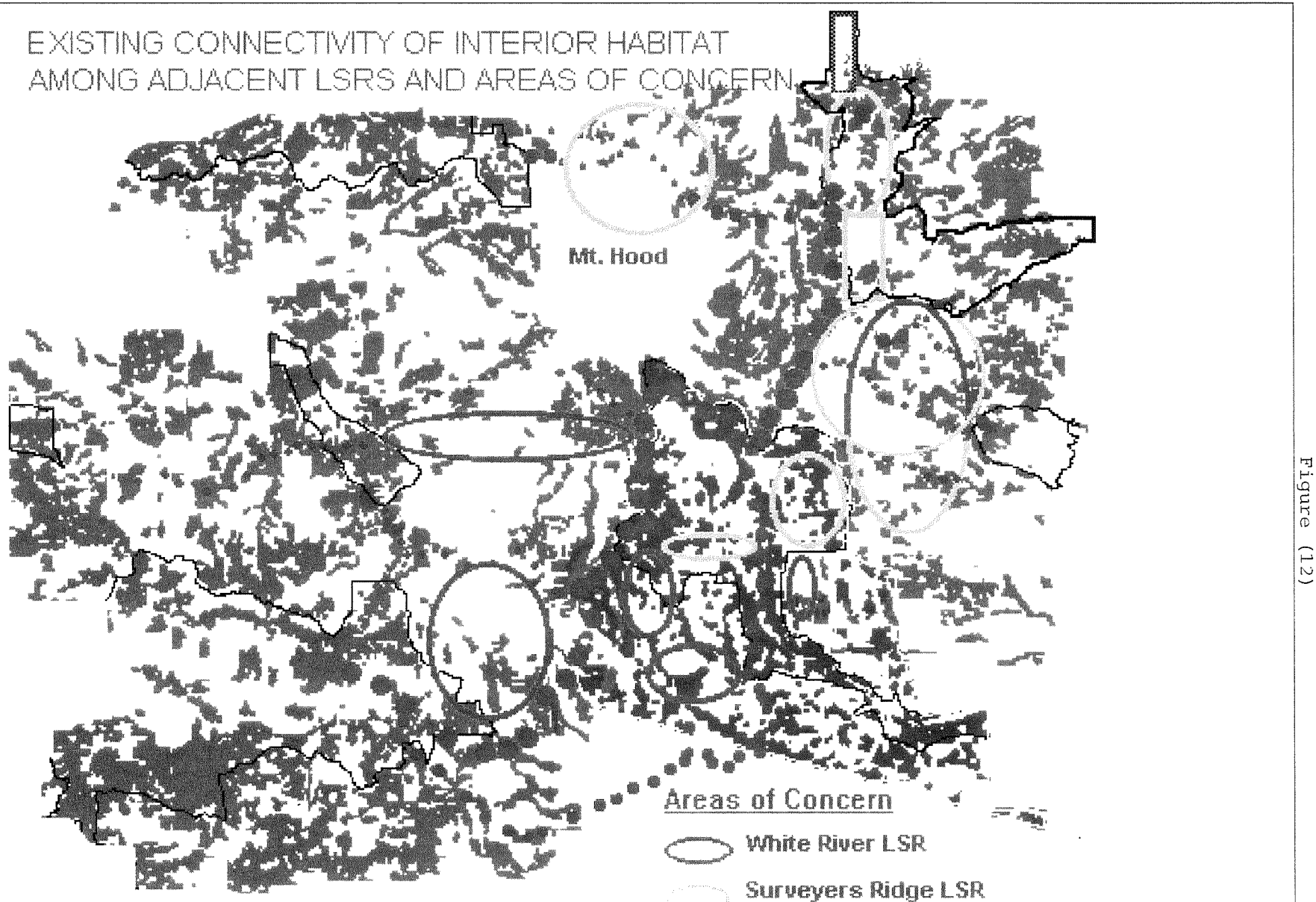

EXISTING CONNECTIVITY OF INTERIOR HABITAT
AMONG ADJACENT LSRS AND AREAS OF CONCERN
Mt. Hood
Areas of Concern
White River LSR
Surveyers Ridge LSR
Connectivity
Stand Data Used on This Map Outside Of The Surveyers Ridge LSR Boundary Is From Terrestrail large Home Range, Mosiac Guild Species Community And Conservation Assment (1993)
Degree of Connectivity Indicated by Size and Spacing of Pink Dots. Smaller and Wider spaced are Weaker Connections

Figure (12)

across the area. Smaller, less mobile animals and plants or fungi whose propagules cannot reach the free air winds, currently have and are expected to have, little or no genetic connections across the area. In short, Surveyors Ridge LSR is relatively isolated at present and portions of it will remain isolated in the future.

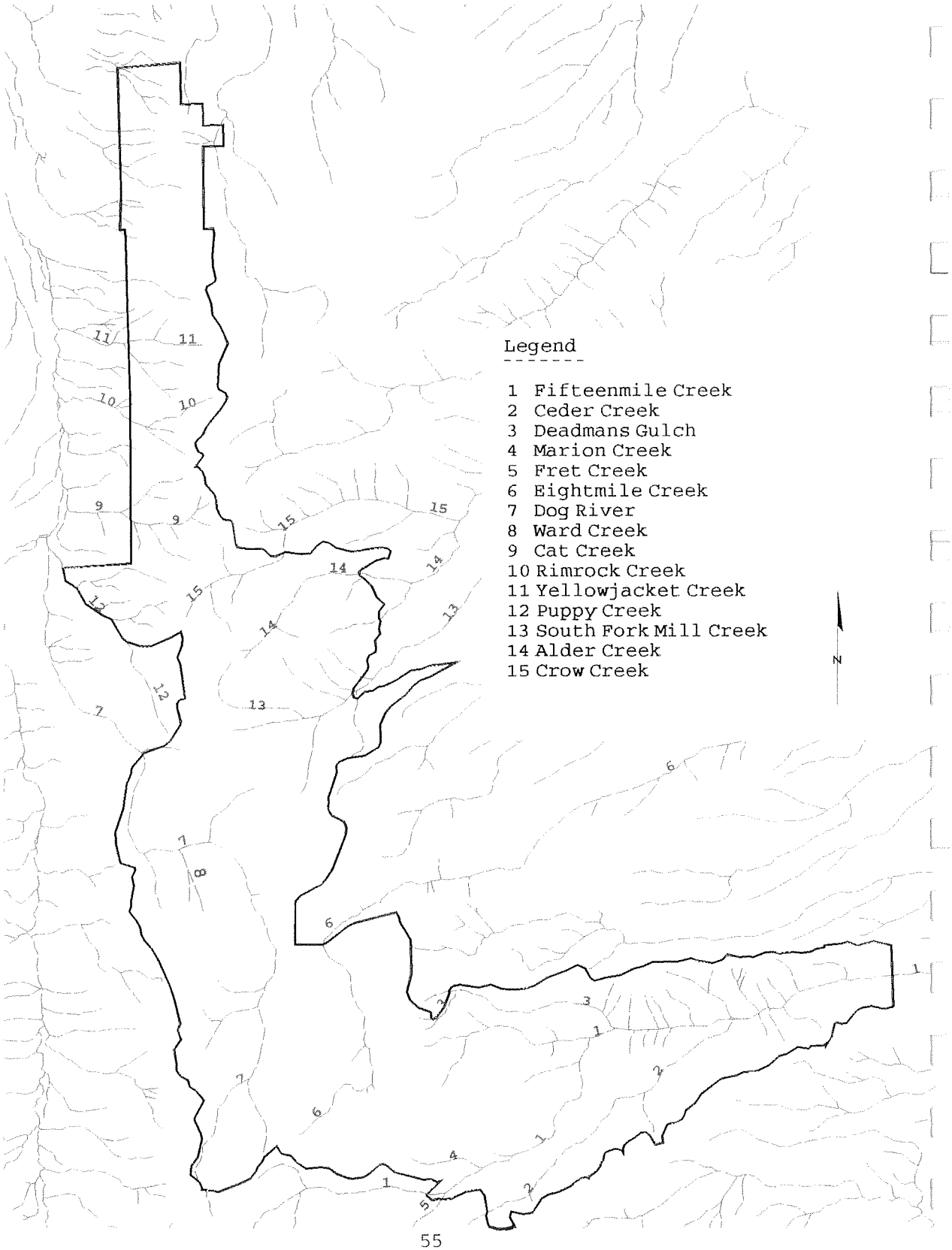
Providing north-south connections across the Eastside Zone and the lower edge of the Transition Zone is virtually impossible for species that depend on closed canopy forest. South aspects are typically dry and open, capable of supporting only Open Parklike stands, Woodlands, or savannas. All connections end at the Forest boundary due to changes in landowner management, both timber and agriculture, and vegetation type.

Internally, the potential for good to acceptable connectivity exists, but current connectivity is weak. Connectivity across Surveyors Ridge LU may always be weak due to natural fragmentation. Connectivity across 15 North LU should not be expected due to site capability. The lack of connectivity outside of perennial streams is primarily due to timber harvesting in Marion LU and the northern half of Dog River LU and due to insect and disease activity in Eightmile Plateau, Mill Creek Buttes, southern half of Dog River, and the eastern edge of Surveyors Ridge LUs'.

(see Figure 12) Figure 12 points out connectivity of interior habitat adjacent to LSR's and areas of concern. Areas of concern are focused on the White River and Surveyor Ridge LSR's and their connectivity to each other and adjacent LSR's.

Figure (13)

Surveyors Ridge Named Perennial and Intermittent Streams



Fish/Aquatic Condition

Surveyors Ridge LSR contains several perennial fish bearing streams as well as other perennial non-fish bearing and intermittent streams or portions thereof (Table III-4 and Figure 13). Resident interior redband trout *(Oncorhynchus mykiss gairdneri)*, cutthroat trout *(O. clarki clarki)*, or hybrids between the two species reside in all fish bearing streams. The anadromous (sea-run) form of rainbow trout, steelhead, live in Fifteenmile Creek. Eightmile Creek supports steelhead but it's not likely they are high enough in the system to be in the LSR.

Table III-4. Named perennial (at the LSR boundary) and intermittent streams within the LSR and approximate upper limits, in river miles, of salmonid fish distribution within the LSR, where applicable.

Stream Name	Perennial	Intermittent	Fish Bearing	River Miles Upper Limits
Fifteenmile Cr.	X		Yes	49
Cedar Creek	X		Yes	1.75*
Deadman Gulch		X	Susp. Seasonal	Unkown
Marion Creek		X	No	
Fret Creek	X		No	
Eightmile Creek	X		Yes	32.0*
Dog River	X		Yes	6.5-7.0*
Ward Creek		X	Unknown	
Cat Creek	X		No	
Rimrock Creek	X		Yes	1
Yellowjacket Cr	X		No	
Puppy Creek	X		Yes	Unknown*
So. Fk. Mill Cr.	X		No	
Alder Creek	X		No	
Crow Creek	X		Yes	3.0*
*** See write-up below for more details.**				

In general, trout and steelhead residing within streams in the LSR spawn in the spring and the young emerge from the gravel in summer. Steelhead young live in freshwater streams from 1-3 years, migrate to the ocean during spring runoff, spend from 1-2 (sometimes 3) years in the ocean, and then return to their natal stream to spawn. Steelhead, unlike salmon, do not always die after spawning but the percentage of total spawners is usually low and whether steelhead in the Fifteenmile Creek subbasin repeat spawn is unknown. Resident trout remain in streams or lakes their entire lives which may span 7-10 years. Sculpin life history varies by species but generally they spawn in the spring, remain in the stream for their lives, and live on the stream bottom.

Fifteenmile Creek subbasin steelhead are a state of Oregon stock of concern. Resident redband trout inhabit Eightmile Creek and are likely the resident trout species present in Fifteenmile and Cedar Creeks as well. Cutthroat trout are the predominant trout within other streams in the LSR.

There are no known C3 aquatic mollusc species within the LSR. However, surveys have not been conducted for mollusk within any waterbodies inside the LSR so presence of some C3 mollusk species is a possibility. Mollusk surveys should be conducted prior to any management activities planned within the LSR.

Four species of aquatic insects (all caddisflies) that are on the R6 sensitive species list are found in the Mt. Hood National Forest at high elevations on the slopes of Mt. Hood. None of these species are known to occur within Fifteenmile Creek subbasin and, given their specific habitat requirements, their presence within the East Fork and Mill Creek subbasin portions of the LSR are unlikely. Comprehensive macroinvertebrate surveys have been completed within the Fifteenmile Creek subbasin but not in other streams within the LSR. Refer to the species list in **Appendix E** for a complete list of know macroinvertebrates.

The following is a short summary of known and suspected fish species presence and distribution within the LSR, grouped by subbasin. There very well may be seasonal use in many intermittent tributaries but unless strong evidence points to that possibility it is not discussed.

Fifteenmile Creek Subbasin

Fifteenmile Creek harbors the easternmost run of wild winter steelhead trout in the Columbia River drainage as well as resident rainbow/redband and cutthroat trout (past surveys list both species; could also be hybrids). Based on spring spawning surveys the approximate upper limit of distribution for these salmonids is river mile 49.2. Monitoring and evaluation crews in 1991 electrofished extensively above the barrier located at RM 49.2 and found no fish.

Eightmile Creek also supports steelhead trout but it is unlikely they make it as far upstream as the LSR. A brief electrofishing survey from road 44 upstream 0.25 miles confirmed presence of these fish. Habitat upstream from this point appears suitable for these fish but the upper limit is unknown. If projects are proposed in this area then upper limits surveys need to be conducted.

Sculpin (*Cottus* spp.) are also present in Fifteenmile Creek within the LSR. Based upon electofishing surveys conducted during 1995 they do not appear to reside upstream from RM 46.5-47.0. Definative surveys have not been completed so sculpin upper limits in Fifteenmile Creek are not verified nor is it known if they inhabit Eightmile Creek in the LSR.

Cedar Creek contains resident trout (likely redbands) at least up to RM 1.75 based on visual surveys conducted in 1991. The true upper limit of distribution is unknown and should be verified by electrofishing. Steelhead likely use the lower portion of Cedar Creek, at least on a seasonal bases. Sculpin presence/absence is unknown. Deadman Gulch and the unnamed tributary 0.25 mile upstream are intermittent but could provide seasonal refuge for trout and/or sculpin.

Mill Creek Subbasin

Cutthroat trout inhabit South Fork Mill, Crow, and Alder Creeks but only Crow Creek is known to be fish bearing within the LSR. When Crow Creek was surveyed in 1990 it was intermittent within the LSR. However, during a wet year the stream may be perennial well within the LSR and could support fish further upstream. South Fork Mill Creek is fish bearing to within 0.25 mi. of the LSR boundary but a long, steep riffle may act as a upstream passage barrier. Alder Creek was intermittent beginning about a mile below the LSR boundary at the time of the survey; during a wet year fish may be able to move up into the definative; electrofishing and/or hook and line sampling is needed to confirm upper limits distribution. Sculpin presence/absence is unknown.

East Fork Hood River Subbasin

Cutthroat trout inhabit Dog River and Rimrock Creeks within the LSR and rainbow trout are found in Puppy Creek. The trout in Dog River are confirmed cutthroat trout based on genetic analysis but those in Rimrock Creek are unconfirmed. Upper limit of distribution in Rimrock Creek is based on a 1991 stream survey so verification is needed. The upper limit is estimated to be an 1/8 mile upstream from the LSR/Forest boundary. In Dog River, electrofishing confirmed fish presence up to road 44 and stream surveyors in 1989 noted trout above The Dalles Watershed intake facility, somewhere in the

neighborhood of Agnes Springs. Actual upper limits are unknown but should be verified by electrofishing if projects are proposed in the area. Oregon Department of Fish and Wildlife found rainbow trout (likely the coastal subspecies O.m. irideus) in Puppy Creek up to the river mile 0.25; presence higher than that is possible but unverified. Presence of sculpin in any of the East Fork tributaries is unknown but suspected.

Riparian Condition

The Surveyors Ridge LSR was divided into 5 hydrologic units for ease of description. The units are: northern face drainages, Mill Creek, Dog River, Eightmile Creek, and Fifteenmile Creek. (Refer to Figure 13 for approximate location of these drainage's.)

(Note - information contained in this report was gathered from the Mile Creeks watershed Analysis, knowledge of district personnel, and 1989 and 1995 aerial photos of the area. Field verification was limited to 2 site visits due to winter weather conditions and snow levels.)

Northern Face Drainage's:

These streams are short, steep tributaries that flow east to the East Fork Hood River. The reaches within the LSR are typically less than one mile long with gradients ranging from 15 to 25%; most of these are intermittent streams. Riparian reserves are designated on 145 acres. There have been little or no disturbance to the riparian vegetation from harvest, fire, wind throw, insects or disease for the past 60 years. The riparian reserves have canopy closures nearing 80% in the forested reaches; in the headwaters areas, rock outcrops and shallow soils contribute to a more open, high meadow type of vegetation which exposes the stream channels to sunlight.

Mill Creek::

This area consists of Crow, Alder, and South Fork Mill Creeks. These are perennial streams that flow in a northeasterly direction and form the headwaters of The Dalles Municipal watershed. Three hundred ninety six acres are in riparian reserves. Approximately 10 acres of riparian reserves on Alder Creek has been degraded by timber harvest. The health of the riparian reserves of the upper tributaries of Crow and Alder Creek are showing signs of decline and mortality due to insect and disease - specifically spruce budworm and root rot. The lower 3/4ths of all three streams are healthy with some overstocking. Canopy closures in the Mill Creek unit range from 55 to 100% and average around 70%.

Dog River:

Dog River flows north from the Badger Wilderness boundary and is piped into the Mill Creek system near the junction of Forest Roads 44 and 17. Riparian reserves occupy slightly more than 370 acres with a canopy closure of 70%. The river flows through an unmanaged stand that is beginning to thin out due to mortality from insects and disease. The early seral species such as larch are being replaced with late seral species. At the present time, the riparian reserve is relatively intact. Due to the mortality and transitional nature of the stand, the riparian reserve is at a high risk to total loss from a stand replacing wildfire.

Eightmile Creek::

Eightmile Creek is a perennial stream that flows north through the LSR. One hundred ten acres is in riparian reserve which has a canopy closure ranging from 60-80%. Less than 5 acres of the riparian reserve has been adversely affected by timber harvest. The riparian reserve in the headwaters of Eightmile creek is composed primarily of lodgepole pine which is showing signs of mortality due to age. The remainder of the riparian reserve is in the same stand type as Dog River but with less total mortality than in Dog River. Because the upper drainage is shifting toward greater mortality and the rest of the

drainage is showing signs of insect and disease infestation, the riparian reserve is at high risk for total loss from a stand replacing wildfire.

Fifteenmile Creek::

Fifteenmile Creek and Cedar Creek, both perennial, and Deadman Gulch, intermittent, form this hydrologic unit which is the headwaters for the City of Dufur water supply. These streams flow in a easterly direction and are buffered by 460 acres of riparian reserve. Harvest activity has removed trees and adversely impacted Deadmans Gulch, which has many narrow corridors through it, and several springs. About 25 acres of the riparian reserve has been directly impacted due to these activities. There is little evidence of mortality in the riparian reserves in these streams; canopy closures range from 80 to 100% in the upper drainage decreasing to 65% in the lower drainage in the pine oak type.

Overall the riparian condition of the streams within the LSR is good. Three of the units, Dog River, Mill Creek, and fifteenmile creek are the headwaters for municipal water supplies. Of these, the Dog River riparian area is at the greatest risk of loss and the most likely cause would be to a wildfire event.

Botany

Individuals consulted for this portion of this assessment stressed that the information currently available on habitat types, distribution range, geographic extent, and ecology of fungi, lichens and bryophytes (mosses and liverworts), is not at all conclusive. There is a paucity of information available for these groups, due in part to the lack of actual field surveys and expertise. Therefore the data in here should only be used as a preliminary analysis of base information to be expanded upon prior to actual field verification surveys.

The following information can be found in **Appendix F** (Titled: Survey and manage Fungi, Lichens, Bryophytes, and vascular plants , and their probability of occurring on the eastside of the Mt. Hood National Forest.). Refer to columns (MC) for Mill Creek and (M) for Mile Creeks to asses the likelihood of a species occurring in Surveyors Ridge LSR. A data dictionary page is enclosed in the front of the appendix.

Sensitive, Survey and Manage, and Inventory Species in the Surveyors Ridge LSR:

Agoseris elata (AGEL - Sensitive), in Bottle Prairie and Brooks Meadow, wet meadows without any tree cover. These two meadows harbor the only known populations on Barlow District. Fire Exclusion may encourage tree encroachment around these meadows. This plant produces airborn seeds (much like a dandelion), so this species can potentially disperse into distant, isolated patches of suitable habitat. If the wet meadows currently present in the LSR are maintained, this sensitive species will most likely persist.

Arabis furcata (ARFU - Inventory) grows on rocky slopes at moderate to higher elevations within the LSR. It's habitat does not support late successional forest (it's too rocky) so trees will not likely encroach on existing populations. Several populations are scattered along ridges and isolated rock outcrops throughout the LSR. Some geneflow between populations may occur through insect pollination.

Arabis sparsiflora v. atrorubens (ARSPA - Sensitive) Grows in open, grassy areas within pine/oak stands. Trees (primarily oak) have encroached on these openings due to fire exclusion and may shade out some populations if the trend continues. We do not know the historic distribution of this species but large tracts of contiguous oak woodlands provide widespread suitable habitat. Current distribution of woodland stands within the LSR should be maintained so that pollination and seed dispersal can occur between populations of *Arabis*.

Castilleja thompsonianus (CATH - Inventory) Discovered in 1995 atop Eight Mile Point, on an exposed, rock outcrop - no canopy cover from trees. Habitat too rocky to support late successional forest.

Populations may be genetically isolated because suitable habitat is widely scattered and naturally isolated.

Lomatium watsonii (LOWA - sensitive) - Grows on large rocky, thin-soiled grassy opening within the LSR. Soil too thin, dry, and rocky to support trees; encroachment not likely. Introduced forbs and grasses plus physical damage from off-road human, vehicle traffic, and livestock are the most immediate threats to this population. Only two populations in the state (the other is on Mill Creek Ridge) are known to persist (a few historic sites also reported from Warm Springs Reservation and the Arlington, Oregon vicinity. Populations may be genetically isolated because suitable habitat is widely scattered and naturally isolated.

TES, Survey and Managed, and Inventoried Species with suitable habitat (but no known sites) in the LSR:

This LSR contains suitable habitat for many of the fungi and lichen species listed in Table C-3 of the Forest Plan, and may also harbor populations of mingan and mountain moonwort *(Botrychium minganense, B. montanum)* and candystick plant *(Allotropa virgata)*. See Appendix F for a complete list of Table C-3 species and their habitats. Refer to the columns (M) Mile Creeks and (MC) for Mill Creek watersheds; this will closely approximate the list for Surveyors Ridge LSR.

For sensitive species, and strategy 2 species, surveys must be conducted prior to ground disturbing activities. For strategy 3 and 4 species, coordinated regional surveys will be conducted, but are not required prior to individual projects.

Species Dependent on Late Successional Habitat:

Late Seral Multistory and Cathedral Stands: Many mycorhizzal fungi species are found only in late successional stands with deep duff and non compacted soil. Appendix F lists these fungi. Several achlorophyllous heath species *(Allotropa virgata , Pleuricospora fimbriolata , Pterospora andromeda , Hemitomes congesta)* occur only in these late succssional stands. Like the fungi, they require undisturbed duff and soil, as well as shade from a closed canopy.

Woodland and Open Parklike stands are home to *Ararbis sparsiflora v. atrorubens*, a sensitive species which is not found in other habitat types.

Most of vascular plants found in late successional forests of Surveyors Ridge LSR occur in many other stand types as well (ie, they are not restricted to old growth stands).

Unique Habitats within the LSR:

Wet Meadows (334 Acres) -Ex. : Brooks Meadow. Pristine, native vegetation (forbs, rushes, sedges) dominate these habitats within the LSR - occasional thistles but noxiou weeds generally not present at this time. Monitor for purple loosestrife *(Lythrum salicaria)* and reed canary grass *(Phalaris arundinaceae)*, aggressive invaders of wetlands that do occur in the lower Hood River watershed.

Dry Meadows (1006 Acres) - includes ridgetops and balds, and high elevation forb/sedge lodgepole pine/ mtn hemlock communities north of the 4420 road, near High Prairie. The dry grasslands within the LSR, once dominated by native bunchgrasses and perennial forbs (*Lomtium* spp, *Allium* spp, *Eriogonum* spp, etc), now harbor large population of introduced grasses (i.e. *Poa bulbosa, Bromus tectorum*) and noxious weeds (i.e. *Centauea diffusa*).

Rocky Areas: (119 acres), - scree, talus and exposed basalt outcrops. Too rocky to grow a closed canopy forest; will probably remain as is regardless of our management activities.

Special Forest Products in Surveyors Ridge LSR:

Sitka valerian *(Valeriana sitchensis)* , a perennial forb whose roots are dug up and processed as a medicinal herb, is fairly common within the LSR in moist subalpine meadows, along stream banks, and in some shelterwood timber sale units. We do not know how quickly harvested areas grow back, nor do we have any estimates of how much valerian exists on the eastside (in or out of the LSR). Nor do we know what role this species plays in the maintenance of late successional ecosystems.

Since the effects of valerian root harvesting within the LSR are not known and since a sufficient supply of valerian can be obtained outside the LSR, commercial collection will not be permitted inside the LSR boundary, except if a ground disturbing activity is planned (ie, a road or a timber sale). Then, any valerian growing within the project area should be made available to collectors.

King bolete *(Boletus edulis)* , a choice, edible fungi, is found sporadically throughout the LSR. It is mycorhizzal with various conifers, and fruits in both spring and late summer (primarily at high elevations in August/September). This species is harvested but we are unsure what effect, if any, this harvest has on the fungi or it's ecosystem. Picking this mushroom is analogous to picking an apple from a tree - you won't kill, and likely will not damage the fungi by taking its fruiting body. On the other hand, many forest animals consume this mushroom, so it may be an important part of the food chain in late successional forests, and should be left as part of the ecosystem. No commercial harvest of boletes will be permitted within the LSR, but collection for personal consumption will be allowed.

Morels (*Morchella* spp.), another choice, edible fungi, grow in small patches throughout the LSR, especially where fire or insects have recently killed conifers. This species is a component of early seral forests and will become scarcer as late successional stands develop. Both commercial and personal use permits will be issued within the the LSR.

Traditional gathering of forest products by Native Americans will be permitted within the LSR.

Appendix G is a list of plant species known or suspected to occur in Surveyors Ridge LSR. This appendix deals with Grasses, Herbs, Fern-ALI, Rushes, Sedges, Shrubs, Tree species. It also identifies native and Non-native species, as well as noxious weeds.

Recreation/ Human Interaction:

This section of the document will highlight the prehistoric, historic, and modern day uses of the Surveyors Ridge LSR. The main emphasis here is to illustrate how humans interact within this entire landscape.

Prehistoric use in the area was primarily subsistence oriented, with people living, hunting, and gathering in a seasonal-use pattern (staying in a small area for a short time while utilizing the available resources, then moving on to a new area as resource needs were meet or changed). Although people were most likely in the area at an earlier time, more concentrated use of the area probably began during 3000 to 500 BC, and continued into historic times. Dating of prehistoric lithic sites in the LSR is based on projectile point styles and places the sites at Tucannon Phase or later. No older Windust or Cascade Phase artifacts have been located in the LSR.

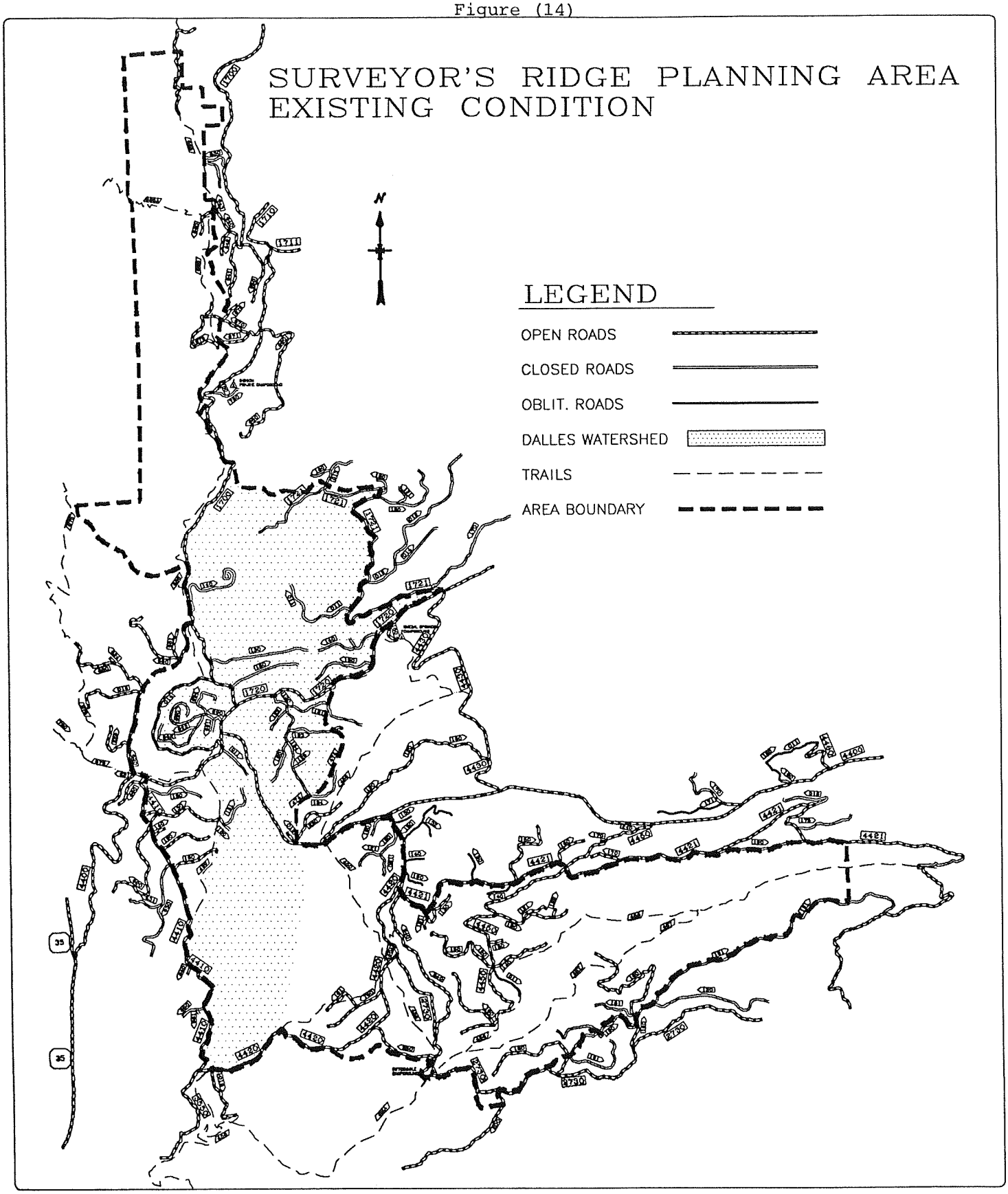
Historic use of the LSR probably began in the 1840s - 1850s, with emigration to the general area by European Americans. Although for many years used for little except hunting, by the late 1800s a few cabins were present in the LSR, and early logging activity had begun. Forest Service associated activities such as building small ranger cabins and fire prevention began in the early 1900s. Sheep and cattle grazing were dominant in the area in the 1920s and 30s. Sites in the area have been dated using historic artifacts such as tin cans and diaries.

Modern-day use of the period was dominated by logging activity from the 1960s to the mid 80s. Although it has slowed down in more recent years, logging activity still took place until the Northwest Forest Plan took affect in 1994. The timber harvest activities were primarily concentrated in the Mill Creek Butte, Dog River, and Marion LUs. There are approximately 2500 acres either needing or receiving reforestation and Timber Stand Improvements (TSI) within the entire LSR. **Appendix H** details the status of each plantation in the LSR. It also describes the current problems, along with suggestions and/or thoughts of how to treat these problems. The plantations within the Late Successional Reserve will be monitored to ensure that they will develop into late successional stands in the future. An overview of this appendix indicates that most plantations are in good shape and will likely meet our future expectations.

The roads in the LSR are used for a variety of purposes. (i.e. sight seeing, hunting, access to trails, administrative uses, etc.). There are currently 98.25 miles of road and motorized trails within the LSR, or 2.65 miles per square mile. This is within the guidelines set by the Northwest Forest Plan and the Mt. Hood National Forest Plan. There are 29.50 miles of closed roads, or 1.85 miles per square mile. **Appendix I** describes in some detail, by road number and landscape unit, the existing roads and their future status. This information was derived from the Access and Travel Management plan developed on the Mt. Hood in 1995.

Recreational use is also prevalent here with approximately 49.6 miles of trails of which 22.9 are motorized/OHV trails within the LSR, receiving medium to low use, and averaging between 1000 and 3000 users per year. We have a variety of recreationalist, that use this area such as hunters, mountain bikers, horse back riders, hikers, and OHV users, just to name a few. Some of the OHV trails are used exclusively in the Winter, or the Summer. However, some do receive year round use. We have one campground (Fifteenmile) in the LSR and several dispersed sites can be found (mostly at the ends of roads). Recreational use is on the rise, fast approaching being the dominate feature on this landscape, as more people discover and appreciate the natural beauty of the area. **Appendix J** describes the trails and campground current condition and any changes for the future.

Figure (14)



SURVEYOR'S RIDGE

MOUNT HOOD NATIONAL FOREST

U. S. DEPARTMENT OF AGRICULTURE FOREST SERVICE PACIFIC NORTHWEST REGION

DESIGNED	
DRAWN	JIM NEIGHORN
LANDSCAPE ARCHITECT	
ENGINEER	
DISTRICT RANGER	
RECREATION STAFF	
FOREST SUPERVISOR	

Figure #14 shows the existing condition for the access and travel routes connected with Surveyors Ridge LSR.

Note: Approximately 40 known and recorded cultural resource sites are located within the LSR. Prehistoric sites include lithic isolates, seasonal camps, peeled cedars, and rock features. Historic sites include cabins (USFS and private), lookouts, lookout trees, telephone lines with associated insulators, an aqueduct, and a Civilian Conservation Corps camp.

Very little of the LSR (less than 1/8th) has been officially surveyed for cultural resource sites. A few area surveys using a sample-survey pattern have been completed, as have a number of trail and creek surveys. Considering the terrain, with additional survey it is likely that more sites similar to those mentioned in this assessment will be located.

Part IV Desired Future Conditions

Stand Structures

The primary LSR objective is to provide the maximum amount of habitat for late successional and old growth associated species. We identified three characteristic old growth structure types in Surveyors Ridge LSR and where each type could be expected to occur. Two areas do not produce old growth in the typical sense--woodlands and the Cycle area. The largest single patch of woodland lies in the 15 North landscape unit (LU). In the remaining area, we theoretically could provide 100% old growth forest, but not practically. Disturbances would continue to happen, creating other structure types. Therefore, we estimated the amount of old growth forest we probably could provide within each old growth structure type by landscape unit (Table IV-5).

The percentages of old growth apply only to the areas considered capable of providing a particular structure type over several decades. In a given landscape unit, the area capable of producing a particular structure type usually does not cover the entire landscape unit. For example, only the riparian area along Fifteenmile Creek in the 15 North LU is capable of supporting the Late Seral Multistory structure type. But, we expect that a very high percentage of this area should be in that structure type at any given time. Any portion of the landscape unit not expected to provide a given structure type should fall into one or more of the acceptable structure types. We considered these other stand structures as moving towards an old growth structure type.

The Cycle area is a special case, since it is not a structure type, but a process. We recommend breaking the cycle area primarily in the Marion LU through timber harvesting, in order to provide a wider connection between the eastern portion of the LSR and the northern portion. In moving this area towards a Late Serial Multistory (LSM) structure type requires greatly reducing the number of lodgepole pine and subalpine fir trees per acre and giving competitive advantage to longer lived species such as western larch, western white pine, and Douglas fir. Unsure if it is possible to control lodgepole pine and subalpine fir stocking levels due to the high numbers of trees (seed sources) present, prevailing winds to spread seed into Marion LU, and the favorable growing conditions for these two species.

In the unroaded areas, we recommend that natural forces remain the primary determinant of stand conditions with one exception. The Cycle area is located at a critical point for protecting old growth. The area is oriented north-south while strong west winds have driven many large fires on Barlow Ranger District. We propose that as the area shows indications of cycling again (approximately every 100-125 years) that we use prescribed fire to burn the area, rather than waiting for a wildfire. Using prescribed fire should allow the District to better choose the burning conditions, allowing for better protection of any old growth to the east of the Cycle area.

We would wait until the stands begin to enter the Collapsing stage and, most likely, use management ignited prescribed fire to replace the stands. Another burn would be needed 5-10 years later to dispose of many of the small snags that would fall and create an unacceptable arrangement of fuels. Instead of waiting for an August or September wildfire burning under extreme conditions, we would select cooler conditions and burn a smaller area at a time. It would probably take several years in order to burn the entire area. Whether this activity would cause more unacceptable changes in resource values than a wildfire is unknown at this time. The main drawbacks are the lack of reliable funding for burning natural fuels and how risk adverse the District and Forest are at the time of the project. Trying to deliberately start and stop a stand replacing fire carries a higher risk of failing to meet project objectives and of escaped fire with greater consequences of failure than most natural fuels burning projects.

There are several other areas within each landscape unit where we would allow natural forces to control the actual stand structures. Prescribed burning may be needed to restore that disturbance factor in all Woodland areas and possibly some dry meadows in Surveyor's Ridge LU. These areas probably burned frequently before Euro-American settlement and American Indians may have provided a significant

ignition source. Since fire was an integral part of this ecosystem, it seems wise to return fire to the system; however, natural ignitions within or adjacent to the Woodlands and dry meadows are rare. Further, the locations on the landscape would likely limit the number of qualifying prescribed natural fires to some level below what as probably characteristic before Euro-American settlement. Therefore, we will need to use management ignited prescribed fire. Barlow's Natural Fuels Underburing Integrated Resource Analysis suggested a fire return interval of 20 years for management ignited prescribed fire. We may need to develop some method to make the intervals between fires more irregular, which would more closely mimic the pre-1855 regime.

Old Growth Structures

Open Parklike

The Open Parklike structure type actually contains many different structure types in patches too small to map. Most patches would be less than two acres in size and patch edges would be very indistinct. Collectively, this heterogeneous mix of structure types creates an impression of a very open stand with a grassy understory, similar to a park. Since the Open Parklike structure type contains many different structure types, we could theoretically provide this structure over 100% of the potential area. In reality, we expect that some larger, mappable patches of distinct structure types would likely occur since disturbance regimes and natural systems operate in a chaotic manner despite our efforts to manage and model them. This structure type occurs in dry areas subject to low intensity, low severity, and frequent events that kill individual trees or groups of trees but would not be considered stand replacing.

Cathedral

The Cathedral structure type is a special case of either Mature Stem Exclusion or Understory Reinitiation, depending on actual canopy closure and individual perspective. The Cathedral structure type occurs in areas subject to a variety of disturbance intensities, severalties, and frequencies, so should be more diverse structurally across the landscape. Individual patches would fall into distinct structure types, although patch edges may be difficult to map.

Late Seral Multistory

The Late Seral Multistory structure type occurs in areas generally subject to high intensity, moderate to high severity, and infrequent stand replacing events. Events lower in intensity and severity occur at more frequent intervals, but tend to affect less than 300 acres with each individual event. The Late Seral Multistory area tends to be dominated by only one or two structure types at any given point in time. Edges between patches may be either distinct or indistinct, depending on the particular disturbance event and actual conditions during the event.

Species Composition

In addition to stand structure, we developed a list of desired tree species by structure type (Table IV-6). These species are intended to represent healthy stand and forest conditions for a given stand structure. Since the probable species composition varies little by landscape unit, we listed them by structure type. The listings indicate where a particular species seems restricted more to a particular landscape unit.

In the case of the Late Seral Multistory structure type and the Cycle area, we listed the species that are likely to be present. By definition, Late Seral Multistory stands should include all species that could potentially grow on a given site. If the late successional species are not present, then the stand is not in the Late Seral Multistory stage. Since we recommend that natural forces determine the stand structures in the unroaded portion of the Cycle area, these forces will also determine the species composition. Therefore, the species listing reflects all tree species that could potentially appear, based on current stand information.

There are some high elevation woodlands, or meadow complexes, in Dog River LU. The tree species present in these areas would be more reflective of the Cycle area than of similar woodlands in the other landscape units.

Table IV-5. Summary of desired levels of old growth forests by old growth potential and landscape unit. (To reference where the following areas are located see figure 6, pg26 Potential Old Growth, and figure 7, pg37 All Landscape Units)

Landscape Unit	Old Growth Potential	Desired Levels of Old Growth	Acceptable Levels of Other Structure Types	Acceptable Other Stand Structure Types[1]	Unacceptable Stand Structure Types[1]
15 North	Open Parklike[2]	90%	10%	SI, SE, OIM	POHD
	Cathedral	75%	25%	SI. SE. MSE, UR	HDS, COL, LSM
	LSM	90%	10%	SI, SE, MSE, UR, CAT, RH	HDS, COL
15 South	Open Parklike	90%	10%	SI, SE, OIM	POHD
	Cathedral	60%	40%	SI, SE, MSE, UR	HDS, COL, LSM
	LSM	50%	50%	SI, SE, MSE, UR, CAT, RH	HDS, COL
Marion	Cathedral	60%	40%	SI, SE, MSE, UR	HDS, COL, LSM
	LSM	70%	30%	SI, SE, MSE, UR, CAT, RH	HDS, COL
	Cycle	70% LSM	30%	SI, SE, MSE, UR, CAT	HDS, COL
Eightmile Plateau	LSM	70%	30%	SI, SE, MSE, UR, CAT, RH	HDS, COL
	Cycle	N/A	N/A	N/A	N/A
Dog River	Cathedral	90%	10%	SI, SE, MSE, UR	HDS, COL, LSM
	LSM	60%	40%	SI, SE, MSE, UR, CAT, RH	HDS, COL
	Cycle	N/A	N/A	N/A	N/A
Mill Creek Buttes	Open Parklike	100%			
	Cathedral	75%	0%	SI, SE, MSE, UR	HDS, COL, LSM
	LSM	50%	50%	SI, SE, MSE, UR, CAT, RH	HDS, COL
Surveyor's Ridge	Open Parklike	Natural forces determine	N/A	N/A	N/A
	Cathedral	60%	40%	SI, SE, MSE, UR	HDS, COL, LSM
	LSM	90%	10%	SI, SE, MSE, UR, CAT, RH	HDS, COL

[1] SI - Stand Initiation, SE - Stem Exclusion, OIM - Open Intolerant Multistory, MSE - Mature Stem Exclusion, UR - Understory Reinitiation, CAT - Cathedral, POHD - Pine-Oak High Density, HDS - High Density Stagnating, COL - Collapsing, LSM - Late Seral Multistory, RH - Riparian Hardwood

[2] Includes woodlands

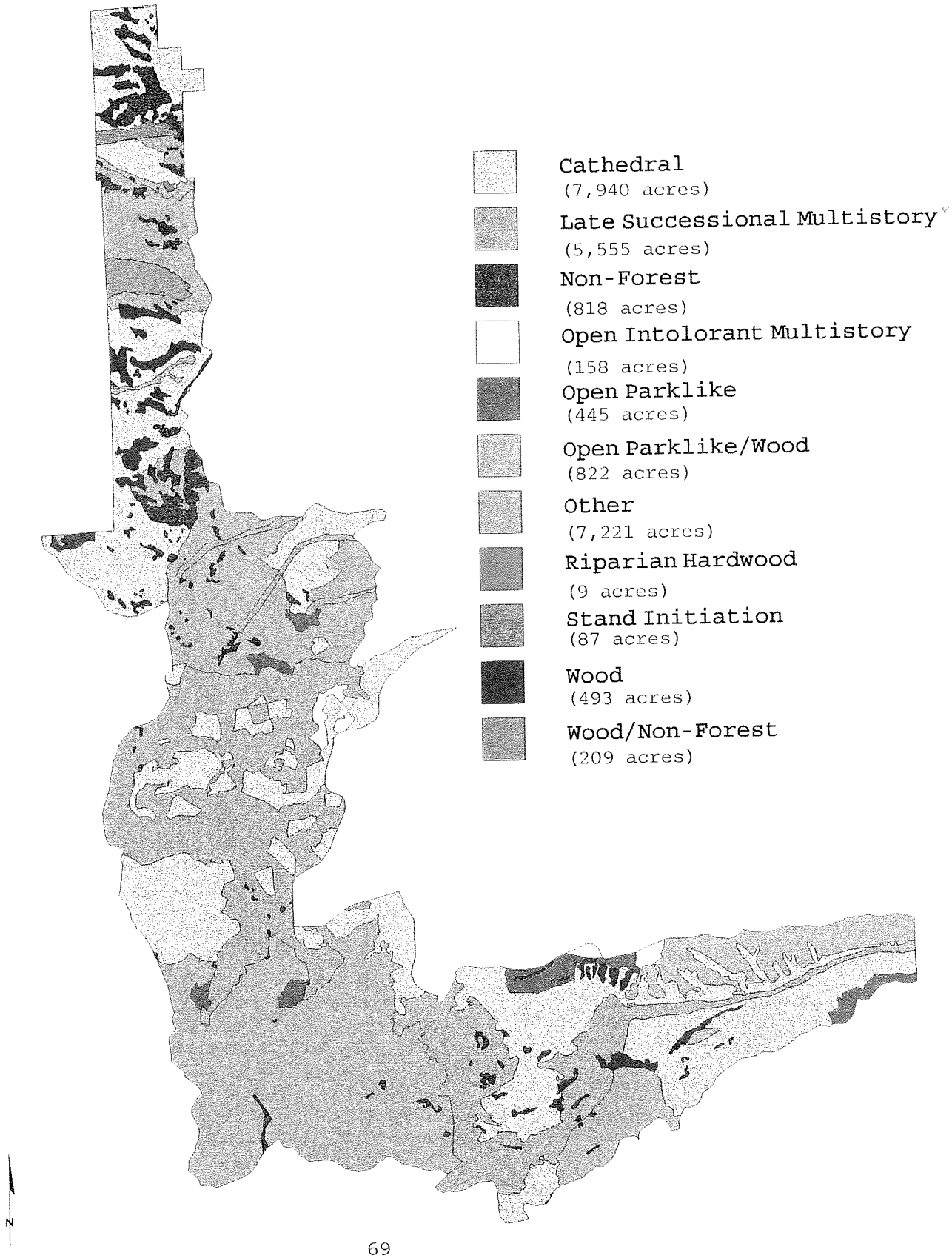
Table IV-6. Desired species composition by stand structure type.

Structure Type	Species	Comments
Woodland[1]	Oregon white oak	Occassional ponderosa pine or Douglas-fir may be present.
Open Parklike	Oregon white oak, ponderosa pine, Douglas-fir	Douglas-fir limited in numbers except in Surveyors Ridge LU; occasional western larch may be present in 15 North and 15 South LUs.
Open Intolerant Multistory	Oregon white oak, ponderosa pine, Douglas-fir	Douglas-fir should be limited in numbers.
Stand Initiation	Primarily shade intolerant species characteristic of a given site/plant association	
Stem Exclusion	Primarily shade intolerant species characteristic of a given site/plant association	
Mature Stem Exclusion	Primarily shade intolerant species characteristic of a given site/plant association in the overstory, some shade tolerant species in lower canopy	
Understory Reinitiation	Primarily shade intolerant species characteristic of a given site/plant association in the overstory, mix of shade intolerant and shade tolerant species in the understory	
Cathedral	ponderosa pine, Douglas-fir, western larch, western white pine	Western larch and western white pine may not be present on drier sites.
Late Seral Multistory	all species characteristic of a given site/plant association	Understory is primarily shade tolerant species. Cottonwood and other riparian hardwoods are important stand components along Fifteenmile Creek in 15 North and 15 South LUs.
Riparian Hardwood[2]	Cottonwood, alder, vine maple, conifers typical of a given site/plant association	Found primarily along Fifteenmile Creek in 15 North and 15 South LUs. May be found along other perennial streams at mid-elevation within the LSR.
Cycle Area	ponderosa pine, western white pine, lodgepole pine, grand fir, noble fir, subalpine fir, Pacific silver fir, Douglas-fir, western larch, western hemlock, mountain hemlock, Engelmann spruce	Noble fir and Pacific silver fir very limited in numbers.

[1] High elevation woodlands contain species typical of subalpine fir-mountian hemlock series.
[2] Early seral structure along perennial streams at mid- and lower elevations; not described elsewhere.

Figure (15)

Stand Structure Projected @ 100yrs



Interior Habitat

Old growth and late successional associated species usually require some level of interior habitat in closed canopy forests. We assumed that interior habitat for animals with large home ranges was more critical. A larger patch provides habitat for several individuals or pairs of species with smaller home ranges and for old growth and late successional associated plants, fungi, mollusks, and arthropods. The interior habitat patch size and minimum levels are based on what little information we could find about species dependent on closed canopy forest dominated by larger trees and professional judgment (Table IV-7). The desired levels are set by old growth potential.

The Open Parklike structure essentially has no interior habitat. Stands are simply too open. It actually consists of several different stand structure types but individual patches are too small to map. The Eastside Zone contains stringer stands of denser forest surrounded by open forest or woodland, such in 15 North LU. Species and individuals dependent on a more closed canopy stand use these stringer stands, but they have adapted to the stand's linear shape and probably use the entire stand rather than only a portion of it within a certain distance from the edge. The number of closed canopy species supported by these stringer stands is less than the number supported by block shaped stands.

Several structure types can provide interior habitat. High Density Stagnating stands are not an acceptable structure type, except by default in the Cycle area, but provide interior habitat when they occur around the Mature Stem Exclusion stage. We do not consider natural or created openings less than 5 acres in size or corridors created by unpaved roads as edges that reduce interior habitat. The only paved roads in the LSR are roads 44, 4420, 2730, and a short portion of 17.

Table IV-7. Desired characteristics of interior habitat.

Old Growth Potential	Minimum Patch Size	Minimum Levels *	Qualifying Structure Types
Open Parklike	N/A	N/A	N/A
Cathedral	100 acres	50%	Mature Stem Exclusion Cathedral
Late Seral Multistory	150 acres	50%	Mature Stem Exclusion Cathedral Late Seral Multistory
Cycle Area	150 acres	50%	High Density Stagnating Mature Stem Exclusion

* Percent of area capable of providing a given old growth structure that should provide interior habitat.

Expected Vegetation

In order to move towards the desired conditions discussed above, we needed some indication of what the LSR may look like in the future in order to evaluate the "distance" between current conditions and desired conditions. Therefore, we created a map of expected stand structures approximately 100 years from present (Figure 15). We do not consider this map to depict the desired stand structures, since the DFC conditions are timeless and a map must represent a particular point in time. One hundred years is an arbitrary time point, but one commonly used in land management planning. The expected stand structures are based on current stand structures, known insect and disease problems, and local knowledge of growth rates. In some landscape units, we will not reach the desired conditions in 100 years. This belief is based on the assumption that current insect and disease problem areas will not reach their characteristic old growth structure in 100 years, whether we treat them or not. We did not attempt to guess where problems may occur in the future, such as changes caused by one or more wildfires exceeding 100 acres or further insect and disease epidemics. Areas listed in the Other category

consist of a mix of Stand Initiation, Stem Exclusion, Mature Stem Exclusion, Understory Reinitiation, and Open Intolerant Multistory.

We compared where we are now to where we expect to be in 100 years in terms of interior habitat (Table IV-8, Figure 9, Figure 16). Since we have a better accounting of existing stand structures, the amount and location of interior habitat now (Figure 9) is a more accurate picture than 100 years in the future. For example, we are unsure exactly how much of the area might be in the Mature Stem Exclusion stage, a category that produces interior habitat, and where Mature Stem Exclusion may occur. It is entirely possible that most or all of the Cycle area will be in this stage, but it also depends on when the area "resets" to the Stand Initiation stage. We are reasonably certain that some of the area mapped in the Other category will be Mature Stem Exclusion (Figure 15). Therefore, we believe the 100 year map underestimates how much interior habitat will exist at that time.

Table IV-8. Current and expected (100 years from now) interior habitat by landscape unit.

Landscape Unit	Current Interior Habitat		Expected Interior Habitat		Comments
	Acres	Percent	Acres	Percent	
15 North	13	1%	105	6%	Along Fifteenmile Cr.
15 South	328	11%	1,402	45%	
Marion	41	1%	2,031	60%	
Eightmile Plateau	0	0%	54	4%	Most of area in Cycle
Dog River	368	5%	4,184	62%	1/3rd of area in Cycle
Mill Creek Buttes	1,096	37%	553	18%	
Surveyor's Ridge	389	9%	703	16%	

In addition to interior habitat, we compared the amount of each landscape unit in the various old growth structure types existing and desired (Table IV-9). Area displayed in the Other category includes stands in a stage other than old growth. Across the LSR we had determined the characteristic old growth structure typical of each site. Each landscape unit, therefore, frequently contains the potential to provide more than one old growth type. For example, a large portion of 15 North LU provides either Open Parklike or Woodland old growth structure. The Cathedral structure occurs in the larger intermittent streams and draws, and Late Seral Multistory lies along Fifteenmile Creek. In this analysis, we lumped Open Parklike and Woodland together. We decided what percentage of each potential old growth structure type in each landscape unit was desired (Table IV-5). For example, in 15 North LU, we decided that 90% of the area capable of providing Open Parklike structure should fall in that category at any given point in time. We then determined how much of the area was currently in the desired type. The resulting percentages compare now to the desired level.

Monitoring of existing reforestation and Timber Stand Improvement units will be done and appropriate silvicultural treatments should be applied as needed, to ensure that these areas will develop into late successional forest. See **Appendix H** for more information on the Desired Future Condition of each unit.

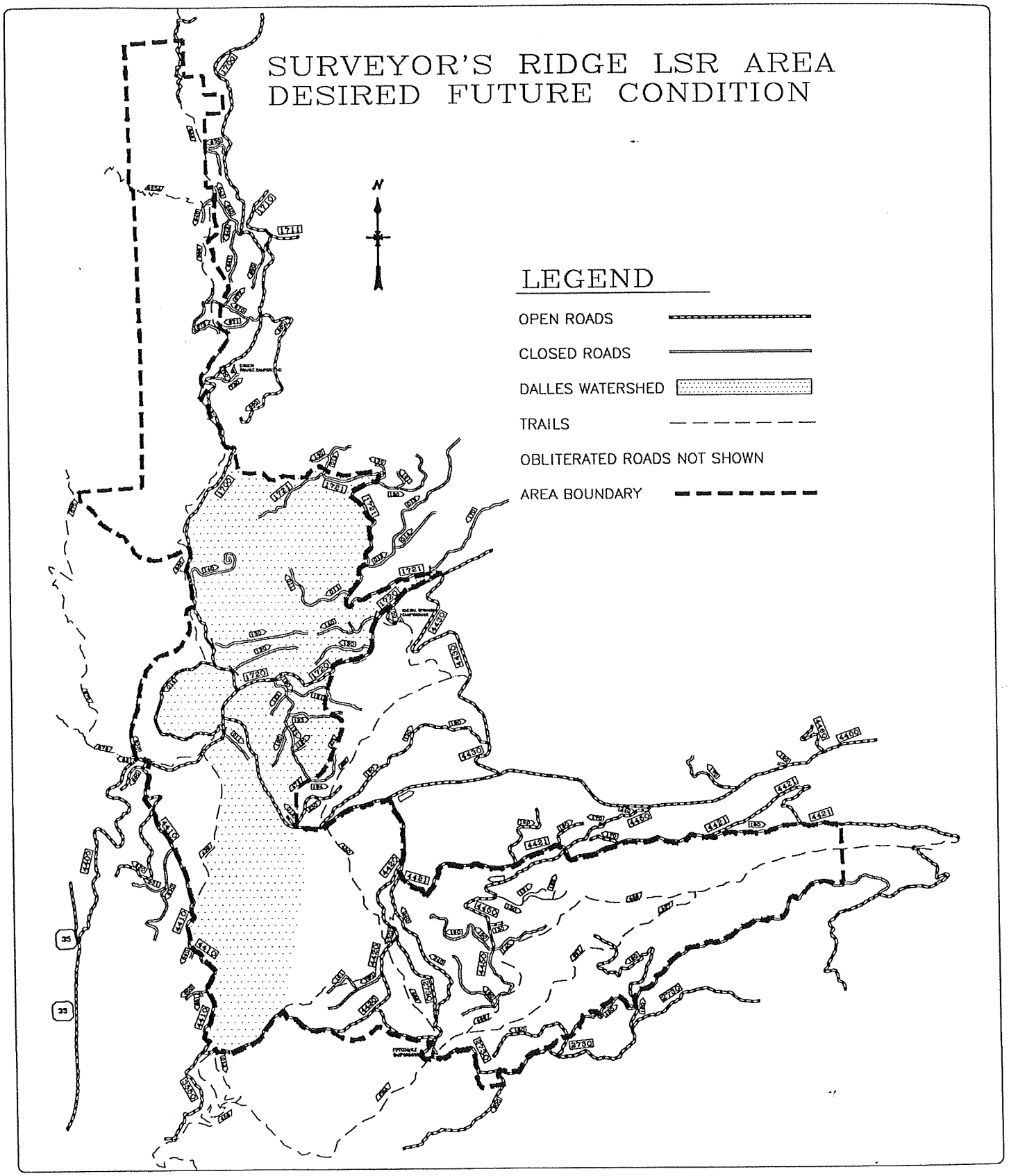
Access and Travel

The Desired Future Condition of the road/trail system within the LSR is 37.15 miles of open roads and 22.90 miles of motorized trails. This will equate to a density of 1.60 miles of road per square mile, well below the Northwest Forest Plan and the Mt. Hood National Forest guidelines. Any new road construction we foresee at this time will only be of a temporary nature. See Figure 17 for map of what the Desired road and trail system will look like. See **Appendix I** for more information about the current and future status for the roads and trails in the LSR. There are no known changes anticipated to the trail system as part of our Desired Future Condition. **Appendix J** describes the current and future use of the trails for each trail in the LSR.

Figure (16)

(8580 acres)

Figure (17)



SURVEYOR'S RIDGE

MOUNT HOOD NATIONAL FOREST

U. S. DEPARTMENT OF AGRICULTURE FOREST SERVICE PACIFIC NORTHWEST REGION

DESIGNED	
DRAWN	JIM NEIGHORN
LANDSCAPE ARCHITECT	
ENGINEER	
DISTRICT RANGER	
RECREATION STAFF	
FOREST SUPERVISOR	

Table IV-9. Comparision of existing and desired levels of old growth structure types by landscape unit.

		Existing Other								Desired	OP/Wood		CAT		LSM	
LU	Acres*	SI	SE	MSE	UR	OIM	POHD	HDS	Total	Other	Existing	Desired	Existing	Desired	Existing	Desired
15 North	1,684	12%	0%	6%	26%	5%	1%	0%	50%	15%	70%	90%	0%	75%	133%	90%
15 South	2,683	6%	6%	58%	9%	5%	0%	2%	86%	41%	67%	90%	0%	60%	43%	50%
Marion	3,334	17%	2%	32%	20%	0%	0%	16%	87%	43%	100%	100%	0%	60%	19%	70%
Eightmile Plateau	1,586	7%	0%	>1%	10%	0%	0%	82%	100%	85%	0%	0%	0%	0%	0%	70%
Dog River	6,620	22%	0%	14%	11%	0%	0%	27%	74%	51%	0%	0%	0%	90%	34%	60%
Mill Creek Buttes	2,917	6%	1%	16%	3%	6%	0%	10%	42%	28%	100%	100%	0%	75%	455%	50%
Surveyors Ridge	3,822	4%	2%	52%	6%	0%	0%	12%	76%	37%	100%	100%	6%	60%	??% ~	90%

* Does not include acres of nonforest

~ Approximately 306 acres of LSM currently exists on uplands; potential for LSM exists along perenniel streams but insufficient data was available to map area in order to calculate existing percentage relative to potential.

Part V Triggers for Management Activities and Projects

Silviculture

In order to decide whether silvicultural treatments are needed to meet LSR objectives, for both uplands and riparian areas , we need some decision method, or triggers, to help determine which stands are potential candidates for treatment. We examined several vegetation related factors to develop these triggers:

- Downed woody loadings,
- Extent of ladder fuels,
- Stand density, expressed as both trees per acre and basal area per acre,
- Percent mortality,
- Interior habitat.,
- Access and Travel, and
- Noxious Weeds.

These factors are based on protecting older forest from stand replacing events and promoting faster growth in younger stands. Reaching a trigger does not necessarily mean that a management action will be taken. Rather, it indicates a need for further analysis to determine if the problem is significant and what types of treatments may be appropriate.

Downed Wood and Snags

The following guidelines are based on work done for White River Watershed Analysis. Although Miles Creek Watershed Analysis includes downed wood recommendations, we decided not to use them for several reasons. Although based on the best available data at the time the watershed analysis was conducted, Miles Creek analysis was forced to rely on primarily westside data. During White River Watershed Analysis we located what we consider to be better information from ecology plots taken on the eastside of the Mt. Hood National Forest and information from ecologically similar areas in the Northern Rockies and Siskiyou National Forest. Ecologically, Surveyor's Ridge LSR is more similar to northern Idaho and northwestern Montana than it is to the westside of the Forest. In the Eastside zone fuel loads are very low because the area has very low suitability for growing trees. In the Crest Zone Surveyor's Ridge LSR is much less productive than the Crest Zone in White River. After reviewing photo guides, we elected to reduce the maximum tonnage in the Crest Zone. In determining downed wood fuel loads overall we tried to balance the needs of soil and wildlife against the hazard posed by the fuel loadings. Our intent is to provide for a mosaic out there, not to manage for the minimums.

Within harvest units, the following downed wood loadings should remain after fuels treatment is complete:

- ☑ Eastside Zone: 3-13 tons per acre, at least one tree-length log per acre, on at least 100 acres.
- ☑ Transition Zone: 10-20 tons per acre, at least three tree-length logs per acre, on at least 300 acres.
- ☑ Crest Zone: 25-40 tons per acre, at least five tree-length logs per acre, on at least 300 acres.

At least 75% of the loading should be in material larger than three inches in diameter as measured using Brown's downed woody inventory method. In the Eastside Zone at the low end of the range, all loading should be in logs larger than twelve inches in diameter at the large end. Manage for the following percentages of the above tonnage within each size class:

	Zone		
Size Classes	Crest	Transition	Eastside
3-6 inches	10-15%	10-15%	5-10%
6-12 inches	10-20%	15-25%	20-30%
12-20 inches	35-40%	40-50%	45-50%
20+ inches	25-45%	20-25%	15-25%

Within the Crest Zone, no more than 25% of the managed acres should fall below 30 tons per acre. Within the Transition Zone, no more than 15% of the managed acres should fall below 15 tons per acre. Within the Eastside Zone, no more than 10% of the managed acres within the forested area should fall below 5 tons per acre. Woody material left after harvesting and fuels treatment should be more-or-less evenly distributed across the unit.

Developing downed wood recommendations for unharvested stands is more problematic. Since stand age or size is a poor predictor of downed woody loading, we decided that the key is to develop a maximum loading. Once downed woody material exceeds the maximum, that stand would become a potential candidate for treatment. We used the recommendations for managed stands and photo guides for downed woody fuels to develop a maximum fuel loading. Stands probably would not be treated on the basis on excessive downed woody loading alone. However, the presence of excessive downed woody loading should be tied to other decision triggers.

There are no universally acceptable methods for deciding when fuel loading is excessive. Arrangement of logs can be just as critical as lineal feet, volume, or tonnage, particularly in smaller diameter stands. We used photo guides to select images where fuel loading seemed excessive, creating high fuel hazard, impeding the movement of large animals, or both. Since the only constant in the photo guides is tonnage, we elected to stick with that measure. After examining several photos we concluded that we could add 25% more tonnage to the levels recommended in managed stands. However, for harvest units lieing within 50 feet of all roads open to use, dispersed camping, and in developed campgrounds, the low end of the recommended loading in harvest units was considered more appropriate to reducing the risk of an escape wildfire. Since most folks do not camp much beyond 50 feet from the edge of the road and most human-caused fires start near roads.

Fuel loading is "excessive" when downed woody loading equals or exceeds:

- 16 tons per acre in the Eastside Zone,
- 25 tons per acre in the Transition Zone, and
- 50 tons per acre in the Crest Zone.

These levels assume that most of the loading is in material larger than nine inches in diameter and that most of it is sound (Decay classes 1,2, and 3). In addition, we selected several photos that indicate unacceptable arrangement of logs, even though the tonnage are within acceptable levels (Table V-10).

Table V-10. References to photos illustrating unacceptable fuel arrangements in unmanaged stands.

Zone	Source	Forest Type	Comments
Eastside	GTR PNW-105 pg 160	ponderosa pine	
	GTR PNW-105 pg 184	ponderosa pine	
	GTR PNW-105 pg 188	ponderosa pine	
	GTR INT-97 pg 108	Douglas-fir	
	GTR INT-97 pg 120	Douglas-fir	
	GTR INT-97 pg 122	Douglas-fir	
Transition	GTR INT-96 pg 14	grand fir-larch-Douglas-fir	Primarily applies to dry grand fir series
	GTR INT-96 pg 16	grand fir-larch-Douglas-fir	Primarily applies to dry grand fir series
	GTR PSW-56 pg 100	white fir	
Crest	GTR PNW-105 pg 118	lodgepole pine	Stand is also overstocked
	GTR PNW-105 pg 128	lodgepole pine	Large animal movement impeded
	GTR PSW-56 pg 68	lodgepole pine	Portion of stand is collapsing
	GTR INT-98 pg 80	Engelmann spruce-subalpine fir	Large animal movement probably impeded
	GTR INT-98 pg 106	Engelmann spruce-subalpine fir	

The intention for snags is to manage for 100% of the biological potential, with the exception of the white-headed woodpecker, across all zones (we will use the current scientific numbers). Any snag that could fall into a road may be considered a hazard. Reduction of the hazard could be to fell the snag, or the tree may be topped so that it cannot fall onto the road.

Ladder Fuels

Dense understories often have two important roles--they help provide hiding cover for species such as deer, and they provide a fuel ladder into the crowns of the overstory trees. Therefore, we need to find some balance between providing hiding cover while striving to protect older forests from crown fire development. Hiding cover needs are particularly important along roads during hunting season. Most wildfires within and immediately adjacent to the LSR are human caused and tend to occur near a road. The main characteristics to consider for ladder fuels are patch size and distribution.

The different plant series have different capabilities of providing for hiding cover and still maintaining tree growth at some level. In addition, the length of fire season varies with aspect and elevation. Fire season in this case refers to the period of time that wildfires can start and spread, as opposed to the declared fire season. We believe we can manage for larger patches of hiding cover in the cooler, moister locations with relatively short seasons than in the warmer, drier locations. Therefore, ladder fuel patch size and distribution recommendations vary by series (Table V-11).

Riparian hardwood patches, although dense, do not generally provide a fuel ladder to the crowns of the overstory trees. Volatile brush species, such as ceanothus and conifers, are the most efficient fuel ladders. Most hardwood species do not have the amounts of volatiles or resins needed to carry a ground fire into the crown. Therefore, riparian hardwood patches will be excluded from the ladder fuel trigger.

The ponderosa pine-Oregon white oak series is not capable of providing hiding cover while still providing for growth of younger trees. In other words, we can either have a growing stand or we can have hiding cover, but we cannot have both. Oak woodlands do not provide much, if any, hiding cover, nor are ladder fuels a particular concern. Stands that do provide hiding cover can become highly susceptible to both mountain pine beetle and western pine beetle. The Douglas-fir series probably is capable of providing more hiding cover while still providing for growth of younger trees than the ponderosa pine-Oregon white oak series, but not much. The main advantage in this series is that most of it does

not occur near a road. The subalpine fir-mountain hemlock series and Pacific silver fire series have similar capabilities, although the subalpine fire-mountain hemlock series typically produces smaller diameter trees.

Table V-11. Ladder fuel patch size and distribution recommendations to trigger further analysis.

Series	Patch Size	Distribution
ponderosa pine-Oregon white oak	10 acres	Two+ adjacent stands[1]
Douglas-fir	10 acres	Two+ adjacent stands
dry grand fir	20 acres	Two+ adjacent stands
moist grand fir	30 acres	Three+ adjacent stands
subalpine fir-mountain hemlock	40 acres	Three+ adjacent stands
Pacific silver fir	40 acres	Three+ adjacent stands
[1] At least two patches of at least 10 acres each		

Stand Density Recommendations

Stand density affects a variety of ecosystem functions and disturbance risks. Generally, as stands become denser, above and below ground competition increases, thereby increasing the risk of a stand replacing disturbance. Also as stands become denser, they also provide more habitat for species that depend on closed canopy forests for some or all of their life needs. There are two basic measures of stand density--basal area per acre and trees per acre. In setting a "trigger" for stand density, basal area per acre would not change with tree size whereas trees per acre will. Further, establishing a trees per acre guideline may be difficult in multi-aged stands, which contain a variety of tree sizes.

There are no models to help establish guidelines for stand density in multi-aged stands. All models available are designed for even-aged stands. As we understand it, one of the goals in LSR is to create multi-aged stands. Therefore, we should be able to use various models to help establish stand density guidelines in young managed stands, particularly those that have undergone a regeneration harvest. Models may help us establish stand density guidelines in plant series that are typically even-aged until they near the Late Seral Multistory stage.

Once stands reach the Mature Stem Exclusion stage or its equivalent, growth is not as important in meeting LSR objectives. Growth is important for stands in the Stand Initiation, Stem Exclusion, and Understory Reinitiation stage and any stage that refers to a stagnating stand. Fred Hall (1987) developed a method for establishing basal area guidelines, called the growth basal area (GBA). The growth basal area is the basal area at which a stand is growing well enough to reduce stress-related competition to acceptable levels and is set at 1.0 inches per decade. Growth basal area is not a density level that produces maximum growth and was designed for use in even-aged stands dominated by only one or two species. We can use GBA in older plantations and possibly some lodgepole pine dominated stands in the subalpine fir-mountain hemlock series. If the plantation or lodgepole pine stand is growing at rate slower than GBA (less than 1.0 inch per decade), thinning may be needed.

Elsewhere, in diverse even-aged stands and in multi-aged stands, we can only rely on professional judgment. We consulted silviculturists familiar with the Mt. Hood eastside and the Forest Silviculturalist to develop guidelines (Table V-12). We developed a range of basal areas for older stands in order to permit variation between stands. In general, once a stand reaches the upper range within a given series, management action may be justified. The intent would be to reduce stand density to or near the lower limits of the range. The number of trees per acre (TPA) can be estimated using average stand diameter (Table V-13). The actual number of trees would probably range from the equivalent of one to two diameter classes below the average stand diameter since some trees are larger than the average and many trees are smaller than the average.

In stands where the dominant trees average less than 10 inches DBH, basal area does not work well as a stand density guideline. In these younger stands, TPA seems to work better. We developed guidelines

for stands where the trees are at least 4.5 ft tall (establishment size) and varied it slightly for the drier types. The number of trees listed equates to an average spacing, although we assume that tree spacing after treatment would be variable. As with the basal area, the intent is to reduce stand density to some level within but not below the range. This stocking level is intended to promote rapid tree growth and development of old growth characteristics.

Table V-12. Recommended ranges of stand basal area and probable trees per acre in old growth stands by plant series.

Series	Basal Area/Acre[1]	Trees/Acre[2]
ponderosa pine-Oregon white oak	50-100 ft^2	70-110
Douglas-fir	100-160 ft^2	150-225
dry grand fir	150-200 ft^2	150-225
moist grand fir	180-250 ft^2	225-435
subalpine fir-mountain hemlock	150-200 ft^2	225-435
Pacific silver fir	200-300 ft^2	225-435

[1] For stands where dominant trees average 10" DBH or greater
[2] For stands where dominant trees average less than 10" DBH

Table V-13. Trees per acre by diameter class and basal area per acre.

	DBH							
BA/A	1	2	3	4	6	8	10	12
50	9,167	2,292	1,019	573	255	143	92	64
100	18,335	4,584	2,037	1,146	509	286	183	127
120	22,002	5,500	2,445	1,375	611	344	220	153
140	25,669	6,417	2,852	1,604	713	401	257	178
160	29,335	7,334	3,259	1,833	815	458	293	204
180	33,002	8,251	3,667	2,063	917	516	330	229
200	36,669	9,167	4,074	2,292	1,019	573	367	255
220	40,336	10,084	4,482	2,521	1,120	630	403	280
240	44,003	11,001	4,889	2,750	1,222	688	440	306
260	47,670	11,918	5,297	2,979	1,324	745	477	331
280	51,337	12,834	5,704	3,209	1,426	802	513	357
300	55,004	13,751	6,112	3,438	1,528	859	550	382
350	64,171	16,043	7,130	4,011	1,783	1,003	642	446
400	73,339	18,335	8,149	4,584	2,037	1,146	733	509

	14	16	18	20	25	30	40
50	47	36	28	23	15	10	6
100	94	72	57	46	29	20	11
120	112	86	68	55	35	24	14
140	131	100	79	64	41	29	16
160	150	115	91	73	47	33	18
180	168	129	102	83	53	37	21
200	187	143	113	92	59	41	23
220	206	158	124	101	65	45	25
240	225	172	136	110	70	49	28
260	243	186	147	119	76	53	30
280	262	201	158	128	82	57	32
300	281	215	170	138	88	61	34
350	327	251	198	160	103	71	40
400	374	286	226	183	117	81	46

Mortality

Some level of tree mortality is desirable in order to provide snags and downed wood. At some point, the level of mortality results in large openings within the stand and it begins to lose its old growth or late successional characteristics.

There are no models to help guide us in developing criteria, so we relied on professional judgment. We agreed that if stand mortality equals or exceeds 15%, management action may be needed. Although a "total mortality" of 15% over the life of the stand certainly is not excessive, 15% within a 1 to 5 year timeframe might be too high if similar losses are expected to continue in the future. This 15% refers to either basal area or trees per acre. Trees per acre is critical if most of the trees affected are small, resulting in a rapid increase in downed woody fuel in the smaller size classes. Basal area per acre is critical if most of the trees affected are large, resulting in a rapid decrease in canopy closure and potentially a rapid increase in downed logs, depending on the species affected. We believe this 15% stand mortality exceeds 100% biological potential.

In addition to mortality, we need to examine the cause of death and whether the area affected is increasing rapidly (i.e. growing noticeably each year). For example, a high level of mortality caused by a single windstorm may not be as significant to meeting LSR objectives as a spreading Douglas-fir bark beetle outbreak.

Another example where it might be difficult to meet LSR objectives is as follows: Large ponderosa pine are relatively rare across the Barlow District. Most large diameter trees remaining are scattered individuals and small groups. Because of moisture and nutrient stress brought on by overstocking, western pine beetle has been successfully attacking these pines for several years. While annual losses are low, the numbers lost are significant. Therefore, more aggressive actions designed to protect the ponderosa pines 20" DBH and larger are warrented. Actions may consist of thinning around large diameter pines and removal of wholly or partly underneath the crowns of the pines within the Eastside zone and in the dry grand fir plant associations of the transition zone. Surveys are needed to locate the pines at risk and identify appropriate actions. We will consult with Forest insect and disease folks to aid in project design.

Interior Habitat

Old growth and late successional associated species usually require some level of interior habitat, at least in closed canopy forests. However, we are unsure what would serve as the minimum level, since larger species need more habitat, while smaller species need less. We assumed that interior habitat for animals with large home ranges was more critical and that a larger patch would also provide habitat for several individuals or pairs of species with smaller home ranges and for old growth and late successional associated plants, fungi, mollusks, and arthropods. The interior habitat size we selected was based on what little information we could find about species dependent on closed canopy forest dominated by larger trees and professional judgment.

The Eastside Zone essentially has no interior habitat in the typical sense. Stands are simply too open. The Open Parklike structure actually consists of several different stand structure types but individual patches are too small to map. The Eastside Zone contains stringer stands of denser forest surrounded by open forest or woodland, such as the slope north of Fifteenmile Creek. Species and individuals dependent on a more closed canopy stand use these stringer stands, but they have adapted to the stand's linear shape and probably use the entire stand rather than only a portion of it within a certain distance from the edge.

We developed constraints only for the Transition and Crest Zone where the characteristic old growth structure is Cathedral or Late Seral Multistory (Table V-14). The interior patch size also applies to the Cycle area, since there are species that need relatively large patches, but are less dependent on large trees. Several structure types can provide interior habitat since the key is tree size and canopy closure. We do not consider natural or created openings less than 5 acres in size or corridors created by unpaved

roads as edges that reduce interior habitat. The only paved roads in the LSR are roads 44, 4420, 2730, and a short portion of 17. Interior habitat starts about 440 feet (135 m) from the edge of the individual or group of qualifying structure types.

The minimum patch size for the transition and crest zones will be used for analyzing risk reduction or other treatments. These minimum patches will be used to help adjust prescriptions for treatment with the emphasis on maintaining the largest Late-Seral Old-Growth habitat while minimizing the edge effect.

Table V-14. Minimum interior habitat patch size and stand structure types that provide interior habitat by climate zone.

Climate Zone	Minimum Patch Size	Applicable Structure Types
Transition	100 acres	Mature Stem Exclusion Cathedral Late Seral Multistory some High Density Stagnating
Crest	150 acres	Mature Stem Exclusion Cathedral Late Seral Multistory High Density Stagnating

Botany--Noxious Weeds

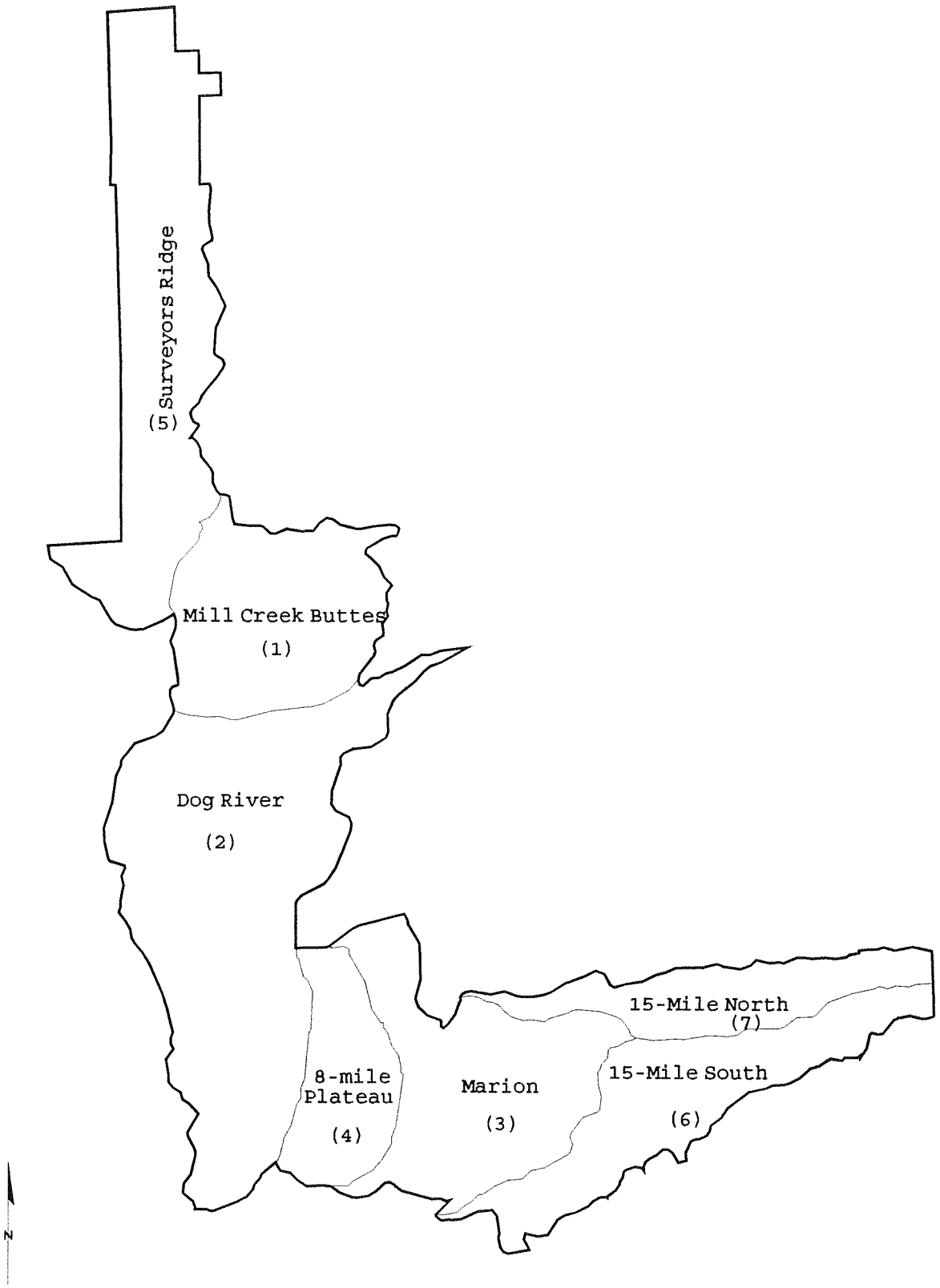
Implement all appropriate control measures whenever "detection weed" species are located within the LSR. Follow the guidelines established in the Record of Decision and Final EIS for Managing Competing and Unwanted Vegetation (USDA Forest Service 1988). Some weed species, such as Scotch broom (*Cytisus scoparius*), can be controlled by manual methods (pulling). This noxious weed currently is showing up periodically in 15-Mile North LU. Other species, such as dalmation toadflax (*Linaria dalmatica*), require herbicides for effective control. This noxious weed species currently is not a problem but could become one. There is toadflax currently in the areas east of the Surveyors Ridge LU..

Access and Travel

Implement the road and trail management recommendations from the Eastside Travel and Access Management planning effort. This effort established road and trail management guidelines and networks designed to meet current and anticipated needs for administrative and recreational access. The network is also designed to reduce sediment input to streams.

Figure (18)

Prioritized Landscape Units



Recommended Projects

Table V-15 lists the potential projects for each landscape unit. The projects listed are designed to address known problems identified by the triggers. Landscape units have been ranked on the basis of the number of triggers "tripped" by current conditions. Chapter VI discusses several specific projects in more detail.

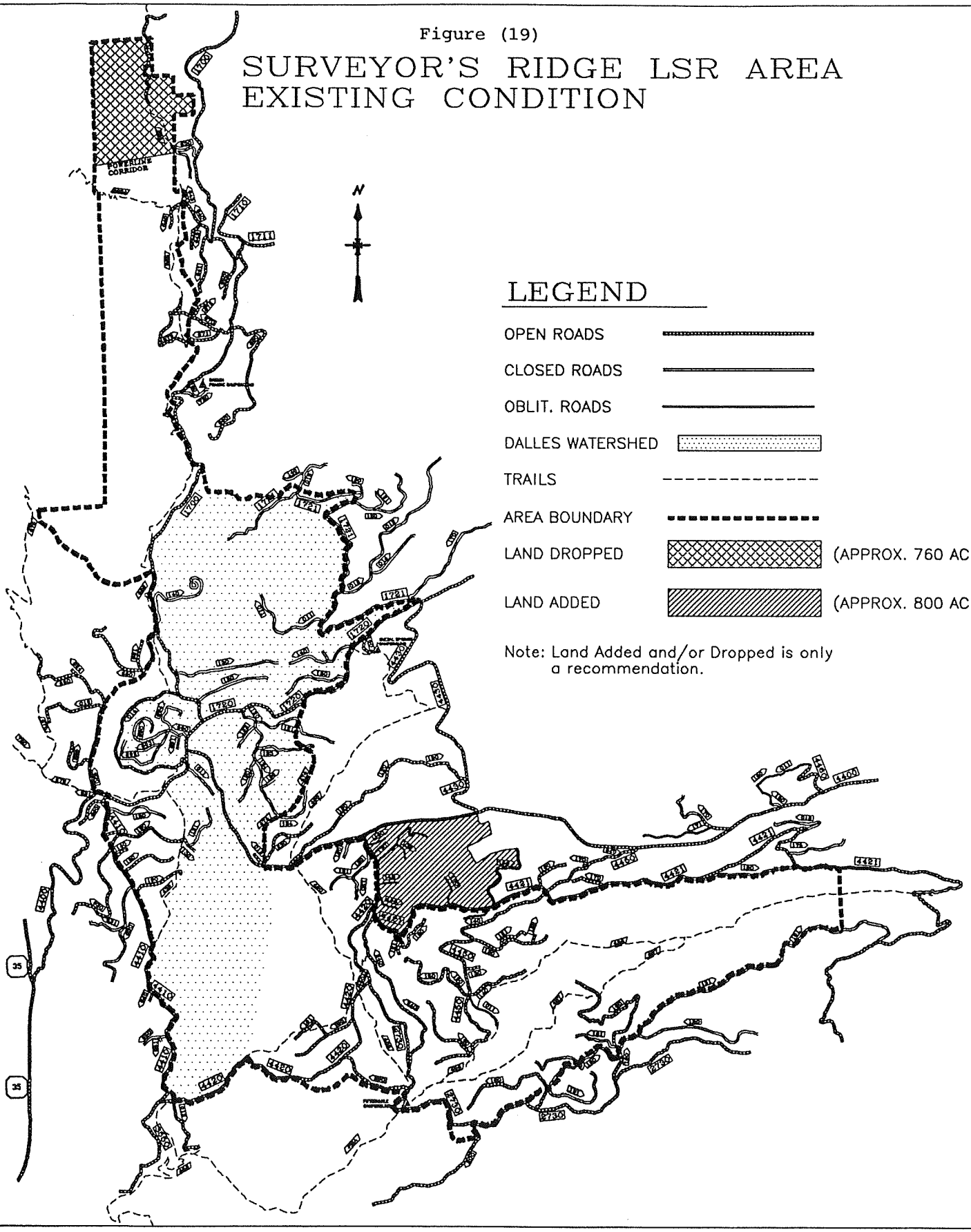
Table V-15. List of landscape units in order of Priority. Included is a list of recommended projects that would curb and slow rate at which the triggering mechanism was spreading throughout the landscape unit. (Refer to Figure 19 for location of the landscape units)

Landscape Unit	Priority	Triggers "Tripped"	Potential Projects
Mill Creek Butte	1	Downed wood, ladder fuels, stand density, mortality, interior habitat	Risk Reduction, Thinning, Firewood Removal, Underburning, Take excess wood and place in areas lacking downed wood
Dog River	2	Downed wood, ladder fuels, stand density, mortality, interior habitat (north half), access and travel (excess roads)	Risk Reduction, Thinning, Firewood Removal, Take excess wood and place in areas lacking downed wood, road obliteration, Establish Plantations
Marion	3	Ladder fuels, stand density, mortality, interior habitat access and travel (excess roads)	Thin, Establish Plantations, Pre commercial Thin, Firewood Removal, Road Obliteration's, Native Plants Break cycle through reducing the numbers of lodgepole pine and subalpine fir.
8-Mile Plateau[1]	4	Downed wood, ladder fuels, stand density, mortality, interior habitat	Risk Reduction (roaded area only), Establish Plantations, Pre commercial Thin, Stand Replacement Prescribed Fire, Adaptive Management Projects along Roads to Break Cycle
Surveyors Ridge	5	Ladder fuels, stand density, mortality, interior habitat, noxious weeds	Risk Reduction, Thin, Pre commercial Thin, Firewood Removal, Noxious Weed Control
15-North	6	Noxious weeds	Underburn[2], Pre commercial Thin[2], Noxious Weed Control
15-South	7	Ladder fuels, stand density, mortality[3]	Thin, Underburn, Risk Reduction (upper end), Firewood Removal, Road Closures and Obliteration's

[1] Main Cycle area
[2] Projects intended to maintain current conditions
[3] Problems identified are in early stages, need for treatment is relatively low at present

Figure (19)

SURVEYOR'S RIDGE LSR AREA EXISTING CONDITION



SURVEYOR'S RIDGE

MOUNT HOOD NATIONAL FOREST

U. S. DEPARTMENT OF AGRICULTURE FOREST SERVICE PACIFIC NORTHWEST REGION

DESIGNED
DRAWN JIM NEIGHORN
LANDSCAPE ARCHITECT
ENGINEER
DISTRICT RANGER
RECREATION STAFF
FOREST SUPERVISOR

Part VI Proposed Projects and Boundary Changes

Introduction

This chapter is designed to highlight some projects that we need to do, following the acceptance by REO that enough information is outlined and detailed in this assessment, thus allowing us to move forward with the projects listed. This document is a dynamic document, meaning it could be changed as new information about this area comes to our attention. The projects we are proposing however, should be compatible with the standards and guides as laid out in the ROD for Late Successional forest. The first thing this chapter will look at is a proposal to change the LSR Boundary.

Proposed Boundary Changes

Late Successional Reserves were created to provide areas where the habitat needs of plants and animals dependent on older forests will be met. The boundaries of Surveyor's Ridge were drawn with this objective in mind. In analyzing the lands within the current boundary, we noted two main problems with meeting LSR objectives.

The first problem involves fragmentation. The Surveyor's Ridge portion of the LSR extends to the Forest boundary, crossing a major east-west power transmission corridor. North of this corridor, lands within and adjacent to the LSR are both naturally and artificially fragmented, and have no potential to provide connectivity. Dryer plant associations north of the powerline do not provide late successional closed canopy habitat, and essentially you run out of habitat. Lands in this area outside the LSR are not National Forest lands. Recent timber harvesting has been heavy, with most of the lands surrounding the LSR either harvested with a regeneration cut or planned for such in the near future. Within the LSR, lands are naturally fragmented. South and west aspects are open, grassy, and scabby with thin, infertile soils. North and east aspects are forested with deeper, more fertile soils. The result is banding of vegetation within the LSR and no direct connections between the bands. Late Successional Reserves were intended, in part, to provide for recovery of the northern spotted owl as well as provide high quality habitat for guilds of species represented by pine marten and pileated woodpeckers. The ownership pattern and vegetation pattern within this area does not help to meet those objectives.

The second problem involves risk of catastrophic loss for wildfire in the central portion of the LSR. South of Road 44 and north of Fifteenmile Creek, the orientation of the LSR switches from east-west in Fifteenmile Creek to north-south in the headwaters of Dog River and Eightmile Creek. Much of this area lies in the Crest Zone and most of that is in the Cycle Area. The connection between areas capable of producing old growth habitat is narrow and oriented north-south. The largest fires on Barlow Ranger District typically burn under strong west winds. A fire starting in the Cycle area and pushed by a strong west wind can easily sever the link between the two portions of the LSR. This problem is particularly acute over the near future, since this area has also been heavily harvested, further attenuating the link between existing older forest habitat.

To address both problems, we propose adjusting the boundary of Surveyor's Ridge LSR (Figure 19). We propose to drop the area north of the powerline corridor, beginning at its southern edge and extending to the Forest boundary. Since this area contains some sensitive plant species, it should be retained as National Forest lands. We also propose to widen the LSR boundary south of road 44 and east of road 4420. The new boundary should run east along road 44 to 4400-140, south along 4400-140 to an unnamed intermittent stream in Ramsey Creek, downhill along the stream and up Ramsey Creek to road 4421-150, and then south along 4421-150 to the current LSR boundary on road 4421. The proposed drop area encompasses 760 acres and the proposed addition incorporates 800 acres, thus the overall size of the LSR remains essentially the same. The change would place Puma Spring, Jacket Springs, and Pebbleford Campground inside the LSR boundaries.

The area recommended for being dropped does not provide for spotted owls or species dependent on old closed canopy forest. There are no owl activity centers north of the powerline.

This change should improve the probability that the LSR can function as intended and better meet the needs of species such as the northern spotted owl and pileated woodpecker. The proposed addition is capable of providing a mix of Late Seral Multistory and Cathedral stand structures, with the Cathedral structure more prevalent. Most of the area should be capable of providing the needed canopy closure for spotted owl nesting, roosting, and foraging habitat and all of the area should provide for northern spotted owl dispersal habitat. While a wildfire burning under strong west winds could still sever this link, a wider area lessens the probability of such an event since the necessary winds would have to be stronger and persist longer than under the current boundary.

Detailed Project Proposals

Risk Reduction:

There is an estimated 1000 acres of risk reduction work needed, primarily in the Mill Creek Butte and Dog River LUs. The areas are collapsing due to years of disease and insect infestations. The combination of the two is what is making us look at this area. The insects may be through with this area, since there is not much left for them to do. Disease (primarily root rots) is an on-going problem, but there is not much we can do at this time. The fuels build up is such that a catastrophic fire risk does appear to exist. Without treatment these areas could threaten surrounding areas and weaken or break several areas where good to fair connectivity currently exists. We believe to minimize this risk, reducing the fuel hazard created is needed through silvicultural treatment. This would provide for the maintenance and protection of the Late Successional Reserve as a whole, and for the longevity of the healthier parts of the stands where this condition (trigger) does currently exist.

The larger (20+" DBH) ponderosa pines would be protected in the Eastside zone, and dry grand fir plant association in the transition zone, from risk reduction activities. This is so no large pines are lost in addition to those loses caused by the western pine beetle each year.

The Dalles Municipal Watershed Pipeline Replacement:

Currently, the City of The Dalles has a 22 inch diameter (below ground) wooden pipe that diverts water from Dog River to the reservoir behind Crow Creek Dam. The water behind the dam is the main source of domestic water for the 11,000+ citizens that live in the city. The current pipe, built and placed in the 1920s, leaks. The leaks are fast reaching the point where the City can no longer repair them, but must consider replacing the pipe. Since the pipe is considered a preexisting structure prior to LSR designation, replacing the pipe should show little or no significant effects to the LSR function and character, except perhaps during the actual construction of the new pipe. Current plans call for a new 30 to 36 inch diameter underground pipe, adjacent to the existing pipe, to be built in the summer of 1998. The new pipe would widen the current pipe corridor from its current width (approx. 30ft) to 60 feet. The new pipe will dramatically reduce leakage and water loss due to evaporation and provide a higher efficiency of water use.

Range:

The Long Prairie Range Allotment where it crosses into the LSR, lies entirely within the Surveyors Ridge LU. The area within the LSR is steep west facing slopes. Cattle grazing began in this area before the 1920s. Also non-native grasses were planted in this area for the purpose of grazing around this time or earlier. In recent years the cattle ranchers that use this allotment have not wanted their cattle to roam down these slopes. Most cattle by nature do not roam down the slopes because plenty of grass and other palatable plants exist on the somewhat flatter areas of the ridge line itself. Very little of the flat areas are within the LSR, most lie just to the east. We were unable to determine if the grazing taking place was having any impacts on the LSR, since use seemed somewhat limited, due to the environment.

This Allotment is expecting to begin a new Environmental Assessment (EA) as soon as funding becomes available. The EA process will enable us to look more closely at the use by cattle in this area and address specifically any concerns we have, and our ability to meet LSR objectives for this area.

Firewood:

In the Summer of 1995 some hazard trees were felled along the 1700 road, Winter and Spring storms in 1995 and 1996 caused additional blowdown. While felling them reduced the risk of an accident happening to one of our forest visitors, the number of trees felled, plus the blowdown, exceeds the triggers we identified for fuel loading and arrangement. This assessment has identified that these trees could provide a large percentage of the District's firewood program in FY97. Most of these trees are true fir. We may use some of these logs in unit Crow 10 to make up for the lack of large downed logs. Because of the demands we have for firewood and the fact that many of these logs are easily accessible by wood cutters, this area is a good candidate for this type of activity. We would monitor wood removal to ensure that the late successional characteristics were not compromised .

Many options will be explored for the materials removal where it exceeds the triggers we identified for this LSR. One opportunity might be firewood cutting but only if it makes sense.

Fifteenmile OHV Project:

Proposal to designate a fifty mile motorized trail system , of which 22.9 miles lie within the LSR, for OHV (motorcycle, three and four-wheelers) use. This trail system would be open to all--hiking, horseback riding, mountain biking, and OHV. It is planned to use existing roads, skid roads and trails and will connect to proposed OHV areas to the south. Opportunities identified are: eliminate cross-country/ride anywhere use patterns with a designated trail system; reconstruct trails to accommodate user; and close 10 miles of existing trail along Fifteenmile and Cedar Creek to motorized use. Moving the OHV use in the Fifteenmile creek bottom to the ridge line above the creek will reduce disturbance on 4 spotted owl activity centers.

Precommercial Thinning:

Projects for precommercial thinning could begin at any time, pending the availability of funding to do the projects. Guidelines for such projects would be in accordance with the criteria outlined in the REO exemption letter dated May 9th, 1995. (see appendix H)

Commercial Thinning:

Commercial thinning is more uncertain than precommercial thinning, as the stands we are dealing with are either very young or very old, with very little in-between. Activities involving commercial thinning would be in accordance with the criteria outlined in the REO exemption letter dated July 26th, 1996. (see appendix H)

ERFO/Hatfield Flood Projects: (taking place in FY97 through FY99)

-Trail reconstruction (fixing existing trail)

-Road weatherization/reconstruction (fixing existing roads that are designated to remain open)

-Wood material placement in Fifteenmile Creek. (Not sure where the wood will come from at this time.)

Part VII Fire Management Plan

Fire History

Pre-1900. In general, we believe that the local tribal groups burned the area frequently for a variety of purposes, such as maintaining travelways and promoting the growth and abundance of culturally important plants. Nothing specific has been documented in Surveyor's Ridge LSR, but it has been alluded to in early letters from the Forest Service. In addition, this type of activity has been documented throughout the western United States and we can find no reason why it would not have occurred here. Diaries and letters suggest that early settlers copied many of the American Indian burning practices, particularly to maintain travelways and pasturage. An early Forest Service letter mentions a large fire which burned the Eightmile Plateau in 1898. This fire supposedly started near Eightmile Meadows and spread north to just past the current road 44 and west to High Prairie. An undated map from around 1916 also shows large fires on Surveyor's Ridge; the largest burning the area from just south of Shellrock Mountain to just north of Rimrock. The dates of these fires are not known, but we suspect they occurred sometime between 1870 and 1900.

1900-1970. Some records exist of fire history for this era, although records are scattered and difficult to locate. Shortly after formation of the National Forests in 1906, effective fire control began in the much of the LSR. A 1939 letter from the Dufur District Ranger boasts of the generally successful nature of the fire control efforts and the resulting increase in conifer regeneration. Associated documents from this time period also discuss the loss of grazing lands due to tree regeneration.

Some effective fire control began as early as 1906 in the Crest Zone. Early diary entries for Forest Service personnel mention fighting fires in the area. Guard camps or lookouts were mentioned at Eightmile Meadows, High Prairie, and Lookout Mountain. Camps were probably established at other high meadows since the meadows provided pasturage for the horses and mules. No large fires are known to have burned in this time period.

1970 to Present. Beginning in 1970, fire occurrence records have been stored in the National Fire Occurrence Data Library, currently housed in Kansas City. Data from these fires as well as associated weather records are used by the National Fire Management Analysis System (NFMAS), specifically the Initial Attack Activity (IAA) module to model the fire suppression organization needed to handle the documented fire occurrence. These records, along with information of fire regimes and fuel loadings, are used to evaluate the existing fire risk.

Fire Regimes

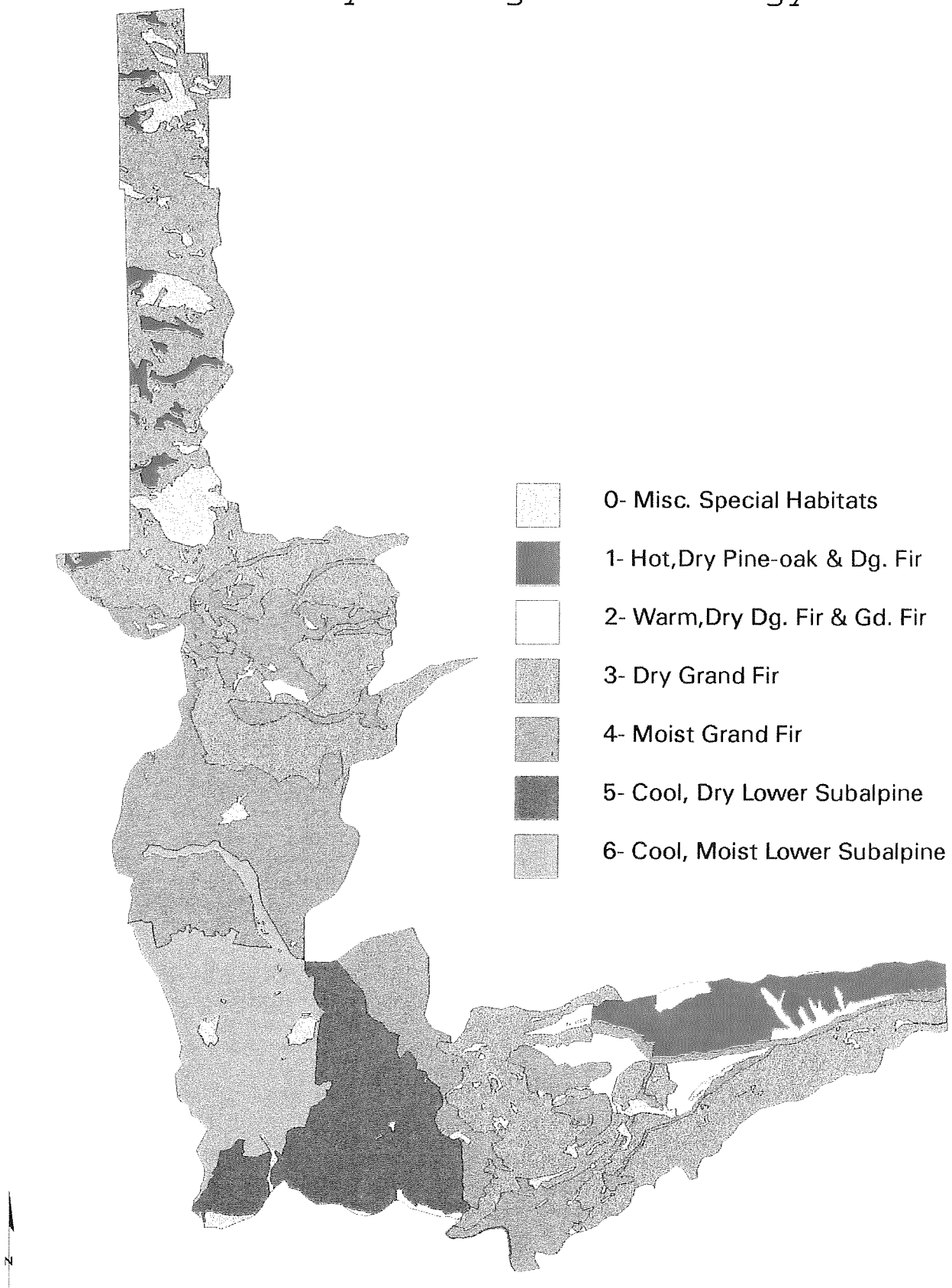
Fire Ecology Groups, or Fire Groups, have been developed for the Mt. Hood National Forest (Evers et al., In Press). We mapped the Fire Groups within Surveyor's Ridge subbasin and used these to depict the fire ecology and regimes of the area based on plant associations and typical pre-1855 conditions. Figure 20 shows where each Fire Group occurs.

Fire Group Zero: Miscellaneous Special Habitats. This Fire Group consists of areas that are not coniferous forest within a forest matrix. Most examples of Fire Group Zero consist of rock outcrops and scree (or talus), forested rock, and wet and dry. Patches of Fire Group Zero burn at highly irregular intervals and generally with a return frequency similar to the surrounding Fire Group. Fire Group Zero occurs throughout the LSR, generally in small patches. Some areas are large enough to serve as fuel breaks for low and moderate intensity fires, but rarely are large enough to slow or stop high intensity fires.

Fire Group One: Hot, Dry Pine-Oak and Douglas-fir. Fire Group One mostly lies on south aspects of Fifteenmile Creek canyon between the forest boundary and road 4450. It also occurs on south and west

Figure (20)

Surveyors Ridge Fire Ecology



aspects of Surveyor's Ridge where Douglas-fir replaces ponderosa pine. Fire Group One typically underburned frequently with an estimated return interval of 5-10 years.

Fire Group Two: Warm, Dry Douglas-fir and Grand Fir. Fire Group Two occupies a small area west of Fire Group One in Fifteenmile Creek. One patch lies north of Fifteenmile, adjacent to Fire Group One. Another patch lies south of Deadman Gulch and west of Fifteenmile Creek. Underburning was the typical landscape level event in Fire Group Two with an estimated return interval of about 15-25 years.

Fire Group Three: Dry Grand Fir. Fire Group Three covers the largest area of the LSR. Most of Surveyor's Ridge lies in this Group. It also occurs throughout the mid-elevations of Fifteenmile Creek, Cedar Creek, and Deadman Gulch. Fire Group Three frequently underburned, but occasionally experienced stand-replacing fire. The fire return interval was highly variable, probably averaging around 30-60 years but with an estimated range of 15-100 years between events.

Fire Group Four: Moist Grand Fir. Group Four occurs around Brooks Meadow, north of road 44 and east of roads 4410 and 2730. Most landscape level fires were stand-replacing through crown fire and lethal underburning, with some non lethal underburning around stand edges and in drier associations within the Group. The average fire return interval was probably between 150-300 years.

Fire Group Five: Cool, Dry Lower Subalpine. Fire Group Five lies on the Eightmile Creek plateau and just north of High Prairie. This Group is similar to Fire Group Six near road 44, but with a fire return interval similar to Fire Group Four. In much of the area, it appears the average fire return interval may be on the order of 100-125 years. The shorter return interval area is dominated by lodgepole pine and subalpine fir while the longer return interval area contains a more even distribution of species and slightly better growing conditions.

Fire Group Six: Cool, Moist Lower Subalpine. Fire Group Six occupies upper Dog River between Fire Group Five and road 44. It also lies north aof road 44 a short distance right along Dog River. Stand-replacing fire is the characteristic landscape level fire event, with little underburning except along the edges of the burn area. The estimated return interval is 200 or more years.

We used Fire Groups as a coarse divider between the climate zones for Surveyor's Ridge. Fire Groups One and Two lie in the Eastside Zone. Fire Groups Three and Four lie within the Transition Zone. Fire Groups Five and Six lie within the Crest Zone. Fire Group Zero occurs in all zones. Fire Group Three is the most common in the analysis area and mostly underburned with some stand-replacing fire. Groups One and Two mostly underburned. Groups Four, Five, and Six mostly experienced stand replacing fires.

Even though Fire Groups Four, Five, and Six typically burn in stand replacing fires that cover several hundred to several thousand acres, lower intensity fires can occur between these events. Low intensity fires typically burn only a single tree or very small patch. These events create snags and downed wood, but the fire occurrence rate is so low that other agents, such as insects and disease, are more important providers of these habitat elements.

Moderate intensity fires involve a mix of stand-replacing fire and a limited amount of underburning. These fires can occur in younger stands that contain relatively low fuel loadings. Moderate intensity fires depend on the presence of "jackpots" of heavier fuel loadings in an otherwise lightly loaded area, at least a moderate lichen load in the overstory trees, and moderate to high winds (generally greater than 10 mph). Wind is needed in increase fire intensity and the lichens serve as a fuel ladder into the tree crowns. The fire spreads primarily by crowning through the needles and lichens and some short-range spotting. In the absence of wind, fire may spread slowly through what surface downed woody material exists and along older rotten logs. The pattern produced in the understory is one of small burned out patches and linear burned out strips ("cigarette" burns) where logs are consumed. The duff is usually too densely packed and just moist enough to not burn well away from the jackpots and dry logs. Moderate intensity burns cannot occur every year but can occur in many years. These fires usually burn between 50-300 acres. When the winds die down, these fires also die down and usually will not "kick up" again in the absence of another wind event.

Existing Fire Risk

Rating the existing risk for large stand-replacing fires involves two separate elements. In fire management, the term "risk" specifically refers to the probability that a fire will start and spread. Risk is often expressed as an occurrence rate, or the average number of fires per 1000 acres per year. An area of low risk means the area typically experiences few starts during the declared fire season (June 15 through October 15). The term "hazard" specifically refers to the available fuel loading. Due to curing and seasonal drought, the hazard rating of a given area changes throughout the declared fire season. An area of high hazard means the area has a large amount of available fuel at the time of the rating. The hazard ratings, as listed under the section on fuel loading, are for the hottest and driest part of the fire season, typically ranging from mid-July through mid-September in this LSR. .

Fire Occurrence Rates. Fire occurrence rates are very low for the entire area, generally 0.097 fires per 1000 acres per year, based on data from 1970-1990. No areas of concentrated starts occur within the LSR. Fires rarely occur in multiple starts (busts). Arson has not been a problem. Storms that form on the south side of Mt. Hood or over the Cloud Cap area typically result in lightning on Surveyor's Ridge. Lightning busts are possible, but rare. The last major lightning bust on record was in 1961. A similar event today would likely result in at least one escaped fire due to the reduction in both initial attack personnel and reinforcements within all wildland fire fighting agencies in the area. Most human caused fires have remained small.

Fuel Loadings. We have not used Brown's method for inventorying downed woody material to estimate natural fuel loadings. This discussion is based on observations of current conditions and is qualitative. Due to the lack of complete data, areas of low, moderate, and high fuel loading have not been mapped. The discussion is by Fire Group. Fine fuels are woody material less than 3 inches in diameter, ponderosa pine needles, and grass.

Loadings in Fire Group One are generally low on the open slopes in Fifteenmile Creek and along Surveyor's Ridge. Loadings in Group Two are generally moderate to borderline high in terms of downed woody material. Ladder fuels are fairly extensive and probably outside the range of natural conditions, particularly in draws and along intermittent streams. Fire Group Two would normally carry a moderate loading in the form of cured grass by late June or early July. Due to increased tree density, the grass load has declined.

Loadings in Fire Group Three are high along Surveyor's Ridge and moderate to high elsewhere. Ladder fuels are very extensive and we believe they are outside the range of natural conditions. Dwarf mistletoe is a significant factor in increasing both downed woody loadings and ladder fuels. Recent spruce budworm, fir engraver, and root disease problems are also causing rapid increases in downed woody loadings. Windstorms have added to the fuel loadings by uprooting trees affected by root disease and snapping other trees. Since fuel accumulation rates far exceed decay rates, fine fuel loadings are starting to become a concern, particularly on Surveyor's Ridge. Little or no fuels treatment occurred on thinning slash in the northern west strip of Surveyor's Ridge.

Loadings in Fire Group Four are high north of road 44 and more moderate south of the road. Fuel ladders in the form of lichens and conifer reproduction are very high north of road 44. As in Group Three, recent spruce budworm, fir engraver, root disease activity, and windstorms are causing rapid increases in downed woody loadings in all size classes.

Fire Groups Five and Six contain many overstocked "dog hair" stands with thin, small crowned trees. The combination of snow breakage, windthrow, insects, and disease are causing several stands to collapse. Downed woody loadings in material less than 6 inches in diameter is approaching extreme in a few stands, mostly along roads and adjacent to clearcuts. Older stands in Group Six also contain extensive ladder fuels in the form of lichens and conifer regeneration.

Expected Fire Intensity and Severity. Fire intensity in this discussion refers to flame lengths. Fire severity refers to duff and downed log consumption. Before 1855, both fire intensity and severity were

low in Fire Groups One, Two, and Three. These areas mostly underburned with low flame lengths. Fires were generally frequent enough to limit duff buildup and downed log numbers. Frequent fire was a main factor in creating and maintaining the characteristic old growth structures in these areas Open Parklike in Fire Groups One and Two, Cathedral in Fire Group Three. Since the average fire return interval was more variable in Group Three, occasionally the fuel complex would support moderate and high intensity fires and moderate severity fires. Fire return was probably frequent enough to limit high severity fire to very small spots that are insignificant even at the stand level.

Current conditions will support high intensity and severity fires in Fire Groups Two and Three. Such fires would eliminate any existing late successional and old growth stands and the potential to move existing stands towards the characteristic old growth structure quickly. On steeper slopes, as in Deadman Gulch or Cedar Creek, such a burn would be much more susceptible to erosion due to the near total loss of protective cover. A high intensity rainstorm before a new vegetative cover established might result in a change in site capability, under worst case conditions. In addition, since the various organisms typical of these Fire Groups are not adapted to high intensity or severity fires, we could see significant reductions in soil arthropods and fungi, particularly mychorrhizal fungi.

Fire Groups Four, Five, and Six typically experienced a wider range of fire intensities and severalties than the drier fire groups, although high intensity fires are the most significant at the landscape level. Fire severity would also be highly variable within an individual burn. Successive reburns often result in high severity fires as a cumulative effect. Most organisms and ecologies within these fire groups are adapted in some manner to high intensity and high severity fires. We do not believe that the fire regime and expected intensities and severalties have changed significantly from what was characteristic before 1855.

Much of the area within Groups Four, Five, and Six is relatively old and carries the fuel complex needed to support development of a high intensity fire. The largest high intensity fires typically burn under conditions of extreme drought, low relative humidity, high temperature, and high winds. Surveyor's Ridge does not need as severe a drought to provide suitable conditions for a large fire as the Crest Zone in most areas of the three Mt. Hood eastside districts. Research in Yellowstone National Park after the 1988 fire season found that stand structure stage and fuel complex are largely irrelevant under extreme conditions (Turner and Romme 1994). Essentially everything will burn until the weather changes (winds die, temperatures drop, humidities rise, or significant precipitation falls).

Fire can result in stand-replacement in two ways it can kill the tree crowns or it can kill a critical amount of tree cambium. Not all stand-replacing fires are crown fires, although this type of fire is the one most often considered. Underburning can also result in stand replacement by scorching, not burning, tree crowns and by killing the cambium near the tree bases or roots (lethal underburn).

Large Stand Replacement Fire Risk

The risk rating in this section attempts to integrate the specific meaning of risk (probability of a fire) with the hazard (available fuel) for the area under discussion. It also attempts to integrate any changes in expected fire intensity and behavior brought on by nearly 100 years of fire exclusion and the various timber management practices. Lastly, the risk rating reflect a subjective judgment on the impacts of a large stand-replacing fire on LSR objectives, available late successional and old growth habitat, the potential to provide such habitat over the next 20 years, and the potential impacts on site quality.

Crest Zone (Fire Groups Five and Six). The overall risk of a large stand-replacing wildfire is high to extreme. Much of this zone is relatively old and currently provides late successional and old growth habitat. Fuel buildup, or hazard, is high in much of the zone and extreme in the collapsing stands. The Cycle area discussed under Vegetation covers over half of the zone. The Crest Zone has a low occurrence rate, or risk, that such a fire could occur in any given year. The probability that a given start could result in a moderate or high intensity fire increases in severe drought years, such as 1994. A fire start could smolder for several days until a wind event caused it to flare up and crown, as occurred with the Grasshopper Fire in 1994.

Fire exclusion and timber harvest practices have not significantly changed the expected fire intensity and behavior. The insect and disease levels are about what could be expected of stands at this elevation, climate, and age. In essence, stand replacement has already begun in collapsing stands. A major fire, would mainly serve to "clean up" the area and prepare seedbeds to allow the next stand to begin. Even though we believe it does not provide late successional or old growth habitat, the Cycle area serves as a critical dispersal link between the Miles Creeks and Mill Creek watersheds, White River subbasin, and upper Hood River basin.

Much of the Crest Zone is roadless and about half of it lies in The Dalles City Watershed. Terrain blocks a direct view of the area from Flag Point Lookout. It can be easily seen from Fivemile Butte Lookout, but this lookout is not staffed on a regular basis. Recreation use in the area is low. The Dalles City Watershed is closed to general use and the remaining area is generally unattractive due to the stand conditions. Most recreation use occurs in winter (over snow vehicles) and during fall hunting seasons.

Transition Zone (Fire Groups Three and Four). Overall stand-replacing fire risk is high north of road 44 and moderate elsewhere in the zone. Clearcuts and shelterwoods break fuel continuity in Fire Group Four. However, in-growth of shade tolerant species and widespread insect and disease related mortality in the surrounding stands has increased fuel loadings and ladder fuels. Most of Fire Group Four north of road 44 lies in The Dalles City Watershed. The current MOU limits the amount of harvesting and prohibits broadcast burning as a fuel treatment. Most units have been hand piled or machine piled and burned. Piling slash does not reduce the fine fuel loading as well as broadcast burning, such that some units still contain the potential to contribute to fire spread and intensity.

Most of Fire Group Three on Surveyor's Ridge lies in a roadless area. As best we know, this area has never been harvested. In-growth of grand fir, widespread insect and disease related mortality, and strong winds have increased fuel ladders and fuel loadings. Surveyor's Ridge is fully exposed to strong west winds that sweep across upper Hood River Valley. The ridge is a large topographic barrier to air flow, causing winds to accelerate as they "squeeze" over the ridge into Mill Creek watershed from upper Hood River valley.

Much of the remaining portion of Fire Group Three lies in a roaded area in Fifteenmile Creek subwatershed. This area has also been affected by insects and disease such that fuel loadings and ladder fuels are higher than we estimate was typical before 1855. However, this area has also been harvested by either selective removal of larger trees in the 1960s and early 1970s or by clearcutting, thinning, and shelterwood harvesting since the mid-1970s. It is also less exposed to wind so that windthrow and snapping is not as large a problem as on Surveyor's Ridge.

As with the Crest Zone, the area has a low risk of fire starts in any given year. The areas between Mill Creek Buttes and road 44 and in the mid-elevations of Fifteenmile Creek are heavily roaded, allowing for rapid initial attack from either Dufur or Parkdale. Surveyor's Ridge and Fifteenmile Creek canyon east of roads 4450 and 2730-160 are largely unroaded with limited access. An escaped fire would depend on the combination of dry conditions, high winds, and either an overwhelming number of starts at the same time (a fire bust) or a lack of fire fighting personnel due to the fire load elsewhere in the region of nation in the roaded areas and on the combination of dry conditions and high winds in the roadless areas. Since the Transition Zone can burn nearly every year, the probability that an individual start could transition into a major fire increases when initial attack is delayed.

Lethal underburning is a strong possibility in the Transition Zone, particularly in areas where ponderosa pine is still a major stand component and the area has not burned for several decades. This risk is highest in Fifteenmile Creek. Ponderosa pine sheds a large number of bark plates each year. Through time, deep pedestals of bark plates and needles have built up around the bases of these trees. The pedestals can be over 4 inches deep around the larger trees. Fire can smolder for many hours to days in these pedestals, killing the cambium even through the thick bark present on the living boles. In addition, smaller diameter grand fir and Douglas-fir are common species in these stands. Grand fir is not very fire resistant and small diameter Douglas-fir is fire sensitive such that even a fire that does not crown can kill the cambium of these thin-barked trees.

The Transition Zone provides the most heavily used northern spotted owl habitat at this time and has the potential to provide the highest quality habitat in the moist grand fir series. Dispersal directly between Fifteenmile Creek and Surveyor's Ridge is already difficult due to the amount of recent regeneration harvesting in the Matrix lands. The amount of connecting Transition Zone habitat within the LSR is very narrow and greatly affected by harvesting. A fire originating in the Crest Zone and pushed by strong west winds could easily sever what direct links exist.

Both Fifteenmile Creek and Surveyor's Ridge receive abundant recreation use. Fifteenmile Trail and Cedar Creek Trail are open to hikers, horseback riders, and both motorized and nonmotorized bikes. Surveyor's Ridge Trail is used by hikers, horseback riders, and mountain bikes. Both trail systems receive relatively high levels of use. At present, no increase in the number of fire starts has been documented due to the increasing levels of summer use. Surveyor's Ridge Trail passes through several areas of high fuel hazard. Fifteenmile Creek Trail passes through an area of moderately high hazard near the trailhead at Fifteenmile Campground. Hazard increases along the ridgetop portions of both Fifteenmile and Cedar Creek trails during the summer due to curing of grasses in both natural and created openings.

Eastside Zone (Fire Groups One and Two). Stand-replacing fire is a low to moderate risk in the Eastside Zone. Much of this area is represented by open woodlands, not very susceptible to crown fire. The areas of Fire Group Two are relatively susceptible due to in-growth of fire sensitive species, ladder fuels, and higher than typical fuel loadings. Stand replacing fire in the intermittent streams and draws of Fifiteenmile Creek could result in the loss of critical thermal and hiding cover on the otherwise open slopes. Most of the Eastside Zone contains neither roads nor trails and is used mostly during spring and fall hunting seasons.

As the landscape moves towards the Desired Future Conditions identified in the Watershed Analysis, the risk of stand-replacing fire should change in all zones. The risk should decrease in the lower Transition Zone and Eastside Zone as stands become more open and dominated by fire resistant species. The risk should increase and then fall in the upper Transition Zone and throughout the Crest Zone as stands collapse and then replace themselves.

Also of concern in the Crest Zone is the likelihood of reburns and delayed conifer regeneration. Research in areas dominated by crown fire has found that reburns are highly likely. More than one reburn can occur. Each reburn usually does not cover the first burn area in its entirety and includes some previously unburned forest.

Studies of recovery rates after wildfires in wilderness areas and National Parks have shown that natural regeneration can take many decades to accomplish. This delay may be due to one or more factors such as lack of seed sources in the fire interior, dominance by dense brush for several years to decades after the fire, and severe erosion triggered by lack of cover, hydrophobic soils, and a high intensity rainstorm shortly after the fire. While we do not know the causes, there was apparently a 20-30 year delay in conifer regeneration following a major fire in Barlow Creek, in White River LSR. A similar delay in regeneration is possible in the Crest Zone and upper Transition Zone of Surveyor's Ridge LSR.

Proposed Management of Identified Fire Risks

Prescribed Natural Fire. The LSR standards and guidelines permit the use of prescribed natural fire (PNF) to meet LSR objectives. Based on LSR size and shape, location on the larger landscape, and surrounding land uses, we believe that Dog River LU south of Road 44, Eightmile Plateau LU, Marion LU, 15 North LU, and 15 South LU are possible candidates for PNF. Since this LSR also abuts the Badger Wilderness, we recommend that the detailed planning effort for prescribed natural fire occur in conjunction with PNF planning for the wilderness. Due to the shape of the LSR and the poor stand conditions in the Crest Zone, we recommend that the prescription limit PNF candidate fires to those starts which will produce only low or moderate intensity fires, at least for the next 10 years.

The prescription parameters should consider:

1. Drought conditions[1],
2. Large fuel dryness[1],
3. Current and expected wind speed and direction,
4. Proximity to existing late successional and old growth stands,
5. Probability of burning into and reducing late successional and old growth stands,
6. Threats to water quality and infrastructure in The Dalles City Watershed, and
7. Proximity to road 44, the LSR boundary, and the Forest boundary.

Allowing low and moderate intensity fires to burn in the Crest Zone and in Fifteenmile Creek will help reduce some fuel buildups and create stand diversity by altering species compositions and creating snags. Restoring fire into Fifteenmile Creek will also help maintain the disturbance dependent old growth structures (Catherdral and Open Parklike).

Management Ignited Prescribed Fire. The LSR standards and guidelines also permit the use of management ignited prescribed fire to meet LSR objectives. In addition, consideration must weigh possible impacts that prescibed fire might have on water quality within the The Dalles watershed portion of the LSR. Due to the size and position on the landscape of the Surveyor's Ridge portion of the LSR prescribed natural fire is not advisable at this time. Instead, restoring the ecosystem functions of fire in maintaining the characteristic old growth structure will need to depend on planned ignitions. We may also want to use management ignited prescribed fire first before allowing PNF in Fifteenmile Creek in order to reduce the risk of a large stand-replacing fire. In both areas, some mechanical vegetation manipulation to reduce the risk of high intensity fires and escaped fires may be appropriate. Such manipulations would reduce the presence of ladder fuels and of fire sensitive species.

Prescribed burns should occur on about the same return interval as estimated for pre-1855 conditions. More detailed fire history studies using fire scarred trees would help better establish an appropriate return interval, assuming a sufficient number of living trees or stumps of known date-of-origin remain in or adjacent to the LSRs. Prescribed burning of natural fuels generally is not appropriate in Fire Group Four. Some exceptions may exist in ponderosa pine plantations; burning could open the plantation and create a seedbed suitable for other species. The grand fir/golden chinkapin plant association is one of the drier associations in Group Four and may be able to tolerate some underburning. Similarly, underburning should be used cautiously in the grand fir/twinflower plant association of Fire Group Three. This association lies on the wet end of Group Three and could support Late Seral Multistory stands in some locations.

Initially, we expect such management ignited prescribed fires to be conducted in spring in order to better control fire effects. Of particular concern is the buildup of needles and bark flakes around large diameter ponderosa pine. Raking these accumulations well away from the boles is an acceptable alternative to spring burning provided such raking occurs at least one year before the planned burn. Studies in other areas have found that many fine roots have migrated into this pedestal of needles and bark flakes in order for the tree to capture scarce moisture. Raking reduces expected fire intensity and severity around the bole, but damages and destroys many of the fine roots. Raking at least one year in advance of the burn should allow the tree to replace the lost and damaged roots. These roots should regrow deep enough in the soil profile to adequately protect them from low severity fire.

Site specific burn plans will identify objectives and monitoring needs for each burn, as required by Forest Service Manual direction and the FEIS for managing competing and unwanted vegetation. The Barlow Ranger District integrated resource analysis for burning natural fuels also contains a potentially useful monitoring plan.

Management ignited prescribed burning should meet the following goals for managing LSRs:

1. Protecting or enhancing stand conditions for old growth associated species, and
2. Reducing the risk of large scale, stand-replacing disturbances.

The lack of access means using management ignited prescribed fire along Surveyor's Ridge and parts of Fifteenmile Creek canyon will be difficult and expensive. Use of this tool may be very limited and restricted to less ecologically desirable burn times. If management ignited prescribed fire is identified as not cost effective or too unsafe, then burning should concentrate on the adjacent forests. The greatest need for restoring fire as a primary ecosystem function to meet LSR objectives is in Fire Groups Two and Three.

Fire Suppression Guidelines

Appropriate Suppression Response. Three suppression responses to wildfires are allowed under manual direction--confine, contain, and control. The Mt. Hood National Forest uses a centralized dispatch system on single starts and a district dispatch system on multiple starts. All fires handled by Mt. Hood Dispatch start with a control strategy. Since district dispatch is not employed until multiple starts occur, burning conditions are such that only a control strategy is used. Confine and contain strategies are almost never used.

The wildfire management goal in LSRs is to keep all stand-replacing events as small as possible. However, few wildfires have the potential to become stand-replacing events. Wildfires with the lowest probability of this type of burning are those that occur outside the main fire season (before June 15 and after October 15) in most years. In wet years, such as 1995, even fires starting within the main fire season have a very low probability of transitioning into a stand-replacing event.

Until a PNF Plan is prepared and approved, all fire starts are declared wildfires. Even after approval of a PNF plan, regional policy is that all human-caused starts are declared wildfires. A given start that is a good candidate for a prescribed natural fire under the physical and ecological guidelines of the PNF plan may still be declared wildfires due to social considerations or the regional or national fire load at the time of the start.

We recommend greater use of confine and contain strategies within Surveyor's Ridge LSR on declared wildfires to improve the cost effectiveness of wildfire suppression and to use the available fire fighting forces more efficiently. We did not have time to fully develop guidelines for use of confine and contain strategies. Appropriate indicators for use of either strategy would be time of year, current levels in selected fire danger indices, current trend in indices, fire location, and fire potential. A matrix could be developed that uses time of year and one or more fire danger index, such as Energy Release Component (ERC). Table VII-16 displays an example of such a matrix. A copy of the running trend of the selected indices that includes the historical average, a dry year or years, and a wet year or years would assist in the decision-making process for use of alternative suppression strategies. Separate matrices would probably be needed for the Crest Zone, Surveyor's Ridge, and Fifteenmile Creek.

Table VII-16. Example of a decision matrix for the appropriate suppression response.

Fuel Model G--Fifteenmile Creek

Time of Year	0-30th Percentile ERC	30-50th Percentile ERC	+50th Percentile ERC
October 15-June 15	Confine	Contain	Contain or Control
June 15-July 15	Confine or Contain	Contain or Control	Control
July 15-September 15	Confine or Contain	Control	Control
Sept. 15-October 15	Confine	Contain or Control	Control

Once the 90th percentile of the selected fire danger index is reached, burning conditions are generally extreme and a control strategy is the only acceptable option. Experience has also shown that rapid initial attack is critical to successful initial attack under extreme burning conditions. Any delays are much more likely to result in an escaped fire and a stand-replacing event. Energy Release Component is a good indicator of seasonal and long-term drought since this value is influenced by 1000 hour fuel moisture. Throughout Surveyor's Ridge LSR, NFDRS fuel models C and G are currently the most suitable for evaluating fire danger and escaped fire risk.

Minimum Impact Fire Suppression. Safety of fire fighters and forest users is the highest priority in all suppression efforts. All fire suppression activities must follow guidelines developed in the Fireline Handbook and listed by the hazard abatement plan developed after the South Canyon Fire deaths. Late Successional Reserve standards and guidelines require use of the minimum impact suppression tactics ("light hand" tactics) designed to minimize the size of all wildfires while producing the least possible impact on late successional and old growth habitat. Elements of particular concern are late successional and old growth stands, snags, downed logs, and duff.

Moody and Mohr (1988) developed a guide for minimum impact suppression tactics, which we recommend for use on both wildfire suppression and for mop-up of prescribed burns within LSR and Riparian Reserve boundaries. Minimum impact tactics include such practices as:

- Allowing fires to burn to natural barriers.
- Minimizing constructed fireline and fireline width; use of fireline explosive (FLE), cold-trailing, and wet line to lessen impacts from constructed line.
- Minimizing bucking and felling of trees and snags in line construction.
- Removing only those limbs with potential to spread the fire beyond the fireline.
- Allowing trees and snags to burn out instead of felling them, provided they do not pose a significant safety risk to firefighters or pose a significant risk of spotting outside the fireline.
- Limiting use of bulldozers to slopes of less than 25%.
- Minimizing spading, or "potato patching" during mop-up; as much as possible using water or foam and stirring or allowing fuels to burn out naturally.
- Minimizing bucking during mop-up; instead attempting to roll logs to extinguish the fire.
- Extinguishing smoldering logs as soon as possible.
- Locating portable pumps to minimize the risk of fuel spills entering streams, ponds, or other areas containing water; keeping hazardous materials spill kits in close proximity to all portable pumps.

Post fire rehabilitation needs should be identified quickly and rehabilitation carried out both quickly and at ecologically appropriate times. For example, seeding should not occur at times when germination and

subsequent survival are expected to be very low. Erosion control seeding should rely on native species or sterile non-native species as much as possible.

Logistics. No suitable locations for incident base camps or camps for 100 people or more exist within Surveyor's Ridge LSR. Suitable locations for smaller camps and spike camps may exist within campgrounds and rock pits. Table VII-18 lists some potential camp locations. No wet meadows, such as Brooks Meadow, or The Dalles City Watershed should be used as campsites. Dry meadows, such as High Prairie, may be used as short-term camps. When laying out camps, minimize the number of trails needed to reach cooking, eating, sleeping, latrine, water supply, and other locations. Do not allow crews to clear vegetation or dig trenches in sleeping areas. Use sawdust or other material on trails to minimize potential erosion. Use commercial toilets in camps in roaded areas; do not depend on campground and day use area toilets. In remote areas, sling in portable toilets or materials to construct portable latrine areas whenever possible. Avoid constructing primitive latrines. Track all camp impacts and develop and update camp rehabilitation plans.

Use of roads 4400-011, 1700-014, and 1700-130 to transport heavy equipment should be avoided if possible and minimized if essential. Dog River Aqueduct, a wooden pipeline constructed in the 1920s, lies under or along these roads. Heavy equipment could severely damage this now-fragile structure. Limit the use of native surface roads to transport large numbers of crews and equipment. Off road vehicle travel should be limited only to the minimum essential to meet fire suppression objectives or to protect firefighter safety.

Table VII-17. Potential fire camp locations for wildfire suppression in Surveyor's Ridge LSR.

Type of Camp	Location	Comments
Incident Base Camp	Hood River County Fairgrounds, Odell	Helibase also
	Farmer's field along Fifteenmile Creek or in Friend area	Helibase also
Spike Camps/Day Sleeping[1]	Gibson Prairie Horse Camp	Need to survey for sensitive plants and archeological sites before using.
	Long Prairie	Campsite used by permittees to gather cattle in allotment; need to survey for sensitive plants and archeological sites before using.
	High Prairie	Need to survey for sensitive plants and archeological sites before using.
	Upper Eightmile Campground	
	Knebal Springs Campground	Room for small kitchen and shower trailers.
	Camp Friend	Need to survey for sensitive plants and archeological sites before using.
	Camp Baldwin Boy Scout Camp	Limited availability
	Little John Sno-Park	Room for small kitchen and shower trailers.
Helispots	Rock pits	Light helicopters only
	Grassy balds on Surveyor's Ridge	

Air Operations. No natural openings with adequate access are available for use as a helibase within the LSR. Some rock pits are suitable for use as helispots, but none can handle anything larger than a light helicopter. Helicopters should not use wet meadows. Helispot construction should be minimized. If a spot is to be used only for cargo drops, use slings and longline in lieu of constructed helispots. No helibases should be constructed. Locate helicopter fueling areas outside Riparian Reserves whenever possible. If a helicopter fueling area is located in a Riparian Reserve, a hazardous materials spill kit large enough to handle the available fuel must be located no farther than 5 minutes away from the site.

As stated in the Northwest Forest Plan and the Mt. Hood Forest Plan, retardant drops should be directed to minimize entry of chemicals into streams, lakes, water courses, or other waterbodies. Uncolored or fugitive chemical suppressants and other water additives should be considered on Surveyor's Ridge. As soon as possible, switch to using helitankers and buckets near waterbodies. Helitankers and helicopters with buckets can make more precise drops than air tankers, lowering the probability of accidental drops into streams and wet areas.

[1] Unless otherwise noted, camps are intended to serve up to six 20-person crews with parking for vehicles and outhouses; no kitchens, showers, or other amenities and services.

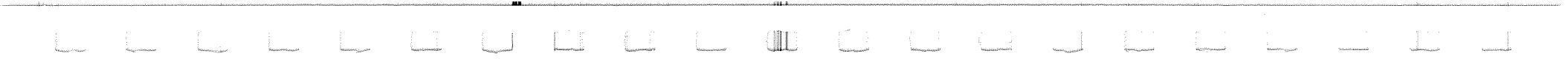
Rehabilitation. Rehabilitation plans must be designed to restore or move the area towards the late successional or old growth conditions, prevent or stop sediment from reaching Riparian Reserves, and restore camp sites and similar areas to the pre-fire condition. Wildfire suppression and the logistical support to the effort will cause some significant damage regardless of how careful and conscientious incident managers and firefighters are. Some rehabilitation work is anticipated on all fires larger than 5 acres. Rehabilitation work may be needed on fires 1-5 acres in size that occur in sensitive areas. Rehabilitation guidelines include:

- Pick up and remove all flagging, garbage, litter, and equipment. Reduce the need for litter and garbage pickup by recycling as much material as possible.
- Discourage the conversion of constructed firelines to recreational trails, by covering the line with brush, limbs, and both sound and rotten logs. The preferred source of these materials is the material removed to construct the line.
- Fill in cup trenches and dug out areas and obliterate berms created during the suppression effort.
- Construct waterbars as needed to reduce erosion on steeper slopes. A soil scientist or hydrologist will provide guidance on the spacing needed.
- Consider subsoiling compacted areas in incident base camps, spike camps, and other high use areas. Scattered rocks and logs and/or transplant small trees and shrubs into the rehabilitated area.
- Erosion control seeding and other rehabilitation work involving planting should use native species or sterile non-native species whenever possible.
- Flush cut and cover with soil all stumps in high use or visually sensitive areas, such as along roads 44, 4410, 2730, and 17; campgrounds; or heavily used dispersed campsites.
- Reshape any constructed helispots in visually sensitive areas or designated viewshed to more closely resemble a natural opening. This rehabilitation effort will likely require falling more trees and potentially the loss of some late successional or old growth trees or habitat.

The incident resource advisor may require additional rehabilitation to meet LSR and Riparian Reserve Objectives. A resource advisor will decide soon after a wildfire is reported whether rehabilitation might be needed. Rehabilitation planning and implementation should begin as soon as possible after firefighting efforts begin and must begin before the fire is declared contained.

Post Fire Monitoring and Evaluation. Post fire monitoring and evaluation will serve to identify areas of this plan or of the suppression effort that need improvement, formulate different strategies and tactics to add to the plan, and assist in adaptive management. Initial evaluation should occur before the firefighting effort ends on all extended attack and project fires. This evaluation should discuss the strategy and tactics used and success or failure of minimum impact tactics in meeting LSR and Riparian Reserve objectives, standards, and guidelines. It should also discuss whether firefighter safety was compromised and what changes might be made to better protect firefighters and still meet LSR and Riparian Reserve objectives. Lastly, the evaluation should rate the incident resource advisor and the Escaped Fire Situation Analysis in providing clear direction to the incident management team on meeting LSR and Riparian Reserve objectives. A copy of the evaluation should be filed with the incident management package and with the LSR Assessment.

Within one year of any fire exceeding 5 acres, an interdisciplinary team should revisit the burn area to ascertain the success or failure of rehabilitation in meeting LSR and Riparian Reserve objectives and standards and guidelines. This team should be comprised of resource specialists with expertise in the areas of concern on a given fire and a representative of the fire management organization. A team need not be very large if the concerns or items under evaluation considered minor or small-scale. A copy of the evaluation should be filed with the incident management package, line officer, and LSR Assessment.



PART VIII GLOSSARY

Acute - a disturbance regime where several decades typically pass between events on the same piece of ground or feature.

Chronic - a disturbance regime where few decades or years typically pass between events on the same piece of ground or feature.

Cohort - a group of trees developing after a single major or minor disturbance with a range in ages of individuals; an age class of trees.

Disturbance Process - events which cause changes in landscape features which are readily visible and measurable. The events usually occur over a brief period of time and usually can be viewed. We do not consider drought, dry-wet cycles, and other climatic changes as disturbance processes under this definition; these items are considered separately. In this analysis, only events which operate at the landscape or watershed level are considered. Examples of events are fires, epidemic insect outbreaks, beaver ponding, and erosion.

Duration - how long a disturbance event typically lasts, **not** how long the effects associated with an event typically last.

Early Seral - created openings of small diameter trees (generally less than 5 inches DBH) where the canopy has not closed (canopy closure less than 50%). A remnant overstory may be present but the canopy closure of that overstory does not exceed 25% in the Eastside Zone, 30% in the Transition Zone and Crest Zone. Includes regeneration harvests and stand-replacing events. STEM INITIATION

Features - items on the landscape which can be visited and are measurable, including both natural and human-made or altered items. Examples of features are created openings, roads, stand structures, ponds, and stream channels.

Frequency - how often a particular disturbance process is likely to happen at a given intensity and severity within the subbasin. Frequency is not necessarily tied to the event happening on a particular piece of ground.

Intensity - aeral extent of a given disturbance event, such as acres or miles; how many features are affected. This definition differs from the term *fire intensity*.

Megafauna - generally, large animals, usually mammals and birds, that are easily seen and recognized such as elk, deer, red-tailed hawks, and so forth.

Metapopulation - a relatively discrete collection of individuals that interact on a genetic basis; the potential gene pool for a given population of a species, such as Snake River sockeye salmon.

Multicohort Stands - stands where component trees arose after two or more disturbances, of which only the first disturbance was major and the others minor.

Old Growth - a stand of multiple cohorts and size classes, dominated by large, old trees. If relatively disturbance independent, then comprised mostly of late seral species, such as the climate climax species. If relatively disturbance dependent, then comprised mostly of early seral species.

Refugia - Locations and habitats that support populations of organisims that are limited to small fragments of their previous geographic range (i.e., endemic populations). FEMAT

Severity - how drastically a disturbance event changes a given feature or series of features. This definition differs from the term *fire severity.*

Single Cohort Stand - a group of trees regenerating after a single major disturbance.

Trigger - a critical threshold or an event that precipitates in the need for management action.

Classification Scheme for Stands in Surveyor's Ridge LSR

Cathedral - Semi-open to semi-closed stands dominated by large, widely-spaced trees. Overstory trees are mostly shade intolerant and fire tolerant species and 20" DBH or greater. Tree crowns nearly touching to just overlapping. Canopy closure ranges from 40-80%. Canopy either single layered or two-layered. If tree regeneration is present, then comprised of a mix of shade intolerant and shade tolerant species generally less than 5" DBH and canopy closure of less than 25%. Understory dominated by grasses, forbs, or shrubs. Dependent on semi-frequent underburning to presist. Typical OLD GROWTH structure type in the Transition Zone and upper end of Eastside Zone. May also be present in the Crest Zone.

Collapsing - Stand with high levels of mortality due to insect and/or disease attack. Canopy closure decreasing, grass, forb, shrub, and tree regeneration ususally increasing. Very high loadings of downed woody material. Usually MID- to LATE SERAL in all climate zones.

High Density Stagnating - Found in either the Stem Exclusion or Mature Stem Exclusion stages. The combination of stand density and either species mix or stand age has resulted in the virtual cessation of tree growth. Canopy closure often near 100%. Dominant trees becoming flat-topped. No understory grasses, forbs, or shrubs are present. Downed woody loadings relatively high and increasing. Stand at high risk of epidemic levels of disease, defoliators, bark beetles, or some combination, and of stand-replacing fire. Disturbance is required for the stand to move to the next structural stage. EARLY to MID-SERAL in Crest and Transition zones.

Late Seral Multistory - Two and three-layered stands dominated by shade intolerant species. Total canopy closure ranges from 60-100%. Overstory layer consists of a mix of shade intolerant and shade tolerant species usually greater than 20" DBH with a canopy closure of 50-80%. Midstory layer consists of mostly shade tolerant species 5-19" DBH with a canopy closure of 10-30%. The understory tree layer consists of mostly shade tolerant species less than 5" DBH with a canopy closure of 10-30%. Stand somewhat broken with small openings that support tree regeneration, shrubs, and forbs. Sun flecks common. Large downed woody loadings variable but can be quite high with numerous large downed logs and trees. Typical OLD GROWTH structure in the Crest Zone. LATE SERAL in the Crest and Transition zones.

Mature Stem Exclusion - Older stands usually dominated by shade intolerant species but with shade tolerant species represented. Canopy closure of 70-90% and dominant and co-dominant trees usually 9-20" DBH. Shade intolerant species are mostly in the dominant and co-dominant crown position. Shade tolerant species are mostly in the co-dominant and intermediate crown position. Canopy generally single-layered or somewhat two-layered. Generally consists of dense stands that may have been salvaged or high-graded in the past. Understory usually contains few grasses, forbs, or shrubs. MID-SERAL to early LATE SERAL in Crest and Transition zones.

Open Intolerant Multistory - One to two-layered open to semi-open stands of medium sized trees. Ponderosa pine or ponderosa pine and Douglas-fir dominate; Oregon white oak often present. Overstory comprised of trees 6-20" DBH with 15-50% canopy closure. Ponderosa pine has not developed yellow bark. If Oregon white oak or conifer regeneration is present, then stand is two-layered. Oregon white oak crowns variable, but often large and spreading. Understory crown closure generally less than 30%. Grass-forb understory with some scattered shrubs present. Stands may have been thinned or high-graded. MID-SERAL in Eastside and Transition zones.

Open Parklike - One and two-layered stands with a canopy closure of less than 40% and dominated by ponderosa pine. If Oregon white oak is common, the stand is considered two-layered. Douglas-fir may be somewhat common to common. Grand fir may be present. No other conifer species are present. Stands consist of even-aged clumps of conifers and clumps to scattered individual conifers and oak of varying ages. All age classes of ponderosa pine are present, but large, "yellow" pines appear to dominate (large trees mostly 20" DBH and larger). Crowns on oak trees variable, but mostly large and spreading. Understory of grass and forbs or grass, forbs, and shrubs. Very light downed woody loadings and few large downed logs or trees. Depends on disturbance to maintain presence. Typical OLD GROWTH structure in Eastside Zone and lower end of Transition Zone. MID-SERAL in Eastside and Transition zones.

Pine-Oak High Density - Two layered stands with scattered large ponderosa pine in the overstory and dense ponderosa pine or ponderosa pine and oak in the understory. Overstory dominated by scattered individual trees or small clumps of ponderosa pine greater than 15" DBH with 40% or less canopy closure. Understory generally continuous ponderosa pine generally less than 12" DBH with 40% or greater canopy closer. If present, oak has small, narrow crowns, except on edges of openings. Understory of pine needles and scattered clumps of grass, forbs, or shrubs. Small pines may have ceased growing. LATE SERAL in the Eastside Zone.

Riparian Hardwood - stands dominated by tree-form hardwoods, primarily black cottonwood, alders, and willows with occasional conifer species and maintained by fire, beaver activity and flood scouring of streambanks. Canopy closure from conifers less than 50%. Early Seral.

Riparian Conifer - stands dominated by conifers with an occasional cottonwood tree or cottonwood tree patch. Dense shrub layer of willow, alder, and a high diversity of other species. Late Seral.

Stand Initiation - Created opening in a forest matrix with trees less than 5" DBH and canopy closure variable. An overstory may be present as long as the canopy closure of the overstory is 30% or less. Includes clearcuts, seed tree cuts, and shelterwood cuts as well as openings created by insects, disease, fire, or other natural events. Grasses, forbs, or shrubs common and may dominate. EARLY SERAL in all climate zones.

Stem Exclusion - Young stands usually comprised of shade intolerant species with canopy closure of 70-90%. Trees usually 5-9" DBH. Canopy is single-layered. Generally consists of plantations and "dog hair" stands of natural regeneration. EARLY SERAL in Crest and Transition zones.

Understory Reinitiation - Semi-open to semi-closed stands of both shade intolerant and shade tolerant species. Stand is distinctly two-layered with shade intolerant species dominating the overstory and a mix of shade intolerant and shade tolerant species in the understory. Overstory trees generally 12" DBH or greater with a canopy closure of 30-55%. Understory trees generally less than 5" DBH with a canopy closure of less than 25%. Understory grasses, forbs, or shrubs are common. Usually occurs between the Stem Exclusion and Mature Stem Exclusion stages and between the Mature Stem Exclusion and Late Seral Multistory stages. MID- to LATE SERAL in the Crest and Transition zones.

Woodland - Very open areas with scattered ponderosa pine and Oregon white oak or Oregon white oak. Canopy closure usually less than 25% if ponderosa pine present or less than 40% if only Oregon white oak present. Site often dominated by grass and forbs or brush. Sites differ from Open Intolerant Multistory in that they are incapable of supporting many trees. Sites most often scabby with shallow or rocky soils or at the lower limits of tree growth. LATE SERAL in Eastside Zone, Special Habitat in Transition Zone.

Appendix A

Appendix A
Species Known To Exist Or Extirpated

Species	Common Name	Guild	LS/CLAS	J-2	C3	PROP C3	Veg. Structure	Presence	KEY
ACCCO	COOPER'S HAWK	TMGG					ANY	KR	VEG. STRUCTURE=that
ACGE	NORTHERN GOSHAWK	TLMLT	Y				MSE CA LS OP	KR	occupied by the species..
ACMA	SPOTTED SANDPIPER	LKRVRO					LAKE/RIVER	SMVL	LS = Late Seral Multi-Story
ACST	SHARP-SHINNED HAWK	TMGG					ANY	KR	PO = Pine oak
AEAC	NORTHERN SAW-WHET OWL	TMGG					ANY	SRM	CA = Cathdral
AGPH	RED-WINGED BLACKBIRD	LKRVRO					LAKE/RIVER	KR	UR = Understory Reinitiation
AISP	WOOD DUCK	LKRVARF	Y				LAKE/RIVER	SRM	MSE = Mature Stem Exclusion
AMGR	NORTHWESTERN SALAMANDER	TSGG	Y				ANY	SRM	SE = Stem Exclusion
AMMA	LONG-TOED SALAMANDER	TSGG					ANY	SRH	SI = Stem Initiation
ANAC	NORTHERN PINTAIL	LKRVA					LAKE/RIVER	SMM	OM = Open Multi-Story
ANCL	NORTHERN SHOVELER	LKRVA					LAKE/RIVER	SMM	OP = Open Park-Like
ANCR	GREEN-WINGED TEAL	LKRVA					LAKE/RIVER	SMM	NF = Non Forest
ANCY	CINNAMON TEAL	LKRVARO					LAKE/RIVER	SML	W = Woodland
ANDI	BLUE-WINGED TEAL	LKRVA					LAKE/RIVER	SMM	ANY = any structural stage
ANPL	MALLARD	LKRVARO					LAKE/RIVER	SMM	PRESENCE..= status of specie
ANST	GADWALL	LKRVA					LAKE/RIVER	SMM	in the LSR
APCO	SCRUB JAY	TSMO					SI NF	KR	KR = Known Resident
APRU	MOUNTAIN BEAVER	TSGG					ANY	KR	KV = Known Visitor (uses for
AQCH	GOLDEN EAGLE	TLC					ANY	KV, SRM	more than migration)
ARHE	GREAT BLUE HERON	LKRVARG					LAKE/RIVER	SRM	KM = Known Migrant (only)
ASOT	LONG-EARED OWL	TMGG					ANY	SRH	SRVL = Suspected Res. very lo
ASTR	TAILED FROG	RIVA	Y	Y			RIVER	KR	likelyhood
AYAF	LESSER SCAUP	LKRVA					LAKE/RIVER	SMVL	SRL = Susp. Res low likelyhoo
AYCO	RING-NECKED DUCK	LKRVARG					LAKE/RIVER	SMVL	SRM = Susp. Res. mod. likely
BAWR	OREGON SLENDER SALAMANDE	TSGG	Y	Y			ANY	SRM	SRH = Susp. Res. high likely
BOCE	CEDAR WAXWING	TSGG					ANY	KM	SMVL = Susp. Migrant very low
BOUM	RUFFED GROUSE	TSGG					ANY	KR	SML = Susp. Mig. low likely
BRCA	CANADA GOOSE	LKRVARO					LAKE/RIVER	SML	SMM = Susp. Mig. mod likely
BUAL	BUFFLEHEAD	LKRVARG	Y				LAKE/RIVER	SML	SMH = Susp. Mig. high likely
BUBO	WESTERN TOAD	TSGG					ANY	SRM	? = likelyhood unknown
BUCL	COMMON GOLDENEYE	LKRVA					LAKE/RIVER	SML	SREXT = Susp. Res. Extirpated
BUIS	BARROW'S GOLDENEYE	LKRVARF	Y				LAKE/RIVER	SML	
BUJA	RED-TAILED HAWK	TLC					ANY	KR	**********
BULA	ROUGH-LEGGED HAWK	TLMO					SI NF	KR	Guild
BUST	GREEN-BACKED HERON	RIVARG					RIVER	SML	* = Categorization estimated
BUVI	GREAT HORNED OWL	TLC					ANY	KR	
CACAL	CALIFORNIA QUAIL	TSMO					SI NF	SRL	
CACAS	CASSIN'S FINCH	TSC					ANY	SRM	
CAGU	HERMIT THRUSH	TSGG	Y				ANY	KR	
CANLA	COYOTE	TLGG					ANY	KR	

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Species	Common Name	Guild	LS/CLAS	J-2	C3	PROP C3	Veg. Structure	Presence	KEY
CANLU	WOLF	TLGG					ANY	SREXT	
CARPI	PINE SISKIN	TSGG					ANY	KR	
CARPU	PURPLE FINCH	TSGG					ANY	KR	
CASCA	BEAVER	LKRVARG					LAKE/RIVER	KR	
CATAU	TURKEY VULTURE	TLC					ANY	KV, SRM	
CATME	CANYON WREN	SPCL					NF	SRH	
CATR	AMERICAN GOLDFINCH	TSMO					SI NF	SRM	
CAUS	SWAINSON'S THRUSH	TSGG					ANY	SRL	
CEAL	BELTED KINGFISHER	LKRVARF					LAKE/RIVER	KR	
CEAM	BROWN CREEPER	TSGSL	Y				MSE CA LS OM OP	SRM	
CEEL	ELK	TLC					ANY	KR	
CHBO	RUBBER BOA	TSGG					ANY	SRH	
CHGR	LARK SPARROW	TSPO					SI NF	SMM	
CHMI	COMMON NIGHTHAWK	TMGG					ANY	SRM	
CHVA	VAUX'S SWIFT	TSGG	Y				ANY	KR	
CHVO	KILLDEER	LKRVRO					LAKE/RIVER	SRM	
CICY	NORTHERN HARRIER	SPCL					NF Meadows	KR	
CIME	AMERICAN DIPPER	RIVARF					RIVER	KR	
CIPA	MARSH WREN	SPCL					Wet Meadow	SMVL	
CLCA	WESTERN RED-BACKED VOLE	TSGSL	Y				SE MSE CA LS OM OP	SRM	
COAU	NORTHERN FLICKER	TMGG	Y				ANY	KR	
COBO	OLIVE-SIDED FLYCATCHER	TSC					ANY	KR	
COBR	AMERICAN CROW	TLGG					ANY	SRL	
COFA	BAND-TAILED PIGEON	TSGG					ANY	SML	
COLCO	RACER	TSPO					SI NF	SRM	
CONTE	SHARPTAIL SNAKE	TSGG					ANY	SRL	
CORCO	COMMON RAVEN	TLGG					ANY	KR	
COSO	WESTERN WOOD-PEWEE	TSGG					ANY	KR	
COVE	EVENING GROSBEAK	TSGG					ANY	KR	
CRVI	WESTERN RATTLESNAKE	TMGG					ANY	KR	
CYCO	TUNDRA SWAN	LAKEA					LAKE	SMVL	
CYST	STELLER'S JAY	TSGG					ANY	KR	
DENCO	YELLOW-RUMPED WARBLER	TSGG					ANY	SMH	
DENI	BLACK-THROATED GRAY WARBL	TSGG					NF OP	SRM	
DEOB	BLUE GROUSE	TSGG					ANY	KR	
DEOC	HERMIT WARBLER	TSGSL					SE MSE CA LS OM OP	KR	
DEPET	YELLOW WARBLER	TSGOS					SI NF SE MSE UR	SRM	
DETO	TOWNSEND WARBLER	TSGSL	Y				SE MSE CA LS OM OP	KR	
DICO	COPE'S GIANT SALAMANDER	LKRVA	Y	Y			LAKE/RIVER	KR	
DIPU	RINGNECK SNAKE	TSGG					ANY	SRH	
DITE	PACIFIC GIANT SALAMANDER	LKRVARF	Y				LAKE/RIVER	KR	

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Species Known To Exist Or Extirpated

Species	Common Name	Guild	LS/CLAS	J-2	C3	PROP C3	Veg. Structure	Presence	KEY
DIVI	VIRGINIA OPOSSUM	TMGG					ANY	SRH	
DRPI	PILEATED WOODPECKER	TLMLT	Y				MSE CA LS OM OP	KR	
ELCO	NORTHERN ALLIGATOR LIZARD	TSGG					ANY	SRH	
ELMU	SOUTHERN ALLIGATOR LIZARD	TSGG					ANY	SRL	
EMDI	PACIFIC SLOPE FLYCATCHER	TSPLT					MSE CA LS OM OP	SRH	
EMHA	HAMMOND'S FLYCATCHER	TSGG	Y				ANY	KR	
EMOB	DUSKY FLYCATCHER	TSPO					SI NF	KR	
EMOC	CORDILLERAN FLYCATCHER	TSPLT					MSE CA LS OM OP	SR	
EMTR	WILLOW FLYCATCHER	TSGOS					SI NF SE MSE UR	SRM	
ENES	ENSATINA	TSGG					ANY	SRM	
EPFU	BIG BROWN BAT	TMC	Y				ANY	SRM	
ERAL	HORNED LARK	TSPO					SI NF	SMM	
ERDO	PORCUPINE	TMGG					ANY	KR	
EUCY	BREWER'S BLACKBIRD	TSMO					SI NF	KM, SRM	
EUSK	WESTERN SKINK	TSGG					ANY	SRH	
FACO	MERLIN	TMMO					SI NF	KM	
FASP	AMERICAN KESTREL	TMC					ANY	KR	
FECA	LYNX	TLGSL*		N		Y	SE MSE CA LS OM	SEXTR	
FECO	MOUNTAIN LION	TLGG					ANY	KR	
FERU	BOBCAT	TLGG					ANY	KR	
FUAM	AMERICAN COOT	LKRVARO					LAKE/RIVER	SMM	
GAGA	COMMON SNIPE	LKRVRO					LAKE/RIVER	SRH	
GAIM	COMMON LOON	LKRVA					LAKE/RIVER	SML	
GETR	COMMON YELLOWTHROAT	LKRVRO					LAKE/RIVER	SRM	
GLGN	NORTHERN PIGMY-OWL	TSGG	Y				ANY	KR	
GLSA	NORTHERN FLYING SQUIRREL	TSPLT	Y				MSE CA LS OM	KR	
GRCA	SANDHILL CRANE	SPCL					Meadows	SMM	
GUGU	WOLVERINE	TLMLT					MSE CA LS OM OP	KV, SRH	
HALE	BALD EAGLE	LKRVARG	Y				LAKE/RIVER	KV, KM	
HIHI	HARLEQUIN DUCK	RIVARF	Y				RIVER	KR	
HIPY	CLIFF SWALLOW	SPCL					NF	SRH	
HIRU	BARN SWALLOW	SPCL					NF OP	SRL	
ICVI	YELLOW-BREASTED CHAT	RIVRO					RIVER	SRL	
IXNA	VARIED THRUSH	TSGG					ANY	KR	
JUHY	DARK-EYED JUNCO	TSGG					ANY	KR	
LAAR	HERRING GULL	LKRVA					LAKE/RIVER	SVL	
LACI	HOARY BAT	TMGG	Y	Y			ANY	SRM	
LADE	RING-BILLED GULL	RIVARG					RIVER	SVH	
LAEX	NORTHERN SHRIKE	TSMO					SI NF	SRM	
LALU	LOGGERHEAD SHRIKE	TSMO					SI NF	SRL	
LANO	SILVER-HAIRED BAT	TMC	Y	Y		Y	ANY	SRM	

Appendix A
Species Known To Exist Or Extirpated

Species	Common Name	Guild	LS/CLAS	J-2	C3	PROP C3	Veg. Structure	Presence	KEY
LEAM	SNOWSHOE HARE	TSGG					ANY	KR	
LEUAR	ROSY FINCH	TMPO					SI NF	SRH	
LOPCU	HOODED MERGANSER	LKRVARF	Y				LAKE/RIVER	SMM	
LOXCU	RED CROSSBILL	TSGG	Y				ANY	KR	
LUCA	RIVER OTTER	LKRVARG					LAKE/RIVER	KR	
MAAM	MARTEN	TLMLT	Y	Y			MSE CA LS OM	KR	
MAFL	YELLOW-BELLIED MARMOT	TSPO					SI NF	SRM	
MAPE	FISHER	TLMLT	Y	Y			MSE CA LS OM OP	KR	
MEFO	ACORN WOODPECKER	TSMST					PO W	SRL	
MEGA	WILD TURKEY	TMGG					ANY	KR	
MELE	LEWIS' WOODPECKER	TSC					ANY	SRH	
MELI	LINCOLN'S SPARROW	TSPO					SI NF	SRL	
MELME	SONG SPARROW	TSGG					ANY	KR	
MEPME	STRIPED SKUNK	TMMO					SI NF	KR	
MERME	COMMON MERGANSER	LKRVARF	Y	Y			LAKE/RIVER	KR	
MILO	LONG-TAILED VOLE	TSPO					SI NF	SR	
MIOR	CREEPING VOLE	TSGG					ANY	SR	
MIRI	WATER VOLE	LKRVARO					LAKE/RIVER	SR	
MITO	TOWNSEND'S VOLE	TSPO					SI NF	SR	
MOAT	BROWN-HEADED COWBIRD	TSGG					ANY	KR	
MUER	ERMINE	TSGG					ANY	KR	
MUFR	LONG-TAILED WEASEL	TMGG					ANY	KR	
MUMU	HOUSE MOUSE	SPCL					Buildings	KR	
MUVI	MINK	TMGG					ANY	KR	
MYEV	LONG-EARED MYOTIS	TMGG	Y	Y		Y	ANY	SRM	
MYOCA	CALIFORNIA MYOTIS	TMC	Y				ANY	SRM	
MYOCI	WESTERN SMALL-FOOTED MYO	SPCL	Y				NF	SRL	
MYTO	TOWNSEND'S SOLITAIRE	TSGG					ANY	KR	
MYVO	LONG-LEGGED MYOTIS	TMGG	Y	Y		Y	ANY	SRM	
MYYU	YUMA MYOTIS	TMGG	Y				ANY	SRM	
NECI	BUSHY-TAILED WOODRAT	SPCL					NF	KR	
NEGI	SHREW-MOLE	TSPLT	Y				MSE CA LS OM OP	SRH	
NUCO	CLARK'S NUTCRACKER	TSGG					ANY	SRH	
OCPR	PIKA	SPCL					Rock outcrop	KR	
ODHE	BLACK-TAILED & MULE DEER	TMGG					ANY	KR	
OPTO	MACGILLIVRAY'S WARBLER	TSPO					SI NF	KR	
ORPI	MOUNTAIN QUAIL	TSMO					SI NF	SRL	
OTFL	FLAMMULATED OWL	TSC	Y				ANY	SRM	
OTKE	WESTERN SCREECH-OWL	TSGG					ANY	KR	
OXJA	RUDDY DUCK	LAKEA					LAKE	SML	
PAAT	BLACK-CAPPED CHICKADEE	TSGOS					SI NF SE UR MSE	KR	

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Species Known To Exist Or Extirpated

Species	Common Name	Guild	LS/CLAS	J-2	C3	PROP C3	Veg. Structure	Presence	KEY
PADO	HOUSE SPARROW	SPCL					Residences	KR	
PAHA	OSPREY	LKRVARG					LAKE/RIVER	SVM	
PAIL	FOX SPARROW	TSGOS					SI NF SE UR MSE	SRM	
PARGA	MOUNTAIN CHICKADEE	TSGG					ANY	KR	
PARU	CHESTNUT-BACKED CHICKADEE	TSGG	Y				ANY	KR	
PASA	SAVANNAH SPARROW	TSPO					SI NF	SRL	
PASAM	LAZULI BUNTING	TSPO					SI NF	KR	
PECA	GRAY JAY	TMGG					ANY	KR	
PEMA	DEER MOUSE	TSGG	Y				ANY	KR	
PEPA	GREAT BASIN POCKET MOUSE	TSGG					ANY	SRH	
PETRU	PINON MOUSE	TSPO					SI NF	SRL	
PHAU	DOUBLE-CRESTED CORMORANT	LKRVARG					LAKE/RIVER	SML	
PHCO	RING-NECKED PHEASANT	TSPO					SI NF	SRL	
PHDO	SHORT-HORNED LIZARD	TSGG					ANY	SRH	
PHELO	RED TREE VOLE	TSPLT	Y	Y	Y		MSE CA LS OM	SRL	
PHIN	HEATHER VOLE	TSPO					SI NF	SR?	
PHME	BLACK-HEADED GROSBEAK	TSGG					ANY	KR	
PHNU	COMMON POORWILL	TSMO					SI NF	SRL	
PIAL	WHITE-HEADED WOODPECKER	TMGG	Y				ANY	SRM	
PIAR	BLACK-BACKED WOODPECKER	TMMLT	Y	Y			MSE CA LS OM	KR	
PICA	GOPHER SNAKE	TSPO					SI NF	KR	
PICH	GREEN-TAILED TOWHEE	TSMO					SI NF	KR	
PIEN	PINE GROSBEAK	TSGG					ANY	KR	
PIER	RUFOUS-SIDED TOWHEE	TSGG					ANY	KR	
PILU	WESTERN TANAGER	TSGG					ANY	KR	
PIPI	BLACK-BILLED MAGPIE	TMPO					SI NF	KR	
PIPU	DOWNY WOODPECKER	TSGSL					MSE CA LS OM OP	KR	
PITR	THREE-TOED WOODPECKER	TMMLT	Y				MSE CA LS OM OP	SRH	
PIVI	HAIRY WOODPECKER	TSGG	Y				ANY	KR	
PLDU	DUNN'S SALAMANDER	RIVRF					RIVER	SRL	
PLTO	TOWNSEND BIG-EARED BAT	SPCL					Caves Buildings	SRL	
POEGR	VESPER SPARROW	TSPO					SI NF	KR	
POPO	PIED-BILLED GREBE	LKRVARG					LAKE/RIVER	SML	
PRLO	RACCOON	TSGG					ANY	KR	
PSMI	BUSHTIT	TSMO					SI NF	SRL	
PSRE	PACIFIC TREEFROG	TSGG					ANY	KR	
RAAU	RED-LEGGED FROG	TSGG					ANY	KR	
RACAS	CASCADES FROG	TSGG					ANY	KR	
RACAT	BULLFROG	LKRVA					LAKE/RIVER	SRL	
RECA	RUBY-CROWNED KINGLET	TSGG					ANY	SRH	
RESA	GOLDEN-CROWNED KINGLET	TSGG	Y				ANY	SRM	

Appendix A
Species Known To Exist Or Extirpated

Species	Common Name	Guild	LS/CLAS	J-2	C3	PROP C3	Veg. Structure	Presence	KEY
RHYCA	CASCADE TORRENT SALAMAND	RIVARF		Y			RIVER	SRL	
SAOB	ROCK WREN	SPCL					NF	KR	
SATR	PACIFIC JUMPING MOUSE	TSGG					ANY	SR	
SAYSA	SAY'S PHOEBE	TSPO					SI NF	SRL	
SCEGR	SAGEBRUSH LIZARD	TSGG					ANY	SRH	
SCIGR	WESTERN GRAY SQUIRREL	TSGG					ANY	KR	
SCOC	WESTERN FENCE LIZARD	TSGG					ANY	KR	
SCOR	COAST MOLE	TSGG					ANY	SRL	
SELRU	RUFOUS HUMMINGBIRD	TSGG					ANY	KR	
SICAN	RED-BREASTED NUTHATCH	TSGG	Y				ANY	KR	
SICAR	WHITE-BREASTED NUTHATCH	TSGG	Y				ANY	KR	
SICU	MOUNTAIN BLUEBIRD	TSPO					SI NF	KR	
SIME	WESTERN BLUEBIRD	TSPO					SI NF	KR	
SIPY	PYGMY NUTHATCH	TSGG	Y				ANY	KR	
SOBE	PACIFIC WATER SHREW	LKRVARF					LAKE/RIVER	SR?	
SOMO	DUSKY SHREW	TSGG					ANY	SR?	
SOPAL	WATER SHREW	LKRVARF					LAKE/RIVER	SR?	
SOTR	TROWBRIDGE'S SHREW	TSPLT					MSE CA LS OM OP	SR?	
SOVA	VAGRANT SHREW	TSGG					ANY	KR	
SPBEE	CALIFORNIA GROUND SQUIRREL	TSPO					SI NF	SRH	
SPGR	WESTERN SPOTTED SKUNK	TMMO					SI NF	SRH	
SPHTH	WILLIAMSON'S SAPSUCKER	TSGSL	Y				SE MSE CA LS OM OP	KR	
SPLA	GOLDEN-MANTLED GROUND SQ	TSGG					ANY	KR	
SPNU	RED-NAPED SAPSUCKER (REL Y	TSGG					ANY	KR	
SPPAS	CHIPPING SPARROW	TSGG					ANY	KR	
SPRU	RED-BREASTED SAPSUCKER	TSGG	Y				ANY	KR	
STCAL	CALLIOPE HUMMINGBIRD	TSMO					SI NF	SRH	
STOCCA	NORTHERN SPOTTED OWL	TLMLT	Y				MSE CA LS OM OP	KR	
STRNE	GREAT GRAY OWL	TLC	Y	N		Y	ANY	KV, SRH	
STUNE	WESTERN MEADOWLARK	TSPO					SI NF	KR	
STVA	BARRED OWL	TLMLT	Y				MSE CA LS OM OP	KR	
STVU	EUROPEAN STARLING	TMC					ANY	KR	
SYBA	BRUSH RABBIT	TSGG					ANY	KR	
SYNU	MOUNTAIN (NUTTALL'S) COTTO	TMPO					SI NF	KR	
TAAM	YELLOW-PINE CHIPMUNK	TSGG					ANY	SRH	
TABI	TREE SWALLOW	TSGG					ANY	KR	
TADO	DOUGLAS' SQUIRREL	TSGG	Y				ANY	KR	
TAGR	ROUGH-SKINNED NEWT	TSGG	Y				ANY	KR	
TATA	BADGER	TMMO					SI NF	KR	
TATH	VIOLET-GREEN SWALLOW	TSGG					ANY	SRM	
TATO	TOWNSEND'S CHIPMUNK	TSGG	Y				ANY	KR	

Appendix A
Species Known To Exist Or Extirpated

Species	Common Name	Guild	LS/CLAS	J-2	C3	PROP C3	Veg. Structure	Presence	KEY
THBE	BEWICK'S WREN	TSGOS					SI NF SE MSE UR	KR	
THEL	WESTERN TERRESTRIAL GARTE	TSPO					SI NF	SRH	
THMA	WESTERN POCKET GOPHER	TSPO					SI NF	SRH	
THOR	NORTHWESTERN GARTER SNAK	TSPO					SI NF	SRL	
THSI	COMMON CARTER SNAKE	TSPO					SI NF	SRH	
THTA	NORTHERN POCKET GOPHER	TSPO					SI NF	KR	
TRAI	HOUSE WREN	TSGOS					SI NF SE MSE UR	KR	
TRTR	WINTER WREN	TSGG	Y				ANY	SRH	
TUMI	AMERICAN ROBIN	TSGG					ANY	KR	
TYAL	BARN OWL	TMC					ANY	SRM	
TYVE	WESTERN KINGBIRD	TSMO					SI NF	KR	
URAM	BLACK BEAR	TLGG					ANY	KR	
URAR	GRIZZLY BEAR	TLGG*					ANY	SREXT	
URCI	GRAY FOX	TLGG					ANY	SRM	
VECE	ORANGE-CROWNED WARBLER	TSPO					SI NF	KR	
VERU	NASHVILLE WARBLER	TSGG					ANY	KR	
VIGI	WARBLING VIREO	TSGG	Y				ANY	KR	
VISO	SOLITARY VIREO	TSGG					ANY	KR	
VUVU	RED FOX	TSGG					ANY	SRH	
WIPU	WILSON'S WARBLER	TSGG	Y				ANY	KR	
ZAPR	WESTERN JUMPING MOUSE	TSPO					SI NF	SRH	
ZEMA	MOURNING DOVE	TSGG					ANY	KR	
ZOAT	GOLDEN-CROWNED SPARROW	TSPO					SI NF	SMH	
ZOLE	WHITE-CROWNED SPARROW	TSPO					SI NF	KM, SRH	

Appendix B

Appendix B
Species of Management Concern Identified and
Conflicting Habitat Needs Identified

Species	Common Name	Guild	J-2	C3	PROP C3	Veg. Structure	Presence
ASTR	TAILED FROG	RIVA	Y			RIVER	KR
BAWR	OREGON SLENDER SALAMANDE	TSGG	Y			ANY	SRM
DICO	COPE'S GIANT SALAMANDER	LKRVA	Y			LAKE/RIVER	KR
FECA	LYNX	TLGSL*	N		Y	SE MSE CA LS OM	SEXTR
LACI	HOARY BAT	TMGG	Y			ANY	SRM
LANO	SILVER-HAIRED BAT	TMC	Y		Y	ANY	SRM
MAAM	MARTEN	TLMLT	Y			MSE CA LS OM	KR
MAPE	FISHER	TLMLT	Y			MSE CA LS OM OP	KR
MERME	COMMON MERGANSER	LKRVARF	Y			LAKE/RIVER	KR
MYEV	LONG-EARED MYOTIS	TMGG	Y		Y	ANY	SRM
MYVO	LONG-LEGGED MYOTIS	TMGG	Y		Y	ANY	SRM
PHELO	RED TREE VOLE	TSPLT	Y	Y		MSE CA LS OM	SRL
PIAR	BLACK-BACKED WOODPECKER	TMMLT	Y			MSE CA LS OM	KR
RHYCA	CASCADE TORRENT SALAMAND	RIVARF	Y			RIVER	SRL
STRNE	GREAT GRAY OWL	TLC	N		Y	ANY	KV, SRH

Appendix C

Appendix C

Late Successional Associated Vertebrates Known (or suspected) to occur in LSR

Species	Common Name	Guild	LS/CLAS	Veg. Structure	Presence
ACGE	NORTHERN GOSHAWK	TLMLT	Y	MSE CA LS OP	KR
AISP	WOOD DUCK	LKRVARF	Y	LAKE/RIVER	SRM
AMGR	NORTHWESTERN SALAMANDER	TSGG	Y	ANY	SRM
ASTR	TAILED FROG	RIVA	Y	RIVER	KR
BAWR	OREGON SLENDER SALAMANDE	TSGG	Y	ANY	SRM
BUAL	BUFFLEHEAD	LKRVARG	Y	LAKE/RIVER	SML
BUIS	BARROW'S GOLDENEYE	LKRVARF	Y	LAKE/RIVER	SML
CAGU	HERMIT THRUSH	TSGG	Y	ANY	KR
CEAM	BROWN CREEPER	TSGSL	Y	MSE CA LS OM OP	SRM
CHVA	VAUX'S SWIFT	TSGG	Y	ANY	KR
CLCA	WESTERN RED-BACKED VOLE	TSGSL	Y	SE MSE CA LS OM OP	SRM
COAU	NORTHERN FLICKER	TMGG	Y	ANY	KR
DETO	TOWNSEND WARBLER	TSGSL	Y	SE MSE CA LS OM OP	KR
DICO	COPE'S GIANT SALAMANDER	LKRVA	Y	LAKE/RIVER	KR
DITE	PACIFIC GIANT SALAMANDER	LKRVARF	Y	LAKE/RIVER	KR
DRPI	PILEATED WOODPECKER	TLMLT	Y	MSE CA LS OM OP	KR
EMHA	HAMMOND'S FLYCATCHER	TSGG	Y	ANY	KR
EPFU	BIG BROWN BAT	TMC	Y	ANY	SRM
GLGN	NORTHERN PIGMY-OWL	TSGG	Y	ANY	KR
GLSA	NORTHERN FLYING SQUIRREL	TSPLT	Y	MSE CA LS OM	KR
HALE	BALD EAGLE	LKRVARG	Y	LAKE/RIVER	KV, KM
HIHI	HARLEQUIN DUCK	RIVARF	Y	RIVER	KR
LACI	HOARY BAT	TMGG	Y	ANY	SRM
LANO	SILVER-HAIRED BAT	TMC	Y	ANY	SRM
LOPCU	HOODED MERGANSER	LKRVARF	Y	LAKE/RIVER	SMM
LOXCU	RED CROSSBILL	TSGG	Y	ANY	KR
MAAM	MARTEN	TLMLT	Y	MSE CA LS OM	KR
MAPE	FISHER	TLMLT	Y	MSE CA LS OM OP	KR
MERME	COMMON MERGANSER	LKRVARF	Y	LAKE/RIVER	KR
MYEV	LONG-EARED MYOTIS	TMGG	Y	ANY	SRM
MYOCA	CALIFORNIA MYOTIS	TMC	Y	ANY	SRM
MYOCI	WESTERN SMALL-FOOTED MYO	SPCL	Y	NF	SRL
MYVO	LONG-LEGGED MYOTIS	TMGG	Y	ANY	SRM
MYYU	YUMA MYOTIS	TMGG	Y	ANY	SRM
NEGI	SHREW-MOLE	TSPLT	Y	MSE CA LS OM OP	SRH
OTFL	FLAMMULATED OWL	TSC	Y	ANY	SRM
PARU	CHESTNUT-BACKED CHICKADEE	TSGG	Y	ANY	KR
PEMA	DEER MOUSE	TSGG	Y	ANY	KR
PHELO	RED TREE VOLE	TSPLT	Y	MSE CA LS OM	SRL
PIAL	WHITE-HEADED WOODPECKER	TMGG	Y	ANY	SRM
PIAR	BLACK-BACKED WOODPECKER	TMMLT	Y	MSE CA LS OM	KR
PITR	THREE-TOED WOODPECKER	TMMLT	Y	MSE CA LS OM OP	SRH
PIVI	HAIRY WOODPECKER	TSGG	Y	ANY	KR
RESA	GOLDEN-CROWNED KINGLET	TSGG	Y	ANY	SRM
SICAN	RED-BREASTED NUTHATCH	TSGG	Y	ANY	KR
SICAR	WHITE-BREASTED NUTHATCH	TSGG	Y	ANY	KR
SIPY	PYGMY NUTHATCH	TSGG	Y	ANY	KR
SPHTH	WILLIAMSON'S SAPSUCKER	TSGSL	Y	SE MSE CA LS OM OP	KR
SPRU	RED-BREASTED SAPSUCKER	TSGG	Y	ANY	KR
STOCCA	NORTHERN SPOTTED OWL	TLMLT	Y	MSE CA LS OM OP	KR
STRNE	GREAT GRAY OWL	TLC	Y	ANY	KV, SRH
STVA	BARRED OWL	TLMLT	Y	MSE CA LS OM OP	KR
TADO	DOUGLAS' SQUIRREL	TSGG	Y	ANY	KR
TAGR	ROUGH-SKINNED NEWT	TSGG	Y	ANY	KR
TATO	TOWNSEND'S CHIPMUNK	TSGG	Y	ANY	KR
TRTR	WINTER WREN	TSGG	Y	ANY	SRH
VIGI	WARBLING VIREO	TSGG	Y	ANY	KR
WIPU	WILSON'S WARBLER	TSGG	Y	ANY	KR

Appendix D

Appendix D
Locations of Late Successional Species

Species	Landscape Units (obs.)	Landscape Units (habitat)
ACGE	Fivemile, Rameight	All
AISP		Mill, Fivemile, Rameight, 15 South
AMGR		All
ASTR	Marion, Fivemile, Rameight	Dog River, 15 South, Mill
BAWR		All
BUAL		Mill, Fivemile, Rameight, 15 South
BUIS		Mill, Fivemile, Rameight, 15 South
CAGU		All
CEAM		All
CHVA		All
CLCA		All
COAU		All
DETO		ALL
DICO	Mill Creek Buttes	Mill, Rameight, 15 South, Fivemile, Dog River
DITE		Mill, Mill Cr Buttes, Fivemile, Rameight,Dog River
DRPI	Nonrecorded sightings Common in All the units	All
EMHA		All
EPFU		All
GLGN		All
GLSA		All
HALE		Rameight, 15 South, Mill, Fivemile, Dog River
HIHI		15 South, Rameight, Mill, Fivemile
LACI		All
LANO		All
LOPCU		15 South, Rameight, Mill, Fivemile
LOXCU		All
MAAM		All
MAPE		All
MERME		Mill, Rameight, Fivemile, 15 South
MYEV		All
MYOCA		All
MYOCI		All
MYVO		All
MYYU		All
NEGI		All
OTFL		Rameight, Fivemile, 15 North, 15 South, Mill
PARU		All
PEMA		All
PHELO		All
PIAL		Rameight, Fivemile, 15 North , 15 South, Mill
PIAR		All
PITR		All
PIVI		All
RESA		All
SICAN		All
SICAR		All
SIPY		All
SPHTH		All
SPRU		All

Species	Landscape Units (obs.)	Landscape Units (habitat)
STOCCA	Mill Cr Buttes, Eightmile Plateau, Marion, Surveyors Ridge, 15 North, 15 South, Dog River	All
STRNE		All
STVA		All
TADO		All
TAGR		All
TATO		All
VIGI		All
WIPU		All

Appendix E

Surveyors LSR Aquatic Species List

The following list is for known or highly suspected species only. Mill Creek and East Fork subbasin tributaries likely have many of the same macroinvertebrate species, and possibly others, as in the Fifteenmile Creek subbasin but verification surveys have not been conducted so none are listed here.

Fifteenmile Creek Subbasin

Fish species:

Oncorhynchus mykiss gairdneri - Inland Columbia Basin redband/steelhead
O. clarki clarki - Coastal cutthroat trout (subspecies not confirmed)
(Possible hybrids between cutthroat and redbands - unknown)
Cottus spp. - sculpin (may be one or several species - unknown)

Aquatic insects (Class Insecta):

Mayflies (Order Ephemoptera)
- Rhithrogena spp.
- Heptagenia spp.
- Tricorythodes minutus
- Baetis spp.
- Epeorus spp.
- Cinygmula spp.
- Ephemerella spp.
- Paraleptophlebia spp.
- Cloeon spp.

Stoneflies (Order Plecoptera)
- Podmosta spp.
- Zapada cinctipes
- Zapada oregonensis
- Isoperla spp.
- Yoraperla spp.
- Cultus spp.
- Family Perlodidae (No genus or species given)
- Family Capniidae (No genus or species given)
- Order Plecoptera (Individuals found, no family, genus or species given)

Caddisflies (Order Trichoptera)
- Hydropsyche spp.
- Glossosoma spp.
- Arctopsyche grandis
- Leucotrichia
- Order Trichoptera (Individuals found, no family, genus or species given)

Beetles (Order Coleoptera)
- Optioservus spp.

Flies (Order Diptera)
- Chironomini spp.
- Orthocladiinae spp.
- Dicranota spp.
- Tanypodinae spp.
- Chelifera spp.
- Maruina spp.
- Family Simuliidae (Individuals found, no genus or species given)

Family Chironomidae (Individuals found, no genus or species given)
Order Diptera (Individuals found, no family, genus or species given)

Class Nematoda - round worms

Class Oligochaeta, Order Tubificidae - segmented worms

Class Crustacea, Order Decapoda - crayfish

Class Arachnida, Order Hydracarina - water mites

Mill Creek Subbasin and East Fork Hood River Subbasin

Fish species:
Oncorhynchus clarki clarki - coastal cutthroat trout (subspecies not confirmed)
Oncorhynchus mykiss irideus - coastal rainbow trout (subspecies not confirmed)

Appendix F

Codes Used for Appendix F

The attached table format is similar to the ROD table C-3 on pages 49 to 61, with fungi groups listed first, lichen groups second, bryophytes third, and vascular plants last. Additional columns were added to incorporate habitat information, known range, and/or geographic extent. ROD appendix J2, pages 83-247, provided 1 percent of the information attached. The key identifies codes used to expedite and condense this document. Among the codes is "D" for documented occurrence on the Mt. Hood National Forest. An asterisk (*) preceding a D indicates that there specimen of that species in our Forest Herbarium at the Supervisor's Office in Gresham.

Survey Strategy: Manage known sites; 2 = survey prior to activities manage sites; 3 = conduct extensive surveys and manage sites; 4 = conduct general regional surveys.

Watersheds:

M - Mile Creeks
WF- West Fork Hood River
MC- Mill Creek
WR- White River

Occurrence:

D - Documented sites on MHNF
p - Potential habitat present.
n - Not likely to occur.
? - Unknown, inadequate info.

Trees and Shrubs:

ABAM ---- Abies amabilis (Pacific silver fir)
ABCO ---- Abies concolor (White fir)
ABGR ---- Abies grandis (Grand fir)
ABLA2 ---- Abies lasiocarpa (Subalpine fir)
ABPR ---- Abies procera (Noble fir)
ACCI ---- Acer circinatum (Vine maple)
Arsp. ---- Arctostaphylos (Manzanita)
CACH ---- Castanopsis chrisophylla (Chinquapin)

PIAL ---- Pinus albicaulis (Whitebark pine)
PICO ---- Pinus concorta (Lodgepole pine)
PIEN ---- Pinus engelmannii (Engelman spruce)
PILA ---- Pinus lambertiana (Sugar pine)
PIMO ---- Pinus monticola (Western white pine)
PISI ---- Picea sitchensis (Sitka spruce)
PIPO ---- Pinus ponderosa (Ponderosa pine)
PSME ---- Pseudotsuga menziesii (Douglas-fir)

QUGA ---- Quercus garryana (Oregon white oak)
TABR ---- Taxus brevifolia (Pacific yew)
THPL ---- Thuja plicata (Western redcedar)
TSHE ---- Tsuga heterophylla (Western hemlock)

IV. C-3 FUNGI

SPECIES	SURVEY STRAT.		MHNF	M	MC	WR	WF	HABITAT	KNOWN GEO RANGE or EXT
MYCORRHIZAL FUNGI									
BOLETES									
Gastroboletus subalpinus	1	3	D	p	p	D	p	above 4500', ecto-michorrizal w/pines	Endemic Ore. & N. Sierras
Gastroboletus turbinatus		3	D	p	?	D	p	mid-high elev. w/true firs, PIEN/PISI, TSHE/TSME, w/abundant large woody debris, humus	WA to N. CA, Coast Range, Mts., Klam. M N. ID, MI, Me
BOLETES LOW ELEV.									
Boletus piperatus		3	D	p	p	D	p	low-mid elev forests, requires course woody debris in Douglas-fir	Unknown
Tylopilus pseudoscaber	1	3	?	?	?	?	?	low elev, moist hab., often w/Sitka spruce.	PNW coast end
RARE BOLETES									
Boletus haematinus	1	3	p	?	n	p	p	high elev silver fir	Cal. north to
Boletus pulcherrimus	1	3	p	p	p	p	p	low-mid elev conifer	Cal. to Canad north to Olym
Gastroboletus imbellus	1	3	p	p	n	p	p	upper mid elev (5000') w/ABAM, ABGR, PSME, TSHE, TSME, possibly ectomycorrhizal w/pine	locally endem Willamette NF Ollalie Trail Lamb Butte Sc
Gastroboletus rubra	1	3	D	p	n	p	p	upper mid-high elev. w/mature TSME and dev-eloped humus layer.	endemic to WA Casc. south t Willamette Pa
FALSE TRUFFLES									
Nivatogastrium nubigenium	1	3		p	p	p	p	mid-high elev. in mature forests w/abun-dant lg. coarse woody (relies on mammals for dispersal)	Casc. Mts. of N. to Mt. Ada north ID.
Rhizopogon abietis		3	p	p	?	p	p	high elev. mixed coni-fer (true firs, pines, PSME, TSME), in mod-erate to dry sites.	E. Canada, E N. Rockies, S berry Mts. OR Casc. & Klam.
R. atroviolaceus		3	p	p	?	p	p		
R. truncatus		3	p	p	?	p	p		

TSME - Tsuga mertensiana (Mountain hemlock)

V. C-3 LICHENS

SPECIES	SURVEY STRAT.	MHNF	M	MC	WR	WF	HABITAT	KNOWN GEO RANGE or EXT
RARE FORAGE LICHENS								
Bryoria tortuosa	1 3	D	p	p	D	?	low-mid elev, coastally on conifers, inland in pine/oak wet regimes	Central Cal. Brit. Col., Cascades
RARE LEAFY LICHENS								
Hypogymnia duplicata	1 2 3	?	n	n	?	?	low elev wet, foggy, windy coast & maritime sites on conifers	Ore. to Alask
Tholurna dissimilis	1 3	p	?	n	p	p	subalpine fog zone on stunted TSME, canopy of old-growth PSME	Montane areas Ore. & Wash.
RARE NITROGEN FIXING LICHENS								
Dendriscocaulon intricatulum	1 3	p	?	?	p	p	low-mid elev wet, boreal, riparian, late successional forest	Southern Wash southeast Ala
Lobaria hallii	1 3	p	?	?	p	p	low-mid elev wet, foggy forest on large diam. hardwoods & on shrubs	Central coast Cal. to N. Al
Lobaria linita	1 3	p	?	?	p	p	old-growth PSME & moist fir forest	N. Ore. to so east Alaska,
Nephroma occultum	1 3	p	?	?	p	p	pristine old-growth approx. 400 yrs old	Willamette NF Brit. Col.
Pannaria rubiginosa	1 3	p	p	p	p	p	bases of trees in mature forest	Salem, Ore. & Mt. Rainier,
Pseudocyphellaria rainierensis	1 3	*D	p	p	p	p	old-growth forest on trunks of PSME	Cascades of W and Ore.

SPECIES	SURVEY STRAT.	MHNF	M	MC	WR	WF	HABITAT	KNOWN GE RANGE or EX
NITROGEN FIXING LICHENS								
Lobaria oregana	4	*D	p	p	p	p	open 200 yr old-growth & coastal forests on conifers	Pacific North Cascades
Lobaria pulmonaria	4	*D	?	?	p	p	moist, hardwood, old-growth forest & swamps	Pacific North Cascades
Lobaria scrobiculata	4	*D	p	p	p	p	old-growth forest from 140-200 yrs old	Pacific North Cascades
Nephroma bellum	4	p	p	p	p	p	open old-growth & along roadsides	Pacific North Cascades
Nephroma helveticum	4	*D	p	p	p	p	N. coastal, montane forests & foothill woodlands & valleys	Pacific North Cascades
Nephroma laevigatum	4	p	p	p	p	p	low elev. coastal & old-growth forests	Pacific Nortl Cascades
Nephroma parile	4	*D	p	p	p	p	moist coniferous & decidious old-growth forests	Pacific Nortl Cascades
Nephroma resupinatum	4	*D	p	p	p	p	low-mid elev. coastal & montane coniferous shady forests	Pacific North Cascades
Pannaria leucostictoides	4	*D	p	p	p	p	low-elev. open coastal & old-growth forest	Pacific North Cascades
Pannaria mediterranea	4	p	p	p	p	p	old-growth forest from 140-200 yrs old	Pacific North Cascades
Pannaria saubinetii	4	p	p	p	p	p	old-growth forest from 140-200 yrs old	Pacific North Cascades
Peltigera collina	4	*D	p	p	p	p	low-mid elev. coastal, montane, & old-growth forests	Pacific North Cascades

SPECIES	SURVEY STRAT.	MHNF	M	MC	WR	WF	HABITAT	KNOWN GEO RANGE or EXT
Gelatinodiscus flavidus	1 3	p	?	n	p	p	needles, cones, & twig of high elev. Alaska Yellow cedar	BC, Olympic P OR & WA Casca & Central OR
Helvella compressa	1 3	p	p	p	p	p	low-mid elev. riparian & wet late succession	temperate for areas of N.Am
H. crassitunicata		p	p	p	p	p	forest	
H. elastica		p	p	p	p	p		
H. maculata		p	p	p	p	p		
Neournula pouchetii	1 3	p	p	p	p	p	late-successional Thuja and Tsuga forest	N. OR & WA
Pithya vulgaris	1 3	p	?	n	p	p	high elev. Abies forest	BC, WA, ID, &
Plectania latahensis	1 3	p	?	n	p	p	upper montane, sub-alpine conifer forest	OR, WA, ID, &
Plectania milleri	1 3	D	?	n	D	p	montane, subalpine conifer forest	OR, WA, ID, &
Pseudaleuria quinaultiana	1 3	p	?	p	p	p	low elev. wet late-successional conifer forest on wood or soil	Olympic Penin coastal WA &
CLUB CORAL FUNGI								
Clavariadelphus ligula	3,4	p	p	p	p	p	cool/cold moist late-successional hardwood or conifer forest, increases in frequency w/increasing lat. & elev., need well-developed litter layer	Pacific North BC, AK, Midwe eastern N. Am
		p	p	p	p	p		
C. pistilaris	3,4	p	p	p	p	p		
C. truncatus	3,4	p	p	p	p	p		
C. borealis	3,4	p	p	p	p	p		
C. lovejoyae	3,4	p	p	p	p	p		
C. sachalinensis	3,4	p	p	p	p	p		
C. subfastigiatus	3,4	p	p	p	p	p		
JELLY MUSHROOM								
Phlogoitis helvelloides	3,4	p	p	p	p	p	riparian zones, upper headwater seeps, & intermittent streams w/large woody debris	Pacific North northwest, mi & Rockies

SPECIES	SURVEY STRAT.	MHNF	M	MC	WR	WF	HABITAT	KNOWN GE RANGE or EX
BRANCHED CORAL FUNGI								
Clavulina cinerea	3,4	p	p	p	p	p	late-successional forest w/well-	Pacific North & elsewhere
C. cristata		p	p	p	p	p	developed liter layer	
C. ornatipes		p	p	p	p	p		
MUSHROOM LICHEN								
Phytoconis ericetorum	3,4	p	p	p	p	p	large woody debris in well lit forest w/alt. high/low moisture, increases northward	CA to artic, to subalpine
PARASITIC FUNGI (App. J2 p. 212)								
Species are collectively grouped. See App. J2 p. 212.	3	p	p	p	p	p	late-successional moist forest on a host fungus	Pacific North distribution ecology unkno
CAULIFLOWER MUSHROOM								
Sparassis crispa	3	p	p	p	p	p	low-mid elev. old-growth conifer forest on large roots, esp. PSME	Pacific North & N. CA
MOSS DWELLING MUSHROOM (App. J2 p. 216)								
Species are collectively grouped. See App. J2 p. 216.	3	p	p	p	p	p	late-successional moist forest, closely associated with & dependent upon mosses	Pacific North Olympic Penir
CORAL FUNGI								
Clavicorona avellanea	3	p	?	p	p	p	low-mid elev. moist late-successional forest on large roots	Pacific North

SPECIES	SURVEY STRAT.	MHNF	M	MC	WR	WF	HABITAT	KNOWN GEO RANGE or EXT
RARE GILLED MUSHROOMS								
Clitocybe subditopoda	1 3	p	p	p	p	p	low-mid elev. moist late successional	WA, OR, & CA
C. senilis		p	p	p	p	p	forest, large logs in later stages of decay	
Neolentinus adherens	1 3	p	p	p	p	p	low-mid elev. moist late successional forest, large logs in later stages of decay	Olympic Natl.
Rhodocybe nitida	1 3	p	p	p	p	p	low-mid elev. moist late successional forest, large logs in later stages of decay	WA, OR, & CA
Rhodocybe speciosa	1 3	p	p	p	p	p	low-mid elev. moist late successional forest, large logs in later stages of decay	Mt. Rainier N Park to Barlo
Tricholomopsis fulvescens	1 3	D	p	p	p	p	low-mid elev. moist late successional forest, large logs in later stages of decay	Mt. Hood area Rainier Natl. Mt. Baker-Sno
NOBLE POLYPORE (rare and endangered)								
Oxyporus nobilissimus	1 2 3	D	p	p	p	p	late-successional forest on Abies spp. esp. A. procera	OR & WA Casca
BONDARZEWIA POLYPORE								
Bondarzewia montana	1 2 3	p	?	n	p	p	late-successional high elev. forest on ass'd w/Abies	Pacific North W. NV, & ID
RARE RESUPINATES AND POLYPORES								
Aleurodiscus farlowii	1 3	p	p	p	p	p	on wood, humus, litter stumps, & dead roots	WA, OR, & N.
Dichostereum granulosum	1 3	p	p	p	p	p	(same as above)	(same as abov

SPECIES	SURVEY STRAT.	MHNF	M	MC	WR	WF	HABITAT	KNOWN GE(RANGE or EX
Cudonia monticola	3	p	p	p	p	p	duff layer of mature conifer forest	WA, OR, & N.
Gyromitra californica	3,4	p	p	p	p	p	decaying matter in soil & rotten wood in	Northwestern America & Eu
G. esculenta		p	p	p	p	p	older forest (except	
G. infula		p	p	p	p	p	G. esculenta which	
G. melaleucoides		p	p	p	p	p	prefers second growth)	
G. montana(syn. G. gigas)		p	p	p	p	p		
Otidea leporina	3	p	p	p	p	p	conifer duff in moist- wet late-successional	Unknown
O. onotica		p	p	p	p	p	mid-low elev. conifer	
O. smithii		p	p	p	p	p	forest	
Plectania melastoma	3	p	p	p	p	p	late-successional to old-growth conifer forest duff	NE. & NW. No America & Eu
Podostroma alutaceum	3	p	p	p	p	p	mature conifer & mixed conifer/hardwood forest duff	Pacific North
Sarcosoma mexicana	3	p	p	p	p	p	late-successional & old-growth high elev. forest	Coastal OR &
Sarcosphaera eximia	3	p	p	p	p	p	conifers & Fagaceae sp on chalky soils	Pacific North CA, Rockies, U.S. & Europe
Spathularia flavida	3	p	p	p	p	p	duff layer of mature conifer forest	OR, WA, & N.
RARE CUP FUNGI								
+Aleuria rhenana	1 3	p	p	p	p	p	late succesional conifer forest liter	San Francisco Mt. Rainier
+Bryoglossum gracile		p	p	p	p	p	mossy, wet, alpine/ subalpine montane conifer forest	artic & alpin America & Eu

SPECIES	SURVEY STRAT.	MHNF	M	MC	WR	WF	HABITAT	KNOWN GEO RANGE or EXT
CHANTERELLES - GOMPHUS								
Gomphus bonarii	3	p	p	p	p	p	late successional west	throughout re
G. clavatus	3	p	p	p	p	p	conifer forests	especially N.
G. floccosus	3	D	p	p	p	p	" (& w/hemlock in east	
G. kauffmanii	3	p	p	p	p	p	" N. America)	
RARE CHANTERELLE								
Cantharellus formosus	1 3	p	p	p	p	p	a variety of mixed & conifer forest	N. CA, OR, &
Polyozellus multiplex	1 3	D	p	p	p	p	in montane areas along intmnt. streams/seeps w/true fir and spruce	N. Sierras, O WA Cascades
UNCOMMON & RARE CORAL FUNGI (App. J2, pp 163, 164)								N. CA, OR, WA
(Ramaria spp.)	(1 3) & (3)	p	p	p	p	p	w/TSHE, Abies, Picea, Pinus, Pseudotsuga, & Taxus	Overall distr ution of indi ual spp., unk
PHAEOCOLLYBIA (App. J2, p. 166)							low elev. to montane,	Distribution
(Phaeocollybia spp)	(1 3)	p	p	p	p	p	w/conifers, moist hab. (prefers low elev.)	frequency cur ly under stud
UNCOMMON GILLED MUSHROOMS (App. J2, p. 168) (Catathelasma sp., Cortinarius spp., Dermocybe sp., Hebeloma sp., Hygrophorus spp., Russula sp.)	(1 3) & (3)	D	D	p	D	p	ectomycorrhizal in low low elev. to montane, w/conifers	Distribution range of indi idual species unknown. Som be PNW endemi
RARE GILLED MUSHROOMS								
Chroogomphus loculatus	1 3	p	p	?	p	p	upper mid-elev (5000') w/ABAM, ABGR, PSME, TSHE, TSME.	local endemic type locality Ollalie Trail
Cortinarius canabarba	1 3	p	p	p	p	p	The range of elev. and host species are un-	Overall ecolo and distribut
C. rainierensis	1 3	p	p	p	p	p	known. All require	are not well
C. variipes	1 3	p	p	p	p	p	diverse coniferous	for these spe
Tricholoma venenatum	1 3						forests w/heavy hummus layer and crs. woody.	

SPECIES	SURVEY STRAT.	MHNF	M	MC	WR	WF	HABITAT	KNOWN GEO RANGE or EXT
Cortinarius verrucisporus	1 3	p	p	n	p	p	high elev. montane, w/ conifers & true firs, hypogeous (fruits underground)	CA and OR
Cortinarius wiebeae	1 3	D	?	n	D	p	(same as above)	Local endemic only known s
UNCOMMON ECTO-POLYPORES								
Albatrellus ellsii	3	D	?	?	D	?	coastal old-growth & mixed hardwood forest	WA, OR, N. C Rocky Mts., N & Europe
A. flettii		D	?	?	D	?		
RARE ECTO-POLYPORES								
Albatrellus avellaneus	1 3	?	?	?	?	?	coastal old-growth & mixed hardwood forest	WA, OR, N. CA Rocky Mts., & Europe
A. caeruleoporus		?	?	?	?	?		
TOOTH FUNGI								
Hydnum repandum	3	p	p	p	p	p	late-successional & second growth conifer & hardwood forest	Widespread in America & Eur
H. umbilicatum		p	p	p	p	p		
Phellodon atratum		p	p	p	p	p		
Sarcodon fuscoindicum		p	p	p	p	p		
S. imbricatus		p	p	p	p	p		
RARE ZYGOMYCETES								
Endogone acrogena	1 3	p	?	p	p	p	low elev. mesic old-growth PSME/TSME forest	W. Cascades f Mt. Rainier t Whitechuck Rv
Endogone oregonensis	1 3	?	n	n	?	?	low elev. old-growth PSME/PISI/TSME coastal forest	Suislaw NF, (
Glomus radiatum	1 3	p	?	?	p	p	mature to old-growth Coastal Redwood/Alaska cedar mesic wet forest	OR & WA Casca N. CA, & NE.
SAPROBES (DECOMPOSERS)								
UNCOMMON GILLED MUSHROOMS (App. J2 p. 179)								
Species are collectively grouped. See App. J2 p. 179	(1 3) & (3)	p	?	?	?	?	low-mid elev. conifer ecosystems; on PISI, recently fallen logs, or decomposed logs	N. CA, OR, &

SPECIES	SURVEY STRAT.	MHNF	M	MC	WR	WF	HABITAT	KNOWN GEO RANGE or EXT
Gymnomyces sp. nov. #Trappe 4703 & #5576	1 3	?	n	n	?	?	upper mid elev. mature ABPR forest	Siuslaw NF, O Coast range o
Gymnomyces sp. nov. #Trappe 5052	1 3	D	?	n	p	p	high elev. mature to old-growth TSME/ABAM forest	Phlox Pt., Mt NF, OR
Gymnomyces sp. nov. #Trappe 1690 & #1706, 1710	1 3	p	p	p	p	p	upper mid elev. mature to old-growth ABGR/ ABPR/ABAM/TSME forest	W. OR Cascade Willamette NF
Gymnomyces sp. nov. #Trappe 7545	1 3	p	?	n	p	p	high elev. mature to old-growth true fir & coniferous forest	Klamath NF, O
Hydnotrya sp. nov. #Trappe 787, 792	1 3	D	p	p	p	p	upper mid elev. old-growth ABAM/TSME forest	Mt. Jefferson
Hydnotrya subnix sp. nov. #Trappe 1861	1 3	p	p	p	p	p	old-growth ABAM forest	Gifford Pinch WA
Martellia sp. nov. #Trappe 311, 649	1 3	D	?	n	p	p	high elev. mature to old-growth TSME/ABAM forest	Phlox Pt., Mt NF, OR
Martellia sp. nov. #Trappe 1700	1 3	p	p	p	p	p	upper mid elev. mature to old-growth ABGR/ ABAM/PSME/TSME forest	Willamette NF
Martellia sp. nov. #Trappe 5903	1 3	p	p	p	p	p	upper mid elev. old-growth ABAM/TSME forest	Mt. Jefferson
Octavianina sp. nov. #Trappe 7502	1 3	p	p	p	p	p	upper mid elev. mature to old-growth ABGR/ ABAM/PSME/TSME forest	Willamette NF
Rhizopogon sp. nov. #Trappe 9432	1 3	p	?	n	?	?	mid-high elev. mature to old-growth PSME/ PILA/ARsp/PIAT/Shasta	Siskiyou Mts. southwestern pine)

SPECIES	SURVEY STRAT.	MHNF	M	MC	WR	WF	HABITAT	KNOWN GEO RANGE or EX
Rhizopogon sp. nov. #Trappe	1 3	p 1692, 1698	p	p	p	p	upper mid elev. mature to old-growth ABGR/ ABAM/PSME/TSME forest	Willamette N
Thaxterogaster sp. nov. #Trappe & #7427, 7962, 8520	1 3	? 4867, 6242	n	n	?	?	mature to old-growth PISI/TSME/PSME coastal fog belt forest	Lane, Lincol Tillamook cou OR
Tuber sp. nov. #Trappe	1 3	? 2302, 12493	n	n	?	?	same as above	same as above
RARE TRUFFLES								
Balsamia nigra	1 3	p	p	p	p	n	low elev. mature xeric pine/oak forest	Sierra Nevad CA to Yamhil
Choiromyces alveolatus	1 3	D	p	n	p	p	mid-high elev. old-growthTSME/Abies spp. forest	Mt. Hood, OR Yuba Pass, C
Choiromyces venosus	1 3	p	p	p	p	p	low elev. w/coniferous decidious or mature PSME forest	Springfield, Europe
Elaphomyces anthracinus	1 3	p	p	p	p	?	mature PIPO forest	W. Europe, E. America, & E Cascades
Elaphomyces subviscidus	1 3	p	p	p	p	?	mid elev. mature to old-growth pine forest	Central to S Cascades
RARE CHANTERELLES								
Cantharellus formosus	1 3	p	p	p	p	p	coniferous & mixed forest	N. CA, OR, &
Polyozellus multiplex	1 3	D	p	n	p	p	intermittent steams of montane fir forest	N Sierras, CA Cascades, OR
CHANTERELLES								
Cantharellus cibarius	3,4	D	p	p	p	p	coniferous & mixed forest	N. CA, OR, &
C. subalbidus		D	p	p	p	p		
C. tubaeformis		D	p	p	p	p	late-successional forest	

SPECIES	SURVEY STRAT.	MHNF	M	MC	WR	WF	HABITAT	KNOWN GEO RANGE or EXT
Leucogaster microsporus	1 3	D	p	p	p	p	mid elev. w/PSME or in stands w/abundant legacy of crs. woody	Slopes of W. Mts., N. Casc Coast Range O S. Casc. of W
Macowanites lymanensis	1 3	P					mid elev. old-growth TSME/ABPR forest	Lyman Lake, Wenatchee NF
Macowanites mollis	1 3	D	p	p	p	p	mid elev. mature to old-growth PSME, Pines	Mt. Rainier N Larch Mt., MH
Martellia fragrans	1 3	p	p	p	p	p	mid-high elev. old-growth TSME/Abies spp.	S. OR, N. CA,
Martellia idahoensis	1 3	p	p	?	p	p	mid-upper mid elev. w/ true firs & Pinacea	Coast Range S Cascade Range N. ID
Martellia monticola	1 3	p	p	?	p	p	mid-high elev. old-growth TSME/Abies spp.	Central to No Oregon Cascad
Octavianina macrospora	1 3	D	p	p	p	p	mt. foothills in PSME/TSME old-growth forest	former Twin B forest Camp
Octavianina papyracea	1 3	?	?	?	?	?	coastal mixed PSME/TSME/PISI forest in a fog belt	Humboldt Co,
Rhizopogon brunneiniger	1 3	D	p	p	D	?	low-high elev. dry old growth PSME/TSME/fir/pine forest	N. OR Cascade coast ranges, N. CA
Rhizopogon evadens var. subalpinus	1 3	D	?	n	p	?	upper mid elev. TSME/fir/pine forest near timberline	N. CA to WA &
Rhizopogon exiguus	1 3	p	p	p	p	p	moist-dry mature to old-growth PSME/TSME low-mid elev. forest	Cascade Mt., coast ranges
Rhizopogon flavofibrillosus	1 3	p	p	p	p	p	mid-upper mid elev. mature to old-growth mixed conifer forest	N. CA, Siskiy mts, & centra Cascades of O

SPECIES	SURVEY STRAT.	MHNF	M	MC	WR	WF	HABITAT	KNOWN GEO RANGE or EXT
Rhizopogon inquinatus	1 3	p	p	p	p	p	mid-upper mid elev. mature to old-growth PSME forest	S. Santiam Ri WNF, & ID
Sedecula pulvinata	1 3	?	?	?	?	?	mid-high elev. old-growth TSME/Abies spp.	Mt. Shasta to Pass, CA & C
UNDESCRIBED TAXA, RARE TRUFFLES & FALSE TRUFFLES								
Alpova sp. nov. Trappe #9730 Trappe #1966	1 3	?	?	?	?	?	mid-high elev. mature to old-growth PSME/ PILA/ARsp/PIAT/ABMASH	Siskiyou Mts. southwestern
Arcangeliella sp. nov. #Trappe 12382	1 3	?	?	?	?	?	forest	
Arcangeliella sp. nov. #Trappe 12359	1 3	?	n	n	?	?	mature to old-growth PISI/TSME/PSME coastal fog belt forest	Lane, Lincoln Tillamook cou OR
Chamonixia pacifica sp. nov. #Trappe 12768	1 3	?	n	n	?	?	upper mid elev. old growth PSME/TSME/PISI/ ABAM forest	N. coastal OR N. Cascades
Elaphomyces sp. nov. #Trappe 1038	1 3	?	n	n	?	?	mature to old-growth PISI/TSME/PSME coastal fog belt forest	Lane, Lincoli Tillamook cou OR
Gastroboletus sp. nov. #Trappe 2897	1 3	p	n	n	?	?	mid-high elev. mature to old-growth PSME/ PILA/ARsp/PIAT/Shasta fir	Siskiyou Mts. southwestern
Gastroboletus sp. nov. #Trappe 7515	1 3	p	?	n	p	p	high elev. old-growth TSME forest	Crater Lake National Park
+Gastrosuillus sp. nov. #Trappe 7516	1 3	p	?	n	p	p	high elev. mature to old-growth true fir & coniferous forest	Klamath NF,
+Gastrosuillus sp. nov. #Trappe 9608	1 3	p	?	n	?	n	upper mid elev. mature mixed conifer forest w/ PILA	Lassen NF, CA

SPECIES	SURVEY STRAT.	MHNF	M	MC	WR	WF	HABITAT	KNOWN GEO RANGE or EXT
Thaxterogaster pinque	3	D	p	?	D	p	only mid-high elev. true firs, w/ thick humus, lg. crs. woody	Casc. Mts. S. Canada border Sierras, Sisk OR, Klam. Mts
UNCOMMON FALSE TRUFFLES								
Macowanites chlorinosmus	1 3	?	n	n	?	?	low elev. PISI, PSME, TSHE w/lg. crs. woody	endemic OR co & Coast Range
RARE FALSE TRUFFLES								
Alpova alexsmithii	1 3	D	p	p	p	p	mid to upper mid elev. w/true firs, TSHE, and possibly pines.	endemic to Ca Mts. & Britis Columbia Coas
Alpova olivaceotinctus	1 3	?	?	?	?	?	a single site known in the range of N. Spotted owl w/Shasta fir	Unknown
Arcangeliella crassa	1 3	?	?	?	?	?	mid to high elev. montane forests w/ Abies spp. and /or TSME.	Western OR, N Mts. Shasta/L
A. lactarioides	1 3	?	?	?	?	?		
Destuntzia fusca	1 3	p	p	p	p	?	low to lower-mid elev. in variously mixed true firs, TSHE, PSME, oaks, pines, redwood	Mendocino Cnt & Willamette (WNF), Linn C
D. rubra	1 3	p	p	p	p	?		
Gautieria magnicellaris	1 3	p	p	n	p	p	high elev. w/TSME and true firs	WNF, Klamath Mt. Wash. Wil NE USA, Germa Czechoslovaki
Gautieria otthii	1 3	p	p	p	p	p	mid to upper-mid elev. ectomychorrizal w/ Pinaceae	N. CA, Sisk. OR Centr. Cas Europe, Alask
Leucogaster citrinus	1 3	p	p	p	p	p	low to high elev. w/ PSME, TSHE, CACH, manzanita, tanoak, or in stands w/lg. woody	Mendocino Cnt north to Linn Benton Counti

VI. BRYOPHYTES

SPECIES	SURVEY STRAT.	MHNF	M	MC	WR	WF	HABITAT	KNOWN GEO RANGE or EXT
Antitrichia curtipendula	4	*D	p	p	p	p	low-mid elev. old-growth forest canopies	N. Cal. to N. west of Casca
Bartramiopsis lescurii X	1 3	p	p	p	p	p	old-growth forest	Pacific North esp. Wash.
Brotherella roellii X	1 3	p	p	p	p	p	low-mid elev. old-growth forest on rotting logs	Wash. Cascade
Diplophyllum albicans X	1 3	?	n	n	n	n	coastal old-growth TSME/PISI forest	unknown
Diplophyllum plicatum	1,2,	?	n	n	n	n	coastal PISI forest	W. Ore. & W.
Douinia ovata	4	p	?	?	p	p	low-mid elev. foggy old-growth forest w/ ridges & rock outcrops	Pacific North Cascades and
Encalypta brevicolla var. crumiana X	1 3	p	p	p	p	p	foggy rock outcropping shaded by old-growth forest	Mountains of & Wash.
Herbertus aduncus X	1 3	p	?	n	p	p	high elev. old-growth forest	N. coast & Ca of Ore. & W.
Herbertus sakurali X	1 3	?	n	n	?	?	foggy rock faces in old-growth forest	N. coast rang Ore.
Iwatsukella leucotricha X	1 3	?	n	n	?	?	bark in old-growth forest	N. coast rang Ore.
Kurzia makinoana	1,2	p	p	p	p	p	low-elev. old-growth forest	Ore. & Wash. growth
Marsupella emarginata var aquatica	1,2	p	p	p	p	p	mid-high elev. stream splash zones	Oregon Cascad
Orthodontlum gracile X	1 3	?	n	n	n	n	old-growth redwood forest	N. Cal. & sou western Ore.

(X = Added after Appendix J2)

SPECIES	SURVEY STRAT.		MHNF	M	MC	WR	WF	HABITAT	KNOWN GEO RANGE or EXT
Hydrothyria venosa	1	3	*D	p	p	p	p	mid-high elev. clear, cold streams in pristine old-growth	Central Cal. central Brit.
Leptogium rivale	1	3	D	p	p	p	p	low-mid elev. streams	Oregon & Mont
RARE OCEANIC INFLUENCED LICHENS									
Bryoria pseudocapillaris	1	3	n					PISI forests, open sand dunes on coast	Oregon coast
Bryoria spiralifera	1	3	D			D		pantropical areas, on peninsulas & headlands	Northern Cal.
Bryoria subcana	1	3	n					coastal bays & streams	Ore., Cal., A
Buellia oidalea	1	3	?	?	?	n	n	low-elev. dry coastal oak forest	Mexico to Bri Col.
Erioderma sorediatum	1	3	n					stabilized dunes in old PISI & PICO forest	Oregon coast
Hypogymnia oceanica	1	3	*D	n	n	n	p	coast & maritime microclimates in old-growth forest	Inland & coas Oregon
Leioderma sorediatum	1	3	n					stabilized dunes in old PISI & PICO forest	Oregon coast
Leptogium brebissonii	1	3	n					stabilized dunes in old PISI & PICO forest	Oregon coast
Niebla cephalota	1	3	n					promontories of land along windspept coasts	Coastal S. Ca maritime N. W
Pseudocyphellaria mougeotiana	1	3	n					coastal old-growth PISI forest	Oregon coast
Teloschistes flavicans	1	3	p	p	p	p	?	dry uplands & praries, on coastal shrubs	Equador to Or coasts
Usnea hesperina	1	3	n					broken dune PICO forest	Oregon Coast

SPECIES	SURVEY STRAT.	MHNF	M	MC	WR	WF	HABITAT	KNOWN GE RANGE or EX
OCEANIC INFLUENCED LICHENS								
Cetraria californica	1 3	n					scrubby dune areas on old growth PICO	S. Cal. to S east Alaska c
Heterodermia leucomelos	1 3	n					on large PISI in forested headlands	S. Cal. to N. coasts
Loxospora sp nov "corallifera"	1 3	n					old-growth conifers on immediate coast	Pacific Nort coasts
Pyrrhospora quernea	1 3	n					old-growth conifers on immediate coast	S. Cal. to N. coasts
ADDITIONAL LICHENS (Added after Appendix J2)								
Cladonia norvegica	3	?					unknown (not listed in Appendix J2)	unknown
Heterodermia sitchensis	3	?					unknown (not listed in Appendix J2)	unknown
Hygomnia vittiata	3	?					unknown (not listed in Appendix J2)	unknown
Hypotrachyna revoluta	3	p	p	n	p	p	high elev. open forest	N. Cal., W. O W. Wash.
Ramalina pollinaria	3	?	n	n	n	n	low elev. N. coastal forest with sandstone outcroppings	W. Ore. & W.
Nephroma isidiosum	3	?					unknown (not listed in Appendix J2)	unknown

SPECIES	SURVEY STRAT.	MHNF	M	MC	WR	WF	HABITAT	KNOWN GEO RANGE or EXT
Sticta arctica	1 3	?	?	?	?	?	rock outcrops in foggy wet coastal forest	Coast range o
RIPARIAN LICHENS								
Cetrelia cetrarioides	4	*D	?	n	p	p	low-mid elev. foggy, riparian forest on older hardwood trees	Coastal Ore. Alaska
Collema nigrescens	4	p	?	?	p	n	low-mid elev. foggy riparian forest mostly on QUGA	Pacific North to Alaska (to Equador)
Leptogium burnetiae var. hirsutum	4	*D	?	?	p	p	low-mid elev. foggy riparian forest on older hardwood trees	Pacific North & N. Europe
Leptogium cyanescens	4	*D	?	?	p	p	low-mid elev. foggy riparian forest on older hardwood trees	Equador to Al including Ore
Leptogium saturninum	4	*D	?	?	p	p	low-mid elev. boreal riparian forest on older hardwood trees	Pacific North (mostly Canad
Leptogium teretiusculum	4	p	?	?	p	p	low-mid elev. foggy riparian forest on older hardwood trees	Pacific North & Montana
Platismatia lacunosa	4	p	p	p	p	p	low-mid elev. moist forest on decidious & hardwood trees	Central Ore. southcentral Alaska
Ramalina thrausta	4	p	p	p	p	p	low-mid elev. boreal forest on hardwood & coniferous trees	Ore., Wash., Mont., Cal., Brit. Col.
Usnea longissima	4	*D	?	?	p	p	low-mid elev. wet coniferous/hardwood forests and swamps	Northwest Cal Alaska
AQUATIC LICHENS								
Dermatocarpon luridum	1 3	p	p	p	p	p	low-mid elev. streams	Ore., Brit. C Colo., & Virg

SPECIES	SURVEY STRAT.	MHNF	M	MC	WR	WF	HABITAT	KNOWN GE(RANGE or EX
Peltigera neckeri	4	*D	p	p	p	p	old-growth forest from 140-200 yrs old	Pacific Nortl Cascades
Peltigera pacifica	4	*D	p	p	p	p	old-growth forest from 140-200 yrs old	Pacific Nortl Cascades
Pseudocyphellaria anomala	4	*D	p	p	p	p	low-mid elev. coastal, montane, & old-growth forests	Pacific Nortl Cascades
Pseudocyphellaria anthrapsis	4	*D	p	p	p	p	low-mid elev. open, coniferous old-growth forest	Pacific North Cascades
Pseudocyphellaria crocata	4	*D	p	p	p	p	old-growth forest from 140-200 yrs old	Pacific North Cascades
Sticta beauvoisii	4	*D	p	p	p	p	old-growth forest from 140-200 yrs old	Pacific North Cascades
Sticta fuliginosa	4	*D	p	p	p	p	low elev. coastal & moist coniferous old-growth forests	Pacific North Cascades
Sticta limbata	4	*D	p	p	p	p	low-mid elev. coastal & old-growth forests	Pacific Nortl Cascades

PIN LICHENS (See App. J2, pp 234, 235)
Species grouped collectively; all have potential to occur in MHNF watersheds. Three species listed below, from the Pin Lichen group, have special informat

Calicium adaequatum	4	*D	p	p	p	p	sheltered microsites w/high atmospheric	Pacific North & N. Europe
C. viride	4	*D	p	p	p	p	humidity provided by old-growth forest	
Stenocybe clavata	4	p	p	p	p	p	conditions, substrate and texture specific	Endemic to tl Pacific North
RARE ROCK LICHENS								
Pilophorus nigricaulis	1 3	p	p	p	p	p	talus rock patches w/in old-growth forest w/ low fire frequency	Coastal Ore., Wash. & Brit.

VII. VASCULAR PLANTS

SPECIES	SURVEY STRAT.	MHNF	M	MC	WR	WF	HABITAT	KNOWN GEO RANGE or EXT
VASCULAR PLANTS								
Allotropa virgata	1,2	D	p	p	p	D	1500'-5000' elev. under closed canopy ABAM, ABGR, PICO, PSME requires association w/fungus & vasc. plnts (saprophytic)	east slopes C range to coas to CA, disjun in ID & MO.
Arceuthobium tsugense	1,2	p	?	n	p	p	parasitic primarily on TSHE older than 600 years, & on shore pine	rare from AK to CA, & S. O
Aster vialis	1,2	?	n	n	n	n	low elev. w/mid-successional conifers, thriving in edge habs. or in canopy openings	endemic to OR Lane, Linn, & Douglas Count (Willamette V
Bensoniella oregana	1,2	?	n	n	n	n	3000'-5000' elev. w/ mixed evergreen & white fir, meadow/strm	Coast Range O Douglas, Jose Curry, Rosebu Counties, (Si
Botrychium minganense	1,2	D	p	p	D	p	variable elev. w/THPL and/or ACCI, ACMA variable habitats	Endemic to No America, diff taxonomically
Botrychium montanum	1,2	D	p	p	p	p	between 3200' & 4100' (MHNF) in deep shade old-growth THPL, seeps	Enemic to wes North America
Clintonia andrewsiana	1,2	n	n	n	n	n	coastal redwood forest	California co
Coptis asplenifolia	1,2	p	?	?	?	?	from 360'-3600' w/ABAM TSHE, THPL, in cool, wet, shady habitats	OR Coast Rng. Cascades, Oly Peninsula
Coptis trifolia	1,2	D	p	?	D	p	perimeters of small wetlands/swamps w/PSME	Disjunct in O (MHNF), East. (Geographic E
Corydalis aquae-gelidae	1,2	D	n	n	?	n	1220'-4260' on gravel bars in cold perrenial	Gifford Pinch Mt. Hood NF,

SPECIES	SURVEY STRAT.	MHNF	M	MC	WR	WF	HABITAT	KNOWN GEO RANGE or EX
Plagiochila satol X	1 3	p	p	p	p	p	old-growth forest on cliffs, rocks, & bark	Pacific North
Plagiochila semidecurrens var. crumniana X	1 3	?	n	n	n	?	foggy cliffs & shaded rocks	Oregon coast
Pleuroziopsis ruthenica X	1 3	p	p	p	p	p	low-elev. shrub thickets, old-growth swamps, stream edges	Wash.
Ptilidium californicum	1,2	p	p	p	p	p	conifers in old-growth forest	N. Cal. to Wa
Racomitrium aquaticum X	1 3	p	p	p	p	p	shaded moist rocks & streambanks of old-growth forest	unknown
Radula brunnea X	1 3	?	n	n	n	?	foggy rock walls in old-growth forest	N. coast rang Ore.
Scouleria marginata	4	p	p	p	p	p	splash zone of streams	Pacific North endemic
Tetraphis geniculata X	1 3	p	p	p	p	p	low-mid elev. old-growth forest on shaded, moist wood	N. Cal. to W
Tritomaria exsectiformis	1,2	p	p	p	p	p	old-growth forest on moist shaded rocks	Ore. & Wash. growth
Tritomaria quinquedentata X	1 3	p	p	p	p	p	old-growth forest on moist shaded rocks	Ore. & Wash. growth

(X = Added after Appendix J2)

						streams w/high canopy	BLM

SPECIES	SURVEY STRAT.	MHNF	M	MC	WR	WF	HABITAT	KNOWN GE RANGE or EX
Cypripedium fasciculatum	1,2	?	?	?	?	?	1300'-5300' in 60-100% shade by numerous plnt communities	Western US
Cypripedium montanum	1,2	D	p	p	p	?	broad range of habs., presence of specific symbiotic fungi	All Cascade Provinces, (H River, Wasco
Galium kamtschaticum	1,2	p	?	?	p	p	seeps w/conifers and west Cascades riparian associated species	Circumboreal Olympic & We WA Casc. Prov
Habenaria orbiculata	1,2	p	?	?	?	?	mesic-dry mossy forest w/deep litter in TSHE and lower ABAM zones	uncommon, wi spread, W. WA Provinces (Geographic
Pedicularis howellii	1,2	n/?	n	n	n	n	4200'-6300' in mixed conifer/shrub, edge of openings or damp shade	Endemic to th Siskiyou Mts
Scoliopus biglovei	1,2	n/?	n	n	n	n	low elevation Redwood forest	Endemic to CA Sisk. NF, Six Rivers NF

/s/Susan Nugent
HRRD Botanist
06/27/94

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IX. PERSONAL COMMUNICATION SOURCES:

Forestry Sciences Laboratory (PNW): 6-7-94, Michael Castellano, mycologist. (Data base list of J2 and C3 fungi species in Oregon and Washington). ph. 503-750-7329 (fax).

Oregon Natural Heritage Program: 6-8-94, John A. Christy, mosses and liverworts, (C-3 bryophytes habitat and potential for occurrence on the MHNF). ph. 503-228-3153 (fax).

Oregon Natural Heritage Program: 6-8-94, David H. Wagner, liverworts. (Synopsis of liverworts on the Oregon Natural Heritage Program list).

USDA Forest Service, Siuslaw National Forest, Corvallis OR, 6-15-94, Linda Geiser, lichen specialist. (R/E C-3 coastal lichen species, habita types and potential for occurrence on the MHNF) ph. 503-750-7000

Oregon Natural Heritage Program: 6-6-94, Sue Vrilakas, data base contact. (C3 species on the Oregon Natural Heritage Data Base List of Rare, Threatened, and Endangered [species] of Oregon). ph. 503-228-3153 (fax).

USDA Forest Service, Mt. Hood National Forest Herbarium, Gresham OR, 6-14-94, Mark Boyll, Ecologist. (List of lichen specimens in the MHNF Herbarium). ph. 503-666-0700

USDA Forest Service, Mt. Hood National Forest, Zig-Zag/Columbia Gorge Ranger Districts, 6-15-94, Molly Sullivan, District Botanist. (Species inventor list of fungi in Old Maid Flats, 109 species). ph. 503-622-5622

Appendix G

Status: I = introduced I-W = noxious weed N = native N-S = sensitive
Sens. Status: RFS = Regional Forester's Sensitive Species List
ORC, ORT, ORE = OR State candidate, threatened, endangered
NHP1-4 = OR Natural Heritage Program species of Concern
SM = Survey and Manage Species (President's Forest Plan)
Stand Type: LS = Spp strongly associated with Late Successional Multistory
OP = Spp strongly associated with Open Parklike Stands

SPECIES NAME	DIVISION	Status	Sens. Status	Stand Type
Agropyron spicatum	GRASSES	N		OP
Festuca idahoensis	GRASSES	N		OP
Koeleria cristata	GRASSES	N		OP
Poa sandbergii	GRASSES	N		OP
Allium acuminatum	HERBS	N		OP
Allium campanulatum	HERBS	N	NHP4	OP
Arabis sparsiflora atrorubens	HERBS	N-S	RFS	OP
Balsamorhiza sagittata	HERBS	N		OP
Brodiaea howellii	HERBS	N		OP
Brodiaea hyacinthina	HERBS	N		OP
Calochortus macrocarpus	HERBS	N		OP
Clarkia gracilis	HERBS	N		OP
Clarkia pulchella	HERBS	N		OP
Clarkia quadrivulnera	HERBS	N		OP
Clarkia rhomboidea	HERBS	N		OP
Delphinium nuttallianum	HERBS	N		OP
Erigeron filifolius	HERBS	N		OP
Erigeron linearis	HERBS	N		OP
Eriogonum compositum compositum	HERBS	N		OP
Eriogonum sphaerocephalum halimioides	HERBS	N		OP
Eriogonum strictum	HERBS	N		OP
Eriogonum umbellatum umbellatum	HERBS	N		OP
Frasera albicaulis columbiana	HERBS	N		OP
Habenaria elegans	HERBS	N		OP
Lomatium nudicaule	HERBS	N		OP
Lomatium triternatum triternatum	HERBS	N		OP
Lupinus leucophyllus leucophyllus	HERBS	N		OP
Paeonia brownii	HERBS	N		OP
Perideridia gairdneri	HERBS	N		OP
Senecio integerrimus	HERBS	N		OP
Sisyrinchium douglasii	HERBS	N		OP
Trifolium macrocephalum	HERBS	N		OP
Botrychium lanceolatum	FERN-ALI	N-S	RFS	LS
Botrychium minganense	FERN-ALI	N-S	RFS	LS
Botrychium montanum	FERN-ALI	N-S	RFS	LS
Botrychium multifidum	FERN-ALI	N		LS
Botrychium pinnatum	FERN-ALI	N-S	RFS	LS
Lycopodium clavatum	FERN-ALI	N		LS
Adiantum pedatum	FERNS	N		LS
Achlys triphylla	HERBS	N		LS
Actaea rubra	HERBS	N		LS
Adenocaulon bicolor	HERBS	N		LS
Allotropa virgata	HERBS	N-S	SM	LS
Anemone deltoidea	HERBS	N		LS

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SPECIES NAME	DIVISION	Status	Sens. Status	Stand Type
Arnica latifolia latifolia	HERBS	N		LS
Asarum caudatum	HERBS	N		LS
Calypso bulbosa	HERBS	N		LS
Chimaphila umbellata occidentalis	HERBS	N		LS
Clintonia uniflora	HERBS	N		LS
Corallorhiza maculata	HERBS	N		LS
Corallorhiza mertensiana	HERBS	N		LS
Corallorhiza striata	HERBS	N		LS
Corallorhiza trifida	HERBS	N		LS
Disporum hookeri oreganum	HERBS	N		LS
Erythronium grandiflorum grandiflorum	HERBS	N		LS
Goodyera oblongifolia	HERBS	N		LS
Habenaria saccata	HERBS	N		LS
Hemitomes congestum	HERBS	N		LS
Hypopitys monotropa	HERBS	N		LS
Listera caurina	HERBS	N		LS
Listera cordata	HERBS	N		LS
Lysichitum americanum	HERBS	N		LS
Mitella breweri	HERBS	N		LS
Monotropa uniflora	HERBS	N		LS
Pleuricospora fimbriolata	HERBS	N		LS
Pterospora andromedea	HERBS	N		LS
Pyrola asarifolia	HERBS	N		LS
Pyrola picta	HERBS	N		LS
Pyrola secunda secunda	HERBS	N		LS
Rubus lasiococcus	HERBS	N		LS
Streptopus amplexifolius americanus	HERBS	N		LS
Tiarella trifoliata unifoliata	HERBS	N		LS
Trillium ovatum	HERBS	N		LS
Vancouveria hexandra	HERBS	N		LS
Taxus brevifolia	TREES	N		LS
Botrychium simplex	FERN-ALI	N		
Botrychium virginianum	FERN-ALI	N		
Equisetum arvense	FERN-ALI	N		
Equisetum hyemale affine	FERN-ALI	N		
Athyrium filix-femina	FERNS	N		
Blechnum spicant	FERNS	N		
Cheilanthes gracillima	FERNS	N		
Cryptogramma crispa acrostichoides	FERNS	N		
Cystopteris fragilis	FERNS	N		
Gymnocarpium dryopteris	FERNS	N		
Polystichum munitum munitum	FERNS	N		
Pteridium aquilinum pubescens	FERNS	N		
Woodsia oregana	FERNS	N		
Woodsia scopulina	FERNS	N		

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SPECIES NAME	DIVISION	Status	Sens. Status	Stand Type
Agropyron dasystachyum	GRASSES	N		
Agropyron intermedium	GRASSES	I		
Agrostis exarata	GRASSES	N		
Agrostis interrupta	GRASSES	I		
Agrostis tenuis	GRASSES	I		
Agrostis thurberiana	GRASSES	N		
Aira caryophyllea	GRASSES	I		
Bromus carinatus	GRASSES	N		
Bromus orcuttianus	GRASSES	N		
Bromus tectorum	GRASSES	I		
Bromus vulgaris vulgaris	GRASSES	N		
Calamagrostis rubescens	GRASSES	N		
Dactylis glomerata	GRASSES	I		
Danthonia unispicata	GRASSES	N		
Deschampsia cespitosa cespitosa	GRASSES	N		
Deschampsia danthonioides	GRASSES	N		
Deschampsia elongata	GRASSES	N		
Elymus caput-medusae	GRASSES	I		
Elymus glaucus glaucus	GRASSES	N		
Festuca arundinaceae	GRASSES	I		
Festuca bromoides	GRASSES	I		
Festuca microstachys	GRASSES	N		
Festuca occidentalis	GRASSES	N		
Festuca viridula	GRASSES	N		
Glyceria elata	GRASSES	N		
Lolium perenne	GRASSES	I		
Melica bulbosa	GRASSES	N		
Melica subulata	GRASSES	N		
Muhlenbergia filiformis	GRASSES	N		
Phalaris arundinacea	GRASSES	N		
Phleum alpinum	GRASSES	N		
Phleum pratense	GRASSES	I		
Pleuropogon refractus	GRASSES	N		
Poa bulbosa	GRASSES	I		
Poa nervosa	GRASSES	N		
Poa pratensis	GRASSES	I		
Poa scabrella	GRASSES	N		
Scribneria bolanderi	GRASSES	N-S	RFS	
Sitanion hystrix	GRASSES	N		
Stipa lemmonii lemmonii	GRASSES	N		
Stipa occidentalis	GRASSES	N		
Trisetum canescens	GRASSES	N		
Trisetum spicatum	GRASSES	N		
Ventenata dubia	GRASSES	I		
Achillea millefolium	HERBS	N		

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Aconitum columbianum howellii	HERBS	N		
Agoseris aurantiaca aurantiaca	HERBS	N		
Agoseris elata	HERBS	N-S	RFS	
Agoseris grandiflora	HERBS	N		
Agoseris heterophylla	HERBS	N		
Agoseris retrorsa	HERBS	N		
Alisma plantago-aquatica americanum	HERBS	N		
Allium douglasii nevii	HERBS	N	NHP4	
Allium validum	HERBS	N		
Anaphalis margaritacea	HERBS	N		
Androsace filiformis	HERBS	N		
Anemone oregana oregana	HERBS	N		
Antennaria dimorpha	HERBS	N		
Antennaria luzuloides	HERBS	N		
Antennaria microphylla	HERBS	N		
Antennaria racemosa	HERBS	N		
Apocynum androsaemifolium pumilum	HERBS	N		
Aquilegia formosa	HERBS	N		
Arabidopsis thaliana	HERBS	I		
Arabis furcata	HERBS	N-S	NHP4	
Arabis glabra	HERBS	N		
Arenaria macrophylla	HERBS	N		
Arnica chamissonis interior	HERBS	N		
Arnica cordifolia cordifolia	HERBS	N		
Arnica discoidea eradiata	HERBS	N		
Arnica mollis	HERBS	N		
Aster foliaceus	HERBS	N		
Aster ledophyllus ledophyllus	HERBS	N		
Aster modestus	HERBS	N		
Aster occidentalis occidentalis	HERBS	N		
Athysanus pusillus	HERBS	N		
Balsamorhiza serrata	HERBS	N		
Boisduvalia densiflora	HERBS	N		
Brassica campestris	HERBS	I		
Calochortus subalpinus	HERBS	N		
Caltha biflora biflora	HERBS	N		
Caltha leptosepala	HERBS	N		
Camassia sp.	HERBS	N		
Campanula scouleri	HERBS	N		
Cardamine pulcherrima pulcherrima	HERBS	N		
Castilleja hispida acuta	HERBS	N		
Castilleja miniata miniata	HERBS	N		
Castilleja suksdorfii	HERBS	N		
Centaurea diffusa	HERBS	I-W		
Centaurea maculosa	HERBS	I-W		

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SPECIES NAME	DIVISION	Status	Sens. Status	Stand Type
Cerastium viscosum	HERBS	I		
Chimaphila menziesii	HERBS	N		
Circaea alpina	HERBS	N		
Cirsium callilepis oregonense	HERBS	N		
Cirsium vulgare	HERBS	I		
Claytonia lanceolata lanceolata	HERBS	N		
Claytonia megarhiza bellidifolia	HERBS	N		
Collinsia parviflora	HERBS	N		
Collomia grandiflora	HERBS	N		
Collomia linearis	HERBS	N		
Comandra umbellata californica	HERBS	N		
Cornus canadensis	HERBS	N		
Crepis barbigera	HERBS	N		
Crocidium multicaule	HERBS	N		
Cryptantha affinis	HERBS	N		
Cryptantha ambigua	HERBS	N		
Cryptantha flaccida	HERBS	N		
Cuscuta sp.	HERBS	N		
Disporum smithii	HERBS	N		
Dodecatheon alpinum	HERBS	N		
Dodecatheon conjugens	HERBS	N		
Dodecatheon jeffreyi	HERBS	N		
Dodecatheon poeticum	HERBS	N		
Downingia elegans	HERBS	N		
Draba verna boerhaavii	HERBS	N		
Epilobium alpinum lactiflorum	HERBS	N		
Epilobium angustifolium	HERBS	N		
Epilobium glaberrimum	HERBS	N		
Epilobium glandulosum	HERBS	N		
Epilobium minutum	HERBS	N		
Epilobium paniculatum paniculatum	HERBS	N		
Epilobium watsonii	HERBS	N		
Eremocarpus setigerus	HERBS	N		
Erigeron peregrinus callianthemus	HERBS	N		
Eriophyllum lanatum lanatum	HERBS	N		
Eupatorium occidentale	HERBS	N		
Floerkea proserpinacoides	HERBS	N		
Fragaria vesca bracteata	HERBS	N		
Fragaria virginiana platypetela	HERBS	N		
Fritillaria lanceolata	HERBS	N		
Fritillaria pudica	HERBS	N		
Gaillardia aristata	HERBS	N		
Galium aparine echinospermum	HERBS	N		
Galium boreale	HERBS	N		
Galium oreganum	HERBS	N		

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SPECIES NAME	DIVISION	Status	Sens. Status	Stand Type
Galium trifidum pacificum	HERBS	N		
Galium triflorum	HERBS	N		
Gayophytum racemosum	HERBS	N		
Gentiana sceptrum	HERBS	N		
Geum macrophyllum macrophyllum	HERBS	N		
Geum triflorum ciliatum	HERBS	N		
Gilia aggregata	HERBS	N		
Gnaphalium palustre	HERBS	N		
Gnaphalium sp.	HERBS	N/I		
Gnaphalium viscosum	HERBS	N		
Gratiola ebracteata	HERBS	N		
Habenaria dilatata	HERBS	N		
Habenaria unalascensis	HERBS	N		
Hackelia diffusa cottonii	HERBS	N	NHP4	
Hackelia micrantha	HERBS	N		
Haplopappus bloomeri	HERBS	N		
Haplopappus carthamoides	HERBS	N		
Haplopappus greenei	HERBS	N		
Haplopappus hallii	HERBS	N		
Heracleum lanatum	HERBS	N		
Hesperochiron pumilus	HERBS	N		
Heuchera chlorantha	HERBS	N		
Heuchera cylindrica alpina	HERBS	N		
Hieracium albiflorum	HERBS	N		
Hieracium cynoglossoides	HERBS	N		
Hieracium gracile	HERBS	N		
Hieracium scouleri	HERBS	N		
Horkelia fusca fusca	HERBS	N		
Hydrophyllum capitatum	HERBS	N		
Hydrophyllum fendleri albifrons	HERBS	N		
Hypericum anagalloides	HERBS	N		
Hypericum perforatum	HERBS	I-W		
Idahoa scapigera	HERBS	N		
Iliamna rivularis rivularis	HERBS	N		
Lactuca muralis	HERBS	I		
Lactuca serriola	HERBS	I		
Lagophylla ramosissima	HERBS	N		
Lathyrus lanszwertii lanszwertii	HERBS	N		
Lathyrus nevadensis pilosellus	HERBS	N		
Leontodon nudicaulis	HERBS	I		
Lewisia triphylla	HERBS	N		
Ligusticum grayi	HERBS	N		
Lilium columbianum	HERBS	N		
Lilium washingtonianum	HERBS	N		
Linanthus bakeri	HERBS	N	NHP3	

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SPECIES NAME	DIVISION	Status	Sens. Status	Stand Type
Linanthus bicolor bicolor	HERBS	N		
Linanthus harknessii	HERBS	N		
Linanthus septentrionalis	HERBS	N		
Linnaea borealis longiflora	HERBS	N		
Lithophragma bulbifera	HERBS	N		
Lithophragma glabra	HERBS	N		
Lithophragma parviflora	HERBS	N		
Lomatium dissectum dissectum	HERBS	N		
Lomatium gormanii	HERBS	N		
Lomatium macrocarpum	HERBS	N		
Lotus crassifolius	HERBS	N		
Lotus crassifolius crassifolius	HERBS	N		
Lotus nevadensis douglasii	HERBS	N		
Lotus purshiana	HERBS	N		
Luina nardosmia glabrata	HERBS	N		
Lupinus albicaulis	HERBS	N		
Lupinus argenteus	HERBS	N		
Lupinus caudatus	HERBS	N		
Lupinus latifolius latifolius	HERBS	N		
Lupinus laxiflorus laxiflorus	HERBS	N		
Lupinus polyphyllus polyphyllus	HERBS	N		
Lupinus sericeus	HERBS	N		
Madia exigua	HERBS	N		
Madia gracilis	HERBS	N		
Madia minima	HERBS	N		
Microseris laciniata	HERBS	N		
Microseris nutans	HERBS	N		
Microseris troximoides	HERBS	N		
Microsteris gracilis	HERBS	N		
Mimulus alsinoides	HERBS	N		
Mimulus breweri	HERBS	N		
Mimulus guttatus guttatus	HERBS	N		
Mimulus moschatus moschatus	HERBS	N		
Mimulus primuloides	HERBS	N		
Mitella pentandra	HERBS	N		
Mitella trifida	HERBS	N		
Montia chamissoi	HERBS	N		
Montia cordifolia	HERBS	N		
Montia dichotoma	HERBS	N	NHP4	
Montia fontana	HERBS	N		
Montia linearis	HERBS	N		
Montia perfoliata	HERBS	N		
Montia sibirica	HERBS	N		
Navarretia intertexta intertexta	HERBS	N		
Navarretia intertexta propinqua	HERBS	N		

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SPECIES NAME	DIVISION	Status	Sens. Status	Stand Type
Nemophila parviflora parviflora	HERBS	N		
Onobrychis viciaefolia	HERBS	I		
Orobanche fasciculata	HERBS	N		
Orobanche uniflora	HERBS	N		
Orobanche uniflora minuta	HERBS	N		
Orthocarpus hispidus	HERBS	N		
Orthocarpus sp.	HERBS	N		
Osmorhiza chilensis	HERBS	N		
Osmorhiza purpurea	HERBS	N		
Pedicularis groenlandica	HERBS	N		
Pedicularis racemosa racemosa	HERBS	N		
Penstemon euglaucus	HERBS	N		
Penstemon procerus	HERBS	N		
Penstemon rydbergii varians	HERBS	N		
Petasites frigidus palmatus	HERBS	N		
Phacelia hastata compacta	HERBS	N		
Phacelia heterophylla heterophylla	HERBS	N		
Phlox diffusa longistylis	HERBS	N		
Phlox hoodii	HERBS	N		
Plagiobothrys scouleri	HERBS	N		
Polemonium occidentale	HERBS	N		
Polemonium pulcherrimum calycinum	HERBS	N		
Polygonum bistortoides	HERBS	N		
Polygonum californicum	HERBS	N		
Polygonum confertiflorum	HERBS	N		
Polygonum douglasii latifolium	HERBS	N		
Polygonum kelloggii	HERBS	N		
Polygonum minimum	HERBS	N		
Polygonum newberryi newberryi	HERBS	N		
Potentilla drummondii	HERBS	N		
Potentilla flabellifolia	HERBS	N		
Potentilla glandulosa	HERBS	N		
Potentilla gracilis	HERBS	N		
Psilocarphus elatior	HERBS	N		
Pyrola aphylla	HERBS	N		
Ranunculus alismaefolius alismaefolius	HERBS	N		
Ranunculus aquatilis capillaceus	HERBS	N		
Ranunculus flammula	HERBS	N		
Ranunculus glaberrimus glaberrimus	HERBS	N		
Ranunculus occidentalis occidentalis	HERBS	N		
Ranunculus orthorhynchus platyphyllus	HERBS	N		
Ranunculus uncinatus	HERBS	N		
Rumex acetosella	HERBS	I		
Sagina procumbens	HERBS	I		
Sagina saginoides	HERBS	N		

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SPECIES NAME	DIVISION	Status	Sens. Status	Stand Type
Sanguisorba minor	HERBS	I		
Sanicula graveolens	HERBS	N		
Satureja douglasii	HERBS	N		
Saussurea americana	HERBS	N		
Saxifraga ferruginea macounii	HERBS	N		
Saxifraga integrifolia	HERBS	N		
Saxifraga oregana oregana	HERBS	N		
Scrophularia lanceolata	HERBS	N		
Sedum oreganum	HERBS	N		
Sedum oregonense	HERBS	N		
Sedum stenopetalum	HERBS	N		
Senecio cymbalarioides	HERBS	N		
Senecio jacobaea	HERBS	I-W		
Senecio pseudaureus	HERBS	N		
Senecio triangularis triangularis	HERBS	N		
Silene douglasii douglasii	HERBS	N		
Silene douglasii monantha	HERBS	N		
Silene oregana	HERBS	N		
Smilacina racemosa	HERBS	N		
Smilacina stellata	HERBS	N		
Solidago canadensis salebrosa	HERBS	N		
Spiranthes romanzoffiana	HERBS	N		
Spraguea umbellata caudicifera	HERBS	N		
Stachys cooleyae	HERBS	N		
Stellaria nitens	HERBS	N		
Stellaria umbellata	HERBS	N		
Streptopus roseus curvipes	HERBS	N		
Taraxacum officinale	HERBS	I		
Tellima grandiflora	HERBS	N		
Thalictrum occidentale	HERBS	N		
Tofieldia glutinosa brevistyla	HERBS	N		
Tolmiea menziesii	HERBS	N		
Tragopogon dubius	HERBS	I		
Trautvetteria caroliniensis occidentalis	HERBS	N		
Trientalis latifolia	HERBS	N		
Trifolium cyathiferum	HERBS	N		
Trifolium longipes	HERBS	N		
Trifolium longipes hansenii	HERBS	N		
Trifolium microcephalum	HERBS	N		
Trifolium repens	HERBS	I		
Valeriana sitchensis	HERBS	N		
Veratrum californicum caudatum	HERBS	N		
Veratrum viride	HERBS	N		
Veronica americana	HERBS	N		
Veronica anagallis-aquatica	HERBS	I		

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SPECIES NAME	DIVISION	Status	Sens. Status	Stand Type
Veronica peregrina xalapensis	HERBS	N		
Veronica serpyllifolia	HERBS	I		
Veronica wormskjoldii	HERBS	N		
Vicia americana truncata	HERBS	N		
Viola adunca	HERBS	N		
Viola glabella	HERBS	N		
Viola howellii	HERBS	N		
Viola nuttallii	HERBS	N		
Viola orbiculata	HERBS	N		
Viola palustris	HERBS	N		
Xerophyllum tenax	HERBS	N		
Zigadenus venenosus venenosus	HERBS	N		
Juncus balticus balticus	RUSHES	N		
Juncus bufonius	RUSHES	N		
Juncus nevadensis nevadensis	RUSHES	N		
Juncus orthophyllus	RUSHES	N		
Juncus parryi	RUSHES	N		
Luzula campestris	RUSHES	N		
Luzula campestris multiflora	RUSHES	N		
Luzula hitchcockii	RUSHES	N		
Carex amplifolia	SEDGES	N		
Carex aquatilis	SEDGES	N		
Carex deweyana	SEDGES	N		
Carex disperma	SEDGES	N		
Carex eurycarpa	SEDGES	N		
Carex fracta	SEDGES	N		
Carex geyeri	SEDGES	N		
Carex halliana	SEDGES	N		
Carex luzulina	SEDGES	N		
Carex mertensii	SEDGES	N		
Carex microptera	SEDGES	N		
Carex nigricans	SEDGES	N		
Carex pensylvanica vespertina	SEDGES	N		
Carex rossii	SEDGES	N		
Carex sitchensis	SEDGES	N		
Carex spectabilis	SEDGES	N		
Eriophorum polystachion	SEDGES	N	NHP4	
Scirpus microcarpus	SEDGES	N		
Acer circinatum	SHRUBS	N		
Acer glabrum douglasii	SHRUBS	N		
Alnus incana occidentalis	SHRUBS	N		
Amelanchier alnifolia	SHRUBS	N		
Arctostaphylos nevadensis	SHRUBS	N		
Arctostaphylos patula	SHRUBS	N		
Arctostaphylos uva-ursi	SHRUBS	N		

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SPECIES NAME	DIVISION	Status	Sens. Status	Stand Type
Artemisia arbuscula	SHRUBS	N		
Artemisia rigida	SHRUBS	N		
Artemisia tridentata	SHRUBS	N		
Berberis aquifolium	SHRUBS	N		
Berberis nervosa	SHRUBS	N		
Berberis repens	SHRUBS	N		
Castanopsis chrysophylla	SHRUBS	N		
Ceanothus integerrimus	SHRUBS	N		
Ceanothus prostratus	SHRUBS	N		
Ceanothus sanguineus	SHRUBS	N		
Ceanothus velutinus velutinus	SHRUBS	N		
Chrysothamnus nauseosus albicaulis	SHRUBS	N		
Cornus stolonifera occidentalis	SHRUBS	N		
Corylus cornuta californica	SHRUBS	N		
Cytisus scoparius	SHRUBS	I-W		
Gaultheria ovatifolia	SHRUBS	N		
Gaultheria shallon	SHRUBS	N		
Holodiscus discolor	SHRUBS	N		
Juniperus communis montana	SHRUBS	N		
Lonicera ciliosa	SHRUBS	N		
Lonicera involucrata	SHRUBS	N		
Pachistima myrsinites	SHRUBS	N		
Philadelphus lewisii	SHRUBS	N		
Physocarpus capitatus	SHRUBS	N		
Prunus emarginata	SHRUBS	N		
Prunus virginiana	SHRUBS	N		
Purshia tridentata	SHRUBS	N		
Rhus diversiloba	SHRUBS	N		
Ribes cereum cereum	SHRUBS	N		
Ribes lacustre	SHRUBS	N		
Ribes sanguineum	SHRUBS	N		
Ribes viscosissimum hallii	SHRUBS	N		
Ribes watsonianum	SHRUBS	N		
Rosa gymnocarpa	SHRUBS	N		
Rosa nutkana	SHRUBS	N		
Rosa pisocarpa	SHRUBS	N		
Rosa woodsii ultramontana	SHRUBS	N		
Rubus discolor	SHRUBS	I		
Rubus leucodermis	SHRUBS	N		
Rubus nivalis	SHRUBS	N		
Rubus parviflorus	SHRUBS	N		
Rubus ursinus macropetalus	SHRUBS	N		
Salix scouleriana	SHRUBS	N		
Sambucus cerulea	SHRUBS	N		
Sorbus scopulina	SHRUBS	N		

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SPECIES NAME	DIVISION	Status	Sens. Status	Stand Type
Sorbus sitchensis	SHRUBS	N		
Spiraea betulifolia lucida	SHRUBS	N		
Spiraea douglasii	SHRUBS	N		
Symphoricarpos albus laevigatus	SHRUBS	N		
Symphoricarpos mollis hesperius	SHRUBS	N		
Vaccinium alaskaense	SHRUBS	N		
Vaccinium membranaceum	SHRUBS	N		
Vaccinium occidentale	SHRUBS	N		
Vaccinium ovalifolium	SHRUBS	N		
Vaccinium scoparium	SHRUBS	N		
Abies amabilis	TREES	N		
Abies grandis	TREES	N		
Abies lasiocarpa	TREES	N		
Abies procera	TREES	N		
Acer macrophyllum	TREES	N		
Alnus rhombifolia	TREES	N		
Cornus nuttallii	TREES	N		
Juniperus occidentalis	TREES	N		
Larix occidentalis	TREES	N		
Picea engelmannii	TREES	N		
Pinus albicaulis	TREES	N		
Pinus contorta latifolia	TREES	N		
Pinus lambertiana	TREES	N		
Pinus monticola	TREES	N		
Pinus ponderosa	TREES	N		
Populus tremuloides	TREES	N		
Populus trichocarpa	TREES	N		
Pseudotsuga menziesii menziesii	TREES	N		
Quercus garryana	TREES	N		
Thuja plicata	TREES	N		
Tsuga heterophylla	TREES	N		
Tsuga mertensiana	TREES	N		

Appendix H

Evaluation of Reforestation and TSI units
For Surveyor's Ridge LSR

Overview: There are approximately 2500 acres of reforestation and TSI units in this LSR. In general, these units are well stocked (Table 1), with only 7% falling below the Forest Plan standard of 125 TPA (FW361)[1]. There is another 7% which is marginal with 125-199 TPA. The remaining 86% is 200 TPA or higher. However, high stocking levels can be a problem on the other end of the spectrum and 40% of the units have over 500 TPA while 16% have more than 1000 TPA.

Generally, species diversity is directly correlated with elevation in this LSR. Coniferous species are very well represented, with 86% of the units having at least five different species, and close to 50% having at least nine species (Table 3). This gives plenty of room to thin units to desired future spacing and species mixes. Current REO direction calls for "increased stand diversity, varied density, varied spacing, created holes and unthinned patches."

For the units with only two or three species present, this usually indicates a site with a predominance of pioneer conifer species such as ponderosa pine at the lower elevations or lodgepole at higher elevations. For the present time this is fine as this layer will eventually make a more suitable habitat for later seral species. An example of this is the Cedar Creek units which filled in with lodgepole pine at levels in the thousands of trees per acre but are now showing an understory of larch, spruce, white pine and Douglas-fir. Disposing of the slash created presents a challenge. Careful timing is required in order to let a unit grow enough to be well-stocked and start a microclimate for new species, but not so much that there is a high fuel loading or so that cut trees smother released trees.

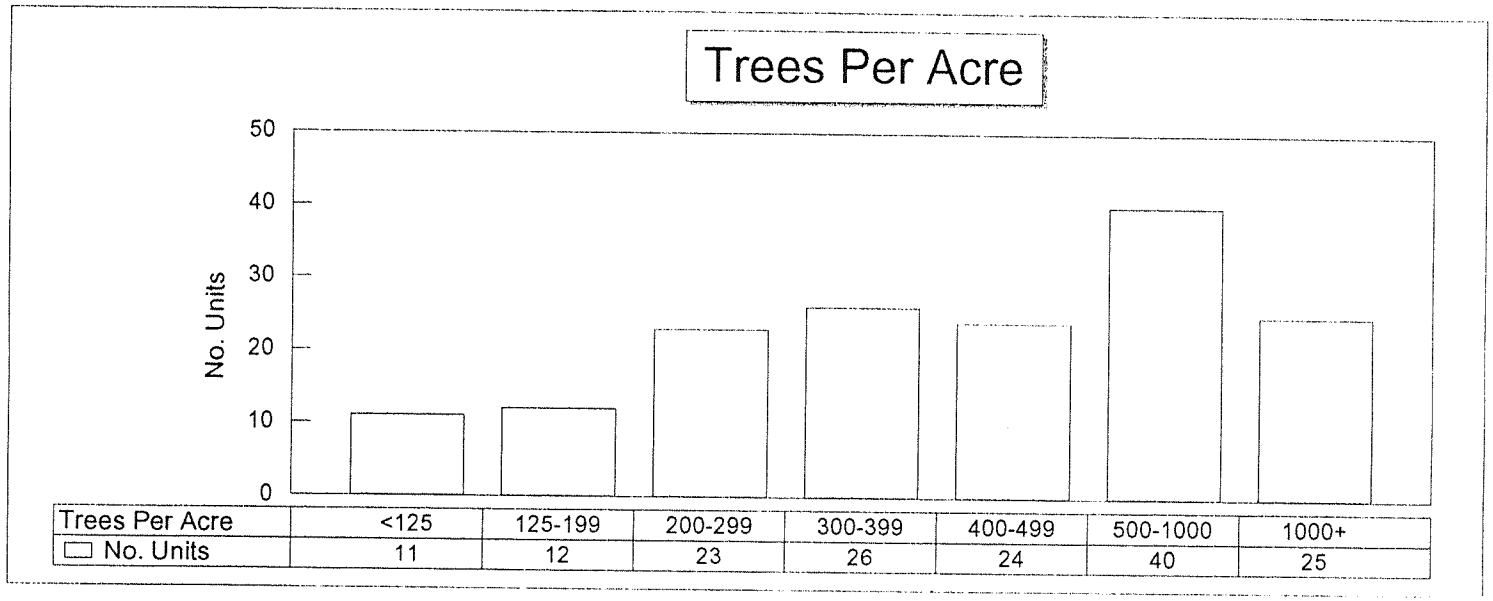
Outlook: Most of the units are in the reforestation category and most of the TSI units have been thinned. However, some of the Cedar Creeks and Bulos are scheduled for thinning in 1996. The units to keep a close eye on are those in the "cycle" area, as we can do a lot to bring conditions to what we think is appropriate while treatment cost and fuel levels are relatively low. This would include the Wampus and South Puma units, for example.

Some units such as the Ramseys have had several reforestation efforts including shade card placement and intensive gopher control, but the grass levels and tenacity of the gophers keep stocking levels very low. Discussion is needed as to what direction to take these units. Should we leave them alone and let time take care of it, or dump more money in to regeneration efforts?

Natural regeneration is an important component in regeneration of units and in many cases can bring the unit "up to par" where artificial regeneration is inadequate. This is especially true on units with brush or on smaller units where the climate is relatively milder and there is more seeding from the adjacent stands. As can be seen in Table 2 however, many of the units are filling in with grand fir (lower elevations) and lodgepole pine (higher elevations). These species need to be monitored and treated appropriately.

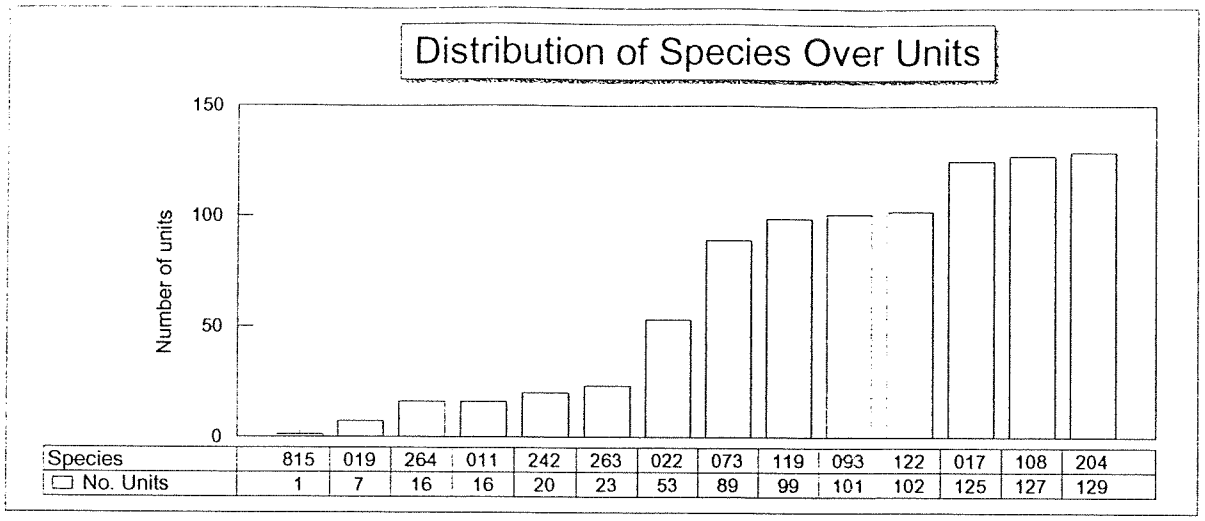
[1]The TPA figures reflect a unit average so many units may have high stocking levels but the trees are unevenly distributed. This may or may not be desirable. Historically, stands were not established (status changed from reforestation to TSI) until there were 125 trees evenly distributed over the unit. Over the last few years, however, silviculturists are more lenient in allowing patchiness, taking in to account spacing diversity and natural openings. A perfectly even distribution is more appropriate for a high site west side stand.

Surveyors Ridge LSR - Status of Reforestation and TSI Units



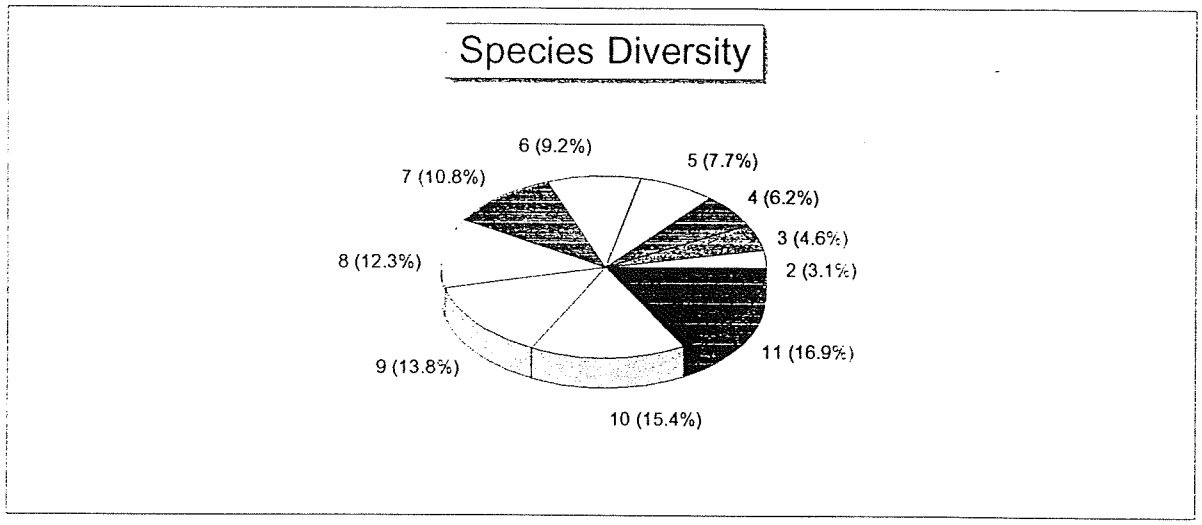
Trees Per Acre	<125	125-199	200-299	300-399	400-499	500-1000	1000+
No. Units	11	12	23	26	24	40	25

Table 1



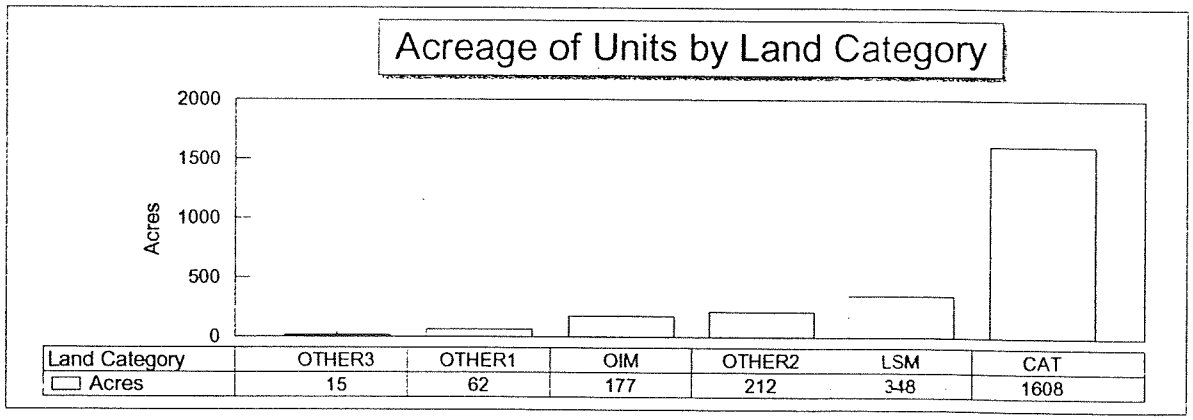
Species	815	019	264	011	242	263	022	073	119	093	122	017	108	204
No. Units	1	7	16	16	20	23	53	89	99	101	102	125	127	129

Table 2



e.g. 13.8% of the LSR units have 9 tree species represented

Table 3



Land Category	OTHER3	OTHER1	OIM	OTHER2	LSM	CAT
Acres	15	62	177	212	348	1608

Table 4

Surveyors Ridge LSR - Status of Reforestation and TSI Units

	Name	No	Let	Ac	DFC	Elev	Slope	Aspect	Lst Surv	TPA	Height	017	122	204	073	119	242	093	108	263	264	011	022	019	815
0	jordan creek	4		6	CAT	4600	464	E																	
0	cedar creek	11		1	CAT	2740			87																
0	putt	5		3	CAT	4600	15	NW	86	214															
0	putt	9		4	CAT	4600	15	N	91	90	1														
0	bulo	19	A	5	CAT	3400	35	S	94	245															
0	bulo	15		12	CAT	3600	45	N	94	1489	2														
0	cedar creek	6		2	CAT	3800																			
0	jordan creek	1		5	CAT	4600	20	E	76																
0	putt	7		4	CAT	4800	10	NW	91	67	3.6														
2	putt	2		4	CAT	4450			90	280				1				1							
2	bulo	20		8	CAT	3600	5	E	94	38	8.1		6	31											
2	track	6		5	CAT	3000	20	R	94	310	2		250	60											
3	cedar creek	2		11	CAT	3600		SE	94	291	7	32	14	246											
3	butte	4		5	CAT	3500	10	S	90	292	14	10	232	50											
3	butte	3		30	CAT	3440	13	SE	90	301	18	30	167	105											
3	quarterback	1	A	6	CAT	4400	10	E	94	38								25	13				13		
3	deadman gulch	2		9	CAT	3500	23	E	90	880	12	170	530	180											
3	windfall	6			CAT				95		1		23			13			18						
3	bulo	18		20	CAT	3400	35	S	94	168		5	120	43											
3	big butte	7		8	CAT	3800	10	SE	94	238	2.4	38	125	75											
3	putt	4		5	CAT	4600	15	NW	91	90	1.4							1	1				1		
3	butte	2		18	CAT	3800	20	SE	90	373	11	250	87	37											
3	alder crow	2		6	CAT	3800	30	S	90	500	14	380	10	110											
3	bulo	6		10	CAT	4000	10	NW	94	106	3.3		11	61					39						
3	bulo	21		7	CAT	3400	35	S	94	329		114	57	157											
3	bulo	16		18	CAT	3600	45	N	83			1	1	1											
4	butte	4	A	7	CAT	3500	10	S	83			1	1	1					1						
4	big butte	4		14	CAT	3900	20	SE	94	511	1.6	218	207	75		207									
4	big butte	8		26	CAT	3600	25	S	94	367	1	78	252	35						2					
4	bulo	3		10	CAT	3800			94	200	2	15	155	25					5						
4	south mill	1		12	CAT	3600			90	200	11	80	90	20		10									
4	bulo	17		13	CAT	3600	45	N	94	673	2	258	58	354				6							
4	bulo	4	A	16	CAT	3800	50	S	94	156	4.7	6	100	46				3							
4	butte	5		27	CAT	3720		SE	90	188	20	18	120	46		5									
4	jacket	2		9	CAT	4680	15	NE		356					35			70	200				35		
4	bulo	19		15	CAT	3400	50	S	94	346		10	173	60					3						
4	track	5		17	CAT	3200	20	NW	94	209	4	74	182	21	21										
4	ridge	1			CAT				93		17	439		15				31	346						
4	perry	10		6	CAT	4900	15	N	95	175	1	25		33	17				108						
4	putt	3		3	CAT	4500	15	N	91	190	2.9			1		1		1					1		
4	windfall	2			CAT				95		1		77		92	10			35						
4	windfall	7			CAT				95		1		125		156	31			125						
4	touchdown	1		13	CAT	4500	10	NW	94	158	2.2	65		12		27		54							
5	touchdown	7		29	CAT	4700	20	NW	94	360	2.9			10		24		66	178				83		
5	putt	10		12	CAT	4600	20	N	90	250		1		1		1		1	1						
5	bulo	22		13	CAT	3400	35	S	94	477		77	262	127	8										4
5	bulo	4		16	CAT	3800	50	S	94	303	4.7	53	96	143				1	6						
5	puma	2		62	CAT	4560			90	445	11	230	70		15			30	100						
5	stroud	11		15	CAT	3000	30	NW	91	160	1.4	1	1	1		1			1						
5	windfall	5			CAT				95		1	28	128	14	43	14									
5	putt	6		2	CAT	4720	15		90	1657	8	30		20	30			90					1486		

Surveyors Ridge LSR - Status of Reforestation and TSI Units

5	windfall	18			CAT				94		1	1075	175	425	275			13							
5	perry	9		9	CAT	5000	25	E	95	367	1	51		50	72			6	200						
5	bulo	14		15	CAT	3900	5	E	94	327	3	177	73	60	3				13						
5	mill butte	1		12	CAT	4180		W	90	135	11	45		20		10		5	55						
6	windfall	4			CAT				94		1	176	100		82	24		21	9						
6	ridge	2			CAT				93		25	200	40	27	7			13	107						
6	puma	3		4	CAT	4600			90	1310	6	910	20	10	120			40	210						
6	windfall	3			CAT				94		1	136	71	29	314	50			7						
6	marion salvage	2		3	CAT	4700			90	5450	3			17	33	17		67	5250				67		
6	putt	1		60	CAT	4500	15	NW	94	414		205		83	39			125	4		4				
6	bulo	5		19	CAT	4200	20	SE	94	832	1	263	68	192	84			105	118						
6	bluster	9		9	CAT	4200	25	NE	95	356	1	33				50	11	44	172	60					
6	deadman gulch	3		9	CAT	3760	30	NE	90	709	11	415	144	106	6	13			25						
6	touchdown	11		19	CAT	4800	20	N	94	332	3.2	168		42	42			53	3				24		
6	big butte	16		18	CAT	3600	10	S	95	1010	1	400	333	139	8				14	19					
6	touchdown	2		16	CAT	4500	10	N	94	625	2.3	106		25		44		441	3				6		
6	remarion	2		14	CAT	4560	5	NE	93	418	1	71	25	186	21			21	93						
6	marion salvage	1		6	CAT	4600	17		90			50		150	17		133	17	83						
7	deadman gulch	5		15	CAT	4040		N	90	1121	8	493	171	129		29	36	200	64						
7	remarion	1		13	CAT	4480	5	NE	93	550	3	142	15	81	4	39		12	258						
7	marion salvage	3		3	CAT	4300			83			1	1	1	1		1	1	1						
7	stroud	13		15	CAT	4500	30	NE	92	190	1.7	63	53	34		6		3	16			3			
7	bluster	6		14	CAT	4000		F	92	211	1	7	4	171	7	18		18	7						
7	touchdown	12		31	CAT	5100	20	E	94	229	2.3	3	12	3		4		161	38				4		
7	stroud	8		9	CAT	4000	60	NW	93	933	2	377		61	77	211	50			122			38		
7	putt	8		5	CAT	4800	10	NW				70		30	40			220	230	10			20		
7	bulo	13		16	CAT	3800	30	E	94	272	6	78	22	128	3	3		311	6						
7	jacket	5		5	CAT	4600	15	NE	94	610	1	60	30	50	130			340	490					20	
7	jacket	4		14	CAT	4600	10	N	94	857		342		4	42	39		507	82				46		
7	bluster	4		15	CAT	4000	27	N	94	267	1.6	7		200	10	27		43		33		23			
7	touchdown	6		22	CAT	4800	30	N	94	316	2.4	91		57	9	5		111	5				39		
7	big butte	3		22	CAT	3800	30	SE	94	443	1.1	116	182	125	2	7			9	2					
8	perry	6		38	CAT	4800	27	W	95	316	1	81		53	119			35	45	1	3		4		
8	stroud	12		36	CAT	3500	60	NW	94	660	1.2	280	144	143	15	16	9		47		2				
8	touchdown	10		46	CAT	4900	20	SE	93	419	1	14	3	88	79	158		90	23				19		
8	touchdown	3		48	CAT	4500	20	N	95	439	1	120		220	3	15		24	3			4	23		
8	ward	4		67	CAT	4200	30	N	93	445	2	102	11	11		86	2	222	3				6		
8	bluster	5		17	CAT	4200	27	N	94	468	5.5	218		38	9	32		135			47	38	3		
8	touchdown	8		71	CAT	4500	30	NW	93	342	2	53	5	104	73	69		73	1				31		
8	bluster	7		28	CAT	4200	27	N	95	313	1	20		107	20	80	14	66		13				7	
8	south puma	10		12	CAT	4600	25	N	94	604	2	8	13	79		204		46	200		8		46		
8	remarion	3		9	CAT	4200	45	NE	93	522	2	161		72	17	50	111	61	61				6		
9	jordan creek	2		28	CAT	4400	7	NE	90	828	10	408	145	85	15	20		20	125		5		5		
9	ward	7		80	CAT	4500	30	N	93	357	2	83	19	44	44	13		150	15	1			1		
9	ward	5		40	CAT	4500	30	N	93	328	1	33	51	31	13	141		55	16	1			21		
9	bulo	7		14	CAT	3700	30	N	90	640	6	95	240	185	10	5	30	15	50		10				
9	jacket	3		7	CAT	4600	10	NE	95	221	2	7		136	7	7		29	71		7	14	14		
10	jordan creek	3		18	CAT	4440	25	NE	90	1083	10	408	50	67	33	17		50	300	17		58	83		
10	ward	3		49	CAT	4200	30	N	93	404	2	130	25	54	27	45		132	62	1	1		6		
11	ward	9		39	CAT	4700	30	NE	93	1005	8	452	23	23	31	33		335	64		7	19	4	9	
				1608																					
0	marion ssts	1		9	LSM	4400	15	S																	

3	bulo	10		3	LSM	3800	10	E	94	410			60	100					80						
3	thorhead	12			LSM				94				294		69	61									
3	thorhead	5			LSM				94				221		148	83									
3	perry	5		8	LSM	4700	25	N	95	294	1			31	169				194						
5	deadman gulch	4		8	LSM	4080			90	525	12	250	163	25				63	25						
5	bulo	11		4	LSM	3600	40	S	94	120	3.2	10	60	50	160				10						
5	windfall	8			LSM				94		1	50	80		240	10			100						
5	cedar creek	9		2	LSM	4320			90	680	9		30		10	20		10	610						
6	cedar creek	10		3	LSM	4380			90	2008	4	8	83		83	25		8	1800						
6	south puma	7		11	LSM	4900	20	E	94	332	2.1	5	14	5	9	214			91						
6	marion salvage	4		8	LSM	4700	10	E	90	2240	4	170	20	30	320			370	1330						
6	cedar creek	3		3	LSM	4300			90	1125	6		133	25	17	25		17	908						
6	bottle prairie	1		38	LSM	4800	20	SE	95	334	0.6	3	11	49				145	128						4
7	remarion	4		19	LSM	4400	45	NE	93	358	1	126	111	92	53	5		11	21						
7	bulo	8	A	3	LSM	3800	40	N	94	120		20	140	40	30	20			30						3
7	touchdown	9		27	LSM	4500	30	W	94	276	5.2	383		127	16	37		37	216					20	
7	cedar creek	12		4	LSM	4400			90	1475	5	42	108	92	275	17		442	500						
8	bulo	8		19	LSM	3800	40	N	94	797		182	40	500	3	8	3	24	37						
8	bulo	12		17	LSM	4000	40	S	94	450	2	127	91	127	50	3		12	94					3	
8	ward	1		48	LSM	4200	30	N	93	865	1	97	15	40	220	87		75	331					1	
9	bluster	1		8	LSM	3920	5	N	94	600	1	69	19	288	225	6	13	6	6	44					
9	bluster	2		18	LSM	3880	15	NE	94	2242	1.4	475	3	194	319	64	722	61	25	444					
9	bulo	9		23	LSM	4200	25	N	94	1904		1202	13	398	4	2		128	115		4		37		
10	buster salvage	4		51	LSM	4400			95	564	1	195	29	53	56	48	1	154	55	9					75
11	bluster	3		14	LSM	3880	15	NE	94	2850	1.3	614	11	678	368	32	732	25	7	368	86		4		
				348																					
0	stroud	14		6	OIM	4500	50	NE	91	108	3.1														
3	ramsey	10		62	OIM	3800	10	S	94	178	13.9	23	221	14											
7	stroud	6		12	OIM	5000	30	NW	92	167	1.2	38		50		25		38	13			13	4		
7	stroud	2		21	OIM	4000	60	N	95	664	1	33	143	56	30	10	40		13						
7	ramsey	9		32	OIM	3800	5	E	94	269	1.1	97	159	41	2	3		8	14						
8	stroud	7		19	OIM	4500	30	NW	94	537	2.5	300		47	10	152		13	18	26			2		
9	stroud	5		10	OIM	4500	30	NW	94	410	2.8	180	5	40	10	40	55		5	50					25
9	stroud	1		15	OIM	3500	30	N	94	170	2.8	26	23	16	6	23	63	3	23	3					
				177																					
0	bulo	2		23	OP	3800	40	S	91	113	4.5														
4	ramsey	3		11	OP	4000	20	S	94	568	2.3	77	582	96				5							
8	bulo	1		69	OP	3800	50	S	93	521		306	146	122	4	2	17	2	2						
				103																					
4	big butte	1		15	OTH1	4000	30	NE	94	294	1.2	100		131				44	18						
5	butte	1		26	OTH1	3400		SE	90	592	13	277	162	112		8			35						
9	crow	10		21	OTH1	4000	17	SE	95	300	1	200	12	31	24	2	2	14	19	5					
				62																					
2	south puma	13		5	OTH2	5400	15	SE	94	710	2.2					260			450						
2	south puma	27		5	OTH2	5100	25	NW	94	510	1.4							20	490						
3	south puma	12		4	OTH2	5300	15	SE	94	540	2.4					40			490				10		
3	south puma	25		4	OTH2	4800	25	NW	94	400	1.5				60	160			180						
3	south puma	22		2	OTH2	5400	10	N	94	590	1.4							260	260			70			
4	south puma	29		5	OTH2	5100	25	NW	94	1875	1.7				12	87			1725			50			
4	south puma	14		5	OTH2	5400	15	SE	94	1170	2.4					130		20	1000				20		
4	south puma	15		5	OTH2	5200	15	NE	94	450	1.3	10				90		80	270						
4	south puma	21		5	OTH2	5300	15	N	94	450	1.1					150		220	40			40			

4	south puma	8		8	OTH2	4900	30	SE	94	544	2.7	12		106		137			300					
4	south puma	19		7	OTH2	5400	15	NE	94	740	1.1					120		140	280				200	
4	south puma	26		4	OTH2	5100	25	NW	94	1290	3			40		110		60	1080					
4	south puma	24		7	OTH2	4900	25	NW	94	1186	2.8	7				14			1057				107	
4	south puma	18		4	OTH2	5400	10	NE	94	1700	1.9					150		100	14				50	
5	south puma	3		18	OTH2	4900	30	NE	94	371	2.4	3				26		140	195				8	
5	south puma	28		7	OTH2	5000	25	NW	94	1500	3			71		21		35	1242				128	
5	south puma	17		4	OTH2	5400	10	NE	94	3120	1.3	120				170		170	2620		40			
5	south puma	23		8	OTH2	4800	25	NW	94	478	2.1	5				5		33	366				66	
6	south puma	16		4	OTH2	5300	15	NE	94	650	1.6				110	100		40	310			10	80	
6	south puma	6		12	OTH2	4900	30	NE	94	638	2.4	33	8	8		63			492				33	
6	wampus	8		10	OTH2	4800	15	SE	95	985	1	195	60			55			2025		15		220	
6	south puma	20		6	OTH2	5200	15	NW	94	1500	1.5					66		133	950		50	291	8	
6	wampus	7		10	OTH2	5100	14	SE	95	541	1	47	170	13		40			254				60	
8	wampus	5		24	OTH2	5240	9	R	93	3371	1			47	2			10	3122	6	18	41	120	
8	south puma	2		12	OTH2	4700	25	NE	94	467	2.1	4		125	63	50		21	188			13	4	
8	jacket	1		8	OTH2	4760	10	N		319		19		6	19			125	106	6		25	13	
8	south puma	4		19	OTH2	4900	45	NE	94	295	2.6	3	3	18	3	92		3	171				3	
				212																				
0	cedar creek	5		1	OTH3	3600		SE		220	8													

United States Department of Agriculture **Forest Service** **R-6/R-5**

Reply to: 2470/1920 **Date:** May 9, 1995

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

To: Forest Supervisors, Owl Forests

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

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

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

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

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

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

/s/ John E. Lowe

JOHN LOWE
Regional Forester, R-6

/s/Steve Clauson (for)

LYNN SPRAGUE
Regional Forester, R-5

Enclosure

CC:
Forest Silviculturists
PFP Coordinators

Author: K.Denton 4/27/95, S.Perry 5/4/95
I concur, K.Denton, -/--/95
I concur, D.Nelson, -/--/95
I concur, D.Devlin, -/--/95
I concur, J.Ulbrich, 6/03/94
I concur, T.Nygren, -/--/95

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

Memorandum

Date: April 20, 1995

To: Regional Interagency Executive Committee
(See Distribution List)

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

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

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

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

Enclosure

cc:
IAC Members (See Distribution List)

362/ly

Distribution List Date: April 20, 1995

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

TO: Regional Interagency Executive Committee

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

cc: Other Members of Intergovernmental Advisory Committee

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

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

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

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

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

REO Review Exemption Criteria

Background

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

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

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

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

1. Young-Stand Thinning, commonly referred to as TSI or precommercial thinning, where:

   a. Young stands, or the young-stand component (understory) of two-storied stands, is overstocked. Overstocked means that reaching the management objective of late-successional conditions will be significantly delayed, or desirable components of the stand may be eliminated, because of stocking levels. The prescription should be supported by empirical information or modeling (for similar, but not necessarily these specific, sites) indicating the development of late-successional conditions will be accelerated or enhanced.

   b. Cut trees are less than 8" dbh, and any sale is incidental to the primary objective.

   c. Tracked, tired, or similar ground-based skidders or harvesters are not used.

   d. Treatments promote a natural species diversity appropriate to meet late-successional objectives; including hardwoods, shrubs, forbs, etc..

e. Treatments include substantially varied spacing in order to provide for some very large trees as quickly as possible, maintain areas of heavy canopy closure and decadence, and encourage the growth of a variety of species appropriate to the site and the late-successional objective.

f. Treatments minimize, to the extent practicable, the need for future entries.

g. Cutting is by hand tools, including chain saws.

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

a. There is undesirable vegetation (competition) which delays attainment of the management objective of late-successional conditions, or desirable components of the stand may be eliminated, because of such competition. The prescription should be supported by empirical information or modeling (for similar, but not necessarily these specific, sites) indicating the development of late-successional conditions will be accelerated or enhanced.

b. Cut material is less than 8" dbh, and any sale is incidental to the primary objective.

c. Tracked, tired, or similar ground-based skidders or harvesters are not used.

d. Treatments promote a natural species diversity appropriate to meet late-successional objectives, including hardwoods, shrubs, forbs, etc.

e. Cutting is by hand tools, including chain saws.

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

a. No site preparation is required other than hand scalping.

b. Reforestation is necessary to quickly reach late-successional conditions, protect site quality, or achieve other ROD objectives.

c. Treatments promote a natural species diversity appropriate to meet late-successional objectives, including hardwoods, shrubs, forbs, etc.

d. Treatments, either through spacing, planting area designation, or expected survival or growth patterns, result in substantially varied spacing in order to provide for some very large trees as quickly as possible, create areas of heavy canopy closure and decadence, and encourage the growth of a variety of species appropriate to the site and the late-successional objective.

e. Treatments minimize, to the extent practicable, the need for future entries.

United States Department of Agriculture **Forest Service** R-6/R-5

Reply to: 2470/1920 **Date:** July 26, 1996

Subject: Criteria to Exempt Specific Silvicultural Activities in LSR's and MLSA's from REO Review

To: Forest Supervisors, Deschutes, Gifford Pinchot, Olympic, Wenatchee, Mt. Baker-Snoqualmie, Mt. Hood, Rogue River, Siskiyou, Siuslaw, Willamette, Winema, Okanogan, Umpqua, Klamath, Six Rivers, Shasta-Trinity, Modoc, Mendocino, and Lassen NF's, and Area Manager, CRGNSA

Enclosed is a memorandum from the Regional Ecosystem Office (REO) exempting certain commercial thinning activities within LSR's and MLSA's from REO review. We are pleased about this exemption, and consider it a key step toward accomplishing ecosystem management objectives in a timely manner.

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

Please direct any questions regarding these criteria to your forest silviculturist or Northwest Forest Plan coordinator. If you need assistance from the Issue Resolution Team, please call Joyce Casey at 503-326-5817 or Tom Hussey at 503-326-3589.

/S/ NANCY GRAYBEAL
FOR

ROBERT W. WILLIAMS
Regional Forester, R-6

STEVE CLAUSON
FOR

G. LYNN SPRAGUE
Regional Forester, R-5

Enclosure

cc:
TM-Forest Silv:R06C
NWFP Coods:R06A
IRT:Late Successional Reserve:FS Transmit CT Exemption
edit:p.jeffrey:265:07/22/96:07/23/96

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

Memorandum

Date: July 9, 1996

To: **Regional Interagency Executive Committee** (RIEC)

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

From: Donald R. Knowles, Executive Director

Subject: Criteria to Exempt Specific Silvicultural Activities in Late-Successional Reserves and Managed Late-Successional Areas from Regional Ecosystem Office Review

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

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

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

We expect implementation monitoring procedures of the Northwest Forest Plan to select enough silvicultural projects within LSRs and MLSAs, both exempted and

reviewed, to determine if actual projects meet standards and appropriate criteria. Obviously, if any of you have questions or comments about the attached, please call me directly at 503-326-6266, Dave Powers at 503-326-6271, or Gary S. Sims at 503-326-6274.

cc: IAC, RMC, LSR Workgroup

Enclosure

694/ly

Criteria Exempting
Certain Commercial Thinning Activities
From REO Review

Background

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

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

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

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

These criteria are based on numerous submittals already reviewed by the REO and found to be consistent with the S&Gs. Other treatments, such as thinning with fire, may be equally appropriate. The REO simply has not had sufficient experience with such prescriptions within LSRs to write appropriate exemption criteria at this time. Agencies are encouraged to develop and submit such prescriptions for review. The REO will consider supplementing or modifying these criteria over time.

These criteria apply range wide. It may be more appropriate to seek exemption at the time of LSR assessment review where specific vegetation types, provincial issues, or objectives do not fit within these criteria or where silvicultural prescriptions are needed other than as described below.

These exemption criteria are not standards and guidelines, and projects meeting LSR objectives but not fitting these criteria should continue to be forwarded to the REO for review.

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

1. We urge caution in the use of silvicultural treatments within LSRs. Silvicultural treatments within old habitat conservation areas (HCAs) and designated conservation areas (DCAs) were extremely limited, and many of the participants in the Forest Ecosystem Management Assessment Team/Supplemental Environmental Impact Statement (FEMAT/SEIS) process advanced good reasons for continuing such restrictions. Only high eastside risks and a case made that late-successional conditions could clearly be advanced by treatments in certain stand conditions led decision makers toward the current S&Gs. Note that the examples for the westside (S&Gs, page C-12) are for even-age stands and young single-species stands. Agencies must recognize when younger stands are developing adequately and are beginning to become valuable to late-successional species. Such stands should be left untreated unless they are at substantial risk to large-scale disturbance.

2. Thinning can easily remove structural components or impede natural processes such as decay, disease, or windthrow, reducing the stand s value to late-successional forest-related species. Thinning prescriptions that say leave the best, healthiest trees could eliminate structural components important to LSR objectives.

3. While historic stand conditions may be an indicator of a sustainable forest, they are not the de facto objectives. The S&Gs require an emphasis toward late-successional conditions **to the extent sustainable.**

4. Treatments need to take advantage of opportunities to improve habitat conditions beyond natural conditions. For example, exceeding natural levels of CWD within a 35-year-old stand can substantially improve the utility of these stands for late-successional forest-related species. Treatments must take advantage of opportunities to optimize habitat for late-successional forest-related species in the short term.

Relation to S&Gs and Other Exemption Criteria

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

EXEMPTION CRITERIA

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

Objectives

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

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

2. Negative short-term effects to late-successional forest-related species are outweighed by the long-term benefits to such species and will not lessen short-term functionality of the LSR as a whole.

3. The leave-tree criteria provide for such things as culturing individual trees specifically for large crowns and limbs and for the retention of certain characteristics that induce disease, damage, and other mortality or habitat, consistent with LSR objectives. Healthiest, best tree criteria typical of matrix prescriptions are modified to reflect LSR objectives.

4. Within the limits dictated by acceptable fire risk, CWD objectives should be based on research that shows optimum levels of habitat for late-successional forest-related species, and not be based simply on measurements within natural stands. For example, recent research by Carey and Johnson in young stands on the westside indicates owl prey base increases as CWD (over 4") within Douglas-fir forests increases, up to 8- to 10-percent groundcover south of the town of Drain, Oregon, and 15-percent groundcover north of Drain, increasing to 15 to 20 percent in the Olympic Peninsula and Western Washington Cascades. Other references that could help identify initial considerations involving natural ranges of variability in CWD include Spies and Franklin, for discussions on Washington Cascades, Oregon Cascades, and Coast Ranges; and Graham, et al., for east of the Cascades.

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

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

Stand Attributes

1. The stand is currently **not** a complex, diverse stand that will soon meet and retain late-successional conditions without treatment.
2. West of the Cascades outside of the Oregon and California Klamath Provinces, the basal-area-weighted average age of the stand is less than 80 years. Individual trees exceeding 80 years in those provinces, or exceeding 20-inches dbh in **any** province, shall not be harvested except for the purpose of creating openings, providing other habitat structure such as downed logs, elimination of a hazard from a standing danger tree, or cutting minimal yarding corridors. Where older trees or trees larger than 20-inches dbh are cut, they will be left in place to contribute toward meeting the overall CWD objective. Thinning will be from below, except in individual circumstances where specific species retention objectives have a higher priority. Cutting older trees or trees exceeding

   20-inches dbh for **any** purpose will be the exception, not the rule.

3. The stand is overstocked. Overstocked means that reaching late-successional conditions will be substantially delayed, or desirable components of the stand will likely be eliminated, because of stocking levels.

Treatment Standards

1. The treatment is primarily an intermediate treatment designed to increase tree size, crown development, or other desirable characteristics (S&Gs, page B-5, third paragraph); to maintain vigor for optimum late-successional development; to reduce large-scale loss of key late-successional structure; to increase diversity of stocking levels and size classes within the stand or landscape; or to provide various stand components beneficial to late-successional forest-related species.

2. The prescription is supported by empirical information or modeling (for similar, but not necessarily these specific sites) indicating that achievement of late-successional conditions would be accelerated.

3. The treatment is primarily an intermediate thinning, and harvest for the purpose of regenerating a second canopy layer in existing stands is no more than an associated, limited objective as described below under openings and heavily thinned patches.

4. The treatment will increase diversity within relatively uniform stands by including areas of variable spacing as follows:

   Ten percent or more of the resultant stand would be in unthinned patches to retain processes and conditions such as thermal and visual cover, natural suppression and mortality, small trees, natural size differentiation, and undisturbed debris.

   Three to 10 percent of the resultant stand would be in openings, roughly 1/4 to 1/2 acre in size to encourage the initiation of structural diversity.

Three to 10 percent of the resultant stand would be in heavily thinned patches (e.g., less than 50 trees per acre) to maximize individual tree development and encourage some understory vegetation development.

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

5. To the extent practicable for the diameter and age of the stand being treated, the treatment includes falling green trees or leaving snags and existing debris to meet or make substantial progress toward meeting an overall CWD objective.

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

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

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

Cited References:

Carey, A.B., and M.L. Johnson. 1995. Small mammals in managed, naturally young, and old-growth forests. Ecological Applications 5:336-352.

Graham, R.T., A.E. Harvey, M.F. Jurgensen, T.B. Jain, J.R. Tonn, and D.S. Page-Dumroese. 1994. Managing coarse woody debris in forests of the Rocky Mountains. Res. Paper INT-RP-477. USDA Forest Service, Intermountain Research Station, Ogden, UT. 12p.

Spies, T.S. and J.F. Franklin. 1991. The structure of natural young, mature, and old-growth Douglas-fir forests in Oregon and Washington. Pages 19-121 in: Ruggiero, L.F., K.B. Aubry, A.B. Carey, M.H. Huff (tech. coords). Wildlife and Vegetation on Unmanaged Douglas-fir Forests. Gen. Tech. Rep. GTR-PNW-285. USDA Forest Service, Pacific Northwest Research Station, Portland, OR.

Appendix I

SURVEYOR'S RIDGE LSR
Roads and Trails

Surveyor's Ridge LSR has 23,759 acres. The Dalles Watershed has 8,831 acres within the LSR. The LSR has been divided into seven Landscape Design Units. Road and trail miles for each landscape unit are below:

SUMMARY OF MOTORIZED ROAD/TRAIL ROAD DENSITY

Total acres: 23,759 Acres = 37.10 Sq.Mi.

Total miles motorized road and trail: 98.25 miles = 2.65 Mi/SqMi

Existing Closed: Total closed miles: 29.50
Total open motorized roads/trails: 68.75 mile = 1.85 mi/sq.mi. density.

Future Open miles:	
Roads:	37.15
Trails:	22.90
TOTAL	60.15

Future Open Motorized (Road/Trail) Density= 1.60 Mi/SqMi

.....

Surveyor's Ridge Landscape Design Unit

Number	Miles Open	Miles Closed	Future Open	Future Closed
1700640	1.15			1.15
1700670	.50		.50	
1700673	.35		.35	
TOTAL	2.00		.85	1.15

Mill Creek Buttes Landscape Design Unit

Number	Miles Open	Miles Closed	Future Open	Future Closed	
17	2.50		2.50		
1700140		1.50		1.50	Closed/Gate/TDWS/Radio Tower
1721		4.60		4.60	Closed/Gate/TDWS
1721011		2.80		2.80	Closed/Gate on 1721/TDWS
TOTAL	2.50	8.90	2.50	8.90	

Dog River Landscape Design Unit

Number	Miles Open	Miles Closed	Future Open	Future Closed	
1700014	2.40		2.40		Surv. Ridge Trail/Dog River Aqueduct
1700120		.90		.90	Closed/Gate/TDWS
1700130		1.25		1.25	Closed/Gate/TDWS
1700???		.50		.50	Closed/Gate/TDWS Dog River Aq. Out
1700680	1.90			1.90	Close
1720	3.50		3.50		
1720120		1.40		1.40	Closed/Gate/TDWS
1720121		1.25		1.25	Closed/Gate on 120/TDWS
1720122		.35		.35	Closed/Gate on 120/TDWS
1720123		.70		.70	Closed/Gate on 120/TDWS
1720124		.80		.80	Closed/Gate on 120/TDWS
1720125		.20		.20	Closed/Gate on 120/TDWS
1721		1.40		1.40	Closed/Gate/TDWS-Butte Cabin
44	3.40		3.40		Dufur Valley/Mill Road.. Primary Road
4400011		.50		.50	Closed/Gate/Dog River Cabin/Aq In
4400620	1.10			1.10	Close
4410	4.50		4.50		
4410120		1.20		1.20	Closed/Berm
4410130	.80	.70	.80	.70	Closed/Gate/TDWS
4410131		.95		.95	Closed/Gate on 130/TDWS
4410140	.15			.15	Berm
4410180	.75			.74	Berm
4410190	.70			.70	Berm
4420	1.00			1.00	Close OHV/Horse/Hike/Mtn Bike Trail
TOTAL	20.20	12.10	14.60	17.70	

Eightmile Plate Landscape Design Unit

Road	Miles Open	Miles Closed	Future Open	Future Closed	
4400	1.30		1.30		
4420	1.60			1.60	Close OHV/Horse/Hike/Mtn Bike Trail
4420160	.90			.90	Close Berm
4420161	.60			.60	Close Berm
TOTAL	4.40		1.30	3.10	

Marion Landscape Design Unit

Road	Miles Open	Miles Closed	Future Open	Future Closed	
4420	3.20		3.20		
4421	1.00		1.00		Dual use road
4421120	.60			.60	Close Berm
4421121	.40			.40	Close Berm
4450	2.50		1.20	1.30	Close at 140 Junction
4450011	.80			.80	Close
4450120	1.05			1.05	Close
4450121	.40			.40	Close
4450122	.10			.10	Close
4450130	.20			.20	Close
4450140	.80			.80	Close
4450150	1.00			1.00	Close
4450160	1.00			1.00	Close
2730230	1.20			1.20	Close OHV/Hike/Horse/MtnBike Trail
2730240	2.40			2.40	Close OHV/Hike/Horse/MtnBike Trail
TOTAL	16.65		5.40	11.25	

Fifteen South Landscape Design Unit

Road	Miles Open	Miles Closed	Future Open	Future Closed	
2730130		.40		.40	
2730131		4.50		4.50	Close OHV/Hike/Horse/MtnBike Trail
2730160	2.50		2.50		
2730161		.70		.70	Closed Guardrail
2730180	1.50		1.50		
2730190		1.70		1.70	Closed w/guardrail OHV etc trail
4421	1.30		1.30		Dual use road
TOTAL	5.30	7.30	5.30	7.30	

Fifteen North Landscape Design Unit

Road	Miles Open	Miles Closed	Future Open	Future Closed	
4421	5.90		5.90		MP 1.0-4.9 & MP 7.1 to 9.1
					Closed seasonally 170 to Forest Bdry
		.70		.70	Closed Berms MP 9.1-9.8
4421180		1.20		1.20	Closed GR/Berm/Scarified
4450	1.30		1.30		
TOTAL	7.20	1.90	7.20	1.90	

TRAILS - SURVEYORS RIDGE LST

NUMBER	NAME	MILES	USERS
688	Surveyors Ridge	10.4	Horse, Hiker, Mountain Bike
675	Dog River	1.0 in LSR, 4.4 total	Horse, Hiker, Mountain Bike,
639	Cooks Meadow	2.0	Horse, Hiker, Mountain Bike
474	Knebal Springs	4.0	Horse, Hiker
450	Lookout Mountain	3.5	Horse, Hiker, Mtn Bike, OHV
450A	Wampus Springs	1.0	Horse, Hiker
456	FifteenMile	10.3	Horse, Hiker, Mtn Bike, OHV (partial)
457	Cedar Creek	5.0	Horse, Hiker, Mtn Bike, OHV (partial)
Road to Trail			
4420		2.60	Horse, Hiker, Mtn Bike, OHV
2730131		4.50	Horse, Hiker, Mtn Bike, OHV
2730190		1.70	Horse, Hiker, Mtn Bike, OHV
2730230		1.20	Horse, Hiker, Mtn Bike, OHV
2730240		2.40	Horse, Hiker, Mtn Bike, OHV
	TOTAL	49.60	

TOTAL MOTORIZED TRAIL MILES: 22.90
TOTAL MILES OF TRAIL: 49.60

Fifteenmile OHV Project:

Proposal to designate a fifty mile motorized trail system , of which 22.9 miles lie within the LSR, for OHV (motorcycle, three and four-wheelers) use. This trail system would be open to all--hiking, horseback riding, mountain biking, and OHV. It is planned to use existing roads, skid roads and trails and will connect to proposed OHV areas to the south. Opportunities identified are: eliminate cross-country/ride anywhere use patterns with a designated trail system; reconstruct trails to accommodate user; and close 10 miles of existing trail along Fifteenmile and Cedar Creek to motorized use. Moving the OHV use in the Fifteenmile creek bottom to the ridge line above the creek will reduce disturbance on 4 spotted owl activity centers.

Fifteen Miles OHV Project

Proposal to designate a fifty mile motorized trail system for OHV (motorcycle, three and four-wheelers) use. This trail system would be open to all --hiking, horseback riding, mountain biking, and OHV. It is planned to use existing roads, skid roads and trails and will connect to proposed OHV areas to the south. Opportunities identified are: eliminate cross-country/ride anywhere use patterns with a designated trail system; reconstruct trails to accommodate user; close 10 miles of existing trail along Fifteenmile and Cedar Creek to motorized use.

Appendix J

The following trails and campgrounds are located within the LSR

TRAILS

456 Fifteen Mile--10.3 Miles

Supports a variety of users, has low use -less than 1000 users per year, and accesses the Badger Jordan Wilderness. It is used mainly by hikers but is being discovered by the mtn bike community. Normal scheduled trail maintenance which includes logging out, brushing, and tread repair will continue into the future.

#457 Cedar Creek----5 Miles

Supports a variety of users and has low use <1000 users per year. This trail is used by motorcycles, hikers, and mtn bikes. Makes a loop opportunity with connections to #456 Fifteen Mile trail. Normal scheduled trail maintenance which includes logging out, brushing, and tread repair will continue into the future.

#450 Lookout Mtn Trail----3.2 miles

Supports a variety of users including hikers, mtn bikes, and motorcycles. It is a low use <1000 users per year. This trail had some reconstruction and realignment in summer of 1995 to bypass a wet meadow area. The long range plan is to realign the majority of the rest of the trail to bypass more wet areas and reduce the steepness of the trail. Becomming more and more popular with the mtn bike community. Connects Bottle Prairie to #456 Fifteenmile Trail and also the Badger Jordan Wilderness. Normal scheduled maintenancc which includes logging out, brushing, and tread repair will continue into the future.

#455 Bottle Prairie---3.0 miles

Supports a variety of users including hikers, horses, and mtn. bikes. It is a medium use trail-1000 to 3000 users per year and ties in with Knebal Springs Trail 474 to make a loop around Knebal Springs Campground which allows "horse camping". Normal scheduled maintenance which includes logging out, brushing, and tread work will continue into the future.

474 Knebal Springs Trail---4.0 miles

Supports a variety of users including hikers, mtn bikes, and horses. It is a medium use trail, 1000 to 3000 users per year and ties in with Bottle Prairie Trail #455 to make a loop around Knebal Springs Campground. Normal scheduled maintenance which includes logging out, brushing, and tread repair will continue into the future

#688 Surveyors Ridge Trail---13.0 miles

This trail is used primarily by hikers and mtn bikes. It is a medium use trail with 1000 to 3000 users per year. It connects Maki Butte with Shellrock Mtn. Normal scheduled maintenance which includes logging out, brushing, and tread repair will continue into the future.

CAMPGROUNDS

Fifteenmile campground

This is a small campground (three tent sites) situated next to Fifteenmile Creek. It is a low use campground and requires very little maintenance. Normal maintenance which includes, hazard tree reduction, toilet cleaning, and general cleanup will continue into the future. Fifteen mile trail passes through the campgrounds and follows the creek and will eventually take you to Badger Jordan Wilderness.

DISPERSED USE

The dispersed use in this LSR is mostly hunting and fishing. There are numerous "dispersed campsites" at the end of roads used for these purposes.

Appendix K

Prof_judgment

Y - professional judgment was used to place these species into the appropriate guild. The guilding scripts did not work to place these species in the most appropriate guild.

Guild

Terrestrial Guilds: use upland, terrestrial habitats

Code	Description of Guild
TSPO	small home range, patch, open structure
TSPST	small home range, patch, sm. tree structure
TSPLT	small home range, patch, lrg. tree structure
TSMO	small home range, mosaic, open structure
TSMST	small home range, mosaic, sm. tree structure
TSGOS	small home range, generalist for open and sm. tree
TSGSL	small home range, generalist for sm. and lrg. tree
TSGG	small home range, generalist for all stages
TMPO	medium home range, patch, open structure
TMMO	medium home range, mosaic, open structure
TMMLT	medium home range, mosaic, lrg. tree structure
TMGG	medium home range, generalist for all stages
TLMO	large home range, mosaic, open structure
TLMLT	large home range, mosaic, lrg. tree structure
TLGG	large home range, generalist for all stages
TSC	small home range, contrast species
TMC	medium home range, contrast species
TLC	large home range, contrast species

Riparian Guilds: riparian habitat obligates - use aquatic or terrestrial portion of riparian habitats or both portions

Code	Description of Guild
LAKEA	aquatic habitats of LAKES
LAKEARO	aquatic and terrestrial open habitats of LAKES
LAKERO	riparian open habitats of LAKES
LKRVA	aquatic habitats of LAKES AND RIVERS
LKRVARO	aquatic and terrestrial open habitats of LAKES/RIVERS
LKRVARF	aquatic and terrestrial forested habitats,LAKES/RIVERS
LKRVARG	aquatic and terrestrial, all stages of LAKES/RIVERS

LKRVRO	terrestrial open habitats of LAKES AND RIVERS
LKRVRG	terrestrial habitats, all stages of LAKES AND RIVERS
RIVA	aquatic habitats of RIVERS
RIVARF	aquatic and terrestrial, forested habitats of RIVERS
RIVARG	aquatic and terrestrial, all stages of RIVERS
RIVRO	terrestrial open habitats of RIVERS
RIVRF	terrestrial forested habitats of RIVERS

Special Habitat Guild: special habitat obligates

Code	Description of Guild
SPCL	require specific special habitats

DATA SOURCE: GUILDMH.DB is created using guilding scripts and information from the other databases

HABITAT USE TABLES

HABITAT USE CODES -Codes used in "Use" field for habitat types in HABITAT.DB, RIPAR.DB, SPCL_HAB.DB.

COMMON TO ALL DATABASES

1 - Primary use for breeding, feeding and/or resting - must have some breeding use
2 - Secondary use for breeding, feeding and/or resting - must have some breeding use
3 - Primary use for other than breeding - no use for breeding
4 - Secondary use for other than breeding - no use for breeding

HABITAT.DB, RIPAR.DB, AND ONLY

6 - Primary use of habitat type only if special and unique or riparian habitat occurs within or near habitat type - distance to special and unique or riparian habitat will vary by species
7 - Secondary use of habitat type only if special and unique or riparian habitat is within or near the habitat type

*** EXAMPLES - Bald eagles use Large conifer and Old growth habitats only if a large river or lake is within a certain distance of the stand. Some amphibians will use upland habitats but only if riparian habitat is nearby.