

United States
Department of
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Forest Service

Pacific
Northwest
Region

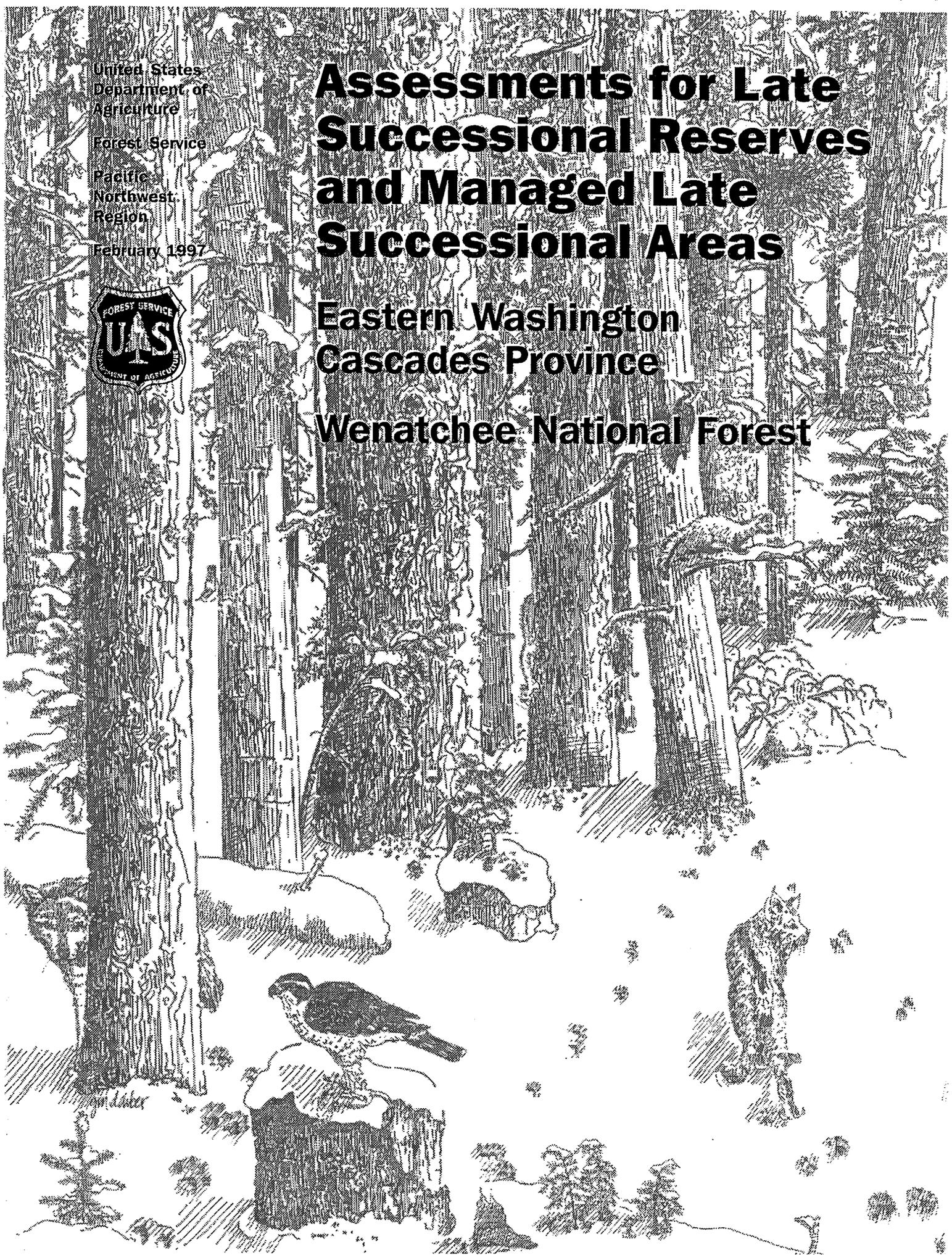
February 1997

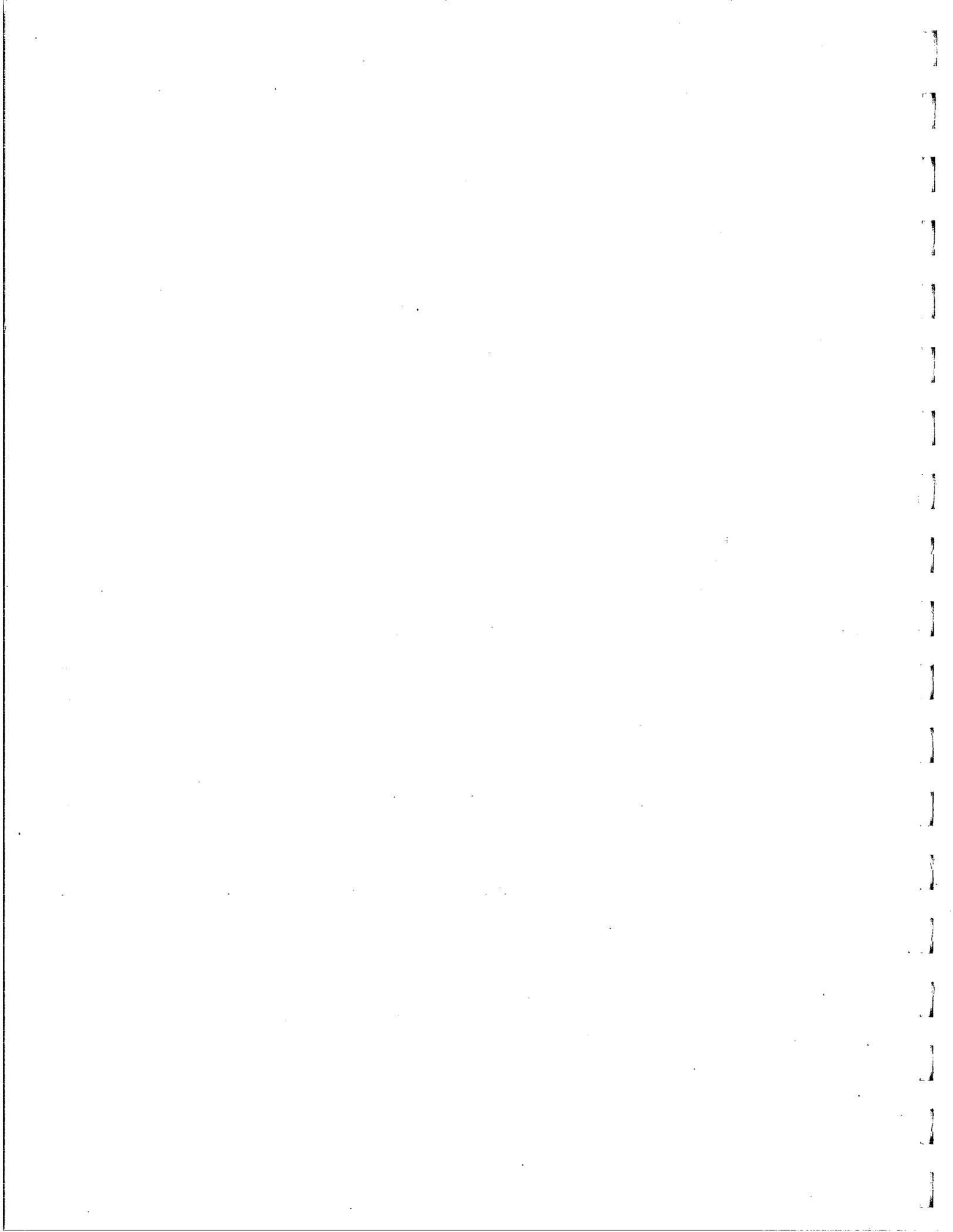


Assessments for Late Successional Reserves and Managed Late Successional Areas

Eastern Washington
Cascades Province

Wenatchee National Forest





Assessments for Late Successional Reserves and Managed Late Successional Areas Eastern Washington Cascades Province Wenatchee National Forest

This document is a compilation of assessments for Late Successional Reserves and Managed Late Successional Areas on the Wenatchee National Forest located in the Eastern Washington Cascades Province. Each chapter covers an individual LSR or MLSA or a combination of these areas, that because of their close geographical proximity and similarity of vegetation types, are grouped together in a single chapter.

This document is one of three documents prepared on the Wenatchee National Forest to assess LSR/MLSA as directed in the Northwest Forest Plan. A second document, the "Assessments for Late Successional Reserves and Managed Late Successional Area, Yakima Province, Wenatchee National Forest" includes assessments for these areas that are located within the Yakima Province. A third document, the "Forest-wide Assessment for Late Successional Reserves and Managed Late Successional Areas, Wenatchee National Forest" provides a Forest overview and a foundation for the processes and format used in the two LSR/MLSA province documents. For ease of reference these documents will be referred to as the "Eastern Washington Cascades Province", the "Yakima Province", and the "Forest-wide Assessment" throughout all three documents.

Each individual chapter in this document focuses on a particular LSR or MLSA (or grouping of these). The first section "A", provides a more specific description of unique resources or factors associated with this LSR than was presented in the general "forest-wide" chapters. Section "B" begins the analysis portion of this document assessing relationships between these LSR/MLSA and neighboring LSR/MLSA. Section "C" continues that analysis focusing on the individual LSR.

The subheadings in "B" and "C" follow the module sequence as shown on the "LSR Analysis Flow Chart" in Chapter VII of the WNFLMA and in Appendix 1 attached to this document. A fire plan is also included at the end of Section "C" to provide more specific detail than that in the fire management plan included in the Chapter VII. Section D includes a table summarizing all of the ecologically derived projects identified from the analysis of each module completed in sections B" and "C".

It is important to note that the type of activities derived from these modules all strive to restore or maintain late successional habitat and species, as such these modules recommend "ecologically derived" projects. The social module, on the other hand, is designed to review projects that do not incorporate these restoration or maintenance objectives. The social module is designed to provide a "road map" to use when planning begins on a specific project that is derived from some social need such as building a new hiker or motorized trail, expanding a ski area, or widening a powerline right-of-way. Since the social module is not used to identify "ecologically derived" projects, the module is not included in this or any of the other individual LSR/MLSA chapters. The process for dealing with socially derived projects is detailed in "Social Module" in Appendix 1. The Assessment Team did complete a social module for the Three Creeks ORV Trail project on the Entiat Ranger District to validate the module and provide an example of the format and the

evaluation process. This module analysis is included in Appendix 1 which is incorporated into all three documents.

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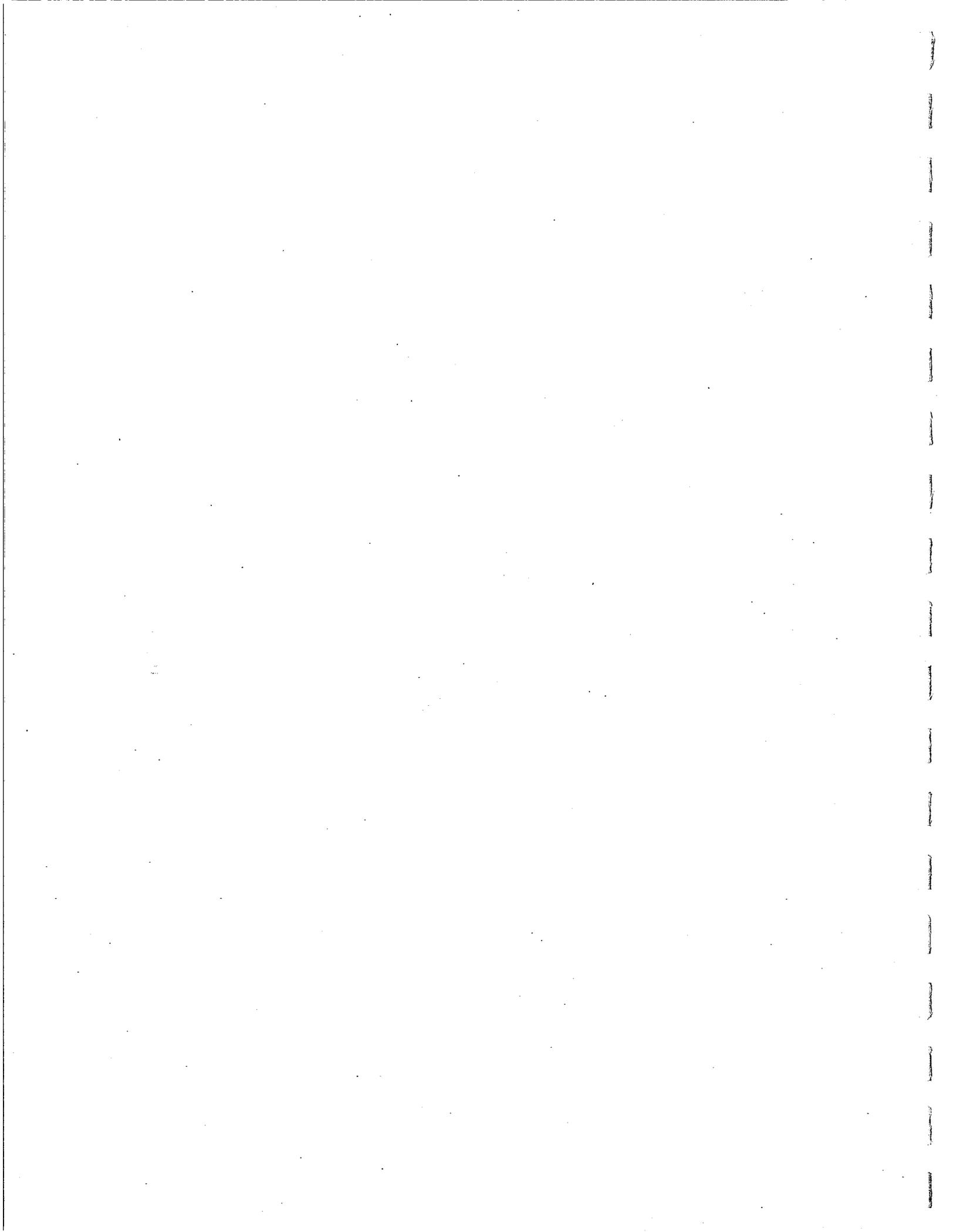
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I. Chiwawa LSR

This individual chapter focuses on the Chiwawa LSR. The first section "A", provides a more specific description of unique resources or factors associated with this LSR than was presented in the general "forest-wide" chapters. Section "B" begins the analysis portion of this document assessing relationships between this LSR and neighboring LSR/MLSA's. Section "C" continues that analysis focusing on this individual LSR.

The subheadings in "B" and "C" follow the module sequence as shown on the "LSR Analysis Flow Chart" in Chapter VII and in Appendix A. A fire plan is also included at the end of Section "C" to provide more specific detail than that in the fire management plan included in the Chapter VII. Section D includes a table summarizing all of the projects identified from the analysis of each module completed in sections "B" and "C".

It is also important to note that the type of activities derived from these modules all strive to restore or maintain late successional habitat and species, as such these modules recommend "ecologically derived" projects. The social module, on the other hand, is designed to review projects that do not incorporate these restoration or maintenance objectives. The social module is designed to provide a "road map" to use when planning begins on a specific project that is derived from some social need such as building a new hiker or motorized trail, expanding a ski area, or widening a powerline right-of-way. Since the social module is not used to identify "ecologically derived" projects, the module is not included in this or any of the other individual LSR/MLSA chapters. The Assessment Team did complete a social module for the Three Creeks ORV Trail project on the Entiat Ranger District to validate the module. This module analysis is included in Appendix X.

The Lake Wenatchee Ranger District completed an Initial Assessment for the Chiwawa Late Successional Reserve (March 1996). This assessment covered the south half of the LSR, on three Ranger Districts (Lake Wenatchee, Leavenworth and Entiat). The Initial Assessment highlighted the Tyee fire recovery area, but was expanded out to include all of the southern portion of the LSR (52,500 acres) and the adjacent lands, altogether covering 85,000 acres. The Initial Assessment is incorporated into this chapter by reference. There are several items that have been added or changed, between the Initial and this Chiwawa LSR assessment. The following are highlights of those additions and changes:

Forest-wide Overview

As a result of analyzing all LSR's and MLSA's across the Wenatchee National Forest, a comparison of the Chiwawa LSR's values, importance, risk, juxtaposition, and connectivity is more thoroughly understood and displayed. This landscape level approach, provides a perspective for late-successional species and habitats.

Complete Chiwawa LSR is Analyzed

The whole Chiwawa LSR is 107,000 acres, and is covered in this assessment, which encompasses the north half of the LSR. This LSR, now includes the portion of the Chiwawa watershed from Grouse Creek northwest to Phelps Creek, which is all on the Lake Wenatchee Ranger District.

Vegetation Modeled

To be consistent across the Forest, models were used to assess vegetation, unless aerial photo interpretation was completed prior to this process. The south portion of the Chiwawa LSR was photo interpreted, based on Forest-wide process. The north half of the Chiwawa LSR vegetation was modeled. Prior to future watershed assessments or project level planning, this vegetation layer needs to be field verified and altered as needed.

This vegetation layer was the baseline for developing other models, such as: Risk Assessment/Susceptibility Matrix; Desired Ecological Conditions; Suitable Spotted Owl Habitat (nesting/roosting/foraging); Dispersal Habitat for spotted owls; Spotted Owl Home Range amounts; Spotted Owl Modules: Unique Habitats; Forest Interior; Snag Assessment; Wildlife Assessment; Noxious Weed Module; Fire Management Plan; and opportunities for Restoration and Maintenance.

Spotted Owl Activity Centers

The Chiwawa Initial Assessment included 19 spotted owl sites, (17 pairs and 2 singles). The Forest-wide Assessment includes 17 spotted owl sites, (16 pairs and 1 single). The two activity centers that were not included in the Forest-wide Assessment were in the Mad River, Upper Mad S-512 and Cougar Shelter S-514. Upon further review of the 2 sites, District Biologists determined these two should have been included in the Forest-wide assessment. This Chiwawa chapter has incorporated these sites back into the assessment, though data and numbers throughout the remainder of the Forest-wide Assessment display 17 activity centers.

A. General Description of LSR

1. Vegetation

This section describes the current condition of vegetation groups (see Vegetative Landscape section) within the Chiwawa LSR. Data was derived by a combination of aerial photo interpretation (only in the southern portion) and modeling (see Vegetative Landscape section). It should be noted that site specific information regarding vegetation structure and distribution will need to be updated as restoration projects are initiated. The idea would be to use the vegetation layer derived for this analysis as a starting point only.

Information is provide below regarding each vegetation group. More detailed information can be found in the Initial Assessment for the Chiwawa LSR.

a) Dry Forest Group

The dry forest group is found in the southern half of the Chiwawa. Twenty-five percent (26,696 acres) of the Chiwawa LSR consists of the dry forest group. Within this group, 54% (14,920 acres) is mapped as high density and only 8% mapped created openings (Appendix 4). Created openings in this group are largely the result of the Tye Fire. The dry forest group in this LSR was mapped from aerial photos, so unlike other LSR's where modeling was used, the amount of created openings are more accurately represented.

b) Mesic Sites-

Mesic sites were only mapped within the southern portion of the Chiwawa LSR because of the limitations of the modeling process used in the northern portion. In general, mesic sites occur on steep (>40% slope), northerly aspects, riparian areas, or moist benches within the dry forest group (see Vegetative Landscape section): In the southern half of the LSR, 2,089 acres of mesic sites have been identified (appendix 4). It is important that these sites are identified through restoration projects since suitable spotted owl habitat may need to be promoted or maintained within 1.8 mile radius spotted owl circles. Mesic sites outside of 1.8 mile radius spotted owl circles (see wildlife section) would be *managed* similarly to dry forest sites.

Mesic sites are typically within the Douglas-fir series and include the more moist plant associations. Common plant associations include *P. menziesii/Symphoricarpos albus* and *P. menziesii/Spirea betulifolia*. Ponderosa pine may be present, but generally only as remnants from early seral

establishment. Western white pine (*Pinus monticola*) and western larch may also be present. The understory tends to be more lush and often with a higher shrub component than in the more dry plant associations within the Douglas-fir and ponderosa series. Understory shrub species include tall shrubs such as *Symphoricarpos ablus*, *Holodiscus discolor*, *Spiraea betulifolia*, and *Rosa* spp., and *Arctostaphylos uva-ursi*, *Berberis nervosa* and *Pachistima myrsinites* as low shrubs (Chiwawa Initial LSR Assessment). Herb composition may include *Festuca occidentalis*, *Carex geyeri*, *Calamagrostis rubescens*, *Smilacina stellata*, and *Claytonia lanceolata*.

c) Moist Grand Fir Group

Seventeen percent (18,724 acres) of the Chiwawa LSR consists of the moist grand fir group. About half (45%) of this forest group is currently layered and/or mature (mid- to late-successional) (appendix 4). The layered and/or mature forest is located in the Mad River in the vicinity of Maverick Saddle and on the west face of Entiat Ridge on the Lake Wenatchee Ranger District. Most created openings within this group are largely the result of the Tyee Fire.

Species composition in the group depending on the degree of moisture available. At the moist end western white pine was an important component before the introduction of white pine blister rust (Chiwawa Initial LSR Assessment, see Disturbance section). Moister associations typically include a shrub component typified by species such as *Acer circinatum*, *Spiraea betulifolia*, *Rosa gymnocarpium*, *Clintonia uniflora*, and *Asarum caudatum* (Chiwawa LSR Initial Assessment).

d) Subalpine Fir Series

The subalpine fir series constitutes 16% (17,344) of the Chiwawa LSR. More than one-third (42%, 7,377 acres) of this series is mapped as layered or mature, while 26% (4,521 acres) is mapped as created openings and 28% (4,798 acres) as single layered stands (appendix 4). This series is concentrated along Entiat Ridge.

Subalpine fir is the most widespread species within the overstory (Wenatchee National Forest, Ecology Plot Database). Common seral dominants include lodgepole pine, Engelmann spruce, and western larch.

e) Wet Forest Group

The largest portion of the Chiwawa LSR consists of the wet forest group (32%, 34,398; Appendix 4). In general, this forest group can be found in the northern portion of the LSR. Nearly three-quarters (72%, 24,853 acres) of this forest group consists of layered or mature stands. Created openings are largely the result of past timber harvest and are mostly located in the vicinity of Grouse Creek Campground.

The wet forest group within the Chiwawa LSR is a fairly contiguous. Western hemlock and western red cedar are the most common overstory dominants forming contiguous forest. Mountain hemlock becomes more important at higher elevations on Chiwawa Ridge. Douglas-fir is the primary seral dominant in this forest group, but both lodgepole and western white pine are present, although scattered. Understory shrubs include *Oplopanax horridum* and *Acer circinatum*, and herbs include *Clintonia uniflora*, *Asarum caudatum*, *Berberis nervosa*, and *Arctostaphylos nevadensis*.

f) Valley Bottom Mixed Conifer

A small amount of this forest group was mapped within the Chiwawa LSR, which underestimates the actual acreage. The acres that were identified was accomplished through aerial photo interpretation which was only completed in the southern portion of the LSR. The vegetation modeling in the northern portion did not distinguish this vegetation group from the wet forest group. It is estimated

that approximately 8% of the Chiwawa LSR consists of this forest group. This means that the modeling overestimated the actual amount of wet forest and, to a lesser degree, moist grand fir.

Some created openings exist in this group and are located from just beyond the mouth of Chikamin Creek to the pavements end on the main Chiwawa River Road. It should be noted that there is difficulty in getting trees to regenerate on these sites because of frost.

This group is highly variable in terms of overstory species composition (refer to Appendix Richy ? for definition of group). Overstory species include western hemlock, lodgepole pine, Engelmann spruce, and grand fir. The understory is largely dominated by *Acer circinatum*.

g) Lodgepole Pine Sites

Some sites were identified where lodgepole pine is persistent and not necessarily seral to other tree species such as subalpine fir. About 1,180 acres were mapped near Lost Lake on Entiat Ridge as persistent lodgepole pine sites. Currently, little information is available regarding species composition at these sites.

h) Whitebark Pine/Subalpine Larch Group and High Elevation Nonforest Types

Approximately 1,900 acres were identified as supporting whitebark pine or subalpine larch. These stands are found mostly in the northern portion of the LSR along Entiat Ridge. Stands of large whitebark pine occur within the Chiwawa LSR and nearby in the Glacier Peak Wilderness. A former state record sized subalpine larch tree is known to occur in or near the Chiwawa LSR.

About 960 acres of upland meadows were identified in the Chiwawa LSR. These meadows are interspersed within high elevation forest types. The amount of upland meadows are likely underestimated because of the vegetation modeling.

i) Non-Forest Vegetation

There are approximately 4,670 acres (4% of LSR) of non-forest vegetation within the Chiwawa LSR. Included in this group are: grassland/shrubland (193 acres), bedrock (85 acres), talus (875 acres), wet meadows (243 acres), upland meadow (966 acres), brushfield (1,203 acres), cliff (328 acres), scree (2 acres), water (700 acres), and agricultural/residential/developed (72 acres). Since half of the Chiwawa LSR was modeled wet, dry, and upland meadows and brushfields are under-estimated.

j) Species with Special Status

Within the Chiwawa LSR, there is potential habitat for a number of special status species, but few surveys have been carried out to determine presence or absence. Surveys should be carried out in conjunction with restoration projects, as well as surveys independent of other activities. It is important that species ranges are known so that better estimates of species viability can be assessed. In addition, little is known about most rare species habitat and biological requirements, and inventories provide a first and necessary step in obtaining this information.

There are five Forest Service sensitive (see Late-Successional Associated Plant Species) species within the Chiwawa LSR; *Botrychium montanum*, *B. paradoxum*, *Carex buxbaumii*, *Cicuta bulbifera*, and *Iliamna longisepala*. Information regarding the biology or ecology of these species is limited, but some information is summarized.

Habitat information regarding *Botrychium* species has been collected and summarized in a number of publications. Additionally local information specific to habitats in the Chiwawa LSR are on file at the Lake Wenatchee Ranger District.

Most of what is known relative to habitat requirements of *Iliamna longisepala* has been made through casual observations. It has been observed (Harrod, personal observation) that this species occurs in disturbed areas including burns, roads, and skid trails. This observation suggests that *I. longisepala* is an early successional species and appears to require open habitats for seed germination, seedling establishment, avoidance of interspecific competition, and/or some other aspect of its life history.

A recent study by Kuhlmann and Harrod (unpubl. report) reports the results of one year of post-fire monitoring on *I. longisepala*. This study found that post-burn populations are younger than unburned populations based an analysis of morphological characters. Greater percent vegetative and lower percent reproductive plants were also present in burned sites. These results suggest that *I. longisepala*, in fact, may respond to fire similar to that of *I. rivularis* which has fire-stimulated germination (Crane and Fischer 1986).

k) Survey and Manage Species

There are a number of survey and manage plant species known to occur in the Chiwawa LSR (Appendix 7). A few species are suspected, even more are simply unknown (Appendix 7). The ROD provides standards and guidelines for survey and manage species, and these should be addressed within the Chiwawa LSR. An important point is that only very general surveys have been completed for non-vascular plants and projects should be initiated which carry out extensive surveys.

Table I-1, Sensitive and Survey and Manage Species in Chiwawa LSR

Group	Latin name	Common name	Federal *	State +	Forest Service ++	Presence **
FUNGI	<i>Albatrellus ellisii</i>				SM	K
FUNGI	<i>Albatrellus flettii</i>				SM	K
FUNGI	<i>Alpova alexsmithii</i>				SM	S
FUNGI	<i>Arcangeliella crassa</i>				SM	S
FUNGI	<i>Boletus haematinus</i>				SM	S
FUNGI	<i>Boletus pulcherrimus</i>				SM	S
FUNGI	<i>Bondarzewia montana</i> (= <i>B. mesenterica</i>)				SM	S
FUNGI	<i>Cantharellus cibarius</i>				SM	K
FUNGI	<i>Cantharellus formosus</i>				SM	S
FUNGI	<i>Cantharellus subalbidus</i>				SM	K
FUNGI	<i>Cantharellus tubaeformis</i>				SM	S
FUNGI	<i>Catathelasma ventricosa</i>				SM	S
FUNGI	<i>Choiromyces alveolatus</i>				SM	S
FUNGI	<i>Clavariadelphus borealis</i>				SM	S
FUNGI	<i>Clavariadelphus ligula</i>				SM	S
FUNGI	<i>Clavariadelphus pistillaris</i>				SM	K
FUNGI	<i>Clavariadelphus truncatus</i>				SM	K

Group	Latin name	Common name	Federal *	State +	Forest Service ++	Presence **
FUNGI	<i>Clavulina cristata</i>				SM	S
FUNGI	<i>Clavulina ornatipes</i>				SM	S
FUNGI	<i>Collybia bakerensis</i>				SM	S
FUNGI	<i>Cortinarius magnivelatus</i>				SM	S
FUNGI	<i>Gastroboletus ruber</i>				SM	S
FUNGI	<i>Gastroboletus subalpinus</i>				SM	S
FUNGI	<i>Gastroboletus turbinatus</i>				SM	S
FUNGI	<i>Gomphus bonarii</i>				SM	K
FUNGI	<i>Gomphus clavatus</i>				SM	K
FUNGI	<i>Gomphus floccosus</i>				SM	K
FUNGI	<i>Gomphus kauffmanii</i>				SM	K
FUNGI	<i>Gyromitra californica</i> (<i>Helvella</i>)				SM	S
FUNGI	<i>Gyromitra esculenta</i> (<i>Helvella</i>)				SM	K
FUNGI	<i>Gyromitra infula</i> (<i>Helvella</i>)				SM	K
FUNGI	<i>Gyromitra melaleucoides</i> (<i>Helvella</i>)				SM	S
FUNGI	<i>Gyromitra montana</i> (= <i>G.gigas</i>)				SM	K
FUNGI	<i>Hebeloma olympiana</i>				SM	S
FUNGI	<i>Helvella crassitunicata</i>				SM	S
FUNGI	<i>Helvella elastica</i>				SM	S
FUNGI	<i>Hydnum repandum</i> (<i>Dentinum</i>)				SM	K
FUNGI	<i>Hydnum umbilicatum</i> (<i>Dentinum</i>)				SM	S
FUNGI	<i>Macowanites lymanensis</i>				SM	S
FUNGI	<i>Mycena lilacifolia</i>				SM	S
FUNGI	<i>Mycena monticola</i>				SM	S
FUNGI	<i>Otidea leporina</i>				SM	S
FUNGI	<i>Otidea onotica</i>				SM	S
FUNGI	<i>Otidea smithii</i>				SM	S
FUNGI	<i>Oxyporus nobilissimus</i>				SM	S
FUNGI	<i>Phlogiotis helvelloides</i>				SM	K
FUNGI	<i>Phytoconis ericetorum</i> (<i>Omphalina</i>)				SM	S
FUNGI	<i>Pithya vulgaris</i>				SM	S

Group	Latin name	Common name	Federal *	State +	Forest Service ++	Presence **
FUNGI	<i>Plectania latahensis</i> (<i>Sarcosoma</i>)				SM	S
FUNGI	<i>Polyozellus multiplex</i>				SM	S
FUNGI	<i>Rhizopogon abietis</i>				SM	S
FUNGI	<i>Rhizopogon atroviolaceus</i>				SM	S
FUNGI	<i>Rhizopogon truncatus</i>				SM	S
FUNGI	<i>Sarcodon imbricatum</i> (<i>Hydnum</i>)				SM	K
FUNGI	<i>Sarcosoma mexicana</i>				SM	S
FUNGI	<i>Sarcosphaera eximia</i> (= <i>S. crassa</i>)				SM	K
FUNGI	<i>Sparassis crispa</i>				SM	S
FUNGI	<i>Spathularia flavida</i>				SM	K
FUNGI	<i>Thaxterogaster pingue</i>				SM	S
VASCULAR PLANTS	<i>Allotropa virgata</i>	sugarstick			SM	K
VASCULAR PLANTS	<i>Botrychium minganense</i>	Victorin's grape-fern			SM	K
VASCULAR PLANTS	<i>Botrychium montanum</i>	mountain moonwort		S	SM	K
VASCULAR PLANTS	<i>Botrychium paradoxum</i>	two-spiked moonwort		S		K
VASCULAR PLANTS	<i>Botrychium simplex</i>	little grape-fern		S		S
VASCULAR PLANTS	<i>Campanula lasiocarpa</i>	Alaska harebell		S		S
VASCULAR PLANTS	<i>Carex buxbaumii</i>	Buxbaum's sedge		S		K
VASCULAR PLANTS	<i>Carex proposita</i>	smoky mountain sedge		S		S
VASCULAR PLANTS	<i>Cephalanthera austineae</i>	phantom orchid		M3		K
VASCULAR PLANTS	<i>Cicuta bulbifera</i>	bulb-bearing water-hemlock		S		K
VASCULAR PLANTS	<i>Cypripedium fasciculatum</i>	clustered lady'slipper	SP	T	SM	S
VASCULAR PLANTS	<i>Cypripedium montanum</i>	mountain lady'slipper			SM	K
VASCULAR PLANTS	<i>Epipactis gigantea</i>	giant hellebore		S		S
VASCULAR PLANTS	<i>Hackelia hispida</i> var.	sagebrush		S		S

Group	Latin name	Common name	Federal *	State +	Forest Service ++	Presence **
R PLANTS	<i>disjuncta</i>	stickseed				
VASCULAR PLANTS	<i>Iliamna longisepala</i>	longsepal globemallow		S		K
VASCULAR PLANTS	<i>Orobancha pinorum</i>	pine broomrape		S		S
VASCULAR PLANTS	<i>Pellaea breweri</i>	Brewer's cliff-brake		S		S

Key to Columns: “*” **Federal status** - “SP” = Special Protection; “+” **Washington state status** - “S” = Sensitive, “T” = Threatened, “E” = Endangered; “++” **Forest Service designations** - “SM” = Survey and Manage; “***” Present (or absent in LSR/MLSA) - “K” = Known, “S” = Suspected

1) Noxious Weeds

A portion of the Chiwawa LSR was surveyed in 1992 for noxious weed species that occur along roadsides (McRae and Harrod unpubl. report). High densities of *Centaurea diffusa* are present along roads particularly along the main Chiwawa River Road. Other species include *Chrysanthemum leucanthemum*, *Hypericum perforatum*, *Cytisus scoparius*, *Cynoglossum officinale*, and *Cirsium canadensis*. Surveys for species presence and extent should be completed in order to develop a noxious management plan for this LSR (refer to Harrod 1994).

2. Late Successional Associated Wildlife Species

a) Introduction

Most of the descriptive information regarding the Chiwawa LSR can be found within the Chiwawa Late-Successional Reserve Initial Assessment (USFS 1996). However, this initial assessment only addressed the portions of the LSR that were affected by the 1994 Tyee fire. Therefore, some vegetation types were not covered and some species not addressed over the entire LSR. This information is provided in this section. The remainder of the vegetation types and species specific information can be found in the Initial Assessment.

b) Late Successional Species By Vegetation Type

The only vegetation group that was not addressed within the Chiwawa LSR initial assessment was the Wet Forest Group. Historically fire occurred relatively infrequently (refer to Chapter III) allowing for succession to result in complex forest structures such as high crown closure, multilayering, and high numbers of snags and down logs. These conditions provide habitat for about 54 wildlife species associated with the late-successional conditions of these forests.

The wildlife species that are associated with the late-successional conditions of these forests and are of special status include: northern goshawk, bald eagle, northern spotted owl, great gray owl, flammulated owl, pileated woodpecker, downy woodpecker, hairy woodpecker, white-headed woodpecker, black-backed woodpecker, three-toed woodpecker, red-breasted sapsucker, Williamsons sapsucker, northern flicker, ruffed grouse, little willow flycatcher, olive-sided flycatcher, red-breasted nuthatch, pygmy nuthatch, tailed frog, spotted frog, Cascades frog, larch mountain salamander, warty jumping slug, blue-gray tailed dropper, Columbia pebblesnail, long-legged myotis, long-eared myotis, fringed myotis, Yuma myotis, silver-haired bat, western big-eared bat, pallid bat, elk, lynx, marten and fisher.

The Wet Forest Group is capable of providing structure that composes suitable spotted owl nesting, roosting, and foraging habitat while remaining within the range of natural variability. Currently there are seven activity centers that are located within the Moist Grand Fir or Wet Forest Group vegetation types. This is 41% of the total activity centers within the Chiwawa LSR.

c) Species Specific Information

The information presented in this section provides an overview of what is known about the species of special status identified in Appendix 27.

d) Endangered Or Threatened Wildlife Species

There are five wildlife species and one Critical Habitat Unit that are federally listed as threatened or endangered and could occur within the Chiwawa LSR. These include the bald eagle (*Haliaeetus leucocephalus*), peregrine falcon (*Falco peregrinus*), northern spotted owl (*Strix occidentalis caurina*), grizzly bear, (*Ursus arctos*), gray wolf (*Canis lupus*), and designated Critical Habitat for northern spotted owl.

(1) Bald Eagle and Peregrine Falcon

The bald eagle is known to occur within the Chiwawa LSR, an occupied nesting territory is adjacent to this LSR. Winter roosts are observed along the Wenatchee River, and may occur along the lower Chiwawa River. About 10% of their available habitat has been surveyed. The upper portion of the Chiwawa LSR has cliffs that would be suitable for peregrine falcon nesting. It is unknown if the peregrine falcon is present in the LSR and only about 10% of their habitat has been surveyed.

(2) Northern Spotted Owl

The Chiwawa LSR is one of the “big three” spotted owl population cluster/source center LSR’s. They are designed to act as a source population for spotted owls, so they can disperse into adjacent smaller LSR/MLSAs. These cluster sources must be large enough to hold multiple breeding pairs, and to support juveniles, subadults and “floaters”. Spotted owl populations must be capable of acting as sources of surplus owls for the species’ metapopulation. Local populations might cease to act as sources if they are too small or if they occupy highly fragmented habitat (Thomas et al 1990, FSEIS App G-7 to 8, 1994). It is crucial for these large LSRs to provide for stable or improving habitat conditions as they are expected to act as sources of surplus owls for the species’ recovery, yet allowing more flexibility in smaller LSRs. For these areas to function as source centers, at least 20 pairs of spotted owls should be managed for.

Nineteen spotted owl activity centers occur within the Chiwawa LSR and about 50% of their habitat has been surveyed. There is 49,489 acres (46%) of suitable nesting/roosting/foraging habitat within the LSR. The Chiwawa LSR is capable of having 81,300 acres or 76%, in suitable spotted owl habitat. A summary of the amount of habitat within a 1.8 mile radius of the activity centers can be found in Appendix 15. Currently, 14 (74%) of the activity centers are below threshold level for habitat available within a 1.8 mile radius, two (10%) is at the threshold level, and three (16%) are at optimum habitat levels. Three of the spotted owl sites below threshold were severely burned by the Tyee fire in 1994, (SO506, SO509, SO510), they will need to be monitored for site validity.

Table I-2, Spotted Owl Status and Habitat Information for the Chiwawa LSR

Spotted owl	Status ³	Ownership ⁴	Dry or Wet Owl ⁵	Threshold ⁶	Critical Habitat Unit (CHU)	Forest Interior ⁸	Suitable Spotted Owl ¹⁰ Habitat	Total Dispersal Habitat ⁹
*SO506	PY	FS	Dry	Below Threshold	WA-6		* 552	2,450
*SO509	PY	FS	Dry	Below Threshold	WA-6		* 640	2,402
*SO510	PY	FS	Wet	Below Threshold	WA-6		* 1,232	1,091
SO 512	RS	FS	Wet	At Threshold	WA-6	Inside	3311	802
SO 514	RS	FS	Dry	Below Threshold	WA-6		3034	489
SO604	P	FS	Wet	Optimum	WA-6	NEAR	4,836	1,051
SO605	PY	FS	Wet	Below Threshold	WA-6		4,311	1,471
SO621	PY	FS	Wet	Optimum	WA-6		4,456	1,635
SO627	PY	FS	Dry	Below Threshold	WA-6		1,675	1,763
SO630	PY	FS	Dry	Optimum	WA-6	NEAR	4,519	492
SO633	PY	FS	Dry	At Threshold	WA-6	INSIDE	3,448	1,009
SO634	RS	FS	Dry	Below Threshold	WA-6	NEAR	2,484	1,864
SO638	P	FS	Wet	Below Threshold	WA-6	NEAR	3,124	1,167
SO645	P	FS	Wet	Below Threshold	WA-6		1,715	1,385
SO649	PY	FS	Wet	Below Threshold	WA-6		2,969	1,312
SO708	PY	FS	Dry	Below Threshold	WA-6		1,434	3,275
SO714	PY	FS	Dry	Below Threshold	WA-6 ⁷		1,326	3,053
SO731	PY	FS	Dry	Below Threshold	WA-6 ⁷		1,650	2,649

Spotted owl	Status ³	Ownership ⁴	Dry or Wet Owl ⁵	Threshold ⁶	Critical Habitat Unit (CHU)	Forest Interior? ⁸	Suitable Spotted Owl Habitat ¹⁰	Total Dispersal Habitat ⁹
SO749	PY	PVT	Dry	Below Threshold	WA-6 ⁷		1,695	1,594

¹ Near the LSR or MLSA but not inside the LSR or MLSA.

² Spotted owl site overlaps with other LSR/MLSA.

³ RS = Residential Single; P = Pair; PY = Pair with Young, based on highest occupancy.

⁴ FS = Forest Service; PVT = Private Ownership (ownership at activity center).

⁵ If the majority of suitable spotted owl habitat in .7 mile circle is dry or mesic, then it is a dry spotted owl. If the majority is wet, then it is a wet spotted owl.

⁶ **Below Threshold:** < 2,663 total suitable spotted owl habitat acres in 1.8 mile circle or < 500 total suitable spotted owl habitat acres in 0.7 mile circle.

At Threshold: 2,663-3,994 total suitable spotted owl habitat acres in 1.8 mile circle.

Optimum: > 3,994 total suitable spotted owl habitat acres in 1.8 mile circle.

⁷ The activity center is within 1/2 mile of the CHU.

⁸ **Inside** = activity center is at least 600' inside (forest interior) late successional habitat.

Near = activity center is inside late successional habitat near forest interior.

⁹ Habitat within 1.8 mile circle around activity center. Dry dispersal habitat includes vegetation codes 11, 13, and 52; mesic includes code 21; and wet includes codes 31, 35, 61, and 41.

¹⁰ Dry suitable spotted owl habitat includes vegetation code 12 where size/structure is multistory greater than 9" DBH; mesic includes code 22; and wet includes codes 32, 36, 62, 64, and 42.

¹¹ A larger circle will be needed if there is less than 100 acres of suitable habitat

e) Critical Habitat Unit for Northern Spotted Owls

The Chiwawa CHU WA-6 overlaps into 75% of the Chiwawa LSR, there are 80,809 acres of critical habitat within the Chiwawa LSR. This CHU should support a cluster of 21+ spotted owl pairs, by providing essential nesting, roosting, foraging and dispersal habitat. It is the only 20 pair conservation area on the north half of the Forest. Much of the habitat in the central portion of the unit is highly roaded and fragmented, and may take some time to fully recover to a suitable condition. This CHU provides essential breeding habitat connectivity with Glacier Peak Wilderness and other CHU's important for the range wide distribution of spotted owl habitat within the north eastern edge of the range.

In all LSR/MLSAs, except the Swauk LSR, Shady Pass LSR, Deadhorse LSR, Boundary Butte LSR, Tumwater MLSA and Sand MLSA, these reserves are predicted to provide the needs for spotted owl recovery over time (50+ years). The Chiwawa LSR and the Manastash LSR are predicted to be sustainable from fire over time. The LSR/MLSA reserve network will also provide the function the CHUs were designated for. Coupled with the LSR/MLSA management, riparian reserve function, Wilderness areas, and Unmapped LSRs, the needs of the spotted owl will be met. These reserves function for connectivity and spotted owl home ranges. It is concluded that the LSR/MLSAs meet the function of the CHU system, as intended in the NWFP (NWFP C-9). Monitoring and maintaining connections, as well as meeting LSR goals will be ongoing.

- (1) Grizzly Bear and Gray Wolf

The grizzly bear is suspected to occur within the Chiwawa LSR. The gray wolf is known to occur, a gray wolf pack was observed 12 miles west of the LSR. About 30% of grizzly bear and gray wolf habitat has been surveyed. This LSR lies within the North Cascades grizzly bear Recovery Zone.

(2) Marbled Murrelet

There is no marbled murrelet habitat on the Chiwawa LSR.

f) Sensitive And Candidate Wildlife Species

There are 15 wildlife species that are on the R6 Sensitive species list or are listed as federal candidate species and could or do occur within the Chiwawa LSR. These include the goshawk (*Accipiter gentilis*), willow flycatcher (*Empidonax trailii*), olive-sided flycatcher (*Contopus borealis*), tailed frog (*Ascaphus trueii*), spotted frog (*Rana pretiosa*), Cascades frog (*Rana cascadae*), Columbia pebblesnail (*Fluminicola columbiana*), long-legged myotis (*Myotis volans*), long-eared myotis (*Myotis evotis*), fringed myotis (*Myotis thysanoides*), Yuma myotis (*Myotis yumanensis*), western big-eared bat (*Plecotus townsendii*), lynx (*Lynx canadensis*), fisher (*Martes pennanti*), and marten (*Martes americana*). See Amphibian Population Status maps in the Appendix 10 of the "Forest-Wide LSR/MLSA Assessment document".

(1) Birds

There are numerous goshawk nests throughout the Chiwawa. About 20% of their habitat has been surveyed.

(2) Amphibians

Surveys for the tailed frog, spotted frog and Cascades frog have been conducted over about 10% of their habitat within the LSR. The tailed frog and Cascades frog are known to occur and the spotted frog is suspected to occur within this LSR. See amphibian Population Status maps in Appendix.

(3) Mollusks

It is unknown if the Columbia pebblesnail occurs within the LSR and no surveys have been completed.

(4) Mammals

Surveys for the long-legged, long-eared, fringed and Yuma myotis have been completed over about 5% of their habitat within the Chiwawa LSR. No surveys have been conducted for the western big-eared bat. The long-legged and long-eared myotis are suspected to occur in the LSR. It is unknown if the fringed myotis and western big-eared bat occur within the LSR. The only one of these sensitive bat species known to occur in this LSR is the Yuma myotis.

Surveys for the lynx and wolverine have been conducted over about 10% of their habitat and surveys for the fisher have covered about 30% of their habitat. All three of these species are known to occur within this LSR.

g) Management Indicator Species

There are 13 wildlife species that are identified as Management Indicator Species and occur within the Chiwawa LSR. These include the pileated woodpecker (*Dryocopus pileatus*), downy woodpecker (*Picoides pubescens*), hairy woodpecker (*Picoides villosus*), three-toed woodpecker (*Picoides tridactylus*), red-breasted sapsucker (*Sphyrapicus ruber*), Williamson's sapsucker (*Sphyrapicus thryroideus*), northern flicker (*Colaptes auratus*), ruffed grouse (*Bonasa umbellus*), mule deer

(*Odocoileus hemionus*), elk (*Cervus elephus*), mountain goats (*Oreamnos americanus*), beaver (*Castor canadensis*), and marten (*Martes americana*).

(1) Primary Cavity Excavators

The pileated woodpecker, downy woodpecker, hairy woodpecker, three-toed woodpecker, and northern flicker are all known to occur within the Chiwawa LSR. The red-breasted sapsucker and Williamson's sapsucker are suspected to occur within the LSR. Surveys for the pileated woodpecker, downy woodpecker, hairy woodpecker and three-toed woodpecker have been completed on about 5% of their habitat within the LSR. No surveys have been completed for the remaining MIS primary cavity excavators.

(2) Ruffed Grouse and Beaver

The ruffed grouse and beaver are both known to occur within the Chiwawa LSR. About 5% of the habitat has been surveyed for the ruffed grouse and 10% for the beaver.

(3) Mule Deer, Elk and Mountain Goats

The mule deer, elk and mountain goats are all known to occur within the Chiwawa LSR. All of the habitat for mule deer and elk has been surveyed and about 70% of the habitat for mountain goats has been surveyed.

(4) Marten

Marten are known to occur and about 30% of their habitat has been surveyed within the Chiwawa LSR.

h) Survey And Manage, Protection And Buffer Species

There are twelve wildlife species that are specific survey and manage or protection and buffer species that do or could occur within the Chiwawa LSR. These include the larch mountain salamander (*Plethodon larselli*), great gray owl (*Strix nebulosa*), flammulated owl (*Otis flammeolus*), white-headed woodpecker (*Picoides albolarvatus*), black-backed woodpecker (*Picoides arcticus*), pygmy nuthatch (*Sitta pygmaea*), silver-haired bat (*Lasionycteris noctivagans*), pallid bat (*Antrozous pallidus*), warty jumping slug (*Hemphillia glandulosa*), blue-gray tail-dropper (*Prophysaon coeruleum*), papillose tail-dropper (*Prophysaon dubium*), and Washington dusky snail (*Lyogyrus* n. sp. 2).

(1) Birds

No surveys for the great gray owl have been completed, however, they are known to occur. The flammulated owl and pygmy nuthatch are suspected to occur and no surveys have been completed. The white-headed woodpecker and black-backed woodpecker are known to occur and surveys have been completed over about 5% of their habitat.

(2) Mammals

There are seven mammals that are Survey and Manage or Protect and Buffer, that may occur in the Chiwawa: silver-haired bat and pallid bat have not been covered in above Sensitive Species section. The other five are long-legged, long-eared, fringed, and Yuma myotis (bats), and lynx. Surveys for bats cover 10% of the Chiwawa LSR. The silver-haired bat is known to occur in the LSR, the others are suspected to occur within the Chiwawa LSR.

(3) Mollusks

The warty jumping slug is suspected to occur, and the blue-gray tail-dropper and papillose tail-dropper are both unknown in the Chiwawa LSR. The Washington Dusky Snail is known to occur adjacent to the LSR in Fish Lake. Surveys for the warty jumping slug and blue-gray tail-dropper have been completed on about 5% of their habitat and no surveys have been conducted for the papillose tail-dropper.

(4) Amphibians

No surveys for the larch mountain salamander have been completed and they are suspected to occur within the Chiwawa LSR.

3. Aquatic

The majority of the land within the Chiwawa LSR contains portions of 13 fish production units (subwatershed's). These subwatershed's are Headwaters Chiwawa, Upper Chiwawa, Middle Chiwawa, Lower Chiwawa, Raging, Chikamin, Rock, Beaver, Upper Chumstick-Little Chumstick, Lower Mad, Middle Mad, Upper Mad, Headwaters Mad. In Chiwawa LSR 14,074 acres (13%) of 107,044 acres are estimated to be within the Riparian Reserve. The average annual precipitation in Chiwawa LSR ranges between 20 and 80 inches. The "Land Type Associations" within the LSR show some variety, they are described as having high sediment response and poor hydraulic regulation or high fine sediment response and soil moisture stress. Others have been described as having well regulated hydraulic and high sediment response or poorly regulated hydraulic response. The Chiwawa is fairly unique on the forest having floodplain response in some areas

The Chiwawa has not been designated as a key watershed. The major streams that drain from Chiwawa LSR are Chiwawa, Chumstick, Mad, Rock and Chikamin Creeks.

4. Human Uses

a) Historic and Current Land Uses

American Indians have used the Chiwawa LSR seasonally to hunt, fish and dig gather roots.

Mining and prospecting have occurred in this area since the mid- to late 1800's. The first large scale mining operation occurred when the mining camp at Trinity was founded in the 1920's and 1930's. Although considerable investment was poured into Trinity it was unable to produce commercial quantities of ore and was soon abandoned.

Some grazing use occurred early in this century however it was not as extensive as in other locations on the forest, most likely due to the lack of suitable, open ridgetops with forage. A limited amount of grazing use continues to the present time.

Some logging activities began in the 1950's however most of the logging activities occurred between 1960 and 1990:

b) Recreation

The Chiwawa drainage is quite popular with people who are seeking more of a rustic, remote type of experience.

(1) Campgrounds

Table I-3, Campgrounds - Number of Units and Use Levels for the Chiwawa LSR

Campground	No. of Units	Use Levels
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Campground	No. of Units	Use Levels
Alder Creek Horse Camp	1	Low
Goose Creek Campground	25	Moderate
Deer Camp	3	Low
Grouse Creek (reservation site)	N/A	Moderate-High
Meadow Creek	4	Low
Riverbend	5	Moderate
Finner	3	Moderate
Rock Creek	3	Moderate
Chiwawa Horse Camp	20	Moderate
Schaefer Creek	7	Moderate
Atkinson Flat	6	Moderate
Alpine Meadows	4	Moderate
19 Mile	4	Moderate
Phelps Creek	7	Moderate
Phelps Creek Horse Camp	4	Recently Constructed

(2) Dispersed Camping

Camping at undeveloped sites in the drainage is very popular. A number of sites are located in the Chiwawa River valley bottom, adjacent to the road and/or Chiwawa River. As with many other locations throughout the Forest, dispersed camping in more remote locations occurs during hunting season.

(3) Trails

There are many miles of trails in the LSR. Some trails provide access to the Glacier Peak Wilderness, some are non-motorized trails designed to serve hikers, bikers and equestrians for day use and some trails are open to motorized.

(4) Other Recreation Uses

The Chiwawa (#6200) and Sugarloaf (#5200) roads are popular with sightseers. The Chiwawa road receives moderate traffic while the Sugarloaf road (a more primitive road) receives a lower level of traffic.

(5) Winter Use

The Chiwawa and Mad River drainages receives very heavy snowmobile use. There are several snowparks located near the emergency airfield, state park, and Fish Lake providing access to the drainage. The Forest Service, with state funding, grooms the Chiwawa River road to Trinity. In addition a number of other roads are groomed up toward Pole Ridge and Maverick Saddle area. Although dependent upon the snow cover, the snowmobiling season extends from early December to late March.

c) Minerals

Although the area had a history of mining, very little mining is underway today. A small pumice mine up the Chikamin drainage extracts pumice, however production is quite low and may, depending upon the market, be non-existent in some years. Exploratory work for gold and silver in the Chikamin drainage has been underway for about five years however no discoveries have been made to pay for further development.

d) Social and Economic Considerations

This area has been valued for the wood products produced and for its recreational/scenic values.

Whidbey Naval Air Station conducts approximately 6 flights per day year around over this area with various jet aircraft. These flights take place between 200 and 1500 feet above ground level during daylight hours.

B. Analysis Between the LSR

1. Sustainability

The sustainability of LSR's/MLSA's across the forest is displayed in Table 19. The Chiwawa LSR falls in the lower 1/2 of all LSR's/MLSA's in terms of the amount of at risk vegetation which puts it in the upper 1/2 in terms of overall sustainability. Chiwawa has a large amount of at risk vegetation, however, due to its larger size the percentage related to the whole is smaller. In addition, over 20,000 acres of at risk vegetation within the LSR burned in the 1994 fires. An important consideration in terms of sustainability is the relationship of the Chiwawa LSR compared to its' neighboring LSR's/MLSA's. Two LSR's, (Shady Pass and Slide Peak) and 3 MLSA's (Twin Lakes, Natapoc and Eagle Creek) are, for the purposes of this analysis, considered to be neighbors. The following table shows the acres at risk and the ignition risk determined in the forest-wide sustainability analysis for the Chiwawa and its five neighboring LSR's/MLSA's.

Table I-4, Sustainability for the Chiwawa LSR (Acreage and Percent at Risk)

LSR/MLSA	LSR/MLSA at Risk		LS Forest at Risk		Ignition Risk
	Acres	Pct.	Acres	Pct.	
Chiwawa	29,042	27%	21,345	38%	Moderate
Shady Pass	31,142	41%	31,044	69%	Moderate
Slide Peak	341	21%	341	100%	High
Twin Lakes	0	0%	0	0%	Moderate
Natapoc	849	79%	670	100%	High
Eagle Creek	3,501	66%	3,163	100%	High

The factor driving this analysis, looking at sustainability issues between LSR's/MLSA's, is the amount and location of at risk vegetation between the Chiwawa and its five neighbors. In other words, linkages in at risk vegetation that would facilitate the spread of fire from one LSR/MLSA to the other. Review of maps of at risk vegetation reveals that there are significant amounts of at risk vegetation between the Chiwawa and both the Eagle Creek and Natapoc MLSA's. Nearly all of the at risk vegetation that linked Shady Pass and Slide Peak to the Chiwawa was burned in the 1994 Tye fire. There is no at risk vegetation between Twin Lake and the Chiwawa.

In the case of Eagle Creek and Natapoc, this creates a situation where fire burning within or between any of these LSR/MLSA's presents a risk to the others. The potential for a fire occurring with resultant effects on the Chiwawa and one or both of these at one time is very high, similar to what happened with Shady Pass and Slide Peak in 1994 when the Tye Fire, which started from an ignition point 6-8 miles away, burned large portions of the "at risk" vegetation between and within these LSR's."

a) Implications

1. Reduce stand density in dense dry successional advanced vegetation types (types 12 and 22) where they exist between the Chiwawa and both Eagle Creek and Natapoc MLSA's. Of highest priority are those areas that also involve private land or urban interface issues in the Plain and Chumstick valleys.

Potential Projects - Commercial Thinning

2. Encourage private land owners in these areas to take similar density management action on private forested areas.

Potential Projects - Communicate need to local landowners.

3. Reduce fuel loadings along roads that exist between these LSR's to increase the roads effectiveness as fuel-breaks.

Potential Projects - Piling of down fuels, firewood gathering, pruning to reduce vertical fuel concentrations (all vegetation types), construction of shaded fuel-breaks.

4. Improve and maintain the BPA powerline as a fuel-break between the Chiwawa and Eagle Creek and the Chiwawa and Natapoc.

Potential Projects - Plant or encourage growth of less flammable deciduous vegetation within the powerline corridor, remove dead fuels from corridor.

5. Reduce fuel loadings in young stands.

Potential Projects - Precommercial thinning.

2. Forest-wide Northern Spotted Owl

The following is the discussion and results of the Forest-wide Spotted Owl Module for the Chiwawa LSR. See appendix for order, explanations and process of modules.

The Chiwawa LSR is one of the "big three" LSR's, which is important as sources for spotted owl distribution throughout the North Cascades province. Being that it is on the far northeastern edge of the range of the spotted owl, the Chiwawa LSR is important for range-wide distribution. It is the only large population cluster/source center on the north half of the Wenatchee National Forest. Much of the habitat in the central and south portions of the LSR are highly roaded and fragmented, which may take time to fully recover suitable spotted owl habitat. This LSR provides essential breeding habitat connectivity with the Glacier Peak Wilderness and Little Wenatchee LSR to the north/west, Shady Pass LSR to the northeast, and Deadhorse LSR/Natapoc MLSA to the south/southwest, and Eagle MLSA to the south. Further east is beyond the range of the northern spotted owl.

There is 49,489 acres (46%) of nesting, roosting and foraging habitat for spotted owls in this LSR, this is one of the highest amounts of suitable spotted owl habitat on the Forest LSR/MLSA's. It also has one of the highest amount of potential N/R/F habitat (81,567 acres), as well as sustainable habitat potential (wet, moist, high elevation).

For these large LSR's to function as source populations, at least 20 pairs of owls should be managed for (see Table 33 "Spotted Owl Pair Goals for 'Big e' LSR's" below). Currently there are 19 spotted owl activity centers within the Chiwawa LSR. Early historical reports of spotted owls show they have been part of these ecosystems at least since 1941 in the Lake Wenatchee area (Condor 1946). The current 19 activity centers include 16 spotted owl pairs. However, as a result of the Tyee fire in 1994, 3 pair sites (SO506, SO509 and SO510) were severely burned, and may not continue to function as a home range. In addition, 4 other sites were affected by the burn, and acreage dropped below threshold

(SO627, SO634, SO638 and SO645). (See the following table and suitable spotted owl habitat and activity center map.).

Table I-5, Connectivity Between LSRs: Spotted Owl Pair Goals for Large Source Center LSRs and CHUs.

Source Center LSR	S.Owl Pairs --1994, FSEIS Appendix G, Table G-3	Highest Occupancy and Reproductive Status, for Field Seasons -- 1995 & 1996		Number of Owl Pairs CHU Should Support, as per USFWS - CHU discussion.	
Chiwawa RW 135	11 Pairs + 1 Res Single	16 Pairs + 3 Res Singles	18 + 1 ¹ (7 Sites [*])	21+ Pairs	WA-6
Swauk RW 129	15 Pairs + 1 Res Single	22 Pairs + 2 Res Singles	23 sites + 2 sites ¹	20+ Pairs	WA-12
Manastash RW 125	13 Pairs	31 Pairs + 2 Res Singles	30 + 5 ¹ 11 Sites ²	20+ Pairs	WA-14 (20+ Pairs) & WA-34 (1+ Pairs)
Greenwater/White River LSR 149 - Mount Baker- Snoqualmie NF	25 Pairs	unk	unk	28 pairs	WA-34
Clear Fork/Cowlitz LSR - 152 Gifford Pinchot NF	23 Pairs + 1 Res Single	unk	unk	25+ pairs	WA-

1 Spotted owl activity center within 1/4 mile of LSR/MLSA boundary.

*S.owl activity center may have been lost, due to 1994 Chelan Forest Fires, monitoring still underway.

² Spotted owl activity center on Private Land

Connectivity is essential within spotted owl home ranges, between home ranges, between LSR's/MLSA's and throughout the provinces and the range of the northern spotted owl. The ability of spotted owls to disperse to adjacent LSR/MLSA's is of particular importance, as this LSR is intended to act as a source for these other areas. It is unknown if the fires of 1994 created dispersal barriers, especially within and adjacent to the Chiwawa LSR.

The existing nesting/roosting/foraging habitat can support 18 plus owl pairs. Over time the potential forested habitat can recover and support 30 plus pairs of owl. However much of this habitat is in the dry and mesic forest types and not sustainable. The sustainable habitat (wetter forest types) are modelled to determine support of 24 pairs of owls over time. This will be a shift from drier habitat to wetter habitat. The 20 plus owl pair goal is predicted to be sustained. (See following table)

Table I-6, Spotted Owl Habitat, Potential Habitat, and Sustainable Habitat in Large Source Center LSRs

LSR or MLSA	1996 Known Pairs & Singles	CHU S. Owl Pair Goals	Existing Suitable Spotted Owl Habitat			Potential SSOH			Sustainable SSOH			% Forest Interior
			Acres	Thres hold Pairs	Target Pairs	Acres	Thres hold Pairs	Target Pairs	Acres	Thres hold Pairs	Target Pairs	
Chiwawa RW 135	18 + 1 ¹ (7 Sites*)	21+ Pairs	49489	18.6 Pairs	12.4 Pairs	81567	30.6 Pairs	20.4 Pairs	65205	24.5 Pairs	16.3 Pairs	24%
Swauk RW 129	23 sites +2 site ¹	20+ Pr	45675	17.2 Pairs	11.4 Pairs	73792	27.7 Pairs	18.5 Pairs	39452	14.8 Pairs	9.9 Pairs	12%
Manastash RW 125	30 + 5 ¹ (11 Site ²) Much Pvt Lnd	20+ Pr	68147	25.6 Pairs	17.1 Pairs	92577	34.8 Pairs	23.2 Pairs	88893	33.4 Pairs	22.3 Pairs	7%

¹ Spotted owl activity center within 1/4 mile of LSR/MLSA boundary.

*S.owl activity center may have been lost, due to 1994 Chelan Forest Fires, monitoring still underway.

² Spotted owl activity center on Private Land.

Spotted owl dispersal habitat is necessary to provide immigration and between the network sites across the range. Wilderness areas have been integrated with the LSR network to provide late successional forests. Specific to spotted owls, wilderness protects populations and nesting/roosting/foraging habitat (ROD pg. 19, NWFP App 3-4 pg. 240, 1994). The Chiwawa adjoins the Glacier Peak Wilderness on the north/northwest, which provides long term connectivity. Though the GPW is naturally fragmented by high elevation rocks and glaciers, the forested component around those high points provides connectivity to other LSR's, especially to the west side of the Cascades.

The four nearest LSR/MLSA's were evaluated to determine their potential for dispersal to occur. This analysis showed that spotted owls could likely disperse to the Shady Pass LSR, Twin Lakes MLSA, Deadhorse LSR/Natapoc MLSA, and Eagle MLSA, as well as into the Glacier Peak Wilderness and the Little Wenatchee LSR to the west.

Habitat providing dispersal/Connectivity corridors between LSR's (outside LSR/MLSA's) include: Glacier Peak Wilderness; Twin Lakes; lower Beaver Creek; Cromwell/Moon Canyon/Clark Canyon; Upper Tommy Creek; Whistling Pig Creek; 3-Creeks; and Pomas Creek, (see Forest Interior map).

a) Restoration Opportunities And Potential Projects

1. Meet goals of LSR for 21 pairs of spotted owls.
2. Improve and accelerate N/R/F habitat, to maintain high number of spotted owl pairs. Current habitat is 49,489 acres, potential to increase to 81,567 acres..
3. Aggressive protection of remaining suitable spotted owl habitat, from outside LSR on Matrix lands, Meadow Creek and Van Creek..
4. Monitor/maintain connectivity outside LSR at Glacier Peak Wilderness, Twin Lakes, Beaver Creek, Cromwell, Upper Tommy Creek, Whistling Pig Creek, 3-Creeks, and Pomas Creek.
5. Monitor spotted owl activity centers, 500 acre core and home ranges of owls affected by Tyee fire.

3. Connectivity (plant & animal)

a) Plant Connectivity

Connectivity can be addressed at several spatial scales when assessing an individual LSR. Connectivity of the LSR/MLSA network on the Wenatchee National Forest has been addressed above in the section title "Species with Special Status." Connectivity specific to the Chiwawa LSR for vascular plants is analyzed here. Refer to the Forest-wide Assessment discussions for connectivity description for lichens, bryophytes, and fungi.

First, connectivity relative to the Chiwawa LSR can be viewed from how well habitat is connected to surrounding LSR's or MLSA's. Species associated with the dry forest vegetation group are dependent on vegetation between the Chiwawa LSR and Shady Pass and Slide Peak LSR's, and Twin Lakes, Natapoc, and Eagle Creek MLSA's for connectivity for all dispersal classes. The one exception is that species with high dispersal capability are connected with the Natapoc MLSA. The dry forest vegetation group is absent from the Twin Lakes MLSA, so there is no connectivity.

Relative to species associated with the moist grand fir vegetation group, connectivity only exist with the Twin Lakes MLSA. Connectivity to Shady Pass and Slide Peak LSR's and Natapoc and Eagle Creek MLSA's is either absent or there is no connectivity because of the great distances.

There is connectivity for the subalpine fir series between the Chiwawa and the Shady Pass LSR, but this series absent from Natapoc and Eagle Creek MLSA's. Connectivity in this series between the Chiwawa and Slide Peak LSR's is dependent on vegetation in between for all dispersal classes.

Species associated with the wet forest group are connected to the Twin Lakes MLSA for all dispersal classes. Also, there is connectivity with the Shady Pass LSR for species with high and moderate dispersal abilities, but low dispersal species are dependent on vegetation in between. This forest group is absent from the Slide Peak LSR and Natapoc and Eagle Creek MLSA's.

Although whitebark pine is present in the Chiwawa LSR, this vegetation type is absent from the surrounding LSR's or MLSA's, so no connectivity exists.

No projects were identified to improve connectivity of habitat's between LSR's or MLSA's. Disconnectivity identified in this analysis results from inherent breaks in the vegetative landscape

b) Wildlife Connectivity

The following are the results of applying the forest wide connectivity module to the Chiwawa LSR (refer to the Dispersion Index in Appendix A). A total of four potential linkages were evaluated for this LSR. These included Chiwawa to Shady Pass LSR,

Chiwawa to Eagle Creek MLSA, Chiwawa to Twin Lakes MLSA, and Chiwawa to Deadhorse LSR.

Table I-7, Dispersal Indices for the Chiwawa Forest Wide Connectivity Module.

Linkage	Distance (MI)	Low	Moderate	High	Index
Ch/Shady Pass	1.6	No	Yes	Yes	3
Ch/Eagle Creek	1.9	No	Yes	Yes	2
Ch/Twin Lakes	0	No	Yes	Yes	2
Ch/Deadhorse	1.6	No	Yes	Yes	2
Overall Rating					2.2

c) Restoration Opportunities

It is recommended that a more site specific analysis be conducted to verify if the linkage between Chiwawa and Shady Pass provides for low mobility species, and if Chiwawa and Twin Lakes has the potential to provide for low mobility species. Clear cuts within the linkage between Chiwawa and Twin Lakes could be a potential dispersal barrier for low mobility species. Habitat development in these areas could be evaluated and potential restoration opportunities, such as stand density management, identified. These activities could provide additional connectivity for the low mobility species.

C. Analysis Within LSR/MLSA

1. Unique Habitat and Species

The following is the discussion and results of the Unique Habitat and Species module for the Chiwawa LSR. See appendix for order, explanations and process of modules.

a) Forest-wide Overview of Unique Habitats and Species: Chiwawa LSR.

The Chiwawa LSR, over all, is high in unique habitats and species. The northern portion is in an area noted for a distribution center for species of rarity and endemism overlap for plants and animals, “the North Cascades Spine”, (Columbia Basin Ecosystem Management Project, 1995). The remainder of the LSR is in an area for plant rarity and endemism (the Wenatchee Mountains). The Wenatchee NF plan noted the Hornet Ridge Potential Botanical Area for protection of park-like stands of ponderosa pine, containing old growth dependent animal and plants. It is less than 3 miles from the Fish Lake Bog RNA, for floating bog plant communities. Glacier Peak Wilderness is to the north and west, with many unique plant and animal species found within that wilderness.

It has one of the highest amounts of riparian reserves, open water, talus, cliffs, meadows, wet meadows, and shrubs compared to all the other LSR/MLSA’s on the Forest (see Table 30 “Unique Habitats and Species” for all LSR/MLSA’s). It also has the second highest amount of known special

wildlife species, 61 species, (the Tieton LSR has the highest) and the second highest amount of known special plant species, 70 species (Little Wenatchee LSR has the highest).

From a Forest perspective, the Chiwawa LSR has forest groupings different than any where else in the Forest, in the bottom lands of the Chiwawa valley. There is an east-west vegetative transition zone running through the LSR. Species of disjunct Pacific yew occur throughout the wetter half of the LSR. Small stands of western hemlock occur on benches and north aspects in the dryer half of the LSR. Ponderosa pine is found at high elevations. The once champion subalpine larch was found in Carne Basin within the LSR, however it has since been struck by lightning and is down.

Forest interior habitats are under-represented in the wetter portion of the LSR, due to modeling limitations. However, for LSR's across the Forest, this LSR has one of the highest amounts of forest interior habitat in the high elevations, wetter forest and the dry forest. Recent burns from Tyee 1994, and the smaller 1990 fires provide variety of snag concentrations within the LSR. Overall, the Chiwawa has moderate quality snags.

American Indian food gathering and other material collections would be moderate to high for the Forest. The huckleberry fields are well noted through historical records as being used by these early people. Salmon, deer, mountain goats are also plentiful in this LSR. Important sites, such as vision quest, early camp sites, and travel/trade routes are within the Chiwawa LSR.

b) Unique Habitats and Species Within : Chiwawa LSR

Each LSR/MLSA can be evaluated for biodiversity, connectivity and function (see Function of Unique Habitats in the main body of the Forest-wide Assessment). As part of the analysis past management activities effect the function of unique habitats and species. For the Chiwawa LSR these include: total open road density of 1.9 miles per square mile; security habitat of 36%; roads and trails in riparian reserves of 3.14 miles per square mile; and past harvest activities of 20% in the LSR. The following describe abundance, connectivity and function for unique habitats and species.

(1) Abundance and Ecological Diversity

Compared to all the other LSR's, the Chiwawa is the second highest in providing high amounts of acreage and wide variety of plant communities and environments. This includes acreage for unique plant and animal habitats, juxtaposition of habitats, availability of wilderness or areas of rarity, and known observations from the plant and animal species list. The Little Wenatchee LSR is higher.

(2) Connectivity for Unique Habitats and Species

The Chiwawa has the second highest quality of providing high connectivity in a landscape pattern for biological flow to sustain unique animal and plant communities. This includes the amount, percent and number of patches of late successional habitat, forest interior habitat patches, and the juxtaposition of wilderness and areas of rarity. The Manastash LSR is the highest.

(3) Process and Function of Unique Habitats and Species

The Chiwawa is again the second highest at providing quality functioning for unique species and habitat. This includes development and maintenance of unique ecosystems, including ecological values for unique species and populations. The plant and animal species list for known observations makes up a large part of this analysis, as well as proximity to wilderness and areas of rarity, which sustain habitat function.

Identified areas of high abundance, connectivity and function for unique habitats and species in the Chiwawa LSR are:

1. McCall Mountain to Maple Creek: Cliffs, Talus, wet lands, meadows, shrubs, forest interior, whitebark pine/subalpine larch, deciduous and GPW.
2. Willow Creek to Chipmunk Creek: Forest interior, whitebark pine/subalpine larch, meadows, talus, cliffs, riparian reserves, shrubs, late successional forest, GPW.
3. Upper Chikamin/Marble Creek/Garland Peak: Wetlands, riparian reserves, talus, forest interior, whitebark pine/Subalpine larch, meadows, wet meadows, shrubs, PETS spp, Glacier Peak Wilderness.
4. Cougar Creek area: Talus, wetlands, meadows, PETS spp, forest interior, riparian reserves, late successional forest.
5. Ghiwawa Valley Bottomland: Grouse Creek to Buck Creek. Major wetlands, salmon, late successional forest, forest interior, PETS species, GPW.
6. Upper Goose to Maverick Saddle: Forest interior, late successional forest, talus, cliffs, riparian reserves, shrubs, natural openings, PETS species.
7. Rock Creek: Forest interior, late successional forest, riparian reserves, natural openings, PETS species, GPW.
8. Hornet Ridge: Natural opening, ponderosa pine old growth, PETS spp, riparian reserves.
9. Morrow Meadows to Grouse Creek: Meadows, wetlands, riparian reserves, shrubs.
10. Lower Beaver Creek: Riparian reserves, forest interior, wetlands, natural openings.

The following is a summary of the Unique Habitats and Species Module. For more information see Unique Habitats Map and Tables, Forest Interior Map and Tables, Riparian Reserves and Roading Map and Tables.

c) Unique Habitats And Species Module

Landscape Analysis:

- Within Bioregion Center Of Species Rarity and Endemism
For Plants and Animals in North, and For Plants in South,
- Includes Hornet Ridge Potential Botanical Area.

Micro-site Analysis:

RIPARIAN RESERVES 13% of LSR

Streams, Rivers, Wet Meadows,
Seeps, Lakes.

NON-FORESTED VEG 4% of LSR

Talus/Cliffs 1%, Shrubs 1%, Subalpine
Mdws 1%, Natural Openings, Deciduous.

SURVEY & MANAGE

PROTECTION & BUFFER

Lynx, Great Gray Owl,
Fungi, Lichens, Plants
Larch Mt. Salamander?,
Black-backed & White-headed woodpecker,
Flammulated Owl, Silver-haired Bat.

UNIQUE FORESTS

Forest Interior Patches 10%,
Whitebark Pine 2%,
Pacific Yew, Whitebark pine,
Dry Forests, Disjunct Cedar.
Snags/Logs Moderate Quality

PETS/MIS/Traditional Use Sites

PETS - Wolverine, Gray Wolf, Goshawk, Spotted Owl, Bald Eagle, Fisher, Harlequin Duck, Yuma Myotis, Tailed Frog, Cascade Frog, Olive-sided Flycatcher.

Illiamna longesepela, Carex bauxbaumii, Orbanche pinoram, Botrychium spp, CYFA.

MIS - Mountain Goat, Mule Deer, Pileated Woodpecker, Marten, Ruffed Grouse, Beaver, Elk.

Traditional Use Sites - Huckleberry gathering, Vision Quests on Talus Ridges.

d) Restoration Opportunities And Potential Projects for Unique Habitats and Species:

1. Reduce road and trail densities in riparian reserves, from 3.14 mi/sq/mi..
2. Reduce open road densities throughout the LSR, from 1.9 mi/sq. mi..
3. Increase amount of security habitat from 36%.
4. Increase and accelerate late successional habitat and forest interior habitat. Thin to accelerate old growth.
5. Reduce roads and trails in unique habitats (meadows, talus, wetlands, etc.).
6. Reduce noxious weed spread in meadows and natural openings.
7. Reduce roads in forest interior patches
8. Protect large trees and screen near talus, cliffs, caves, meadows.
9. Reduce encroaching trees in subalpine meadows.
10. Prescribed habitat burns in Whitebark pine Garland Pk.
11. Prescribed fire in ponderosa pine Hornet Ridge.
12. Reduce Fragmentation of Wet Forest.
13. Protect riparian from grazing.
14. Provide American Indian site access.
15. Maintain black-backed woodpecker nesting/roosting/foraging habitat.
16. Meet high end snag levels.
17. Create log den sites in low quality roaded/forest for marten, fisher, lynx.
18. Balance lynx prey/travel/denning habitat.
19. Protect/maintain/enhance/monitor PETS.
20. Prescribed fire in natural openings as part of fire climax.
21. Interpret values and protection/maintenance of unique habitats and species.
22. Aquire non-Forest System lands with high degree of unique species or habitat.

e) Snag/Log/Green Tree Recruitment

The following is the discussion and results of the Snag/Log/Green Tree Recruitment sub-set module of the Unique Habitats module for the Chiwawa LSR. See appendix for order, explanations and process of modules. Overall the Chiwawa LSR has a medium quality for snags. Snag quality can be judged by a continual supply of tree structure in various stages of decay, size and species. This can be best provided in the moist and wet vegetation groups, areas with large amounts of late-successional habitat, areas with little fragmentation, areas with high amounts of forest interior, and areas with high functioning riparian reserves. (See Appendix 38, "Snag/Downed Logs/Green Tree Recruitment Analysis" in the Forest-wide Assessment).

Table I-8, Snag Habitat Quality/Landscape Scale, Chiwawa LSR

<u>HIGH QUALITY</u>	<u>MEDIUM QUALITY</u>	<u>LOW QUALITY</u>
Moist & Wet Veg Groups 49%	Subalpine Fir & Mesic Veg 19%	Dry & Whitebark Veg 25%
>60% LS (non-dry) Habitat	15% - 60% LS Habitat 42%	<15% LS Habitat
80% - 100% LS (all) Habitat	40% - 80% LS/M Habitat 62%	<40% LS/M Habitat
> 30% Forest Interior (non-dry)	15% -29% Forest Interior Non-dry	<15% Forest Interior ND 10%
>10% Forest Interior Dry	5% - 9% Forest Interior Dry	< 5% Forest Interior Dry 2%
>16% in Riparian Reserves	10% to 16% in Riparian Reserves 13%	<10% in Rip Res
0 Mi/Sq Mi Any Rds in Rip Res	0 to 1 Mi/Sq Mi Rds in Rip Res	> 1 Mi/Sq Mi Rd Rip Res 3.14 mi/sq/mi
< 1 Mi/Sq Mi Open Roads	1 Mi to 2.5 Mi/Sq Mi Roads 1.9 mi/sq/mi	> 2.5 Mi/Sq Mi Roads
>70% Security Habitat	50% to 70% Security Habitat	<50% Security Habitat 36%
>10% in Past Burns 22%		<10% in Past Burns
>50% Insect/Pathogens	25% - 50% Insect/Pathogens (see Insect/Disease Write Up)	< 25% Insect/Pathogens
<10% Past CC Harvest	11% - 25% Past CC Harvest	>25% Past CC Harvest

5%?		
<10% Past PC Harvest	11% - 50% Past PC Harvest 15%	>50% Past PC Harvest

f) Restoration Opportunities And Potential Projects For Snags/Logs

Reduce roads in riparian reserves; Reduce Roads in Forest Interior Patches
 Retain Snags at High End of Range; Incorporate Healthy Insect/Disease Levels,
 Complete snag analysis on 40 acre grid

g) Plant Species with Special Status

Five sensitive species and four survey and manage species (two of which are sensitive species) were identified to occur within the Chiwawa LSR. There are no immediate viability concerns associated with any of the above mentioned species. Consequently, the Species with Special Status Module would recommend monitoring these species and subsequent development of a Conservation Strategy for each species.

Although there are no immediate viability concerns for the species identified in this section, it should be noted that the *Botrychium* species populations are some of the largest in the state of Washington. One species, *B. paradoxum*, is known only from a few scattered locations, and so the populations within the Chiwawa LSR are important to maintain species viability throughout its range. It is recommended that monitoring projects be developed and implemented and that a conservation strategy be developed in cooperation with other national forests and the Washington State Natural Heritage Program.

2. Connectivity (Plant & Animal)

a) Plant Connectivity

Connectivity can also be addressed by qualitatively describing the connectedness of habitats within the LSR. The most noteworthy example involves habitat for *Botrychium* spp. found in the Valley Bottom Mixed Conifer vegetation group. As noted above, created openings within this forest group exist and are in the vicinity of known populations of *Botrychium* species. These openings are thought to effect (or have effected) connectivity for these species. Projects that would encourage the development of a forest environment in this locations would improve connectivity for *Botrychium* species. Richy

b) Wildlife Connectivity

The following is a result of applying the “within LSR/MLSA connectivity assessment process” to the Chiwawa LSR.

Table I-9, Wildlife Connectivity Within Chiwawa LSR

Connect Var.	Dry	Mesic	MGF	Wet	SAF LPP	WBP/SAL	Overall
%LS or FC	LS=M,	M	L	H	L	L	M

Connect Var.	Dry	Mesic	MGF	Wet	SAF LPP	WBP/ SAL	Overall
	FC=L						
Open Road Density	L	L	M	M	M	M	M
Security Habitat	L	L	M	M	M	L	M
Inter. Forest Rds	L	L	L	L	L	L	L
%Inter. Forest	L	L	L	L	L	L	L

(1) Restoration Opportunities

The current open road density is 1.90 mi./sq.mi. and the level of security habitat is 36%. The within LSR connectivity could be improved by identifying roads that could be closed. Consideration should be given to revegetating closed roads to provide for dispersal of low mobility species.

Additional restoration opportunities to improve habitat connectivity within the Chiwawa LSR could include acquisition of the Alder Creek and Chikamin Flats land parcels.

Within the Dry Forests, fuels reduction and prescribed fire could be used to enhance the connectivity of the fire-climax ponderosa pine habitats. This would need to be completed in close coordination with spotted owl habitat needs as the Chiwawa LSR is one of the "big three" and is designed to provide a "source" for spotted owls into other LSR/MLSAs.

Within the Mesic, Moist Grand Fir and Wet Forest groups tree density management of sites identified as created opening or single layered could be used to promote the development of late-successional conditions.

(2) Habitat Effectiveness

Habitat effectiveness within the Chiwawa LSR was assessed using the current open road density and the amount of security habitat. The current open road density is 1.9 mi./sq.mi. and the current level of security habitat is 36%. Based upon these variables, the current level of habitat effectiveness for these species is "low to moderate". The habitat effectiveness for late-successional species could be greatly improved through the reduction of open road densities and an increase in the levels of security habitat. This could be accomplished during access and travel management planning.

3. Disturbance, Risk Analysis

Twenty-five percent of the Chiwawa LSR is in the dry forest group; of that, over half is successional-advanced.

The lower portion of the Chiwawa LSR below Grouse Creek is heavily roaded and much of this area has been harvested in the past. This amounts to about 25 percent of the LSR being harvested, with both partial cutting and clear cutting. There are 15 developed campgrounds within the LSR; recreational use is heavy, including some motorized trails. Heavy recreational use increases the potential for human-ignited fires.

The Chiwawa River is a wide meandering river that would effectively halt the spread of low and moderate severity fires; spotting from wind-driven crowning fires has the potential of spreading fires across this natural barrier. The river itself is a disturbance agent within this LSR, albeit one that frequently increases floral and faunal diversity by providing a variety of habitats along its banks. Because the river meanders within a wide floodplain, many successional stages will be present within the riparian zone.

Within harvested areas are pockets of root disease, some quite extensive. The primary root diseases active in the Chiwawa LSR include annosus root disease and laminated root rot; trees infected by these pathogens are frequently attacked and killed by fir engraver beetles. Mortality from this insect is increasing throughout the lower two thirds of this LSR.

The following information on insect activity in the Chiwawa LSR is from data collected during the aerial surveys conducted by Region 6 Insect and Disease Group. The extent of outbreaks prior to 1980 are not known; activity from 1980 to 1994 is reported only if more than 100 acres or 100 trees are affected in a single area. In most instances, the reported activity since 1980 includes multiple incidences of 100 acre/100 tree events.

- Western pine beetle: 1958-59, 1963, 1965, 1975, 1978, 1986 (heavy), 1990
- Mountain pine beetle (lodgepole pine): 1950-52, 1954-58, 1960-63, 1965, 1975, 1978, 1982, 1984-86, 1988-89 (heavy), 1990, 1993-94
- Mountain pine beetle (w. white pine): 1953, 1955-63, 1965, 1968-74, 1972-74, 1976-79, 1980-81 (heavy), 1982-93
- Mountain pine beetle (whitebark pine): 1988, 1994
- Mountain pine beetle (ponderosa pine): 1960, 1976, 1978, 1987, 1989
- Douglas-fir beetle: 1954, 1959-63, 1965, 1968, 1970; 1976, 1979
- Fir engraver: 1954-55, 1960, 1962-63, 1978-79, 1981, 1985-87, 1988-91 (very heavy), 1993
- Spruce beetle: 1955, 1965, 1986, 1988, 1989-91
- Western spruce budworm: 1972-77, 1985 (heavy)
- Blackheaded budworm: 1985 (extensive)
- Sawfly.(true fir): 1950
- Balsam woolly adelgid: 1985. 1990

Insect activity within this LSR is extremely high. Some of this is because insects and pathogens have always been important disturbance agents within the moist grand fir forests and the wet forest groups that make up much of the Chiwawa LSR. Severity and extent have increased in the last three decades, and are very likely a result of drought stress and increased competition from trees that established following fire exclusion within and surrounding the LSR. Insect activity in the LSR is helping to speed successional trajectories by selectively eliminating seral species such as western white, lodgepole, whitebark, and ponderosa pine. Western white pine mortality associated with white pine blister rust and subsequent attack by mountain pine beetles is very high in this LSR. Whitebark pine is undergoing the same scenario in upper elevation forests. Fir engraver activity tends to produce snags and logs in small size classes. Following a pulse of heavy mortality from fir engravers, risk for catastrophic fires increases for several years because of the vertically-connected, highly flammable fine fuels in the twigs and branches of affected trees.

Table I-10, Disturbance Matrix, Chiwawa LSR

Ve g Ty pe	Fire	Dwarf Mistleto e DF	Root disease			WP BR	WSB	DFB	FE	MPB	Tota l
			AROS	HEAN	PHWE						
10	L	M	M	M	M	-	L	L	L	-	L
11	M	M	M	M	M	-	M	L	M	-	M
12	H	M	M	M	M	-	H	H	H	-	H
13	H	M	M	M	M	-	H	M	H	-	H
20	M	M	M	M	M	-	L	L	L	-	M
21	M	M	M	M	M	-	L	M	M	-	M
22	H	H	M	M	M	-	M	H	H	-	H
30	L	M	L	M	M	H	L	L	L	-	M
31	L	M	L	M	M	H	L	L	M	-	M
32	H	H	L	M	M	H	M	M	M	-	H
33	H	H	M	H	M	H	M	M	M	-	H
40	L	L	L	L	L	H	L	L	L	-	L
41	M	L	L	L	L	H	L	L	L	M	M
42	H	L	L	L	L	H	L	M	M	-	H
43	L	-	L	L	L	H	L	L	L	-	L
44	L	-	L	L	L	M	L	L	L	-	L
50	L	L	L	L	L	M	L	L	L	M	L
51	M	L	L	L	L	M	L	L	L	-	L
52	H	L	L	L	L	M	L	L	L	-	M
60	L	L	L	L	M	H	L	L	L	-	L
61	L	L	L	L	M	H	L	L	L	-	L
62	M	L	L	M	M	H	L	M	M	-	M
63	L	-	L	L	L	H	L	L	L	-	L
65	L	L	L	L	M	H	L	L	L	-	L

Ve g Ty pe	Fire	Dwarf Mistleto e DF	Root disease			WP BR	WSB	DFB	FE	MPB	Tota l
			AROS	HEAN	PHWE						
71	M	-	L	L	L	H	-	L	L	M	L
80	L	-	L	L	L	-	-	L	L	-	L

Key to Column Headings: PP = Ponderosa Pine, DF = Douglas-fir, WL = Western Larch, PIPO = Ponderosa Pine; PSME = Douglas-fir; LAOC = Western Larch; AROS = Armillaria root disease; HEAN = Annosus root disease; PHWE = Laminated Root Disease, WPBR = White Pine Blister Rust; WSB = Western Spruce Budworm; DFB = Douglas-fir Beetle; FE = Fir Engraver, MPB = Mountain Pine Beetle; WPB = Western Pine Beetle.

Key to Letters “-” = no risk = 0; “L” = low risk, “M” = moderate risk, “H” = high risk

Thirty-five percent of the Chiwawa LSR has a high composite risk to disturbances. Areas at risk include the dense, dry forest types, the partially-harvested dry forests, the mesic sites within dry forest, layered mature and partially-harvested moist grand fir, and the layered subalpine fir forests. The moist grand fir and subalpine fir types are at risk because of their adjacency to drier forests and because insect and pathogen activity has elevated fuel loads and vertical and horizontal fuel connectivity within these vegetation types.

This LSR is a major population center for the northern spotted owl; therefore management options must take into account that protecting and enhancing habitat for this species is the primary goal. The Tye Fire (1994) destroyed or modified some of the suitable spotted owl habitat within the LSR; an important objective is to replace lost habitat as rapidly as possible within other areas of the LSR.

Management within this LSR will also focus on protecting existing spotted owl habitat around all activity centers. Management activities will primarily take place in non-spotted owl habitat within spotted owl circles or outside existing spotted owl circles. Management objectives to reduce risk of further habitat loss include creating or maintaining fuelbreaks within low elevation dry forest types east of Fish Lake.

In moist grand fir and wet forest types, suitable habitat will be enhanced by increasing vertical structure in single-layered stands, by thinning from below to increase diameters of dominant trees, and by reforesting created openings with a diverse mixture of species.

4. Northern Spotted Owl

The following is the discussion and results of the within LSR Spotted Owl Module for the Chiwawa LSR. This module reviews the home range sites for spotted owls, as well as connectivity within the LSR. See appendix for order, explanations and process of modules. See Suitable Spotted Owl/Dispersal Habitat and Activity Center map and tables, Forest Interior Map and tables, Riparian Reserve map and tables and Security Habitat map and tables.

a) Suitable Spotted Owl Habitat

The Chiwawa LSR has 49,489 acres (46%) of nesting/roosting/foraging habitat, of that 7,598 acres are in the dry vegetation type and have a low chance of sustainability. There is a potential for the LSR to have 81,567 acres (76%) in suitable habitat, of that approximately 67,000 acres could sustain spotted owls over time. The most contiguous (sustainable) suitable spotted owl habitat in the LSR is

between Grouse Creek and Phelps Creek. Between Chikamin Creek and Second Creek there are extensive past clear cuts, that currently fragment habitat. There are also large clear cuts and shelterwood cuts on DNR sections in Alder Creek, Miners Ridge, and upper Chumstick. This same condition occurs on private land in Dry Creek and Miners Ridge. To meet the recovery goals for the spotted owl, there is a need to increase/accelerate spotted owl habitat, especially accelerating old plantations.

This LSR/MLSA is part of the reserves that are predicted to provide the needs for spotted owl recovery over time (50+ years). Coupled with the LSR/MLSA management, riparian reserve function, Wilderness areas, and Unmapped LSRs, the needs of the spotted owl will be met. The reserves function for connectivity and spotted owl home ranges. With the exception of a few LSR/MLSAs that are not sustainable, it is concluded that the LSR/MLSA reserves on the Wenatchee National Forest meet the function of the CHU system, as intended in the NWFP (NWFP C-9). Monitoring and maintaining connections, as well as meeting LSR goals will be ongoing. (See Appendix 1, "Forest-wide Spotted Owl Module" and "Individual LSR/MLSA Spotted Owl Module")

b) Spotted Owl Home Ranges

The Chiwawa is one the "big 3" LSR's, which will manage owls over risk. Owl home ranges will have a target of optimal habitat per owl pair, to assist recovery of the species. Currently for the Forest, that amount of acreage is 3,994 acres within a 1.8 miles radius, or 60% of the home range. The goal for recovery of the owl, is 20+ pairs of owls in the Chiwawa LSR. There are a total of 19 spotted owl activity centers. This includes 16 pairs of owls (3 sites severely burned during the Tye Fire of 1994), and 3 residential single sites. This LSR has 13 of the 19 sites below threshold, the other 6 sites are at or above threshold. Four owl sites are at target amounts over 3,994 acres: SO 604 Chikamin Trail; SO 605 Chikamin Road; SO621 Rock Creek; and SO630 Grouse Creek.

There are 11 dry owl sites, making this a partial risk for long term sustainability in the dry forests, if the wetter forests are not allowed to recover. There is great potential to restore sustainable habitat in the wetter forest groups for long-term population viability. There is also a need to protect existing habitat and home ranges, especially in sites below threshold and target acreages. Overtime, it is expected that higher quality and more sustainable habitat will be restored to the western portion of this LSR. The drier forests will eventually be managed for other late-successional species, after the northern spotted owl population has recovered.

Status Individual Spotted Owl Home Ranges and Restoration Opportunities

Spotted owl	1.8 mile Circle Around Activity Center				0.7 mile Circle Around Activity Center				.33 mile Circle Around Activity Center ¹¹				Restoration
	Dry	Mesic	Wet	Total	Dry	Mesic	Wet	Total	Dry	Mesic	Wet	Total	
SO506	476	0	75	552	55	0	0	55	13	0	0	13	mpa
SO509	339	0	301	640	59	0	1	60	33	0	0	33	mpa
SO510	426	0	805	1,232	5	0	58	63	0	0	0	0	mpa

Spotted owl	1.8 mile Circle Around Activity Center				0.7 mile Circle Around Activity Center				.33 mile Circle Around Activity Center ¹¹				Restoration
	Dry	Mesic	Wet	Total	Dry	Mesic	Wet	Total	Dry	Mesic	Wet	Total	
SO512	x	x	xx	3,311		x	xx	553		x	xx	unk	ma
SO514	x	x		3,034	xx			unk				unk	mpa
SO604	80	0	4,757	4,836	0	0	894	894	0	0	191	191	m
SO605	417	0	3,894	4,311	42	0	451	492	0	0	82	82	ma
SO621	0	0	4,456	4,456	0	0	573	573	0	0	68	68	m
SO627	428	348	899	1,675	132	167	114	412	48	17	44	109	mpa
SO630	1,632	0	2,888	4,519	477	0	155	632	102	0	63	166	m
SO633	1,209	0	2,239	3,448	257	0	249	506	56	0	51	107	map
SO634	1,227	0	1,257	2,484	493	0	0	493	147	0	0	147	mpa
SO638	376	0	2,748	3,124	96	0	224	320	62	0	32	94	mpa
SO645	276	252	1,186	1,715	4	123	130	257	0	47	0	47	mpa
SO649	786	0	2,183	2,969	64	0	200	263	22	0	51	73	mpa
SO708	725	441	268	1,434	9	187	0	196	0	52	0	52	mpa
SO714	1,010	148	168	1,326	172	0	0	172	52	0	0	52	mpa
SO731	1,219	394	37	1,650	125	115	0	240	36	0	0	36	mpa
SO749	1,682	12	0	1,695	289	0	0	289	69	0	0	69	mpa

¹ Near the LSR or MLSA but not inside the LSR or MLSA.² Spotted owl site overlaps with other LSR/MLSA.

³ RS = Residential Single; P = Pair; PY = Pair with Young, based on highest occupancy.

⁴ FS = Forest Service; PVT = Private Ownership (ownership at activity center).

⁵ If the majority of suitable spotted owl habitat in .7 mile circle is dry or mesic, then it is a dry spotted owl. If the majority is wet, then it is a wet spotted owl.

⁶ **Below Threshold:** < 2,663 total suitable spotted owl habitat acres in 1.8 mile circle or < 500 total suitable spotted owl habitat acres in 0.7 mile circle.

At Threshold: 2,663-3,994 total suitable spotted owl habitat acres in 1.8 mile circle.

Optimum: > 3,994 total suitable spotted owl habitat acres in 1.8 mile circle.

⁷ The activity center is within 1/2 mile of the CHU.

⁸ **Inside** = activity center is at least 600' inside (forest interior) late successional habitat.

Near = activity center is inside late successional habitat near forest interior.

⁹ Habitat within 1.8 mile circle around activity center. Dry dispersal habitat includes vegetation codes 11, 13, and 52; mesic includes code 21; and wet includes codes 31, 35, 61, and 41.

¹⁰ Dry suitable spotted owl habitat includes vegetation code 12 where size/structure is multistory greater than 9" DBH; mesic includes code 22; and wet includes codes 32, 36, 62, 64, and 42.

¹¹ A larger circle will be needed if there is less than 100 acres of suitable habitat

Restoration Opportunities: "m" Monitor site; "a" Accelerate habitat around site and home range; "p" Protect what nesting/roosting/foraging habitat exists.

c) Spotted Owl Dispersal And Connectivity

During dispersal, nesting, roosting, foraging habitat is used, as well as habitat of lower quality (dispersal habitat). Dispersal habitat includes single story stands, and smaller trees with at least 40% crown closure. Dispersal habitat within the LSR is 32,642 acres (30%) and will grow up to be nesting/roosting/foraging habitat. Habitat providing dispersal/Connectivity corridors within the Chiwawa LSR include: Cougar Creek, Jimmy Creek to Berg Creek, Maverick Saddle to upper Goose Creek, Chikamin Creek, Willow Creek, Rock Creek, from Grouse Creek west to Phelps Creek, Beaver Creek, and Chumstick Creek to Dry Creek to Second Creek (see Forest Interior map and Suitable Spotted Owl Habitat Map).

The function of dispersal/connectivity habitat for spotted owls depends on the amount and juxtaposition of late-successional, forest interior, and dispersal habitat. The Chiwawa has 42% in late-successional wetter forest habitat, this needs to increase. There is good amount of forest interior habitat, it's location is disrupted as a result of the Tyee fire, this should be improved as a high priority. There is a high amount of forest interior, dry habitat, which currently provides good connectivity for spotted owls, but over time is not sustainable. Roading effects connectivity, in that fragmentation usually occurs along roads, and snag reductions for road maintenance cumulatively effects habitat overtime. The Chiwawa has a moderate amount of roads overall (1.9 miles per square mile). However, the Initial LSR Assessment found high amounts of roads in: Lower Mad (4.91 mi./sq. mi.); Beaver Creek (3.9 mi./sq. mi.); Lower Chiwawa (3.8 mi./sq. mi.); and Middle Mad (3.42 mi./sq. mi.).

Outside the LSR/MLSA network, dispersal habitat is found in all land allocations, and will be provided mainly in Riparian Reserves, in Unmapped LSR's in Matrix and in AMAs, and in wilderness areas (NWFP 1994, Ch 3-4 pg. 240-241).

d) Restoration Opportunities And Potential Projects

1. Meet goals of LSR for 21 pairs of spotted owls.

2. Improve and accelerate N/R/F habitat, to maintain high number of spotted owl pairs. Current habitat is 49,489 acres, potential to increase to 81,567 acres.
 - Clear cuts in wet/moist vegetation groups predicted to be habitat in 100 years.
 - Pole sized stands in wet/moist will be habitat in 50 years.
 - Clear cuts in mesic/dry vegetation groups will be habitat in 120 years.
 - Pole sized stands in mesic/dry will be habitat in 70 years.
3. Aggressive protection of remaining suitable spotted owl habitat, from fires originating outside LSR, on Matrix lands, Meadow Creek and Van Creek..
4. Protect spotted owl home ranges within LSR, between owl circles, by implementing risk reduction on first on non-suitable habitat, then on Dry and Mesic habitat:
 - Twin Creeks to Goose Creek.
 - Clear Creek to Miners Creek (if owls did not relocate to these sites, as result of Tyee burn).
 - Lower Chikamin.
5. Fuels reduction and hazard reduction occur outside N/R/F habitat in short term, shift emphasis in 50 years. Accept more risk from fire, manage at high end of spotted owl habitat DC. Spotted owl habitat maintained at 60% of home range in "big 3 LSR's, 500 Acre core area protected, 100 acre activity center protected.
6. Monitor/maintain connectivity outside LSR at Glacier Peak Wilderness, Twin Lakes, Beaver Creek, Cromwell, Upper Tommy Creek, Whistling Pig Creek, 3-Creeks, and Pomas Creek.
7. Acquire DNR sections at Alder Creek and upper Chumstick (for spotted owl N/R/F habitat) and on Miners Ridge.(for great gray owl, lynx, and connectivity habitat). Acquire lands in Chikamin Flats (connectivity and risk reduction) and Phelps Creek (connectivity to Wilderness).
8. Monitor spotted owl activity centers, 500 acre core and home ranges of owls affected by Tyee fire: SO506*, SO509*, SO510*, SO512, SO514, SO627*, SO634, SO638*, SO645*, and SO649*. (* Acres below Threshold highest priority.)
9. Monitor spotted owl activity centers, 500 acre core and home ranges of owls below threshold (see list).
10. Field verify habitat within 500 acre home ranges of spotted owl sites below threshold in that core, but above threshold in the home range: SO605, SO 638, SO 649.
11. Increase habitat effectiveness and connectivity by reducing open roads and revegeting road beds. Especially in forest interior habitat patches.
12. Reduce road densities in: Lower Mad (4.91 mi./sqmi); Beaver Creek (3.9 mi./sq. mi.); Lower Chiwawa (3.8 mi./sq. mi.); and Middle Mad (3.42 mi./sq. mi.).
13. Maintain dispersal/connectivity habitat (Cougar Creek, Jimmy Creek to Berg Creek, Maverick Saddle to upper Goose Creek, Chikamin Creek, Willow Creek, Rock Creek, from Grouse Creek west to Phelps Creek, Beaver Creek, and Chumstick Creek to Dry Creek to Second Creek).

5. Aquatic

a) Summary of Aquatic Goals

- Protect salmonid populations and habitat in core areas in the Chiwawa and Mad drainages.
- Prevent increase in water temperature in all drainages. Work to reduce maximum summer temperatures in the Mad River drainage.
- Minimize fine sediment input.
- Monitor streams within the Tye Fire area for changes in temperature and sediment.
- Rehabilitate riparian reserves within the Tye Fire area.
- Reduce groundwater to surface water conversion by roads.
- Evaluate road surfacing and maintenance with an emphasis on reducing sediment input.
- Reduce or avoid increase in riparian roads.
- Manage upslope vegetation, roads and activities to increase base flows, and to avoid increase in peak flows in the basins.
- Preserve and restore all floodplain, side channel, and riparian wetland habitat, especially in C and E channel types in the Chiwawa drainage.
- Protect and inventory upslope wetlands and ponds.
- Restore natural disturbance regimes (landslides, fire, flood, disease) as practicable.
- Discourage the spread of brook trout.
- Gather more information on non-salmonid aquatic biota.

b) Key Issues

1. Core fish areas have been identified within and downstream of Chiwawa LSR. The Chiwawa drainage is a core area for spring Chinook salmon and bull trout. The Mad River drainage, within the Tye Fire area, has core areas for bull trout, spring Chinook, and cutthroat trout.
2. Federal candidate species and other species of concern: bull trout populations in the Chiwawa and Mad could be impacted by LSR management activities.
3. Anadromous salmonid populations occur within and below Chiwawa LSR. Anadromous salmonids within the LSR include: steelhead, early-run (spring) Chinook salmon. Summer/Fall Chinook salmon are known absent.

Concerns include the low anadromous fish populations which are severely reduced from historic levels, within-population genetic and life-history diversity, condition of physical habitat and condition of water quality for incubation, rearing, over-wintering, migration, and spawning. Direct human interaction or harvest of individuals may potentially reducing fitness of the spawning population. All life stages are probably vulnerable to impacts that are caused by management actions.

4. Resident salmonids. Redband/native rainbow trout occur throughout the LSR. Cutthroat trout occur in both the Chumstick and Mad drainages.

Concerns include maintaining existing populations, protecting against habitat degradation, over-harvest, and non-natives.

5. Introduced species. Eastern Brook trout are found in the Chiwawa drainage.

Brook trout can have a deleterious genetic impact on bull trout, and may impact other natives through competition for food or habitat. Habitat changes or other management that would favor brook trout over native species, or would encourage the spread of brook trout, should be avoided.

6. Non-salmonid aquatic biota: We have little data for other aquatic biota in the area. Mountain White Fish and Sculpins (*Cottus* sp.) utilize stream with the LSR.

Several sightings have been recorded for aquatic mollusks within or adjacent to the LSR area. Five species of mollusk have been found. They are *Pisidium*, *Spaerium*, *Valvata*, *Promenetas exacuous*, *Menetus operculus*. They were found near Big Meadow Creek in 1993, Fish Lake bog or Windy Creek in 1995. No systematic surveys for mollusks have been undertaken in this LSR.

7. Water temperature Water temperature information for the Chiwawa drainage is not currently available. Maximum temperatures recorded between 1989 and 1994 for the Mad River drainage recorded the temperature to be between 65 and 69.9 degrees F.

Managing for lower water temperatures in the LSR could include managing summer low flows, and/or groundwater - surface water partitioning. This could be accomplished by managing riparian and upslope vegetation, soils and roads.

8. Fine sediment. An increase in sediment load is often the most important adverse effect of forest management activities on streams. Large increases in the amount of sediment delivered to the stream channel can greatly impair, or even eliminate, fish and aquatic invertebrate habitat, and alter the structure and width of the stream banks and adjacent riparian zone. Sediment levels are a concern because they can cause failure of redds; increased suspended sediments will reduce the penetration of light and can reduce primary production, increase heat absorption, delay initiation of bedload transport.

Bedload is the material transported downstream by sliding, rolling, or bouncing along the channel bottom. Bedload is an important component of the total sediment load of a stream; it can determine the amount of micro habitat available for juvenile fish and invertebrates. Large amounts of easily transported bedload tend to fill in pools and reduce the larger-scale features that are important habitat. In general the courser material provides more habitat space, where as fine sediments tend to fill up the interstitial spaces between larger particles.

There are several causes of sediment entering streams: roading, recreation, human settlements, timber harvest, fire, grazing, mass wasting and mining. Opportunities for all eight types of sediment input exits within or upstream from the LSR. No fine sediment data is available within Chiwawa LSR.

Sediment transport. The headwaters of the drainage systems within the Chiwawa LSR lie primarily in a region of sediment input and transport; within the Chiwawa LSR exists a floodplain areas that act as a region of sediment deposition. Sediment levels of concern occur in the Chiwawa. The sediment sampling period is limited, so it may be premature to draw conclusions at this time. The data shows an indication of a trend toward increasing fine sediment input in the Chiwawa River originating from the glacial moraine landtype. The Chiwawa River was sampled in 1993 and 1994. Fine sediments in the upper and lower reaches were recorded as between 8 and 11%. the middle Chiwawa reach increased in the second year of sample from 12-17% to >20% on average, samples were from 12-35%. The previous year's sample ranged between 6 and 25%.

Fine sediment data has not been collected in the Mad River.

9. Channel complexity. Channel complexity has implications for fish habitat and for the hydrologic regime (hydraulic retentivity). Components of channel complexity include: large woody debris (LWD), pool abundance, pool type, pool depth, width depth ratio, substrate diversity, sinuosity, cover, undercut banks, bank vegetation, riparian vegetation, roughness coefficient, hydraulic retentivity, riparian wetlands, side channels, high flow refugia, and floodplain connectivity.

LWD plays key roles in stream bed and stream bank stability, fines/gravel retention, sinuosity, pool formation, side channel creation, nutrient retention (e.g. deciduous leaves, salmon carcasses), and nutrient input. Single pieces function differently from interwoven masses of LWD known as complexes.

Input mechanisms: small scale riparian disturbances to large scale hillslope disturbances. Management can impact aquatic LWD regimes in a number of ways including: removal from channel; removal from floodplain (down and/or potential); alteration of floodplain area or of frequency of "small" floods; removal from hillslope; or alteration of disturbance regimes controlling input (landslides, avalanches, fire, flood, disease).

Riparian road density is often inversely related to channel complexity. Our information on channel complexity is far from complete; riparian road density and LWD and pool abundance data is available for selected (R6 protocol - surveyed) streams.

10. Aquatic nutrient cycling depends in part on riparian understory vegetation, groundwater /surface water partitioning, in-channel LWD, hydraulic retentivity, pool depth and character, macroinvertebrate community structure, mass wasting disturbance regime, and returning anadromous biomass. We have inadequate data to evaluate aquatic nutrient cycling in Chiwawa LSR at this time; however we can be aware of it when managing any of the above inter-related factors.
11. Landtype. Chiwawa LSR includes landtypes A, B and C. (see the Landtype Association Map) These landtypes are mapped on a gross scale, project level planning may find a need for more precise maps.
12. Channel type. In the absence of human influence, valley shape and geology determine the basic character of the stream channel. A steep boulder torrent, a moderate but continual step - pool - step, a broad meandering river, or a cliff-lined canyon, present different opportunities for aquatic biota. A given organism might require a number of different channel types for different aspects of its life. Various classification systems, such as Rosgen, have been constructed to characterize these differences. Common and fundamental to all systems are: 1) channel gradient, 2) channel confinement (the ability of the stream to move back and forth, or express sinuosity, often quantified as the width of the valley floor relative to the width of the channel), and 3) substrate size (whether the local geology provides huge boulders, moderate cobbles, or only sand and silt to the channel).

Channel type is a fundamental constraint on many other aquatic habitat parameters. The pools found in a steep boulder torrent will be fundamentally different from those in a broad meandering river in abundance, type, and depth. Human influences can alter conditions within a channel type (a meandering river could become shallower, silt filled, and lacking in riparian cover) or the channel type (a deep winding meadow trout stream could become a downcutting gully). If the channel type itself has been altered. It may never be possible to return a stream to its original condition ; however it may be possible to improve the channel condition that moves it toward the characteristics of the original, or at least stabilizes the channel (for example prevent further downcutting).

Channel types vary not only in their natural character (or range of variability of key parameters) but vary also in which human actions they respond to, the degree of their response, and how the response is manifested

An historic/current channel type analysis of Chiwawa LSR needs to be done. As a broad generalization, "A" (high gradient) channel types may present the greatest slope failure concerns, "B" (moderate gradient) channel types may be most stable and most resistant to management impacts and "C" and "E" (low gradient) channel types may be the most sensitive to on-site or upstream management impacts. C and E channel types provide key unique habitat for salmonids and other biota.

Meadows adjacent to C and E channel types may be priority for riparian road removal, human recreation reduction, and reduction in riparian grazing impact.

13. Peak flows The rain on snow floods of 1995/96 caused much damage to human habitat elements. Aquatic habitat for other organisms was improved over all. Some moderate peak flow events are necessary to maintain the substrate and channel conditions required by salmonids and other biota.

Protection of C and E channel meadows, side channels, and other floodplain areas, and careful upslope (vegetation, soil, wetland, road, grazing and recreation) management will help mitigate peak flow impacts on humans.

14. While normal low flows are necessary for salmonids and other biota, extreme low flows can strand organisms, reduce habitat, create passage barriers, reduce water temperatures, and reduce the stream's ability to transport fine sediments. The management factors above that mitigate peak flows will also mitigate low flows.

15. Water Withdrawal

16. Road density. Road density is related to many other issues including fine sediment, mass failures (biotic passage barriers, coarse sediment input, LWD input), effective channel network (increased), hydrograph (peak flows, low flows, water temperature, biotic migration/passage, water/sediment balance, aggradation/degradation), groundwater/surface water partitioning (areas of groundwater upwelling have been documented as key winter thermal refugia for salmonids and may support unique flora/fauna; this is also a water temperature issue). Riparian roads have additional issues of floodplain loss, channel constriction and simplification and human presence (potential harvest, disturbance of spawning, habitat degradation, introduction of non-natives).

Total riparian road density in Riparian Reserves are 3.14 miles per square mile in Chiwawa LSR. The Riparian Reserves are estimated as 14,074 acres (13%) of the 107,044 acres within Chiwawa LSR.

Road management strategies include: 1) relocating riparian roads, 2) reducing the abundance of upslope roads to leave only a well planned core access network, and 3) reducing road-related surface erosion through such actions as frequent maintenance, surfacing, outsloping, drivable dips, seasonal closures cut-and-fill plantings or coverings, and culvert replacement or maintenance. These management actions are predicted to lead to immediate, long-term, widespread "improvements." Allowing the Riparian Reserves to return towards the natural condition of the water/sediment balance, fine sediment abundance, channel complexity, riparian health, and water temperature. Because of a high probability of improvement, and because these are fundamental parameters within which finer scale parameters (such as spawning gravel condition or pool abundance and depth) operate, road repair is generally a management action of high priority, high return, low risk, and nearly universal applicability.

17. Upslope vegetation has profound importance for the yearly streamflow pattern (hydrograph), affecting peak flows, low flows, and total yearly flow, as well as the timing of these flows. Percent canopy closure, or clear-cut acres, are measures often used to address this issue. Human management may have reduced canopy in the watershed (usually through timber harvest) or increased canopy in the watershed (usually through fire exclusion). Overstory canopy may have the greatest effect but understory vegetation, condition of the duff layer, and soil compaction are inter-related and also important, particularly in areas of drier climate. Vegetation, climate (precipitation patterns, rain-on-snow probabilities, and lightning strike patterns), and landtype interact
18. Floodplain connectivity. Historic photos might reveal changes in off-channel habitat, floodplain area and riparian wetland habitat over time. Some of the floodplain area along the Chiwawa is privately owned. Habitat improvement projects on National Forest land.
19. Upslope wetlands and ponds may serve as "islands" and/or refugia for aquatic biota, especially those that do not co-exist with salmonids. They also have important roles in regulating summer base flows in the watershed. We have information regarding wetland locations, but little understanding of alterations in their ecosystem functions over the recent centuries.

As a broad generalization wetlands, especially in late-successional forests may be havens of biodiversity warranting very conservative management until better inventoried and understood.

20. Disturbance Regimes. We have come to recognize that suppression or alteration of natural disturbance regimes can lead to fundamental long-term resource change. This in turn has led to the realization that minimum viable populations or habitats must be large enough to withstand moderate disturbances. A complete description of natural disturbance regimes, their relationship to landtype, climate, and other factors, and their ecosystem roles, is still lacking. Aquatic systems are now seen to depend on disturbance by fire, flood, insect/disease, and landslides for input of the raw materials of channel construction, such as LWD and coarse substrate

The LSR system comprises a set of landscape patches where retention or recreation of primeval conditions is emphasized, allowing the maintenance of wildlife dependent on these conditions. From the aquatic perspective, we consider how this system of reserves and the aquatic corridors that link them can be managed for maximal viability of native aquatic species and the habitat conditions in which they evolved.

Although historic aquatic conditions are not known to the degree desirable this much is clear: many aquatic populations have lost some of their spatial, temporal, and genetic "safeguards;" the nature of the disturbances they experience has changed; individual health/reserves may be reduced (for example salmon enduring longer migration times concurrent with higher temperatures); and habitat conditions have declined in non-random ways, fragmenting populations. The LSR network has the potential to strengthen viability of these at-risk aquatic populations.

6. Noxious Weeds

Six noxious weed species were identified to occur within the Chiwawa LSR. These species are discussed in priority order as identified by the noxious weed analysis module. There are no Class A presently documented from this area. Class B-designate weeds include: *Centaurea diffusa*, *Cytisus scoparius*, and *Chrysanthemum leucanthemum*. Class C species present include *Hypericum perforatum*, *Cynoglossum officinale*, and *Cirsium canadensis*. These species are found along roadsides within the LSR, particularly the main Chiwawa River Road. Following through the noxious weed analysis module, *Cytisus scoparius*, *Cynoglossum officinale*, and *Cirsium canadensis* are limited

in extent and should be controlled or eradicated. The other species are more widespread and containment and prevention of spread should focus on areas of high recreation use such as Grouse Creek Campground, Rock Creek Horse Camp, and Rock Creek, Spider Meadows, Chikamin, and Trinity Trailheads. Harrod (1994) provides a brief synopsis of control methods available and provides recommendation for noxious weed management.

7. Fire Management Plan

a) Overview

This plan is intended to provide guidance for the management of fire in the Chiwawa LSR. It will supplement the Fire Management Plan for the Late Successional Reserve System and will be incorporated into the Fire Management Action Plan for the Wenatchee National Forest.

The disturbance regimes for the vegetation groups have been described in a separate portion of LSR plan. (Section II on Disturbances) The intent of this plan is to provide adequate protection of the reserve which will allow management practices to be initiated to provide for the protection of the Late Successional Associated species and associated unique habitats. These management practices include actions where the role of fire as a disturbance process is important to the management of the reserve.

b) Fire Prevention Actions

The following actions are site specific for the Chiwawa LSR. They are intended to supplement the actions which are outlined in the Fire Prevention Plan which is intended to be implemented on a Forest wide basis.

1. Initiate campfire restrictions as warranted during periods of high fire danger.
2. Emphasize campfire restrictions as warranted during Mule Deer and other hunting seasons.
3. Initiate hazard reduction actions around developed and dispersed recreation sites such as:

Alpine Meadows	River Bend	Maverick Saddle
Trinity	Finner Cr.	Deer Camp
19 Mile	Grouse Cr.	French Corral
Atkenson Flat	Goose Cr.	Miner's Diversion
Schafer Cr.	Deep Cr.	Cougar Cr. Shelter
Rock Cr.	Chikamin Flats	ETC... (Additional sites may be added if overlooked)

4. Emphasize fire prevention activities in the Chiwawa River Drainage .
5. Continue and improve fire prevention signing program on roads and trails included or adjacent to the LSR.
6. Make hunter education, particularly during High Hunt, an emphasis item. Approach this on an interagency basis.
7. Implement road restrictions and closures as warranted during periods of extreme fire danger.

8. Emphasize contact with the following special interest groups: Miners, Local Homeowner's Associations, and owners of private timber land.
9. Work with utilities on hazard management under high voltage power lines.
10. As a hazard reduction measure emphasize fuelwood collection around recreation use sites in the dry forest type.
11. The following actions are proposed to protect the LSR from fires originating outside LSR boundaries.
 - ◆ Maintain and manage existing fuelbreaks.
 - ◆ Utilize cooperative law enforcement agreements to emphasize the inspection of spark arrestors and exhaust systems.
 - ◆ Complete pre-attack planning process for the LSR. Utilize natural fuel breaks when possible.
 - ◆ Emphasize prevention of fires adjacent to the LSR boundary. Work with private landowners and opinion leaders in the community of Plain. Do this on an interagency basis.
 - ◆ Strategic fuel manipulation within and adjacent to LSR boundaries, live and dead, should be included in project design as appropriate.
 - ◆ Emphasize roadside fuel modification in the Beaver Cr. and Chiwawa River drainages.

c) Fire Detection

1. Staffing of Sugarloaf and Alpine Lookouts supplemented by aerial detection after lightning episodes will provide the primary detection resource for this LSR.
2. Emphasize fire reporting procedures with Trinity mine site landowners and occupants.

d) Fire Suppression

1. Spotted owl activity centers are the highest priority for protection of resources (following protection of human life and improvements). All wildfires in the 1.8 mile buffer will be suppressed at minimum acres.
2. Rapid, aggressive initial attack will occur on all dry site ecosystems until vegetation management projects have modified the vegetative condition to where it is in synchrony with inherent disturbance regimes.
3. Develop a prescribed fire management plan for that portion of the LSR north of Estes Butte and adjacent to the Glacier Peak Wilderness. (Ensure the protection of improvements)
4. Ignitions above 5000', northwest of Mad Lakes, along the district boundary between the Entiat RD. and Lake Wenatchee RD., and along the boundary of the Glacier Peak Wilderness near Schafer Lake, will be considered candidate fires and may be managed as prescribed fires after prescribed fire plans are completed.
5. Protection of riparian areas from fires and from disturbance during fire suppression activities is a priority.
6. Improvements will be a priority for protection (recreation facilities, powerlines, Trinity Mine improvements, Sugarloaf Lookout and all guard station facilities).

7. Adjust pre-planned dispatch cards for the LSR. Utilize the following general direction:

- ◆ Use of retardant is appropriate for initial attack.
- ◆ Use of aerially delivered firefighters is appropriate
- ◆ Use of dozers needs district ranger's approval.
- ◆ Use of burning out is appropriate strategy as situation dictates.
- ◆ Escaped Fire Situation Analysis process will be used to guide large fire suppression. Utilize pre-attack plans and materials. These may be prepared in advanced and updated annually prior to the fire season.

e) Vegetation Management

1. Returning dry forest types to sustainable conditions is a priority.
2. Suggested activities include pruning, thinning, commercial, pre-commercial thinning, wood gathering, and prescribed fire.
3. High density, multi-story refugia in mesic sites will be maintained.
4. Prevent the spread of noxious weeds as feasible.
5. Prescribed fire projects in whitebark pine/subalpine larch ecosystems are encouraged to increase amounts of whitebark pine.
6. Maintain a mosaic of age classes and structural conditions across the landscape outside dry forest to support late successional species.

f) Prescribed Fires

1. Prescribed fire opportunities
2. The development and subsequent implementation of Prescribed fire plans should be a priority for this LSR. (See previous notes in this plan)
3. Priorities for the use of Prescribed fire are dry site ecosystems, PIPO, and whitebark pine ecosystems.
4. Priority outcomes include hazard reduction near improved sites and the urban interface.
5. Projects should be of scale/location to enhance landscape-level diversity tied to inherent disturbance regime
6. Projects should attempt to minimize risk of future catastrophic wildfires (those outside the range of inherent disturbance regimes with respect to size and/or severity)

g) Summary:

This plan is presented to provide guidance for fire management for the Chiwawa LSR. It is anticipated that changes in the for of additions and deletions will occur as actions are implemented within the LSR. The continuing increased use of prescribed fire is foreseen as actions are implemented to bring the dry site ecosystems in line with the inherent disturbance regimes.

D. Restoration Opportunity and Potential Project Summary

The following table summarizes the restorations opportunities and potential projects as identified from each module.

Table I-11, Restoration Opportunities and Potential Projects, Chiwawa LSR

Analysis Module	Restoration Opportunity	Potential Projects	Schedule 1
Forest-Wide Sustainability	1) Reduce fuel loading and stocking levels in dense successional advanced dry forest stands where they exist between the Chiwawa and both Eagle and Natapoc LSR/MLSA's.	1) Use commercial thinning, pruning, fuelwood collection and prescribed fire as described in disturbance module treatment key. Favor the development of seral species such as ponderosa pine and western larch. Locate and prescribe sufficient treatments to make landscape level changes in fire susceptibility.	A
	2) Encourage private landowners to take similar density management actions on private forest lands.	2) Communicate need to local landowners.	A
	3) Reduce fuel loadings along roads that exist between these LSR's to increase the roads effectiveness as a fuelbreak.	3) Piling of down fuels, firewood gathering, pruning to reduce vertical fuel continuity, construction of shaded fuelbreaks.	B
	4) Improve and maintain the BPA powerline as a fuelbreak between Chiwawa and Natapoc .	4) Plant or encourage the growth of less flammable deciduous vegetation within the powerline corridor, remove dead fuels from corridor.	C
	5) Reduce fuel loadings in young stands.	Precommercial thinning	C
** Forest-Wide Spotted Owl	1) Meet goals of 20+ pairs of spotted owls.	a) Protect spotted owl home ranges. b) Increase/Accelerate spotted owl habitat within LSR, especially on wet, moist or high elevation large trees.	
	2) Improve and accelerate N/R/F habitat to maintain high number of spotted owls.	a) Rehab and accelerate habitat in areas degraded or lost due to clear cuts, fires or insects. b) Thin of overstocked stands. c) Accelerate existing stands towards old growth, pruning etc.. d) Increase canopy closure.	

Analysis Module	Restoration Opportunity	Potential Projects	Schedule 1
	3) Reduce fuel loading and stocking levels in dense successional advanced dry forest stands where they exist between the Chiwawa and both Eagle and Natapoc LSR/MLSA's	1) Use commercial thinning, pruning, fuelwood collection and prescribed fire as described in disturbance module treatment key. Favor the development of seral species such as ponderosa pine and western larch. Locate and prescribe sufficient treatments to make landscape level changes in fire susceptibility	A
	4) Monitor/maintain connectivity outside LSR in wilderness and in key locations.	Note connectivity provided outside LSR/MLSA and overlap onto riparian reserve, wilderness, etc. Maintain.	
	5) Monitor spotted owl activity centers below targeted habitat acreages.	See list of owl sites in need of monitoring for site tenacity and reproduction status.	
Forest-Wide Connectivity	1) Verify linkage between the Chiwawa and Twin Lakes for wildlife species.	1) Do site specific analysis to determine if clearcuts between the two LSR's are effecting low mobility species movement	C
Unique Habitats and Species	1) Reduce road and trail densities in riparian reserves, talus, meadows and wetlands.	Close or relocate roads and trails as opportunities are identified in Access and Travel Management Planning.	A
	2) Maintain existing meadows. Wet, dry and subalpine meadows.	2) Remove encroaching conifers from meadows. - Reduce noxious weed spread in meadows and natural openings.	C
	3) Increase the amount of interior forest area within the LSR.	3) Close roads near interior forest areas as opportunities are identified through Access and Travel Management Planning. - Accelerate late successional forests.	A
	4) Retain: whitebark pine acreage within the LSR. (Garland Peak area); ponderosa pine old growth trees; and natural openings.	4) prescribed fire.	C

Analysis Module	Restoration Opportunity	Potential Projects	Schedule 1
	5) Improve habitat effectiveness.	5) Reduce open road densities and increase security habitat. - Protect riparian from grazing. - Meet high end snag levels. - Reduce fragmentation of wetter forests.	
	6) Provide access for American Indians.	6) For cedar basket gathering, huckleberry, vision quests, etc.	
	7) Interpret unique habitat and values.	7) Thru signs, brochures, video tapes, etc. interpret special values of micro-site habitats and unique spp.	
	8) Acquire lands.	8) Acquire lands with high unique habitats or spp values.	
	9) Create habitat.	9) For marten, fisher, lynx create denning habitat in areas devoid.	
Connectivity Within the LSR	1) Promote the development of fire climax stands within the dry forest vegetation group.	1) Thin from below favoring ponderosa pine. Use prescribed fire where current fuel loadings permit the attainment of objectives.	A
	2) Increase the amount of interior forest area within the LSR.	2) Close roads near interior forest an in dry forest areas as opportunities are identified through Access and Travel Management Planning.	A
Disturbance	1) Reduce the risk of habitat loss to wildfire by reducing stand density, altering species composition and reducing vertical and horizontal fuel continuity in dry forest types. (Vegetation Type #12 - Dense successional advanced.)	1) Use commercial thinning, pruning, fuelwood collection and prescribed fire as described in disturbance module treatment key. Favor the development of seral species such as ponderosa pine and western larch. Priority areas for treatment of this stand type are: 1) Outside the LSR to the south and west, 2) Within the LSR but outside of activity centers. 3) Over threshold acres within the activity center. 4) See Item 5 under spotted owl for treatment of	A

Analysis Module	Restoration Opportunity	Potential Projects	Schedule I
		threshold acres.	
2)	2) Minimize the extent of stand replacement fires within the LSR and minimize the spread of fire from the Chiwawa to other LSR's.	2) Conduct activities that improve the effectiveness of the existing road system as fuelbreaks.	B
Spotted Owl	1) See Appendix 39, "Northern Spotted Owl Nest Site Protection Within LSRs and MLSAs"		A
	2) Protect 500 acres of nesting habitat within the 19 Chiwawa spotted owl core areas.	2) Protect the best quality habitat within 500 acres of .7 miles of activity center. --No Ground or vegetation disturbing activity in 13 of the 19 core areas (See list of spotted owl core areas with less than 500 acres of nesting habitat).	A
	3) Rehabilitate or accelerate habitat recovery around spotted owl circle 506, 509 and 510.	3) Plant DF in activity centers. 3.1) Fertilize young trees to accelerate growth.	A C
	4) Improve sustainability of dense dry forest (type 12) outside of 1.8 mile spotted owl circles within the LSR.	4) Use commercial thinning, pruning, and fuelwood collection. (Chikamin flats area and area from twin Creek to Fish Lake.)	A
	5) Improve sustainability of dense dry forest (vegetation Type 12) within 0.7 to 1.8 mile home range area on threshold acres. Treatment should maintain suitability of habitat for nesting, roosting and foraging. (see spotted owl desired conditions)	5) Utilize commercial thinning, pruning and fuelwood collection. -- 1st on non-suitable habitat, then on dry/mesic habitat. -- Use Stand Ranking System for spotted owls and for risk..	A
	6) Improve habitat quality in dense single story stands in spotted owl circles 510, 638, 645, 649.	6) Utilize silvicultural activities that accelerate the development of multi-layered stands. Focus on single layered pole size stands in moist grand fir and wet forest	C

Analysis Module	Restoration Opportunity	Potential Projects	Schedule ¹
		groups.	
	7) Obtain information on spotted owl locations.	7) Survey areas to 1994 spotted owl protocol. See monitor list in individual owl section above.	B
	8) Decrease fragmentation.	8) Acquire fragmented private/state lands strategic to owl home ranges and connectivity. --Monitor/maintain connectivity within LSR..	
	9) Improve habitat effectiveness.	9) Reduce road densities, increase security habitat.	
	10) Habitat mapping/analysis	10) Field verify habitat maps and spotted owl activity home range acres.	
Aquatic	1) See goals listed in Aquatic section for Chiwawa LSR.	1) Coordinate projects with Entiat Watershed Assessment.	
Noxious Weed	1) Limit the extent and spread of <i>Centaurea diffusa</i> in twenty five mile creek area.	1) Consider treatments such as hand pulling and herbicides to limit extent and spread. Focus should be in high recreation use areas, particularly where stock are used such as Rock Creek Horse Camp.	B
	2) Control or eradicate <i>Cytisus scoparius</i> , <i>Cynoglossum officinale</i> and <i>Cirsium canadensis</i> where they occur along the Chiwawa river road.	2) Use combination of treatments such as hand pulling, and spot herbicide application to eliminate these populations.	A
	3) Increase knowledge regarding noxious weed presence in Chiwawa LSR.	3) Survey LSR for presence of noxious weeds.	C
Fire Plan	1) Protect LS values from loss due to wildfire	1) See fire plan for specific actions	

¹ Implementation Schedule; (A) = within 1 year; (B) = within 3 years; (C) = within 5 years

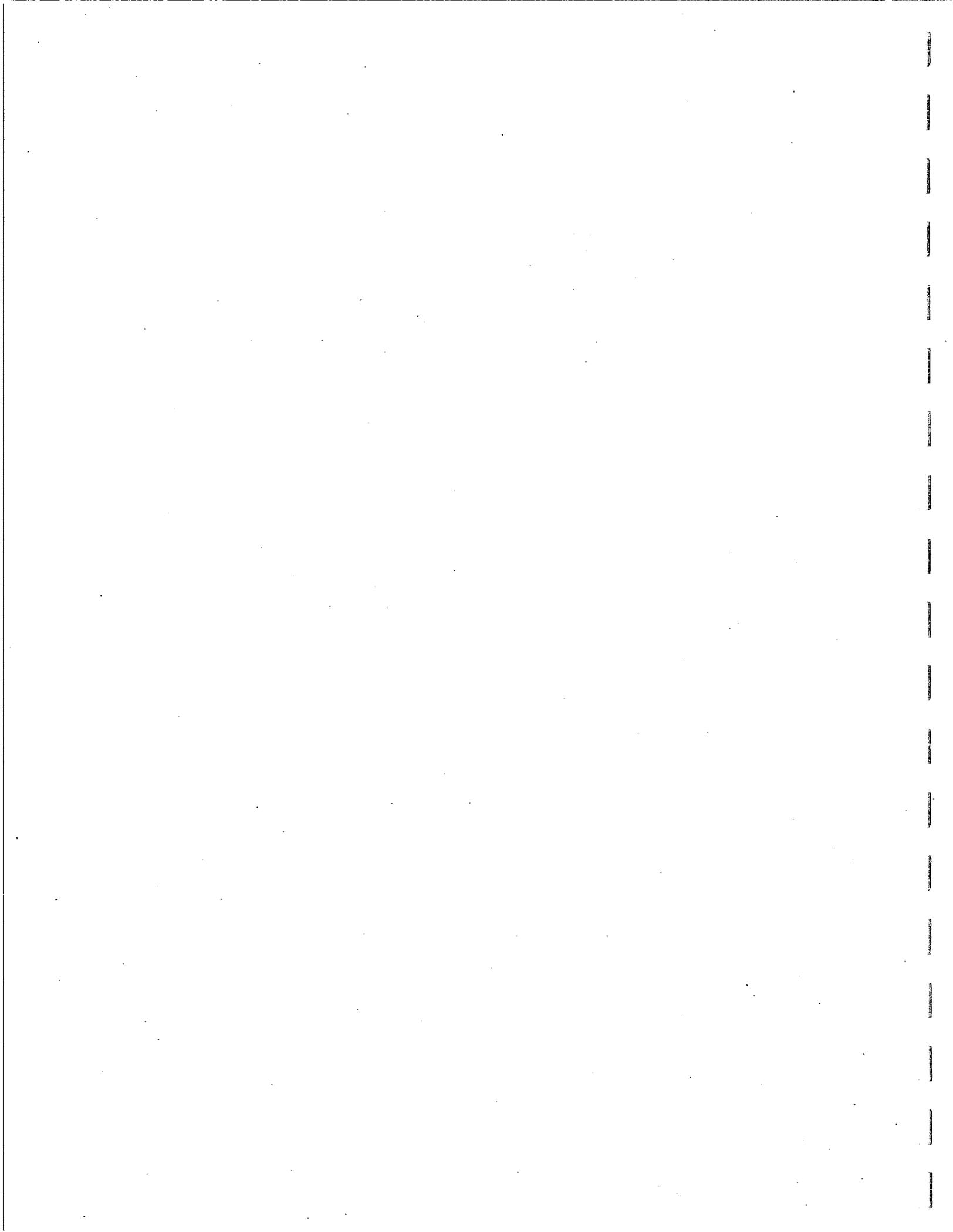
a) Restoration Opportunities And Potential Projects for Unique Habitats and Species:

1. Reduce road and trail densities in riparian reserves, from 3.14 mi./sq./mi..
2. Reduce open road densities throughout the LSR, from 1.9 mi./sq. mi..
3. Increase amount of security habitat from 36%.
4. Increase and accelerate late successional habitat and forest interior habitat. Thin to accelerate old growth.
5. Reduce roads and trails in unique habitats (meadows, talus, wetlands, etc.).
6. Reduce noxious weed spread in meadows and natural openings.
7. Reduce roads in forest interior patches
8. Protect large trees and screen near talus, cliffs, caves, meadows.
9. Reduce encroaching trees in subalpine meadows.
10. Prescribed habitat burns in Whitebark pine Garland Peak.
11. Prescribed fire in ponderosa pine Hornet Ridge.
12. Reduce Fragmentation of Wet Forest.
13. Protect riparian from grazing.
14. Provide American Indian site access.
15. Maintain black-backed woodpecker nesting/roosting/foraging habitat.
16. Meet high end snag levels.
17. Create log den sites in low quality roaded/forest for marten, fisher, lynx.
18. Balance lynx prey/travel/denning habitat.
19. Protect/maintain/enhance/monitor PETS.
20. Prescribed fire in natural openings as part of fire climax.
21. Interpret values and protection/maintenance of unique habitats and species.
22. Acquire non-Forest System lands with high degree of unique species or habitat.

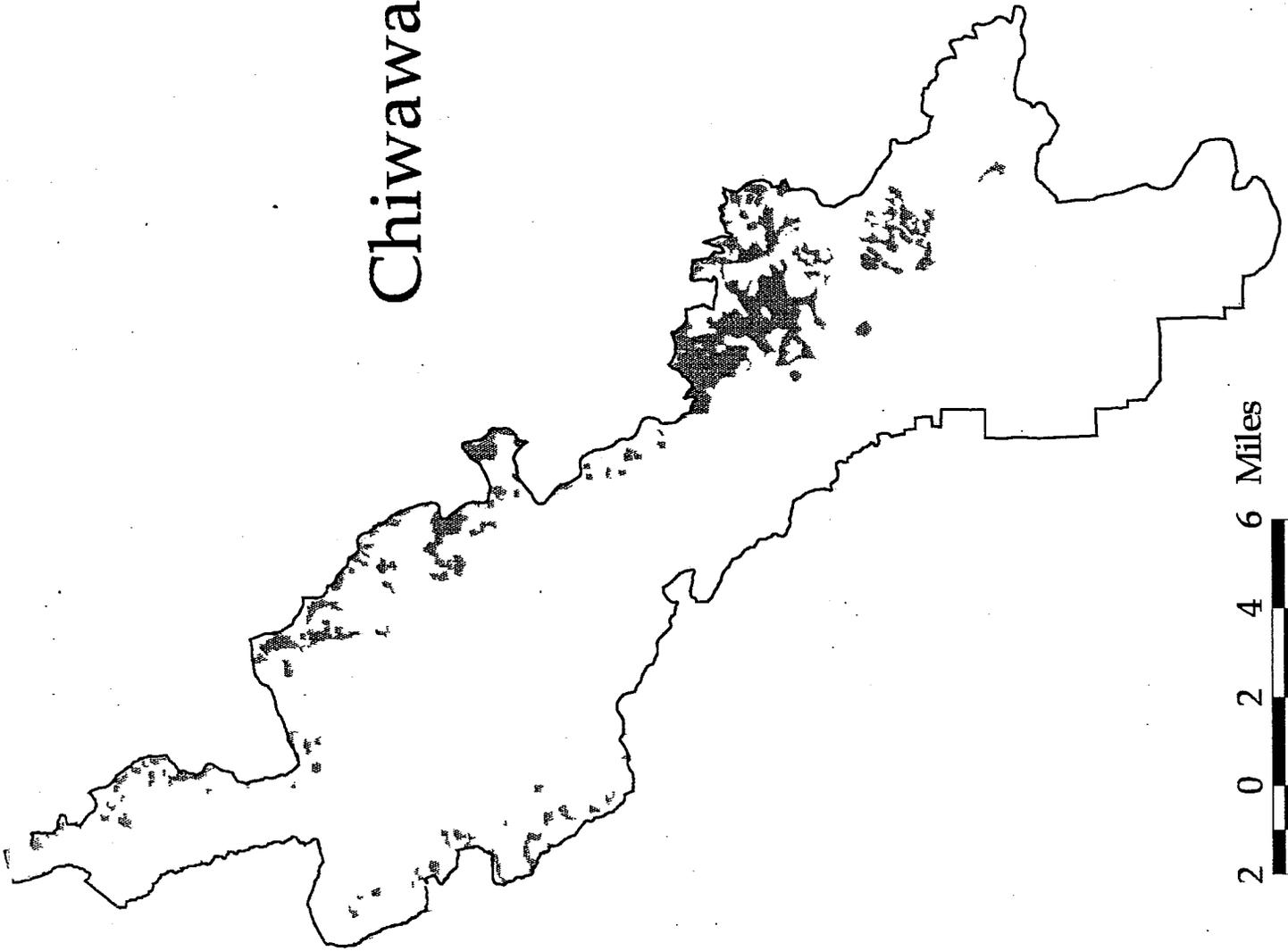
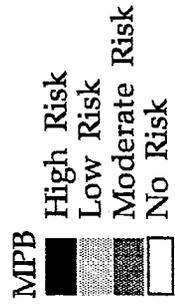
b) Restoration Opportunities And Potential Projects

1. Meet goals of LSR for 21 pairs of spotted owls.
2. Improve and accelerate N/R/F habitat, to maintain high number of spotted owl pairs. Current habitat is 49,489 acres, potential to increase to 81,567 acres.
 - Clear cuts in wet/moist vegetation groups predicted to be habitat in 100 years.
 - Pole sized stands in wet/moist will be habitat in 50 years.
 - Clear cuts in mesic/dry vegetation groups will be habitat in 120 years.
 - Pole sized stands in mesic/dry will be habitat in 70 years.
3. Aggressive protection of remaining suitable spotted owl habitat, from outside LSR, on Matrix lands, Meadow Creek and Van Creek..
4. Protect spotted owl home ranges within LSR, between owl circles, by implementing risk reduction on first on non-suitable habitat, then on Dry and Mesic habitat:
 - Twin Creeks to Goose Creek.

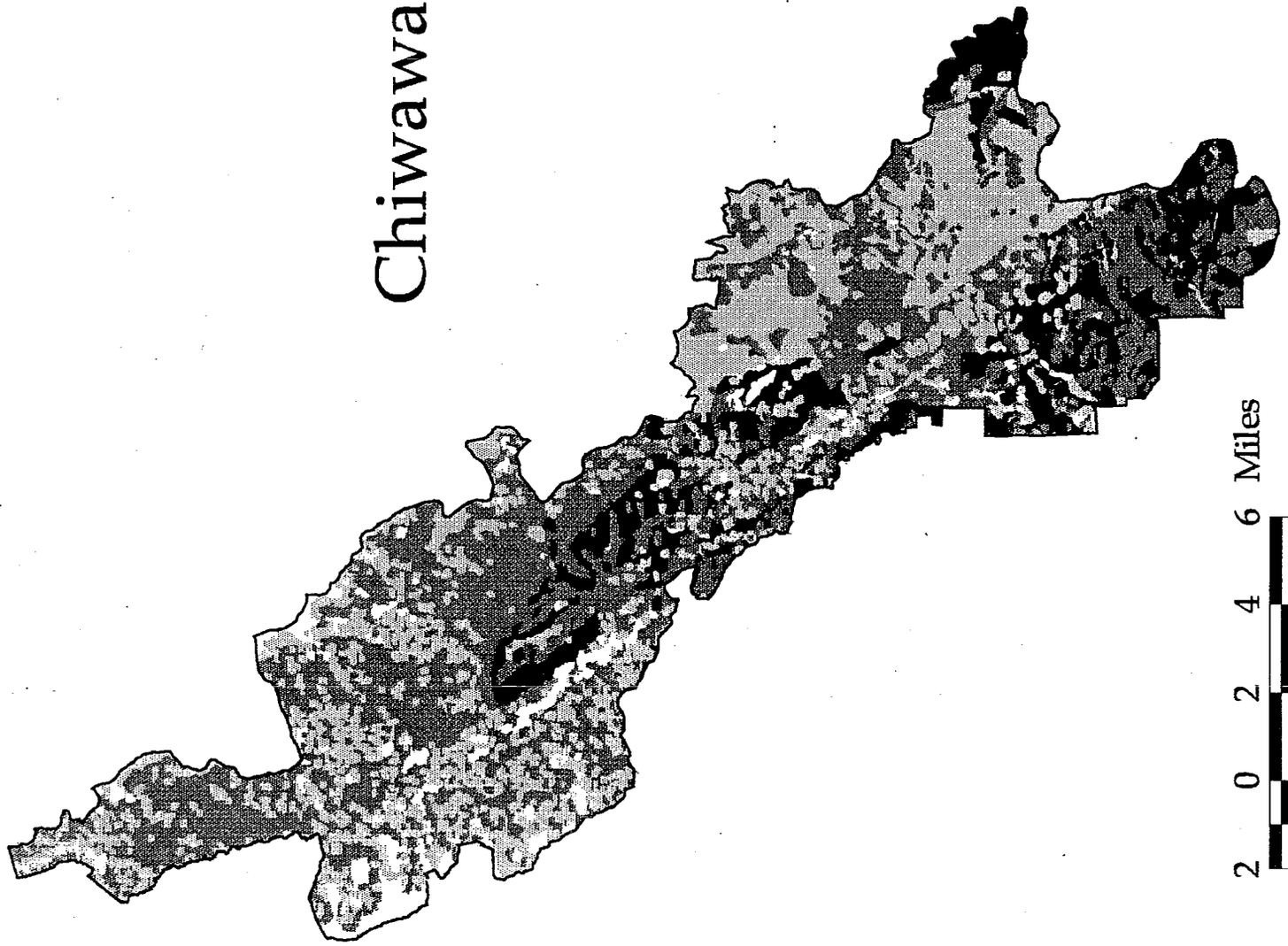
- Clear Creek to Miners Creek (if owls did not relocate to these sites, as result of Tyee burn).
 - Lower Chikamin.
5. Fuels reduction and hazard reduction occur outside N/R/F habitat in short term, shift emphasis in 50 years. Accept more risk from fire, manage at high end of spotted owl habitat DC. Spotted owl habitat maintained at 60% of home range in “big 3 LSR’s, 500 Acre core area protected, 100 acre activity center protected.
 6. Monitor/maintain connectivity outside LSR at Glacier Peak Wilderness, Twin Lakes, Beaver Creek, Cromwell, Upper Tommy Creek, Whistling Pig Creek, 3-Creeks, and Pomas Creek.
 7. Acquire DNR sections at Alder Creek and upper Chumstick (for spotted owl N/R/F habitat) and on Miners Ridge.(for great gray owl, lynx, and connectivity habitat). Acquire lands in Chikamin Flats (connectivity and risk reduction) and Phelps Creek (connectivity to Wilderness).
 8. Monitor spotted owl activity centers, 500 acre core and home ranges of owls affected by Tyee fire: SO506*, SO509*, SO510*, SO512, SO514, SO627*, SO634, SO638*, SO645*,and SO649*. (* Acres below Threshold highest priority.)
 9. Monitor spotted owl activity centers, 500 acre core and home ranges of owls below threshold (see list).
 10. Field verify habitat within 500 acre home ranges of spotted owl sites below threshold in that core, but above threshold in the home range: SO605, SO 638, SO 649.
 11. Increase habitat effectiveness and connectivity by reducing open roads and revegeting road beds. Especially in forest interior habitat patches.
 12. Reduce road densities in: Lower Mad (4.91 mi./sqmi); Beaver Creek (3.9 mi./sq. mi.); Lower Chiwawa (3.8 mi./sq. mi.); and Middle Mad (3.42 mi./sq. mi.).
 13. Maintain dispersal/connectivity habitat (Cougar Creek, Jimmy Creek to Berg Creek, Maverick Saddle to upper Goose Creek, Chikamin Creek, Willow Creek, Rock Creek, from Grouse Creek west to Phelps Creek, Beaver Creek, and Chumstick Creek to Dry Creek to Second Creek).



Chiwawa LSR



Chiwawa LSR



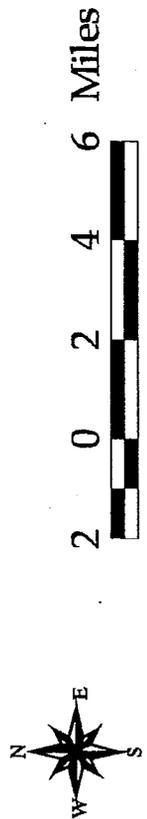
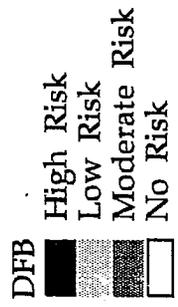
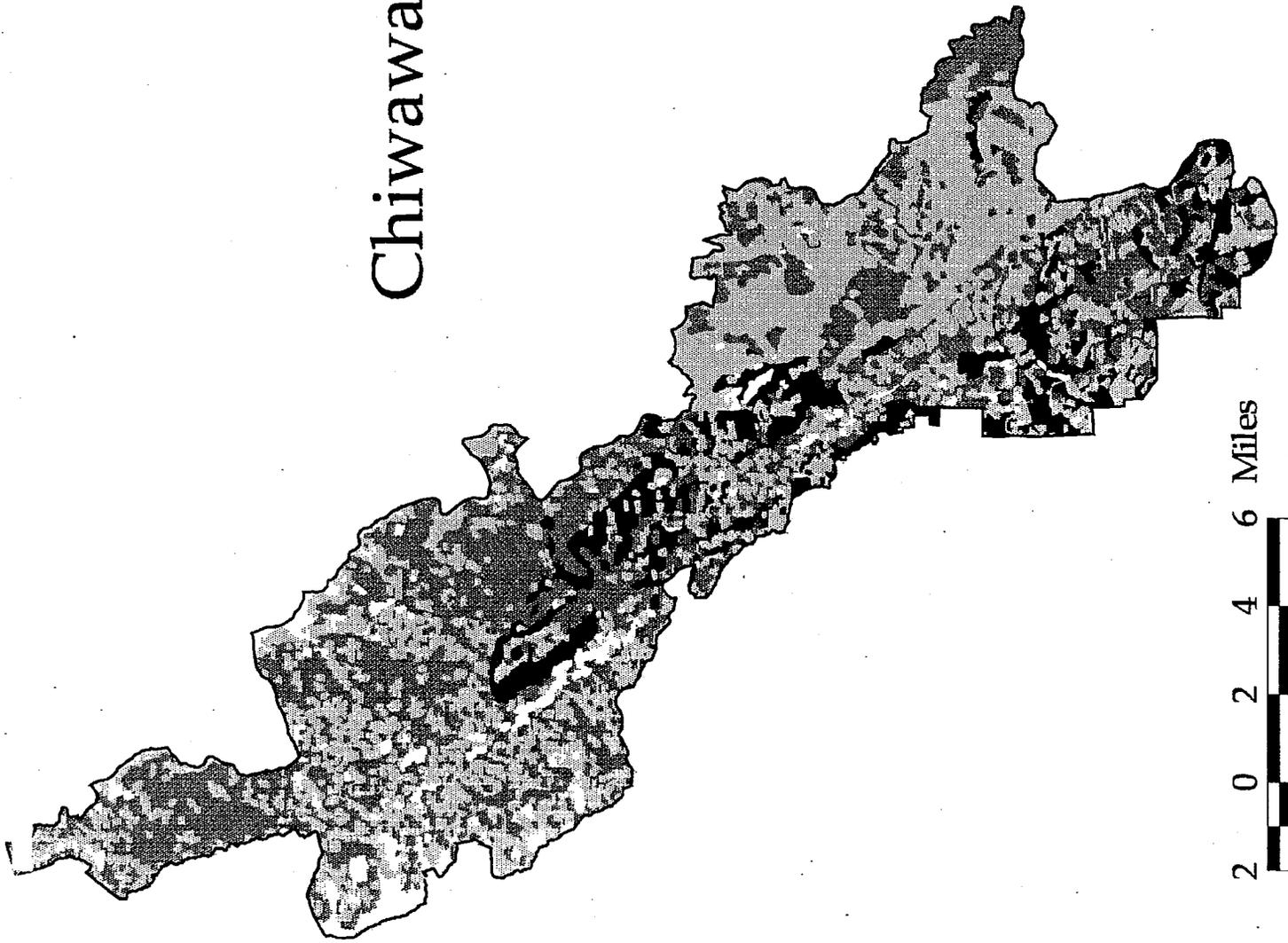
Fir Engraver
High Risk
Low Risk
Moderate Risk
No Risk



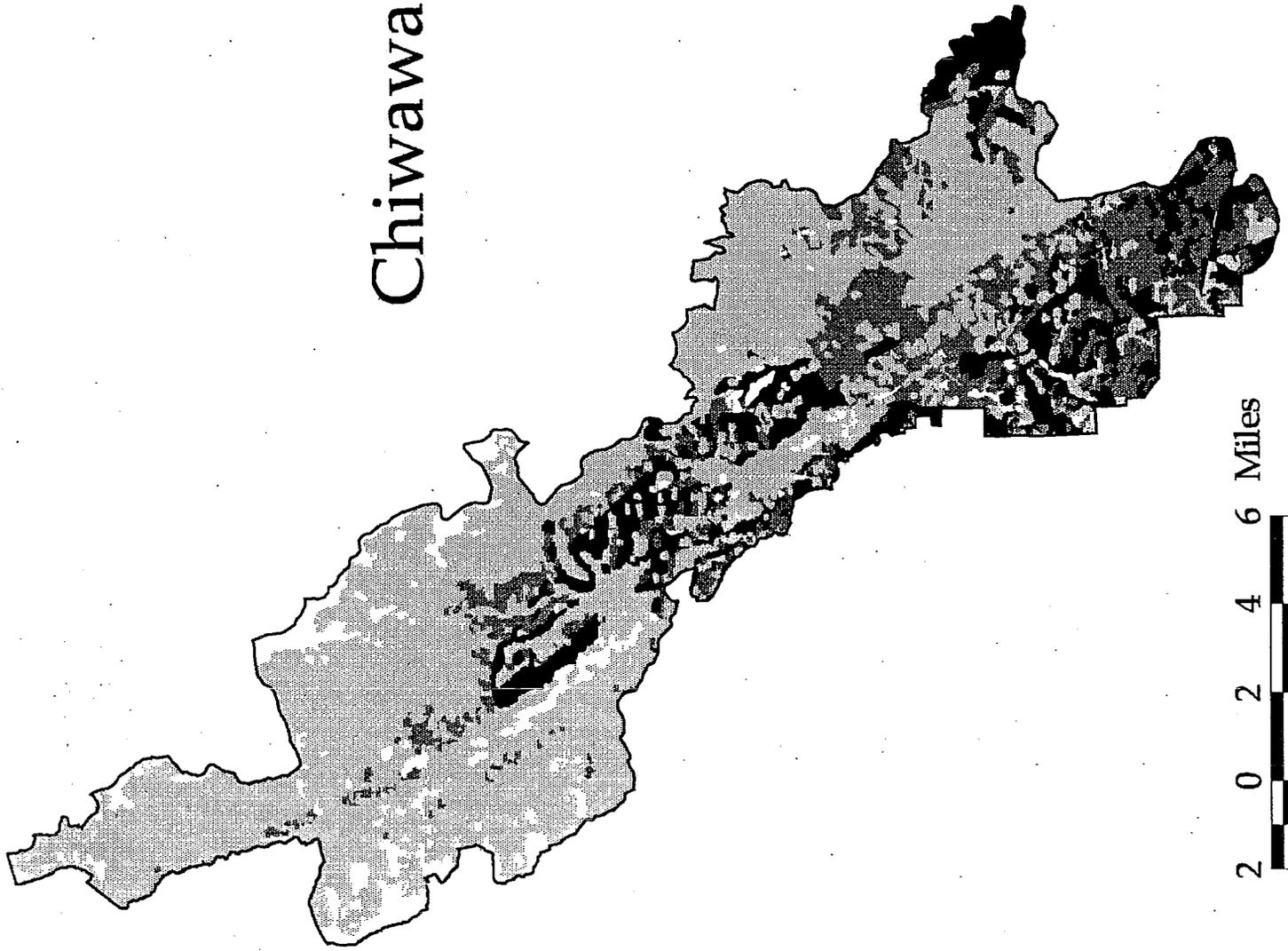
2 0 2 4 6 Miles



Chiwawa LSR



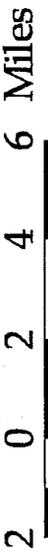
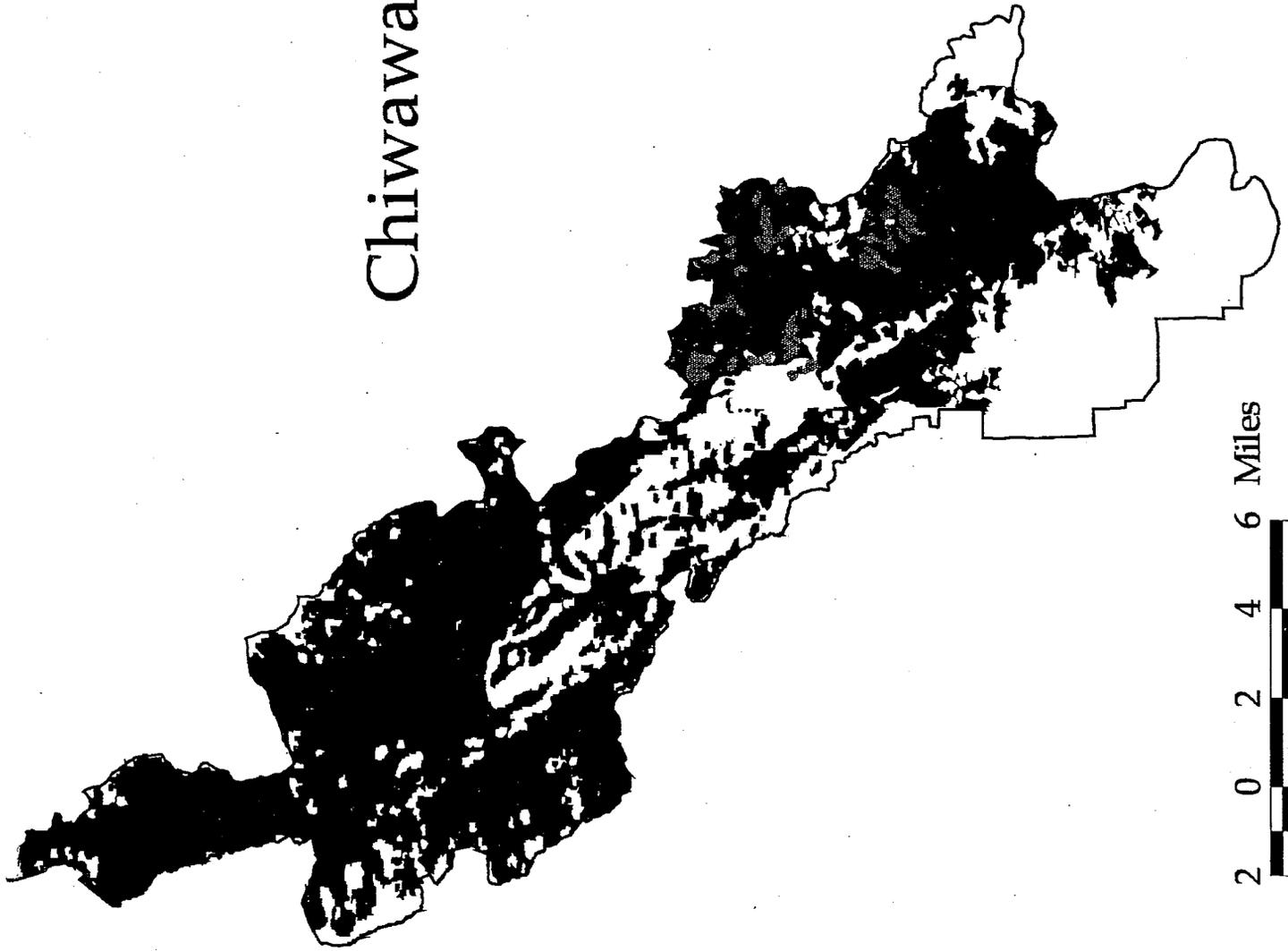
Chiwawa LSR



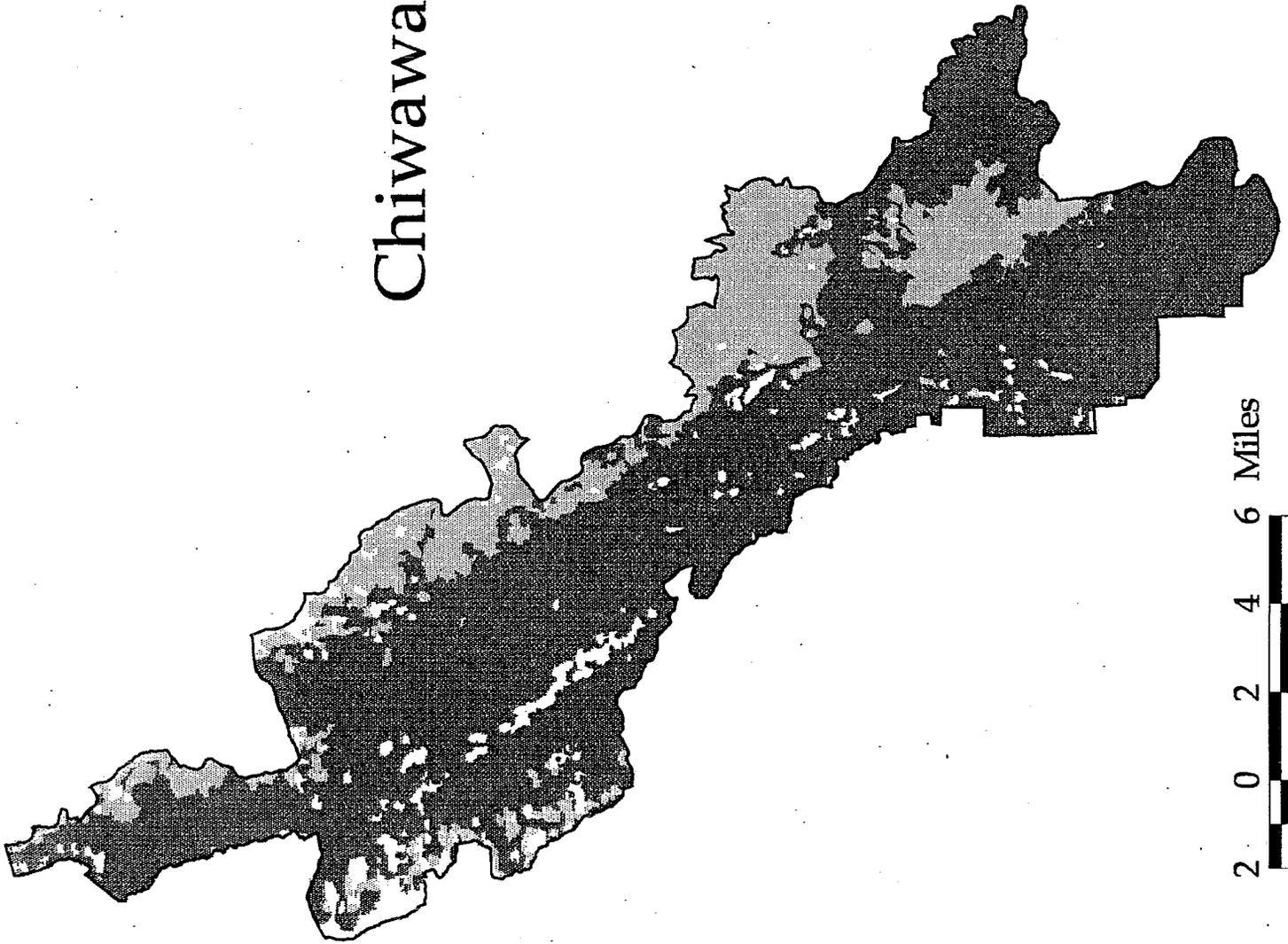
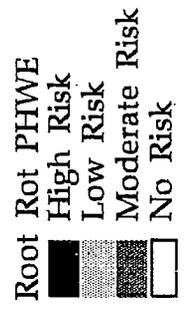
2 0 2 4 6 Miles



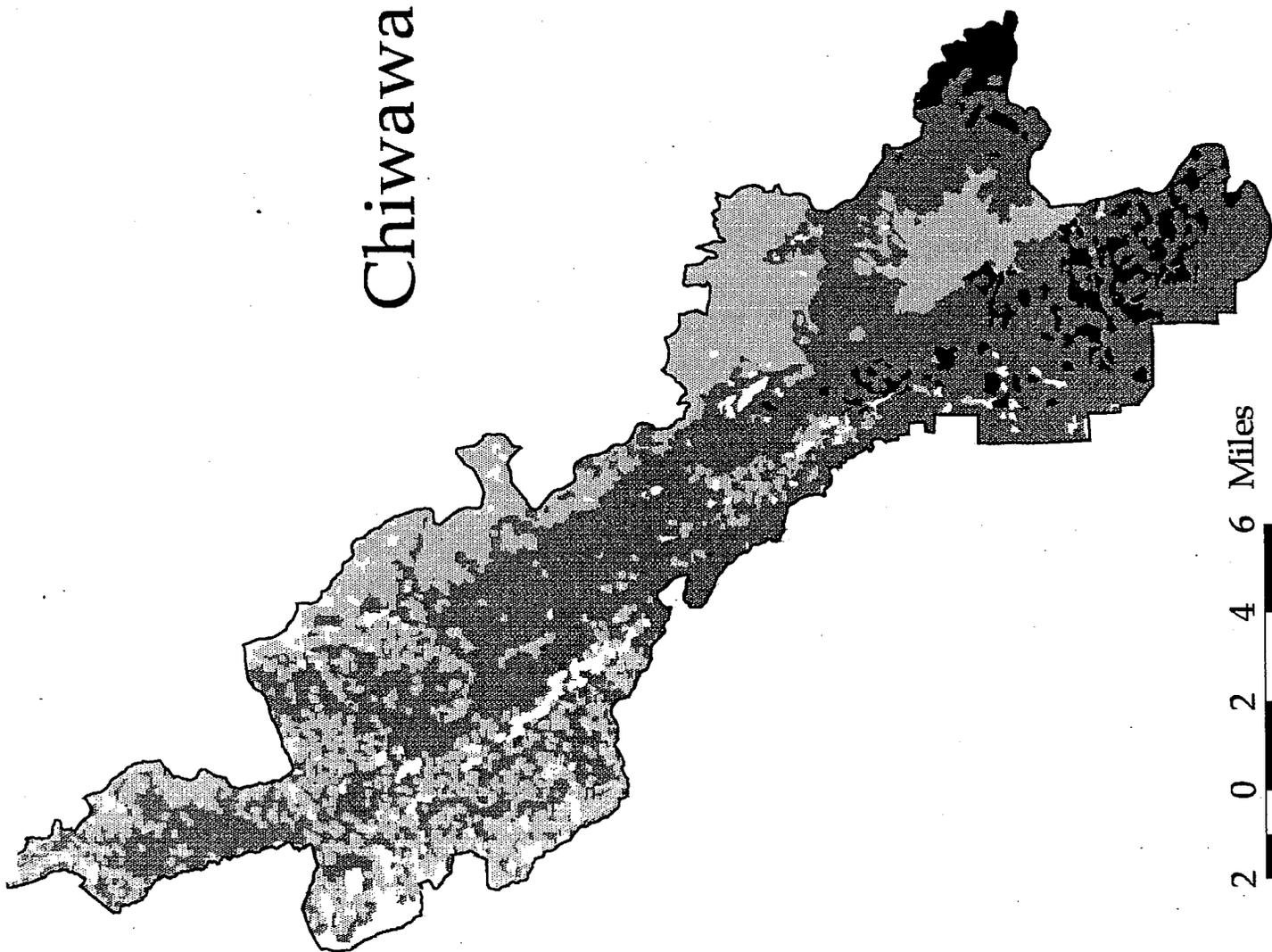
Chiwawa LSR



Chiwawa LSR



Chiwawa LSR



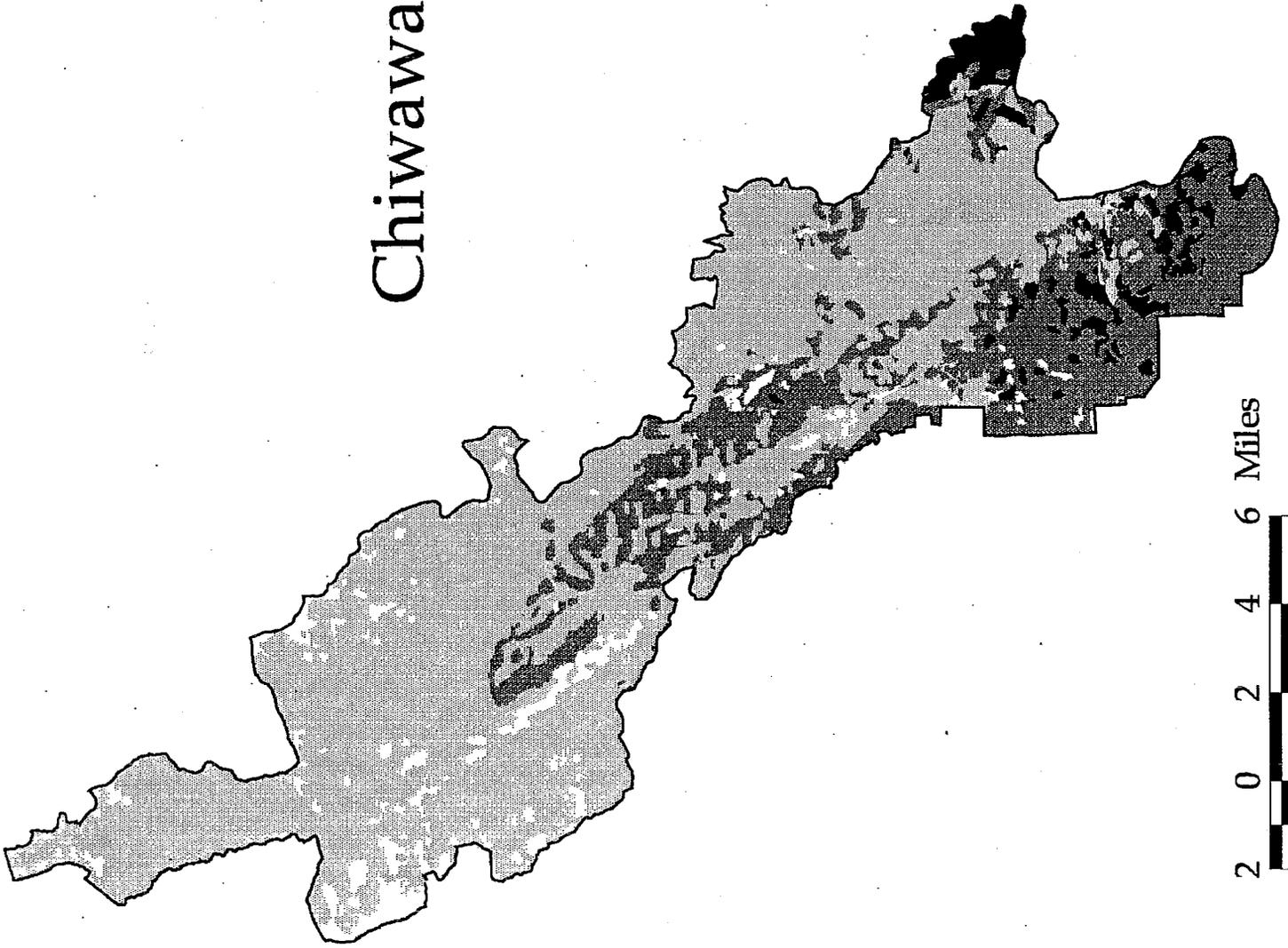
Root Rot HEAN
High Risk
Low Risk
Moderate Risk
No Risk



2 0 2 4 6 Miles



Chiwawa LSR



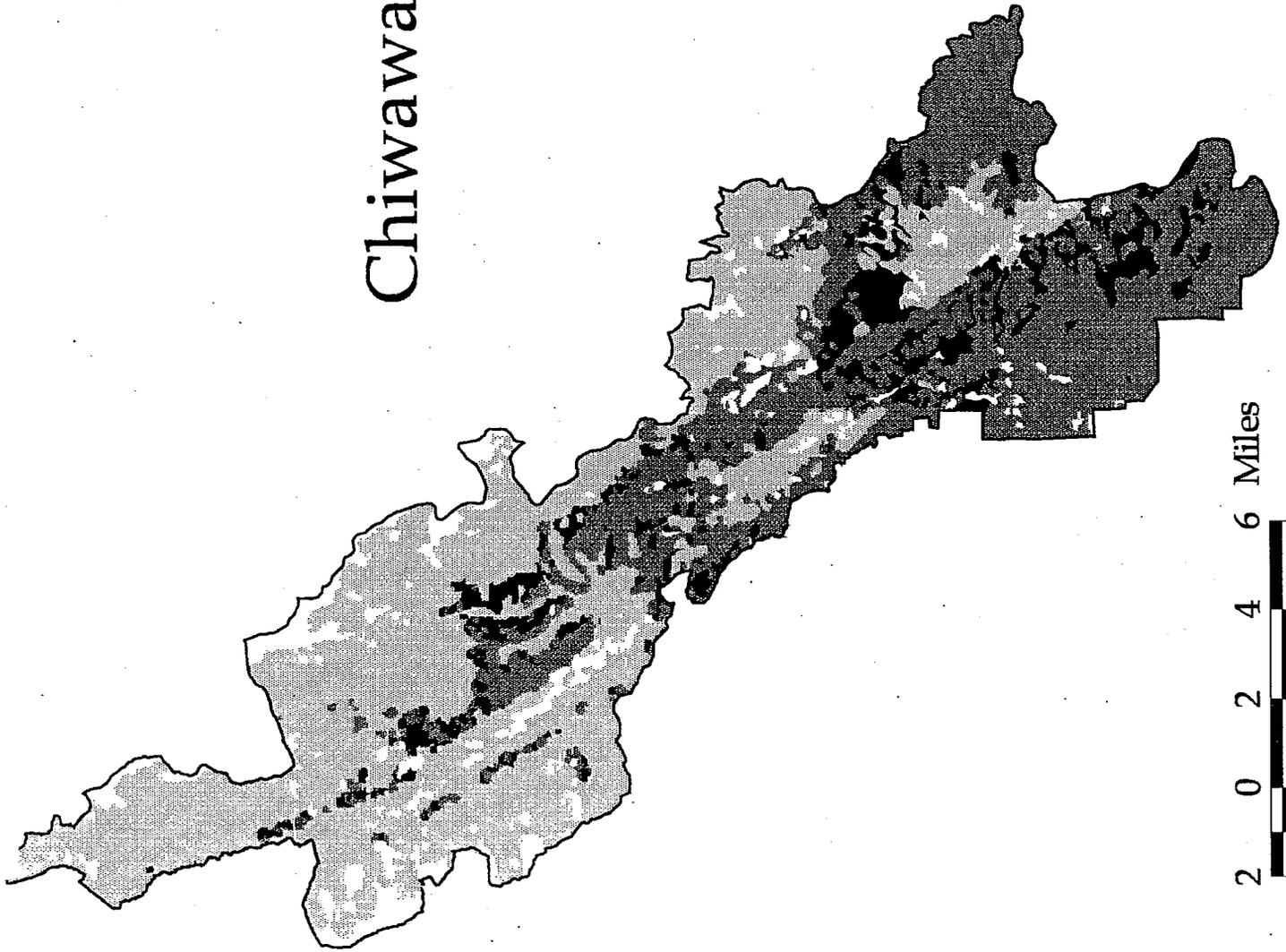
Root Rot AROS
High Risk
Low Risk
Moderate Risk
No Risk



2 0 2 4 6 Miles



Chiwawa LSR

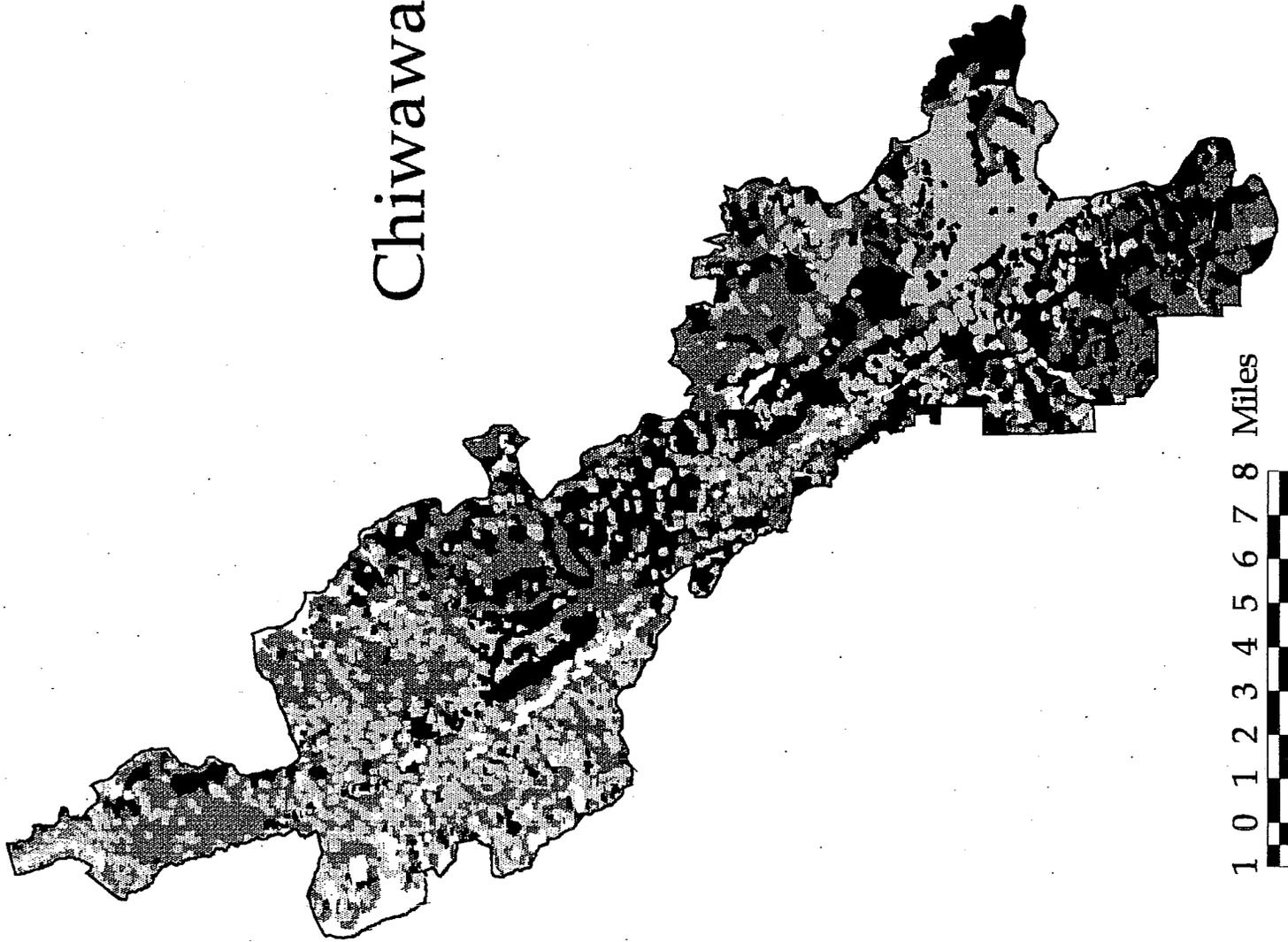


Dwarf Mistletoe PSME
High Risk
Low Risk
Moderate Risk
No Risk



2 0 2 4 6 Miles

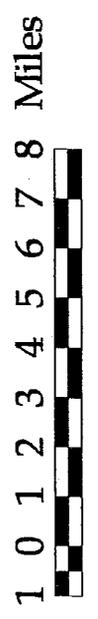
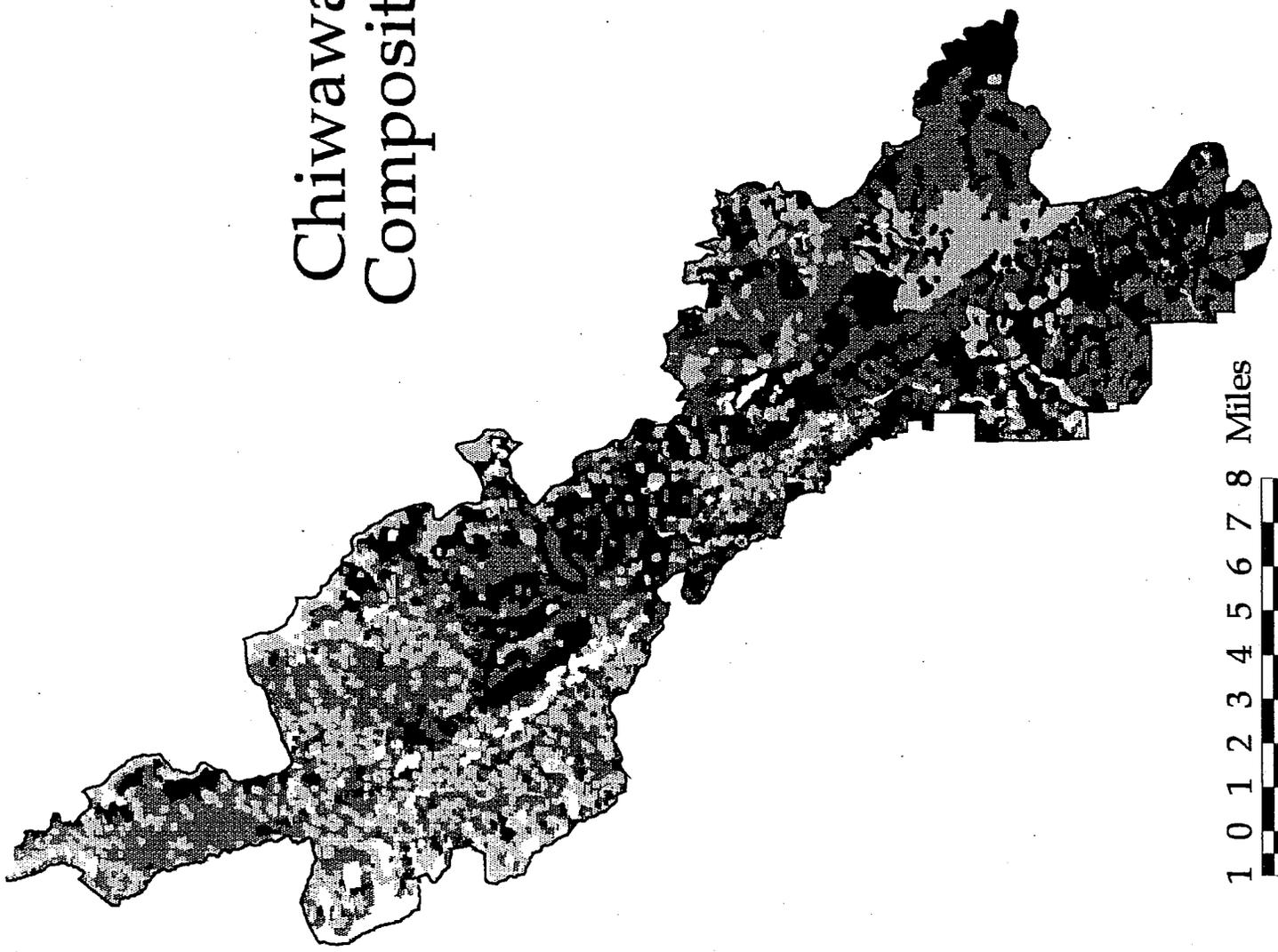
Chiwawa LSR



1 0 1 2 3 4 5 6 7 8 Miles

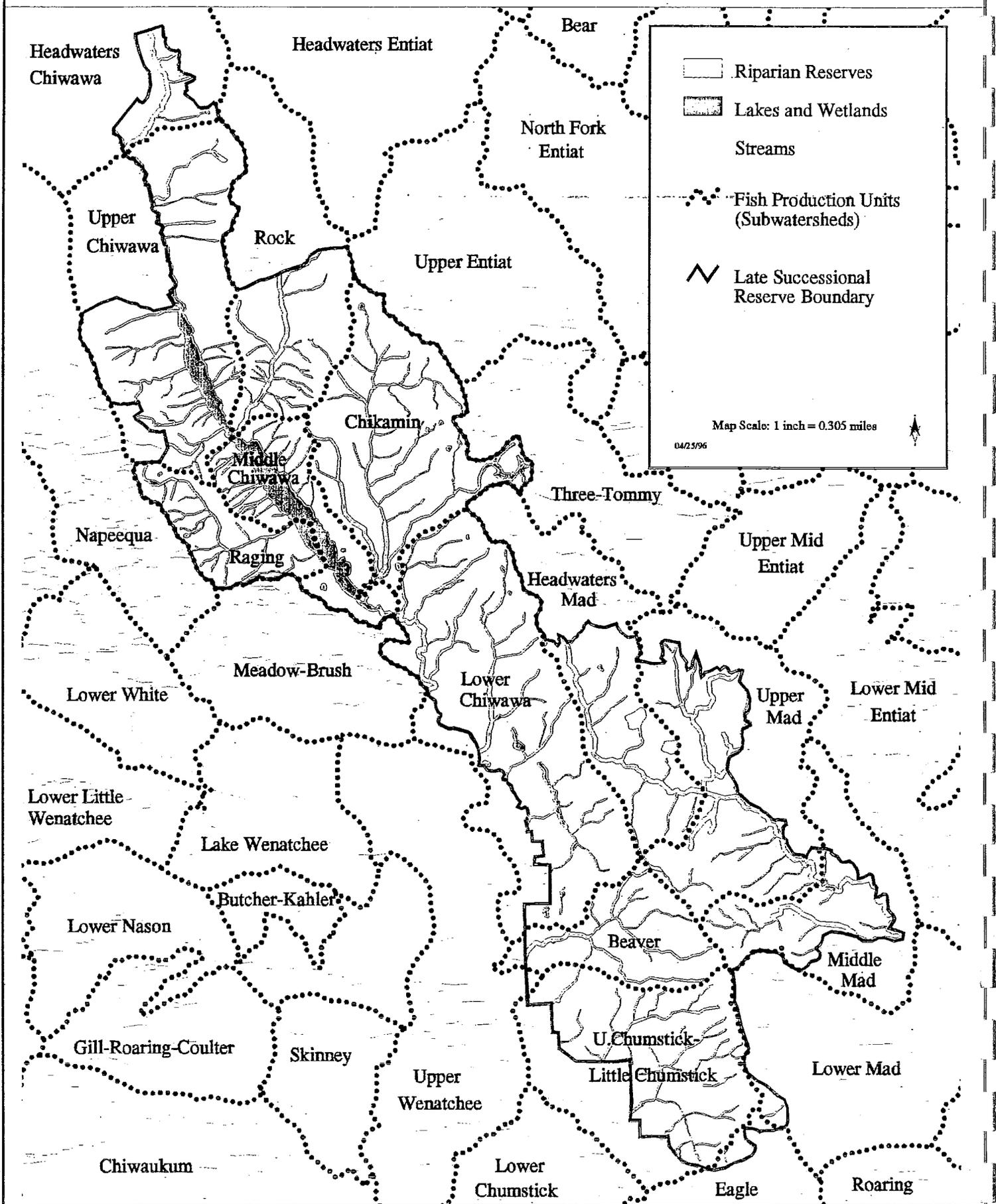


Chiwawa LSR Composite Risk



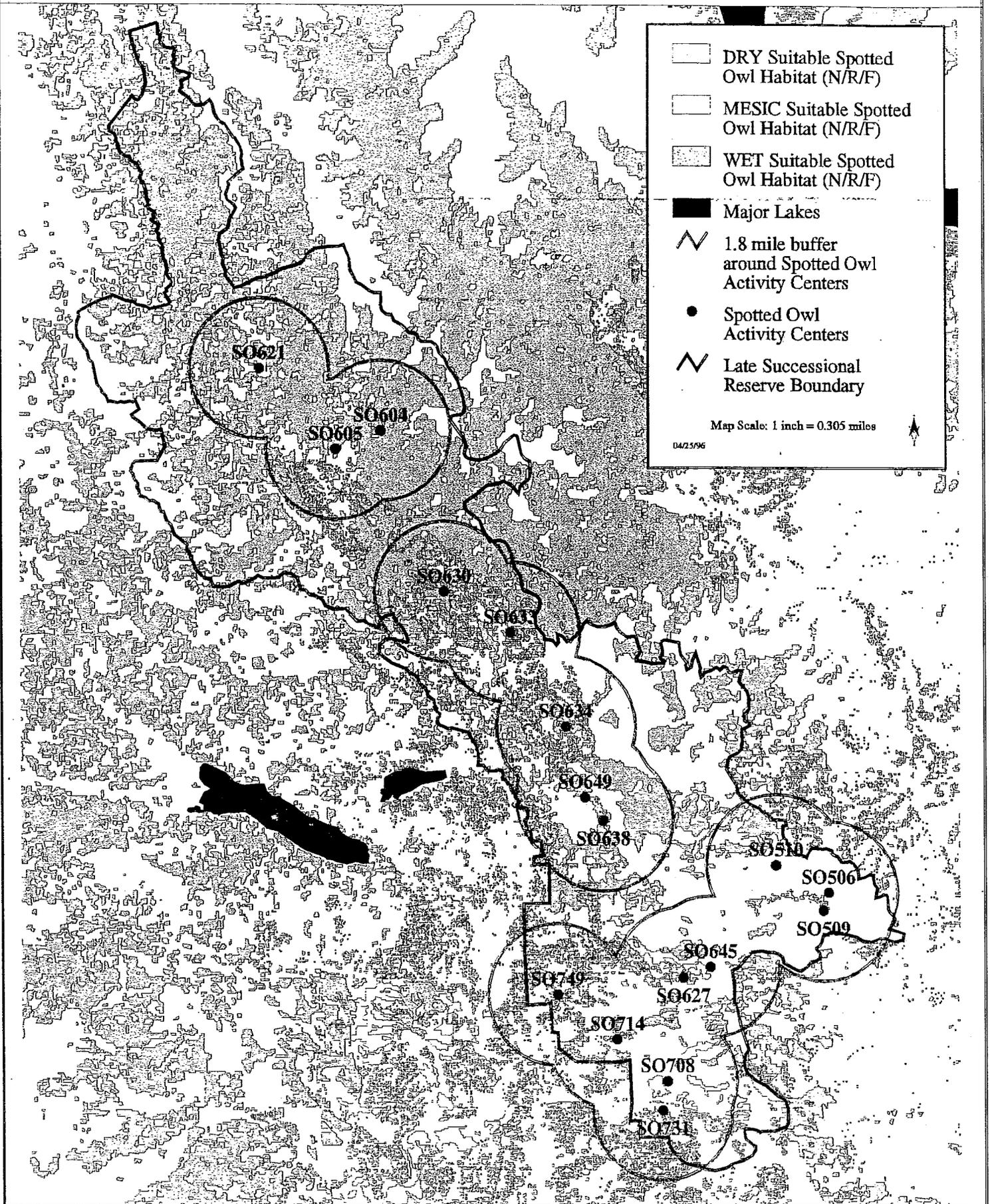
Chiwawa Late Successional Reserve

FISH PRODUCTION UNITS (SUBWATERSHEDS)



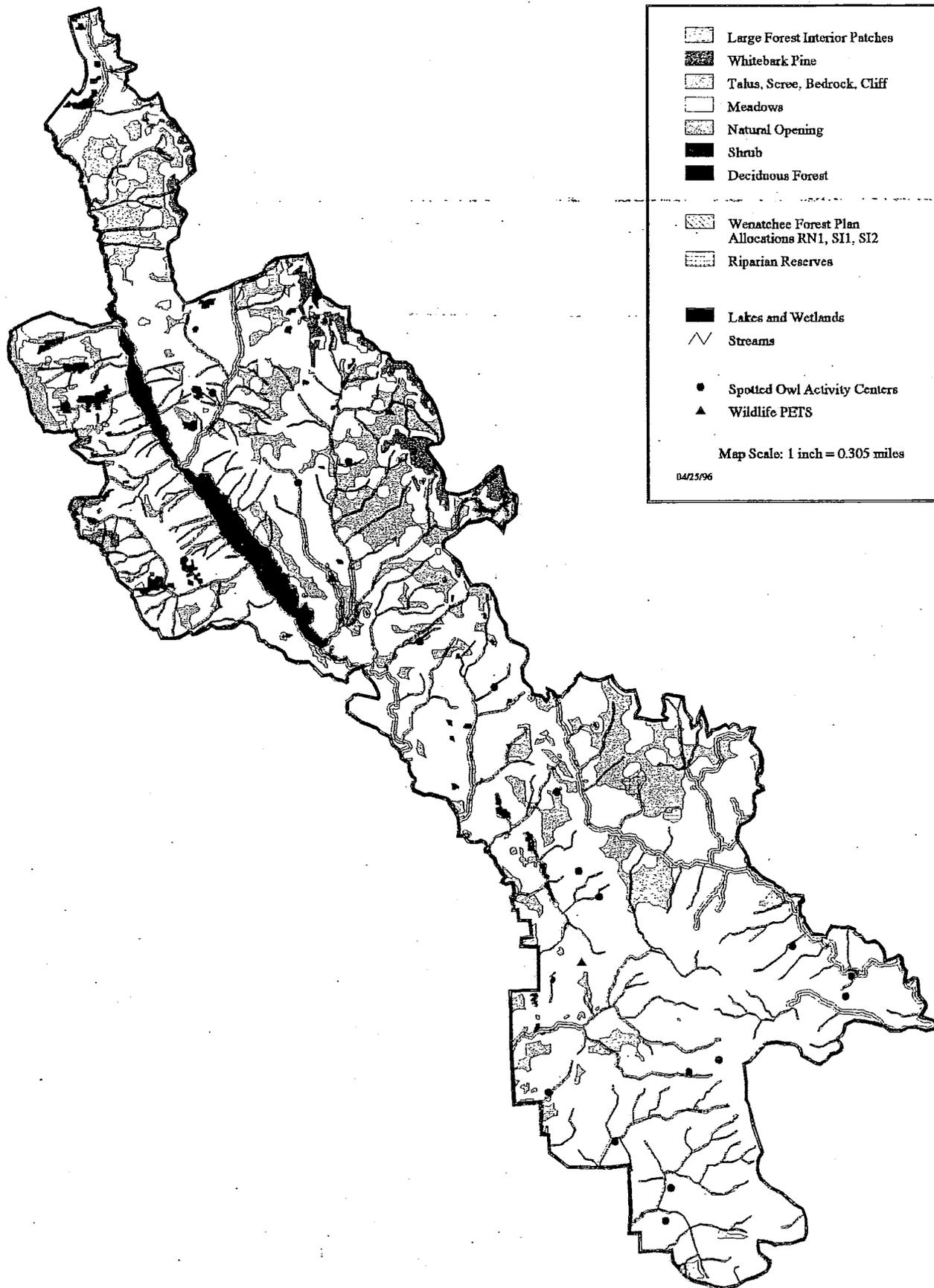
Chiwawa Late Successional Reserve

SUITABLE SPOTTED OWL HABITAT



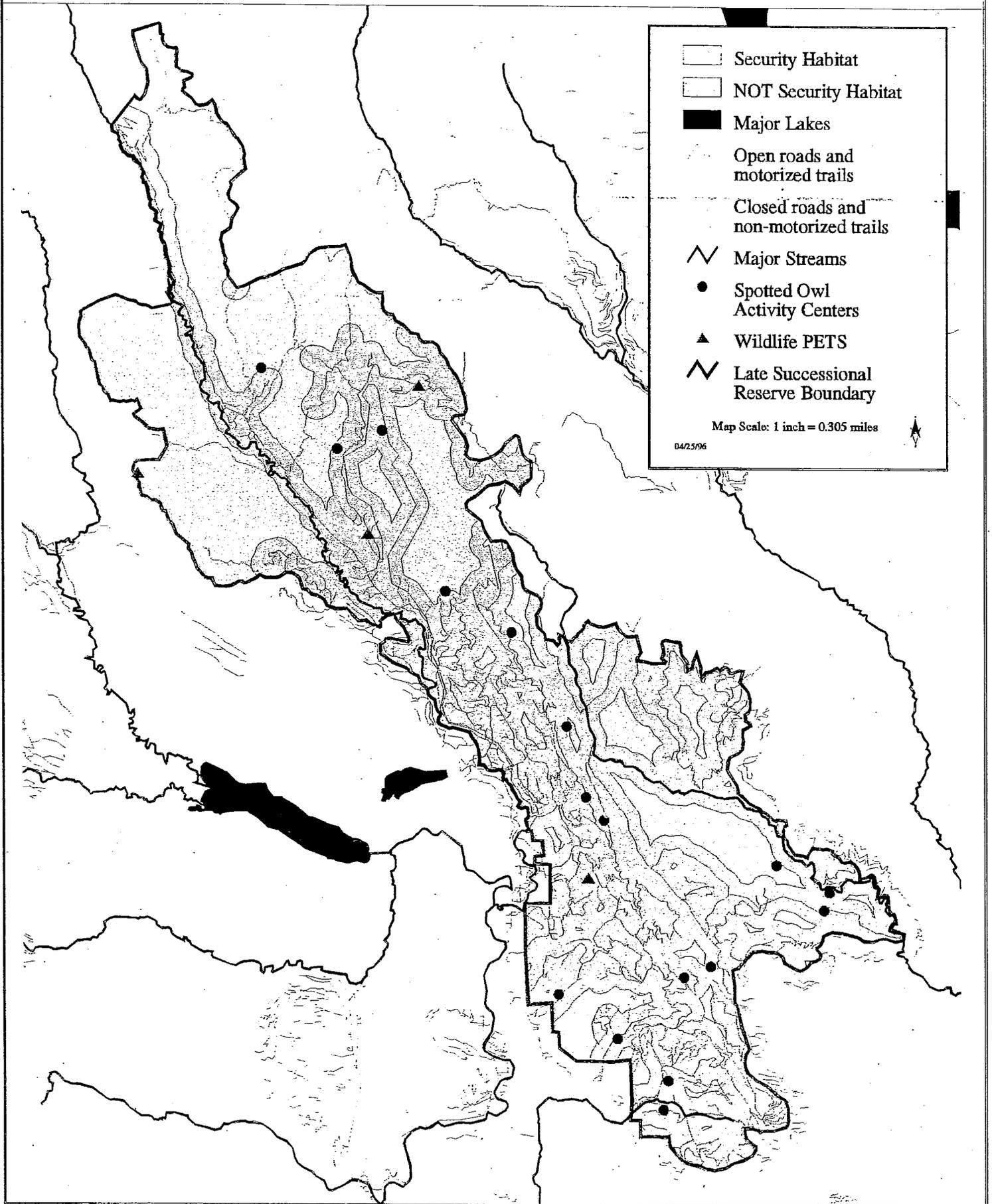
Chiwawa Late Successional Reserve

UNIQUE HABITATS



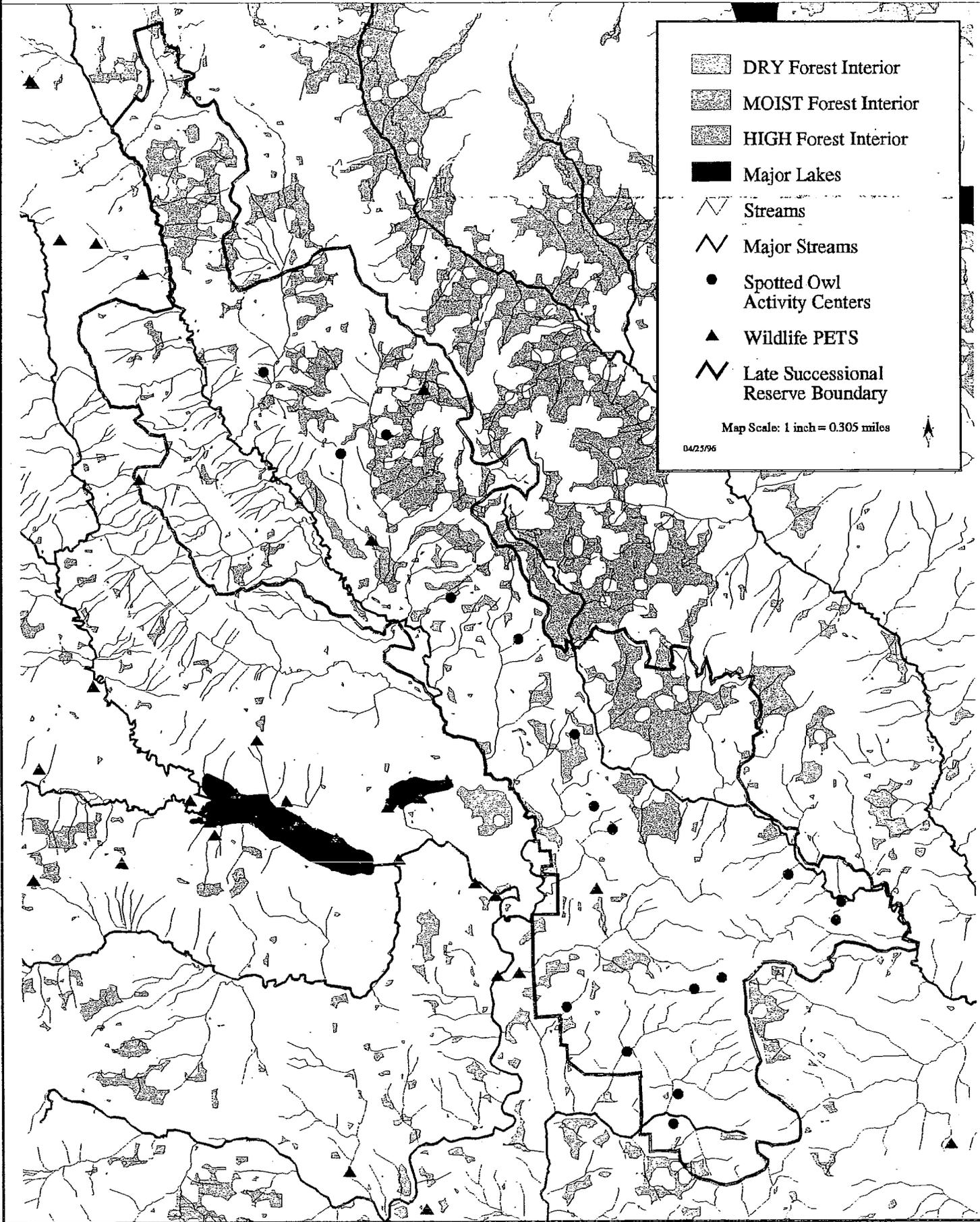
Chiwawa Late Successional Reserve

SECURITY HABITAT



Chiwawa Late Successional Reserve

FOREST INTERIOR

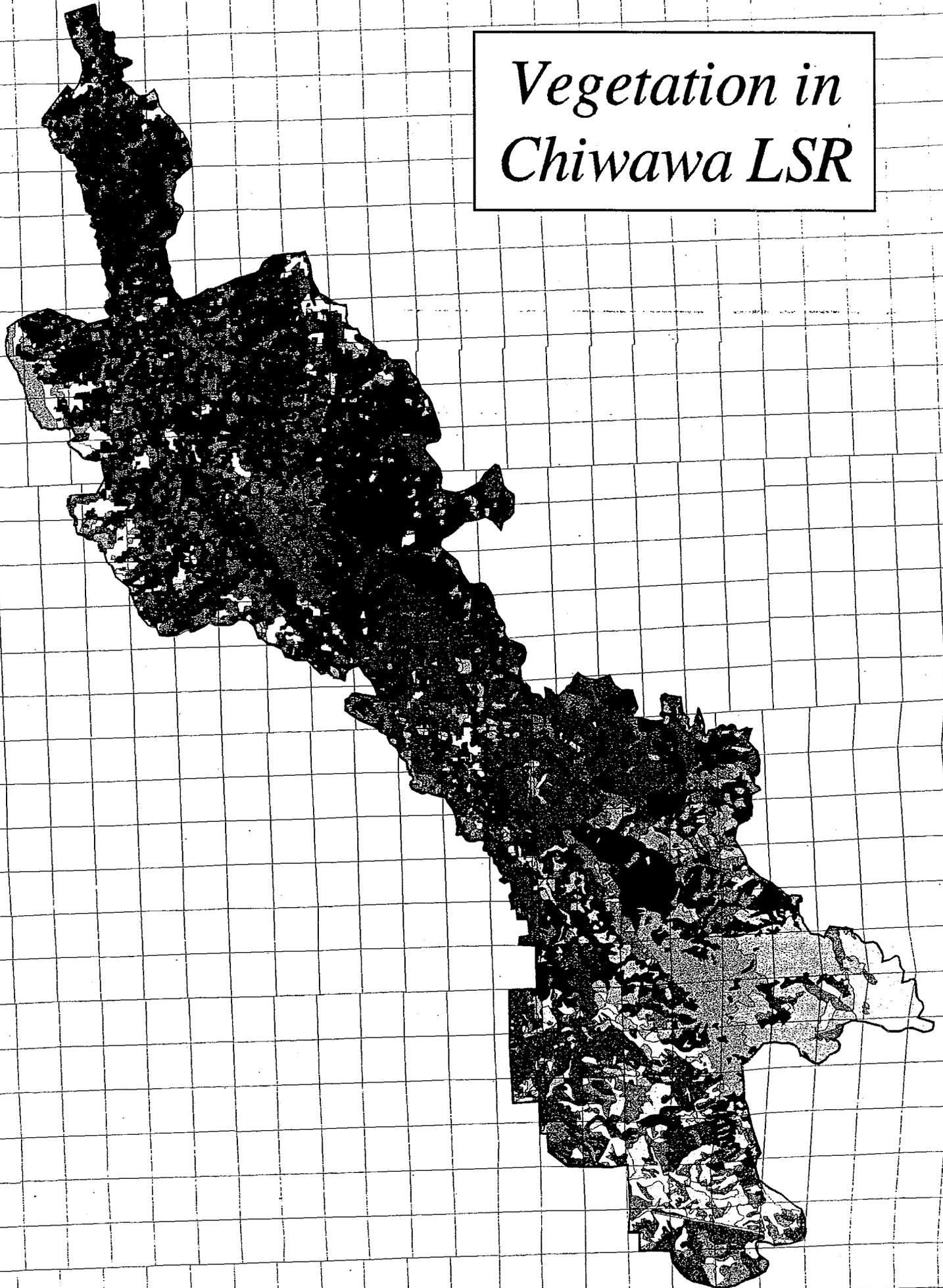


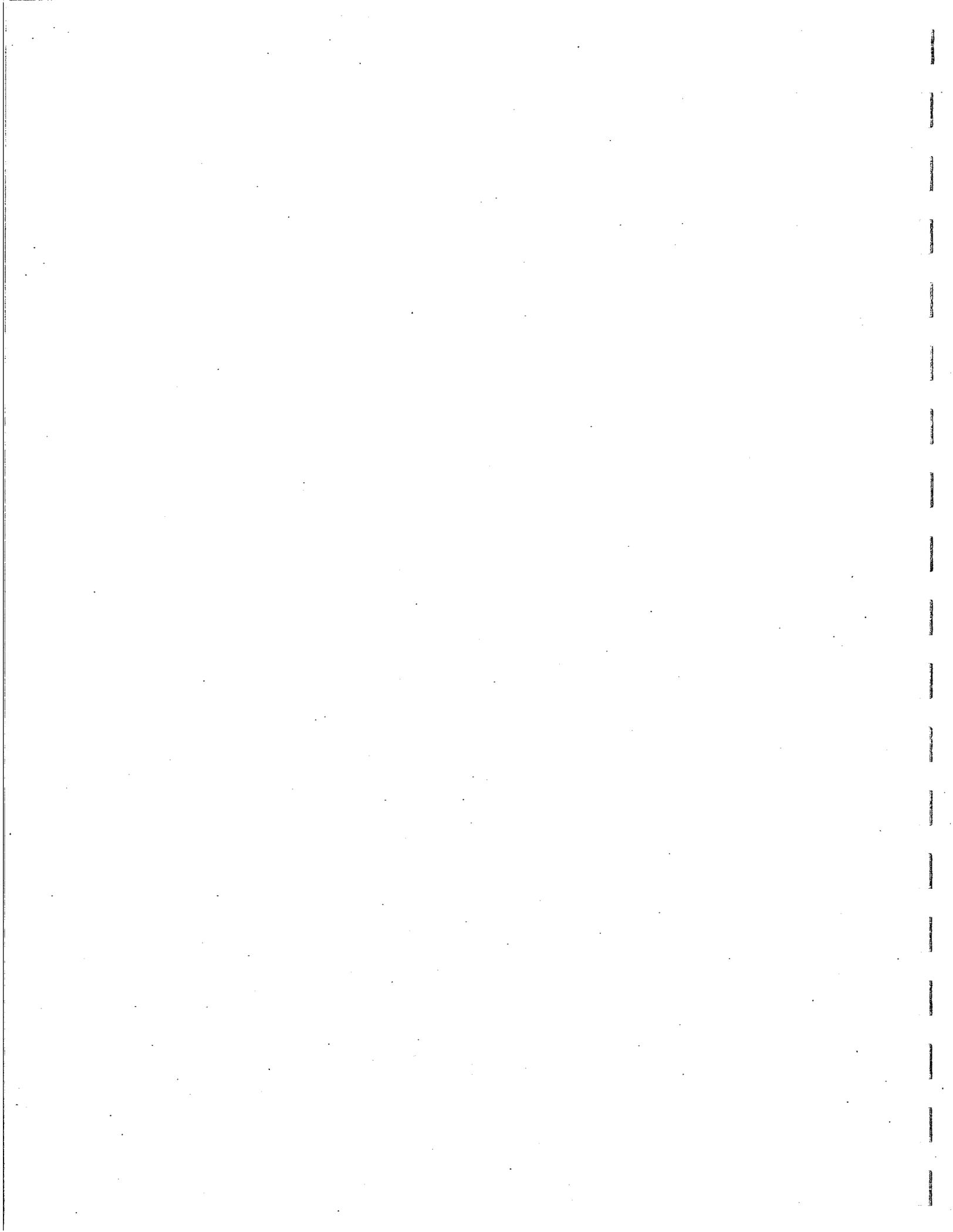
-  DRY Forest Interior
-  MOIST Forest Interior
-  HIGH Forest Interior
-  Major Lakes
-  Streams
-  Major Streams
-  Spotted Owl Activity Centers
-  Wildlife PETS
-  Late Successional Reserve Boundary

Map Scale: 1 inch = 0.305 miles

04/25/96

*Vegetation in
Chiwawa LSR*





II. Eagle MLSA

A. General Description of MLSA

This portion of the document describes the vegetation and wildlife resources and human uses associated with this MLSA.

1. Vegetation

This section describes the current condition of vegetation groups within the Eagle MLSA. Data was derived from aerial photograph interpretation (Appendix 3). It should be noted that site-specific information regarding vegetation structure and distribution will need to be updated, as restoration projects are initiated. The idea would be to use the vegetation layer derived for this analysis as a starting point only.

a) Dry Forest Group and Grassland/Shrubland

Sixty-two percent (3,260 acres) of the Eagle MLSA consists of the dry forest group. Within this group, 55 percent (1,786 acres) of the Eagle MLSA is mapped as high density and 6 percent (215 acres) is mapped as created openings (Appendix 4).

Within this forest group, the ponderosa pine series is limited within the MLSA. In some locations, ponderosa pine exists as the sole overstory dominant, but more often is co-dominant with Douglas-fir. Shrub composition in the understory is dominated almost exclusively by *Purshia tridentata*, but *Holodiscus discolor* is also important. Grasses include *Agropyron spicatum*, *Calamagrostis rubescens*, and *Carex geyeri*, and forbs present include *Achillea millefolium*, *Lupinus serecius*, *Balsamorhiza sagitata*, and *Lomatium* spp.

There is 262 acres of grassland or shrubland within the Eagle MLSA. Grassland or shrubland vegetation is similar to *P. tridentata* or *Agropyron spicatum* habitat types described by Daubenmire (1988).

b) Mesic Forest Sites (Embedded within the Dry Forest Group)

Mesic sites were mapped on 12 percent (647 acres) of the Eagle MLSA. Fifty-eight percent (378 acres) of this group were mapped as high density and 36 percent (233 acres) were mapped as created openings. It will be important for these sites to be identified through restoration projects since suitable spotted owl habitat may need to be promoted or maintained within a 1.8-mile radius of spotted owl circles on mesic sites. Mesic sites outside of these circles (see wildlife section) would be managed similarly to dry forest sites, but different species compositions and structures would direct specific management strategies.

Mesic sites are typically within the Douglas-fir series and include the more moist plant associations. Ponderosa pine may be present, but only as remnants from early seral establishment. The understory tends to be more lush, often with a higher shrub component than in the more dry plant associations within the Douglas-fir and ponderosa series. Understory species include *Symphoricarpos albus*, *Arctostaphylos uva-ursi*, *Spiraea betulifolia*, *Pachistima myrsinites*, *Carex concinnoides*, *Festuca occidentalis*, *Carex geyeri*, and *Calamagrostis rubescens*.

c) Moist Grand Fir Group

Twenty percent (1,057 acres) of the Eagle MLSA consists of the moist grand fir group. Within this group 97 percent (1,029 acres) is mapped as high density and 2 percent (22 acres) is mapped as created openings. This type is largely located on the northwestern aspect in Eagle Creek and in the northern portion near Chumstick Mountain (Fig.?).

Understory composition is graminoid and forb dominated with such species as *Calamagrostis rubescens*, *Spiraea betulifolia*, *Rosa gymnocarpium*, *Linnaea borealis*, and *Chimaphila umbellata*.

d) Wet Forest Group

The wet forest group is not mapped within the Eagle MLSA.

e) Subalpine Fir Series

The Eagle MLSA contains none of the subalpine fir series (Appendix 4). This series is typically restricted to higher elevations.

f) Whitebark Pine/Subalpine Larch Group and High Elevation Nonforest Types

The Eagle MLSA has none of this group.

Information regarding species composition and specific structure is lacking at this time.

g) Non-Forest Vegetation

Six percent (301 acres) of the Eagle MLSA was mapped as non-forest vegetation (Appendix 4) which includes 262 acres of grassland/shrubland.

h) Species with Special Status

Within the Eagle MLSA, there is potential habitat for a number of special status species, but only a portion has been surveyed to determine presence or absence. Surveys should be carried out in conjunction with restoration projects, as well as surveys independent of other activities. It is important that species ranges are known so that better estimates of species viability can be assessed. In addition, little is known about most special status species habitat and biological requirements, and inventories provide a first and necessary step in obtaining this information.

There is one known Forest Service sensitive (see Late-Successional Associated Plant Species, Chapter IV) species within the Eagle MLSA (Appendix 6). A population of the State sensitive species *Iliamna longisepala* is found in the MLSA.

Most of what is known relative to habitat requirements of *Iliamna longisepala* has been made through casual observations. It has been observed (Harrod, personal observation) that this species occurs in disturbed areas including burns, roads, and skid trails. This observation suggests that *I. longisepala* is an early successional species and appears to require open habitats for seed germination, seedling establishment, avoidance of interspecific competition, and/or some other aspect of its life history.

A recent study by Kuhlmann and Harrod (unpublished report) reports the results of one year of post-fire monitoring on *I. longisepala*. This study found that post-burn populations are younger than unburned populations based an analysis of morphological characters. Greater percent vegetative and lower percent reproductive plants were also present in burned sites. These results suggest that *I. longisepala*, in fact, may respond to fire similar to that of *I. rivularis* which has fire-stimulated germination (Crane and Fischer 1986).

There are no known survey and manage plant species within the Eagle MLSA. The ROD provides standards and guidelines for survey and manage species, and these should be addressed within the Eagle MLSA when restoration projects are implemented.

Few if any surveys have been carried out for non-vascular plants. Surveys should be a priority project within the Eagle MLSA.

i) Noxious Weeds

The Eagle MLSA was surveyed along roads in 1992 for noxious weeds species. *Centaurea diffusa*, *Chrysanthemum leucanthemum*, and *Linaria dalmatica* are known to occur along roadsides within the MLSA. These species are located along FS Road #'s 7500, 7503, 7400, and 7502 and their spurs. Diffuse knapweed is also located near a pond in section 20. Surveys for species presence and extent should be updated in order to develop a noxious management plan for this MLSA (refer to Harrod 1994).

2. Late Successional Associated Wildlife Species

a) Introduction

In this chapter, information is presented about wildlife species that are associated with the late-successional habitats that are either present or would be managed for in the Eagle MLSA. A total of 80 species have been identified as being associated with these kinds of forest conditions and are present, unknown or suspected to occur within the MLSA. The list of these species can be found in Appendix 27.

In addition to consideration for the groups of species associated with the various kinds of late-successional forests, individual species assessments were also conducted. These assessments were completed for all threatened, endangered, sensitive, species of concern (USFWS), management indicator, protection and buffer, and survey and manage species. Collectively this group of species is referred to as species of special status. What information is available about the status of these species within the Eagle MLSA is summarized in this chapter. However, relatively little is known about a number of them.

Inventories or surveys have been conducted for only a few of the wildlife as shown in Appendix 27. The most extensive of these were for spotted owl, barred owl, mule deer and elk. Northern spotted owl inventories have been conducted over about 100% of the suitable habitat within the MLSA.

b) Late Successional Species By Habitat Type

(1) Dry Forests

About 3,260 acres (62%) of the Eagle MLSA is composed of the dry forest vegetation group. Fire climax ponderosa pine forests historically dominated these areas and 49 wildlife species are associated with these forests.

Currently, 1,786 acres (55%) of the dry forest is in a successional advanced condition. About 1,474 acres (45%) are in a low density condition and could be fire-climax.

Some species that are associated with the late successional or fire-climax conditions of these forests and that have special management status include: tailed frog, larch mountain salamander, northern goshawk, bald eagle, flammulated owl, pileated woodpecker, hairy woodpecker, white-headed woodpecker, black-backed woodpecker, Williamson's sapsucker, northern flicker, chestnut backed chickadee, pygmy nuthatch, elk, long-legged myotis, long-eared myotis, silver haired bat, fringed myotis, western big-eared bat, pallid bat, marten, fisher and Chelan Mtn. snail.

Historically, only a minor portion of these areas provided the structures that are associated with suitable spotted owl habitat (Thomas et al. 1990, Buchanan et al. 1995). However, fire exclusion has allowed successional advancement for suitable spotted owl habitat to develop in some areas (Agee and Edmunds 1992, Buchanan et al. 1995). These areas are now being used by spotted owls, however the risk of large scale disturbances causing large scale habitat loss is of major concern (Agee and Edmunds 1992, Buchanan et al. 1995, Gaines et al. in press). No spotted owl activity centers occur in the Dry Forests within the Eagle MLSA.

(2) Mesic Sites Within the Dry Forest

The mesic forest group covered about 647 acres (12%) of the Eagle MLSA. Mesic sites within the dry forests provide important wildlife habitat and add diversity across the landscape.

Historically, fire occurred less frequently at these sites (refer to the Disturbance Chapter (Chapter III) in the Forest-wide Assessment) allowing for succession that resulted in more complex forest structure such as a higher canopy closure, multilayering, snags and down logs. These forests occurred in a variety of successional stages across the landscape. The late-successional conditions of these Mesic Forests provide habitat for about 66 wildlife species. The high potential for future fires presents a concern about the sustainability of these forests.

Currently, 378 acres (58%) of the mesic sites are in a late-successional condition. In the absence of any major disturbances the amount of late-successional habitat within the mesic forests in 50 years would be about 407 acres (63%) and in 100 years 640 acres (99%).

Wildlife species that occur in these habitats and are of special management status include: tailed frog, Cascades frog, larch mountain salamander, northern goshawk, bald eagle, northern spotted owl, great gray owl, flammulated owl, pileated woodpecker, downy woodpecker, hairy woodpecker, white-headed woodpecker, black-backed woodpecker, three-toed woodpecker, red-breasted sapsucker, Williamson's sapsucker, northern flicker, little willow flycatcher, olive-sided flycatcher, chestnut-backed chickadee, pygmy nuthatch, elk, long-legged myotis, long-eared myotis, fringed myotis, Yuma myotis, western big-eared bat, silverhaired bat, pallid bat, marten, and fisher.

This forested vegetation group is capable of providing habitat structure that typically composes spotted owl nesting, roosting, foraging and dispersal habitat, while remaining within the historic range of variability. No known spotted owl activity centers occur within the mesic forests.

(3) Moist Grand Fir Group

The Moist Grand Fir group covers about 1,057 acres (20%) of the MLSA. Historically, fire occurred less frequently than in the Dry and Mesic vegetation groups (refer to the Disturbance Chapter (Chapter III) in the Forest-wide Assessment), allowing successional advancement and complex habitat structure such as high crown closure, multilayering, and many snags and down logs. These conditions provide habitat for a wide array of wildlife species, including 73 species within the Eagle Creek MLSA.

Currently, about 1,029 acres (97%) of the Moist Grand Fir group in this MLSA is in a late-successional condition. In the absence of any major disturbance, it is expected that in 50 years 1,035 acres (98%), and in 100 years 1,057 acres (100%) of this habitat would be in a late-successional condition.

Wildlife species associated with the late-successional conditions of this vegetation group and of special status include the northern goshawk, bald eagle, northern spotted owl, great gray owl, flammulated owl, pileated woodpecker, downy woodpecker, hairy woodpecker, white-headed woodpecker, black-backed woodpecker, three-toed woodpecker, red-breasted sapsucker, Williamson's sapsucker, northern flicker, little willow flycatcher, olive-sided flycatcher, red-breasted nuthatch,

pygmy nuthatch, tailed frog, spotted frog, Cascades frog, larch mountain salamander, warty jumping slug, blue-gray tail-dropper, papillose tail-dropper, Columbia pebblesnail, long-legged myotis, long-eared myotis, fringed myotis, Yuma myotis, silver-haired bat, western big-eared bat, pallid bat, elk, lynx, marten and fisher.

The Moist Grand Fir vegetation group is capable of providing structures that compose suitable spotted owl nesting, roosting, and foraging habitat while remaining within the range of historic variability. One spotted owl activity center (SO748) is located within this vegetation group.

c) Species Specific Information

The information presented in this section provides an overview of what is known about the species identified in Appendix 27 as species of special status. Information is provided on a species by species basis whenever it is available.

(1) Endangered Or Threatened Wildlife Species

There are five wildlife species that are federally listed as Threatened or Endangered and could occur within the Eagle Creek MLSA. These include the bald eagle (*Haliaeetus leucocephalus*), peregrine falcon (*Falco peregrinus*), northern spotted owl (*Strix occidentalis caurina*), grizzly bear (*Ursus arctos*), and gray wolf (*Canis lupus*).

(a) Bald Eagle and Peregrine Falcon

The bald eagle and peregrine falcon are considered to be absent from the Eagle Creek MLSA and about 10% of the available habitat has been surveyed.

(b) Northern Spotted Owls

There is 1 spotted owl activity center within the Eagle MLSA. The MLSA was established for this owl site, on the edge of the range. This is an isolated MLSA, the next nearest known activity center is 6 miles to the northwest in the Chiwawa LSR. There are 2,363 acres (45% of the MLSA) of spotted owl habitat for nesting/roosting and foraging within the MLSA. There is potential for 3,350 acres (62% of the MLSA) in the MLSA (see Appendix 13 LSR/MLSA Suitable Spotted Owl Habitat Acreage's). Wetter forest (moist) groups account for 20% of the MLSA, which is sustainable over time (see appendix 4 & 5 Vegetation in LSRs and MLSAs). Within the Eagle MLSA, 100% of the spotted owl habitat has been surveyed for spotted owls.

The estimated amount of habitat within a 1.8 mile radius of the activity center is shown in Table ? Spotted Owl Information. The spotted owl home range acreage is below threshold, of 2,663 acres nesting/roosting/foraging (suitable) habitat. See Appendix 12 Spotted Owl Activity Centers, Reproductive Status and Habitat Availability.

Table II-1, Spotted Owl Information for Eagle MLSA

Spotted Owl	Repro Status ³	Ownership ⁴	Dry or Wetter Owl ⁵	Threshold ⁶	Critical Habitat Unit (CHU) ⁷	Forest Interior? ⁸	Suitable Spotted Owl Habitat ¹⁰ (Acres)	Total Dispersal Habitat ⁹ (Acres)
SO748	PY	FS	Wetter	Below Threshold	None	Near	2,479	2,115

¹ Activity Center is Near the LSR or MLSA, but not inside the LSR or MLSA map boundary (< 1/4 mile).

³ RS = Residential Single; P = Pair; PY = Pair with Young, based on highest Reproductive occupancy.

⁴ FS = Forest Service; PVT = Private Ownership (ownership at activity center).

⁵ If the majority of suitable spotted owl habitat in **0.7 mile circle** is dry or mesic forest groups, then it is a "dry" spotted owl. If the majority is wetter forest groups, then it is a "wetter" spotted owl.

⁶ **Below Threshold:** < 2,663 total suitable spotted owl habitat acres in 1.8 mile circle **OR** < 500 total suitable spotted owl habitat acres in 0.7 mile circle.

At Threshold: 2,663-3,994 total suitable spotted owl habitat acres in 1.8 mile circle.

Optimum/Target: > 3,994 total suitable spotted owl habitat acres in 1.8 mile circle.

⁷ The activity center is within 1/2 mile of the CHU.

⁸ **Inside** = activity center is at least 600' inside (forest interior) late successional habitat.

Near = activity center is inside late successional habitat that creates a forest interior.

⁹ **Habitat** within 1.8 mile circle around activity center. Dry **dispersal habitat** includes vegetation codes 11, 13, and 52; mesic dispersal includes code 21; and wet dispersal includes codes 31, 35, 61, and 41.

¹⁰ **Habitat** within 1.8 mile radius. Dry **suitable spotted owl habitat** includes vegetation code 12 where size/structure is multistory greater than 9" DBH; mesic Suitable includes code 22; and wet Suitable includes codes 32, 36, 62, 64, and 42 (see appendix 2 GIS Veg Model & appendix 3 Veg Photo Mapping Key). Use the highest quality habitat available.

¹¹ A larger circle than 1/3 mile radius will be used to develop **100 Acre Activity Center**, if there is less than 100 acres of suitable habitat.

(i) Critical Habitat Unit for Northern Spotted Owls

There is no Critical Habitat Unit (CHU) for spotted owls within the Eagle MLSA. The nearest CHU is WA-6, Chiwawa (see Appendix 13 LSR/MLSA S. Owl Acreage's and Appendix 34 CHU Maps). The Eagle MLSA area was not identified as an important connectivity/dispersal area for spotted owls. The MLSA does provide genetic interchange for species on the edge of the range of the northern spotted.

In all LSR/MLSAs, except the Swauk LSR, Shady Pass LSR, Deadhorse LSR, Boundary Butte LSR, Tumwater MLSA and Sand MLSA, these reserves are predicted to provide the needs for spotted owl recovery over time (50+ years). They will also provide the function the CHUs were designated for. Coupled with the LSR/MLSA management, riparian reserve function, Wilderness areas, and Unmapped LSRs, the needs of the spotted owl will be met. These reserves function for connectivity and spotted owl home ranges. It is concluded that the LSR/MLSAs meet the function of the CHU system, as intended in the NWFP (NWFP C-9). Monitoring and maintaining connections, as well as meeting LSR goals will be ongoing.

(c) Grizzly and Gray Wolf

No class 1 grizzly bear observations have been made within the Eagle Creek MLSA, however, class 1 observations have been reported nearby (Almack et al. 1993). Grizzly bears are suspected to occur within the MLSA and none of their available habitat has been surveyed. Gray wolves are suspected to occur within the MLSA and about 30% of their habitat has been surveyed.

(d) Marbled Murrelet

The Eagle MLSA does not include any Marbled Murrelet habitat, it is well outside the marine foraging zone.

(2) Sensitive And Wildlife Species of Concern

There are 15 wildlife species that are on the R6 Sensitive Species list or are USFWS species of concern that could occur within the Eagle Creek MLSA. These include the goshawk (*Accipiter gentilis*), willow flycatcher (*Empidonax trailii*), olive-sided flycatcher (*Contopus borealis*), tailed frog (*Ascaphus truei*), spotted frog (*Rana pretiosa*), Cascade frog (*Rana cascadae*), Columbia pebblesnail (*Fluminicola columbiana*), long-legged myotis (*Myotis volans*), long-eared myotis (*Myotis evotis*),

fringed myotis (*Myotis thysanoides*), Yuma myotis (*Myotis yumanensis*), Western big-eared bat (*Plecotus townsendii*), lynx (*Lynx canadensis*), fisher (*Martes pennanti*), and wolverine (*Gulo gulo*).

(a) Birds

The goshawk is known to occur and surveys have been completed over about 10% of the available habitat. It is unknown if the little willow flycatcher and the olive-sided flycatcher occur. No surveys have been completed.

(b) Amphibians

Surveys for amphibians have been completed over about 10% of the habitat within the Eagle Creek MLSA. It is known that spotted frogs, Cascades frogs and tailed frogs occurs in the MLSA. Several ponds are found within this MLSA.

(c) Mollusks

No surveys for the Columbia pebblesnail have been conducted and it is unknown if they are present.

(d) Mammals

Surveys for bat species have not been completed. It is unknown or suspected that the long-legged myotis, long-eared myotis, fringed myotis, Yuma myotis or the western big-eared bat occur in the Eagle Creek MLSA.

Surveys for lynx have occurred on about 10%, for fisher on about 20% and no surveys for wolverine within the available habitat in the MLSA.

(3) Management Indicator Species

There are 12 wildlife species that are listed as management indicator species that occur or could occur within the Eagle Creek MLSA. These species include the pileated woodpecker (*Dryocopus pileatus*), downy woodpecker (*Picoides pubescens*), hairy woodpecker (*Picoides villosus*), three-toed woodpecker (*Picoides tridactylus*), red-breasted sapsucker (*Sphyrapicus ruber*), Williamson's sapsucker (*Sphyrapicus thyroideus*), northern flicker (*Colaptes auratus*), ruffed grouse (*Bonasa umbellus*), mule deer (*Odocoileus hemionus*), elk (*Cervus elephus*), beaver (*Castor canadensis*), and marten (*Martes americana*).

(4) Primary Cavity Excavators

No formal surveys for primary cavity excavators have been completed. The pileated woodpecker, hairy woodpecker, downy woodpecker, and northern flicker are known to occur within the MLSA and the remaining MIS primary cavity excavators are suspected or it is unknown if they occur.

(a) Ruffed Grouse and Beaver

No surveys for the ruffed grouse have been completed and they are suspected to occur in the MLSA. No surveys for beavers have been completed and they are suspected to occur.

(b) Mule Deer, Elk

Surveys for mule deer and elk have covered about 100% of the available habitat and they are known to occur within the MLSA.

(c) Marten

Marten are suspected to occur in the MLSA and about 20% of their available habitat has been surveyed.

(5) Survey And Manage, Protection And Buffer Species

There are eight species that do or could occur within the Eagle Creek MLSA and are identified as survey and manage, or protection and buffer species. These include the great gray owl (*Strix nebulosa*), flammulated owl (*Otis flammeolus*), white-headed woodpecker (*Picoides albolarvatus*), black-backed woodpecker (*Picoides arcticus*), pygmy nuthatch (*Sitta pygmaea*), warty jumping slug (*Hemphillia glandulosa*), blue-gray tail-dropper (*Prophyaon coeruleum*), and papillose tail-dropper (*Prophyaon dubium*).

(a) Birds

It is unknown if the great gray owl occurs within the Eagle Creek MLSA and no surveys have been completed. No surveys have been completed for the flammulated owl, white-headed woodpecker, black-backed woodpecker, or pygmy nuthatch. The flammulated owl is known to occur. It is unknown if the pygmy nuthatch, flammulated owl, white-headed woodpecker, three-toed woodpecker and black-backed woodpecker occur in this MLSA.

(b) Mollusks

It is unknown if the warty jumping slug, blue-gray tail-dropper, Chelan Mtn. snail, or papillose tail-dropper occur in the LSR and no surveys have been completed.

(c) Habitat Effectiveness

Habitat effectiveness was measured using the current open road density and the amount of security habitat. The current open road density within the LSR is 1.9 mi./sq.mi. and the amount of area in security habitat is 31%. This information shows that habitat effectiveness is considered to be "moderate" (1-2 mi./sq.mi.) relative to roads and "low" relative to security habitat (<50%). The long term management objective for LSR/MLSAs is to manage towards a "high" level of habitat effectiveness defined as <1mi./sq.mi. open road density and >70% security habitat.

3. Human Uses

a) Overview

Most of the Eagle Creek MLSA is located on the Leavenworth Ranger District with a small portion on the Entiat Ranger District.

b) Prehistoric and Historic Summary

There is little known about prehistoric and historic use of this area. Prehistoric use would most likely have been limited to seasonal occupancy by American Indians for hunting and plant gathering activities.

Historic use such as some mining or trapping activities as well as sheep grazing or driveways through the MLSA may have occurred although at a very low level. The Eagle Creek drainage was an area of early settlement.

c) Recreation

(1) Campgrounds

There are no developed facilities in the Eagle MLSA.

(2) Dispersed Camping

Little dispersed camping occurs in this MLSA, most of what does occur is attributable to hunters.

(3) Trails

There are no system trails within the MLSA. Some equestrian use does occur near and within this MLSA from horseback riding on some of the abandoned roads on national forest lands. This use originates from the Eagle Creek Ranch and is authorized under an outfitter guide permit.

There is some dispersed camping and trail riding by equestrian groups centered around some of the meadow areas north of this MLSA. Some of this use may continue down into a portion of this MLSA.

(4) Winter Use

The road systems in the MLSA and nearby area do receive some snowmobile use. The Eagle Creek and Van Creek (Van Creek is outside the MLSA) road systems are used by snowmobilers to gain access to the Entiat Ridge. The route is not groomed and snowmobile use of this road system is low to moderate.

(5) Other Recreation

There is only a limited degree of other recreation activities in this MLSA. Some people drive the roads for scenery and to explore the forest. Hunters use the area in the fall. Some of the clients of Eagle Creek Ranch horseback ride in the MLSA.

d) Mining

There are no active mining operations with the MLSA.

e) Social and Economic Considerations:

There are some private and state lands located within the MLSA boundary.

B. Analysis Between LSR/MLSAs

1. Sustainability

a) Sustainability Analysis

The sustainability of LSRs/MLSAs across the Forest is displayed in Table 19 *Vegetation Hazard and Ignition Risk Ratings* of the "Forest-wide Assessment for Late Successional Reserves and Managed Late Successional Areas, Wenatchee National Forest"). The Eagle LSR falls in the upper 1/3 of all LSR/MLSAs in terms of amount of vegetation at risk to loss from catastrophic fire. An important consideration in terms of sustainability is the relationship between the Eagle LSR and its neighboring LSR/MLSAs. This includes the amount of at risk vegetation within the LSR/MLSAs as well as the extent of at risk vegetation between them. For the purposes of this analysis six LSR/MLSAs are considered to be neighbors: Sand Creek; Camas; Boundary Butte; Tumwater; Deadhorse and Chiwawa.

The following table shows a comparison of the acres at risk and the ignition risk determined in the Forest-wide sustainability analysis for the Eagle MLSA and its six neighboring LSR/MLSAs.

Table II-2, Acres at Risk and Ignition Risk, Eagle. MLSA

LSR/MLSA	% of LSR/MLSA at Risk		% of LS Forest at Risk		Ignition Risk
	Acres	Pct.	Acres	Pct.	
Eagle	3,501ac	66%	3,163ac	100%	High

LSR/MLSA	% of LSR/MLSA at Risk		% of LS Forest at Risk		Ignition Risk
	Acres	Pct.	Acres	Pct.	
Camas	941ac	61%	932ac	100%	High
Boundary Butte	No Information.				
Sand Creek	5,998ac	65%	5,973ac	100%	High
Tumwater	1,080ac	26%	1,054ac	100%	Moderate
Deadhorse	10,805ac	59%	9,483ac	100%	High
Chiwawa	29,042ac	27%	21,345ac	38%	Moderate

When looking at sustainability issues between LSRs/MLSAs, the factor driving the analysis is the amount and location of at-risk vegetation between the Eagle LSR and its six neighbors. In other words, identifying linkages in at-risk vegetation that would facilitate the spread of fire from one LSR/MLSA to another. A review of at-risk vegetation maps reveals that this linkage does exist between the Eagle LSR and all six of the neighboring LSR/MLSAs. The greatest risk of fires burning from one LSR to the other exists between the Chiwawa and Deadhorse LSRs and Eagle. The situation as it relates to Eagle and Tumwater, Boundary Butte, Camas, and Sand Creek is less due to the 1994 Rat and Hatchery fires eliminating some of the at risk vegetation and due to the presence of private land orchards along the Wenatchee River which provides somewhat of a break in the at risk vegetation.

(1) Implications

1. Reduce stand density in dense dry successional advanced vegetation types (types 12 and 22 - Appendix 3) where they exist between Eagle and Chiwawa and Deadhorse LSRs. Of highest priority are those areas that also involve private land or urban interface issues in the Wenatchee River and Chumstick valleys.

Potential Projects - Commercial Thinning

2. Encourage private land owners in the Wenatchee River and Chumstick Valley areas to take stand density management actions on private forested areas, including education on the ecological values of maintaining large ponderosa pines.

Potential Projects - Communicate need to local landowners. Work through State and Private Forestry to help local landowners better manage their forest holdings.

3. Reduce fuel loading along roads that exist between these LSR/MLSAs to increase the roads effectiveness as fuel breaks. The best chance for this is along the county road up the Chumstick Valley to Plain as many of the other roads in this area are oriented East and West and do not provide good opportunities for establishing fuelbreaks. Most of the Chumstick road is in private ownership so private landowners also play a role in implementing this opportunity as in item #2 above.

Potential Projects - Piling of down fuels, firewood gathering, pruning to reduce vertical fuel concentrations (all vegetation types), construction of shaded fuel breaks.

4. Improve and maintain the BPA powerline corridor as a fuelbreak between the Eagle and Chiwawa LSRs.

Potential Projects - Plant or encourage growth of less flammable deciduous vegetation within the powerline corridor, remove dead fuels from the corridor.

5. Reduce fuel loading in young stands.

Potential Projects - Precommercial Thinning.

6. Maintain desired fuel levels and vegetation characteristics in low density dry forest vegetation types.

Potential Projects - Prescribed fire.

2. Forest-Wide Northern Spotted Owl

The Eagle MLSA is not one of the “big three” LSRs on the forest designated as a large population cluster/source center LSRs, for the recovery of the spotted owl. The Eagle MLSA is part of the smaller “local population” centers, which are linked to the metapopulations through dispersing individuals (see LSR/MLSA maps, Figures 1 and 2 in the Forest-wide Assessment). The spotted owl is a Threatened species, with the recovery dependent on the implementation of the NWFP, especially in LSR/MLSAs (FSEIS Appendix G, Biological Opinion, 1994).

3. Connectivity (Plant, Wildlife, and Northern Spotted Owl)

a) Plant Connectivity

Connectivity can be addressed at several spatial scales when assessing an individual MLSA. Connectivity of the LSR’S/MLSA network on the Wenatchee National Forest has been addressed above in Chapter VII and in Appendix 1 of the Forest-Wide Assessment. Vascular plant connectivity with surrounding LSRs or MLSAs is analyzed in this section (Table II-3). Refer to Forest-wide Assessment discussions for connectivity descriptions of lichens, bryophytes and fungi.

Primarily, connectivity by vegetation group to the Eagle MLSA only exists for species with high dispersal capabilities with the Chiwawa LSR. Connectivity for high dispersal species with other surround LSRs or MLSAs is dependent on vegetation outside the network. In all other cases, connectivity for low and moderate dispersal species does not exist or is dependent on vegetation outside the network.

For *Iliamna longisepala*, connectivity to surrounding LSRs or MLSAs where this species is known to occur could be improved by promoting fire climax ponderosa pine within and outside the network.

Table II-3, Eagle - Vascular Plant Connectivity

LSR/MLSA	Vegetation Group														
	Dry/Mesic			Moist GF			Subalpine			Wet			Whitebark		
Dispersal Class	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Deadhorse	D	D	D	D	D	D									
Tumwater	N	D	D	N	D	D									
Boundary Butte	N	N	D	N	N	D									
Camas	N	N	D	N	N	D									
Sand Creek	N	N	D	N	N	D									

LSR/MLSA	Vegetation Group														
	Dry/Mesic			Moist GF			Subalpine			Wet			Whitebark		
Dispersal Class	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Chiwawa	D	Y	Y	D	D	Y									

Dispersal Codes = Y=Yes (Connectivity); N=No (Not Connected); A=Veg Group Absent; D=Dependent (Connectivity Depends on Outside Habitat)

b) Wildlife Connectivity

Connectivity between late-successional patches is important to providing movement between patches, minimizing local extinctions, and reducing genetic isolation (Harris 1984, Noss and Harris 1986). In order to assess connectivity between the Eagle Creek MLSA and adjacent LSR/MLSAs the dispersion index was used (as described in Appendix 1). A total of four potential linkages were evaluated: Eagle Creek to Chiwawa LSR, Eagle Creek to Tumwater MLSA, Eagle Creek to Boundary Butte LSR, and Eagle Creek to Deadhorse LSR. The overall dispersion index for this MLSA was 1.2.

Table II-4, Dispersion Indices for the Eagle Creek MLSA

Linkage	Distance (Miles)	Dispersal			Index
		High	Moderate	Low	
Eagle Creek-Chiwawa	3	Yes	Yes	No	2
Eagle Creek -Tumwater	10	Yes	No	No	1
Eagle Creek -Boundary Butte	10	Yes	No	No	1
Tumwater -Deadhorse	7	Yes	No	No	1
Overall					1.2

c) Northern Spotted Owl Connectivity

The Eagle MLSA was established around the Eagle spotted owl pair SO748, which is on the edge of the range of the northern spotted owl. Connectivity between LSRs and MLSAs is essential for genetic interchange. The Eagle MLSA is fairly isolated, but dispersal could occur to the Chiwawa LSR, and possibly to the Deadhorse LSR. For final recovery of the northern spotted owl, smaller LSRs/MLSAs contribute to the goal of occupied home ranges (See the following table). This MLSA was not discussed as a Northern Spotted Owl Critical Habitat Unit. The goal of 1 pair of spotted owls for this MLSA is noted in the CHU discussion.

Table II-5, Connectivity Between LSRs: Spotted Owl Pair Goals for LSRs and MLSAs and CHU's

LSR or MLSA Status and Connectivity	S.Owl Pairs --1994, FSEIS Appendix G, Table G-3	Highest Occupancy and Reproductive Status, for Field Seasons 1995 ---- 1996		Number of Owl Pairs CHU Should Support, as per USFWS - CHU discussion.	
Chiwawa RW135	11 Pairs + 1 Res Single	16 Pairs + 3 Res Singles	18 sites + 1 site ¹ (6 Sites*)	21+ Pairs	WA-6

LSR or MLSA Status and Connectivity	S.Owl Pairs --1994, FSEIS Appendix G, Table G-3	Highest Occupancy and Reproductive Status, for Field Seasons 1995 ---- 1996		Number of Owl Pairs CHU Should Support, as per USFWS - CHU discussion.	
Deadhorse RW133	4 Pr	7 Pr + 2 RS	9 sites (2 Sites*)	4+ Pr	WA-9
Eagle DM5	--	1 Pr	1 site	--	NA
Boundary Butte RW131	3 Pr	2 Pr	2 sites*	3 Pr	WA-11

¹Spotted owl activity center within 1/4 mile of LSR/MLSA boundary.

*S.owl activity center may have been lost, due to 1994 Chelan Forest Fires, monitoring still underway.

² Spotted owl activity center on Private Land.

Objectives in the Eagle MLSA should protect and enhance conditions of late successional and old growth forest ecosystems, while serving as habitat for late successional forest related species, including the northern spotted owl (NWFP A-4, 1994). LSRs and MLSAs are important for maintaining well distributed and well-connected spotted owl populations.

The three nearest LSR/MLSAs were evaluated to determine their potential for dispersal to occur. This analysis showed that spotted owls could likely disperse to Chiwawa LSR through Van Creek and Railroad Creek. Connection could occur to the Deadhorse LSR through Eagle Creek and Freund Canyon, however the area is highly fragmented and interspersed with private lands. Dispersal and connectivity habitat to Boundary Butte LSR is naturally severely fragmented, between Derby Canyon and Peshastin Creek. See Forest Interior Map and Suitable Spotted Owl Habitat Maps. These connectivity corridors should be monitored for effectiveness, and should overlap into Riparian Reserves, unmapped LSRs, wilderness, etc.

(1) Restoration Opportunities And Potential Projects Between LSRs

1. Protection of MLSA from fires originating outside on Matrix lands, in the East Van Creek and Derby Canyon area.
2. Monitor/maintain connectivity outside the MLSA, particularly in the Van Creek to Railroad Creek areas.

C. Analysis Within the LSR

1. Unique Habitats And Species

The following is the discussion and results of the Unique Habitat and Species module for the Eagle MLSA. For more information see "Unique Habitats Maps" at the end of this chapter, "Forest-wide Unique Habitats and Species by LSR/MLSA" table (Appendix 37), "Forest Interior Map" (Appendix 35) and "Acres of Forest Interior in Each Late Successional Reserve" (Appendix 19), Riparian Reserves Map at the end of this chapter, Road Density tables (Appendix 20) in the Forest-wide Assessment. For process see Unique Habitats and Species Module in Appendix 1 for order, explanations and process of modules.

- a) Overview of Unique Habitats and Species
 - (1) Unique Ecosystems Landscape Analysis

Each LSR/MLSA is compared Forest-wide for unique habitats and species abundance, connectivity and function (See the "Function of the Network for Unique Habitats and Species", Chapter VII, in the Forest-wide Assessment). The Eagle MLSA is comparatively low in habitat and species abundance; low for connectivity for these habitats and species; and low in function and process of unique habitats. Overall the Eagle MLSA has 6% in non-forested vegetation types (grass/shrub/natural openings and some wet meadows); 4% in Forest Interior habitat; 61% in Late Successional/Successionally Advanced habitat; 19 wildlife late-successional associated species or species of Special Status; and 16 plant late-successional associated species or species of special status. The most unusual thing about this area is the three ponds within the MLSA, which supply habitat for spotted frogs, Cascade's frog and long-toed salamander.

The Eagle MLSA is within the Wenatchee Mountains area of plant rarity or endemism along the east-west ridges east of the Cascades, as per Columbia Basin Ecosystem Plan (Marcot et al, 1995 Draft).

Identified areas of high abundance, connectivity and function for unique habitats and species within the Eagle MLSA are:

- **Three Ponds Areas:** Wetlands in a relatively dry forest environment. Spotted and Cascade's frog, long-toed salamander, aspen, cottonwood, cedar, songbird area, mule deer summering/fawning.
- **Eagle Creek and Derby Creek Tributaries and Headwaters:** Riparian Reserves, Red-band trout, cutthroat trout, tailed frog; Forest Interior, spotted owls, PETS spp, MIS spp, mule deer migration/fawning.
- **Slopes off Chumstick Mountain:** East Van Creek and natural openings and rocks off Chumstick Mt., big horn sheep, deer winter range, potential peregrine falcon foraging.

Each LSR/MLSA can be evaluated for biodiversity, connectivity and function (see Function of Unique Habitats in the main body of the Forest-wide Assessment). Past management activities affect the function of unique habitats and species. This includes open roads, roading of riparian reserves, and past harvest activities. For the Eagle MLSA: total open road density of 1.85 miles per square mile is moderately high; security habitat of 31% is very low; roads and trails in riparian reserves of 7.04 miles per square mile is very high; and past harvest activities of 15% in the MLSA is lower.

(2) Abundance and Ecological Diversity

Forest-wide, the Eagle MLSA has low amounts of unique habitats and species abundance. This includes acreage for unique plant and animal habitats, juxtaposition of habitats, availability of wilderness or areas of rarity, and known observations from the plant and animal species list. There is 6% of the LSR in non-forested vegetation types, and there are 19 wildlife species associated with late-successional habitat or Species of Special Status and 16 plant species of special status or associated with late-successional habitat.

(3) Connectivity for Unique Habitats and Species

This MLSA is fairly isolated, providing low amounts of connectivity for unique habitats and species. This includes the low amounts, percent and number of forest interior patches, late successional habitat patches, and the lack of juxtaposition to wilderness and areas of rarity. Due to the Eagle MLSA being isolated, and very small in size, it does not provide a high or moderate degree of connectivity. Species utilizing the habitat within are very tied to the specialized or unique habitats (ponds, wetland, rock, natural openings).

(4) Process and Function of Unique Habitats and Species

The MLSA has a low degree of function for unique habitats and species, as determined by the low amounts of Special Status plants and animals, as this MLSA has had some extensive surveys. The lack of juxtaposition to wilderness and areas of rarity, also puts this in the lower ranks compared to other MLSAs and LSRs on the Forest. Function and process includes development and maintenance of unique ecosystems, including ecological values for unique species and populations. The plant and animal species list for known observations makes up a large part of this analysis, as well as proximity to wilderness and areas of rarity, which sustain habitat function. See the "Forest-Wide Function of the Network for Unique Habitats and Species" section and the "Forest-wide Unique Habitats and Species by LSR/MLSA" table in Appendix 37, both in the Forest-wide Assessment.

b) Unique Habitats and Species Known Within MLSA

(1) Unique Habitats and Species Site Specific Analysis

The following is a summary of the Unique Habitats and Species Module for Eagle MLSA. For more information see Unique Habitats and Forest Interior Map Maps at the end of this chapter, "Forest-wide Unique Habitats and Species by LSR/MLSA" table in Appendix 37, and Forest Interior Tables in Appendix 19, Riparian Reserves Map at the end of this chapter, Road Density tables (Appendix 20). For process see Unique Habitats and Species Module in Appendix 1 for order, explanations and process of modules.

Table II-6, Unique Habitats and Species Site Specific Analysis

	Eagle MLSA
Riparian Reserves	Over-all 10% of LSR in riparian reserves, moderate amounts.
	Streams (519 acres), Ponds, Wetlands and Seeps. The 3 ponds are especially important to this area of the Forest, providing wetland habitat amongst dry forest types.
Non-Forested Vegetation	6% (301 acres) of LSR/MLSA
	Grass/Shrub/Natural Openings 5% (243 acres) East Van Creek
	Wet Meadows 9 Acres (main Eagle Creek), Subalpine Meadows 2 Acres.
	Rocks/Cliffs 9 Acres (towards Entiat Ridge)
Unique Forest Groups	Forest Interior Patches 4% (196 acres), mostly moist
	Dry Forest Interior - 1 patch at head of Ollala and Derby.
	No Disjunct Forests known (Western Red Cedar by "Squiggly Road Pond", Black Cottonwood, Aspen by "Old Beaver Pond").
	Snags/Logs Low to Moderate Quality from Landscape Level (see Snag sub-module).
	Late-successional Habitat (20% moist) and Fire Climax/Successionally Advanced (41% dry).
Animal - Late Successional Associated Species and Species of	19 Species of Special Animals

	Eagle MLSA
Special Status	
PETS - Animals	3 species: Spotted Owl, Big-horned Sheep, Red Band Trout
Survey & Manage and Protection & Buffer	1 species: Flammulated Owl
Management Indicator Species (WNF)	7 species: Spotted Owl, Pileated Woodpecker, Primary Cavity Excavators, Ruffed Grouse, Elk, Mule Deer, Red Band Trout.
Other Animal Species of Special Status	Species of Concern: Northern Goshawk, Tailed Frog, Spotted Frog
	Neotropical Migratory Birds: along the streams, shrub fields, meadows.
	Late Successional Species Cutthroat Trout (suspected).
	Significant Fish Populations: Not an area of significance.
Plants - Late Successional Associated Species and Species of Special Status	16 Species of Special Plants
PETS - Plants	2 species: <i>Illiamna longisepala</i> , <i>Orbanche pinorum</i> .
Survey & Manage and Protection and Buffer Plants	Fungi, Lichens, Vascular Plants
Other Plant Species of Special Status	
American Indian Uses	Traditional Use Sites: unknown
	Vision Quest Sites: unknown
	Traditional Food Plants: Roots
	Food Gathering: Elk, Deer.

c) Restoration Opportunities and Potential Treatments Unique Habitats Within MLSA:

Weeds (Toadflax, Knapweed, Oxeye Daisy):

1. Reduce noxious weed spread in POND AREAS and in meadows/natural openings;
2. Reduce noxious weed spread in partial cuts and roads through-out the MLSA;

Roads:

1. Reduce roads in Riparian Reserves and wet meadows, ESPECIALLY IN THE POND AREAS. Sec 29 "Squiggly Pond", Sec 21 "Upper Pond", Sec 20 "Old Beaver Pond";and

in other areas inside and outside of the MLSA. Reconstruct roads to reduce sediment either through structures or surfacing.

2. Increase Security Habitat;
3. Reduce roads in forest interior patches;
4. Reduce open road density.

Access:

1. Retain American Indian access to traditional use sites;

Habitat Improvement:

1. Reduce encroaching trees in shrubfields; where fire historically maintained them as meadows,
2. Use prescribed fire in ponderosa pine with low density and large tree sizes;

Protect:

1. Establish Special Interest Area for the POND AREAS;
2. Protect and/or enhance riparian areas, wetlands, intermittent streams, and dispersal corridors in Riparian Reserves;
3. Protect/maintain/enhance/monitor PETS species;
4. Protect large trees and screen near meadows, talus, cliffs, caves;
5. Meet high end snag levels and species;
6. Protect caves and cliff/caves for 250' around (roads/trails/cutting) to benefit bat species.

Coordinate and/or Acquire:

1. Coordinate unique habitat management and interpretation on non-Forest System lands with high degree of unique species or habitat and in the Eagle Creek area. Especially control of noxious weeds to POND AREAS;

Monitor:

1. Monitor for beaver in the old beaver pond areas;
2. Monitor and maintain unique habitat concentrations;
3. Monitor and maintain connectivity corridors;
4. Monitor old clearcuts and partial cuts for snag levels and wildlife/plant species use;
5. Survey & Manage prior to activities: Great Gray Owl, Larch Mt. Salamander, Lynx, Mollusks and other S&M or P&B species;
6. Survey & Manage prior to activities: fungi, lichen, bryophytes, vascular plants;
7. Follow PETS, Species of Concern, Species of Special Status guidelines in Biological Evaluations for projects.

d) Snag/Log/Green Tree Recruitment Module

The following is the discussion and results of the Snag/Log/Green Tree Recruitment sub-set module of the Unique Habitats module for the Eagle MLSA. Over-all, the Eagle MLSA has a low to moderate quality of available snags and future green tree recruitment snags and logs. See Appendix 1 for order,

explanations and process of modules. Snag quality can be judged by a continual supply of tree structure in various stages of decay, size and species. This can be best provided in the moist and wet vegetation groups, areas with large amounts of late-successional habitat, areas with little fragmentation, areas with high amounts of forest interior, and areas with high functioning riparian reserves. (See Appendix 38, "LSR/MLSA Snag/Downed Logs/Green Tree Recruitment Analysis" in the Forest-wide Assessment.

Table II-7, Eagle MLSA Snag Habitat Quality/Landscape Scale

<u>HIGH QUALITY</u>	<u>MEDIUM QUALITY **</u>	<u>**** LOW QUALITY</u>
Moist & Wet Veg Groups 20%	Subalpine Fir & Mesic Veg 12%	Dry & Whitebark Veg 62%
>60% LS (non-dry) Habitat	15% - 60% LS Habitat 20%	<15% LS Habitat
80% - 100% LS (all) Habitat	40% - 80% LS/M Habitat 61%	<40% LS/M Habitat
> 30% Forest Interior (non-dry)	15% -29% Forest Interior Non-dry	<15% Forest Interior Non Dry 3%
>10% Forest Interior Dry	5% - 9% Forest Interior Dry	< 5% Forest Interior Dry 1%
>16% in Riparian Reserves	10% to 16% in Riparian Reserves 10%	<10% in Riparian Reserves
0 Miles/Square Miles, Any Roads in Riparian Reserves	0 to 1 Miles/Square Mile, Roads in Riparian Reserves	> 1 Mi./Sq. Mi. Rd Rip Res, 7.04 mi/sq/mi
< 1 Miles/Square Miles Open Roads	1 to 2.5 Mi./Sq., Miles Roads 1.85 mi/sq/mi	> 2.5 Miles/Square Mile Roads
>70% Security Habitat	50% to 70% Security Habitat	<50% Security Habitat 31%
>10% in Past Burns-snags available		<10% in Past Burns < 10%
>50% Insect/Pathogens (See Disturbance Section in this Chapter)	25% - 50% Insect/Pathogens 25 to 50%	< 25% Insect/Pathogens
<10% Past Clearcut Harvest 9%	11% - 25% Past Clearcut Harvest	>25% Past Clearcut Harvest
<10% Past Partial Cut Harvest 5%	11% - 50% Past Partial Cut Harvest	>50% Past Partial Cut Harvest

(Percentages in bold indicate values for MLSA)

(1) Restoration Opportunities And Potential Projects For Snags/Logs

1. Reduce roads in riparian reserves;
2. Reduce roads in Forest Interior patches;
3. Monitor for snag dependent species, and snag longevity;
4. Retain snags at high end of range;

5. Complete snag analysis on 40 acre grid;
6. Manage insects and disease at endemic levels;
7. Increase Security Habitat.

e) Species with Special Status (Plant)

There is one known species with special status within the Eagle MLSA. There are no immediate viability concerns for *I. longisepala* so the model would recommend monitoring and development of a conservation strategy. There is potential habitat for a few other species with special status and additional surveys should be carried out to determine presence or absence. Plant surveys should be carried out in conjunction with restoration projects, as well as surveys independent of other activities. It is important that species ranges are known so that better estimates of species viability can be assessed. In addition, little is known about most species habitat and biological requirements, and inventories provide a first and necessary step in obtaining this information.

There are no known survey and manage plant species within the Eagle MLSA (See Appendix 6 & 7). Although a few species are suspected, even more are simply unknown. The ROD provides standards and guidelines for survey and manage species.

Table II-8, Sensitive and Survey and Manage Species in Eagle MLSA

Key to Columns: "*" Federal status - "SP" = Special Protection; "+" Washington state status - "S" = Sensitive, "T" = Threatened, "E" = Endangered; "++" Forest Service designations - "SM" = Survey and Manage; "***" Present (or absent in MLSA'S/MLSA) - "K" = Known, "S" = Suspected

2. Plant Connectivity

Connectivity can be addressed by analyzing the connectedness of habitats within the MLSA. Within the Eagle MLSA, most forest groups are fairly well connected. Many disjunct populations result from inherent breaks or openings in the landscape. At this time, information is not available to complete this type of analysis for the Eagle MLSA.

3. Wildlife Connectivity

The following is a result of applying the "within LSR/MLSA connectivity assessment process" to the Eagle Creek MLSA.

Table II-9, Connectivity Rankings for Eagle Creek MLSA

Connectivity Variable	Dry	Mesic	MGF	RR	Overall
% Late-success or Fire Climax	L	M	H	M	M
Open Road Density	L	L	M	L	M
Security Habitat	L	L	L	L	L
Forest Interior Roads	L	L	H	L	L
% Forest Interior*	L	L	L	L	L

Currently, the availability of habitat in a late-successional or fire-climax condition is at a low level in the dry forests, moderate in mesic, and high in moist grand fir. Restoration projects that promote the development of fire-climax conditions would improve the connectivity in this forest group. The overall open road density and level of security habitat provides for a low to moderate level of connectivity. The road density within Riparian Reserves is particularly high at 3.8 mi./sq.mi. The current level of forest interior connectivity is considered to be low. This is a concern for species with low mobility. The percent of each vegetation type in a forest interior will improve over time unless a large-scale disturbance occurs. It should be noted that the ranking for this variable may never be high as a result of natural landscape fragmentation. The amount of habitat within a forest interior needs to be evaluated based upon the ecological capabilities of the site and sustainability on a site-specific basis. Site-specific analysis is also necessary to more adequately address connectivity for the less mobile species. This was not adequately addressed at the coarse/moderate filter approach used in this assessment.

(1) Restoration Opportunities

(a) Dry Forest Group

There is an opportunity to improve connectivity within the dry forest vegetation group through the implementation of thinning, prescribed fires, and road closures with associated revegetation.

(b) Moist Grand Fir, Riparian Reserves

There is an opportunity to improve habitat connectivity within riparian reserves and interior forest patches by reducing the number of roads. This could include relocating roads or revegetating them to provide for connectivity for low mobility wildlife species.

4. Disturbance Risk Analysis

The Eagle MLSA contains 5,266 acres, at least 46% of which is successional advanced or partially harvested dry or mesic forest. According to the District silviculturist, the entire MLSA has been high-graded at least once and many stands have been entered two or more times. Most of the large ponderosa pine is gone as a result of these harvest entries. Many younger / smaller pines are being out-competed by more shade-tolerant Douglas-fir and grand fir, especially on north-facing slopes. An interesting component of the Eagle MLSA is small stands of western red cedar within riparian areas and extending upslope where springs and seeps provide adequate moisture for this species. This MLSA also includes some small aspen stands.

Mortality associated with insect attack is high. Overstocked stands are creating moisture stresses that have led to outbreaks of bark beetles. Residual pine are being killed by western pine beetle, mountain pine beetle, and pine engraver beetle. On north-facing slopes, grand fir are being attacked by fir engraver. The heaviest mortality from this insect occurred during the late 1980s and early 1990s. Aerial surveys done in 1990 showed more than 8,000 trees killed by this insect. Historically, frequent low severity fires virtually eliminated grand fir as a component of forests in much of the area now within the Eagle MLSA. The "outbreak" of grand fir that resulted from excluding fires has resulted in an outbreak of the fir engraver beetle where grand fir is under drought stress or infected by root and stem pathogens.

Pathogen activity within the MLSA is also high. Many Douglas-fir are infected by dwarf mistletoe, some very heavily. Armillaria and laminated root rots are prevalent, especially in higher-elevation stands. These decay organisms are killing both Douglas-fir and grand fir, but openings created by tree mortality associated with these pathogens are not large enough for the more tolerant pines to establish and grow. The prevalence of past high-grade logging likely resulted in establishment of P-type annosus root rot.

The Eagle MLSA is at high risk to stand-replacing fires. The lower valley is privately owned, with increasing development. The area is dry and slopes very steep. Prior exclusion of fire coupled with aggressive high-grade harvests have allowed grand fir and Douglas-fir to establish and grow, creating heavily stocked stands. A long drought during the 1980s and 1990s stressed trees growing in overstocked stands, causing high mortality from insects and diseases. Now, dead and live fuels are connected both horizontally and vertically across the landscape.

The following information on insect activity in the three reserves is from data collected during the aerial surveys conducted by Region 6 Insect and Disease Group. Light infestations or damage on less than 100 acres are not reported.

- Mountain pine beetle (ponderosa): 1969, 1976, 1978, 1989, 1991-92, 1995
- Western pine beetle: 1958, 1969, 1990, 1995
- Pine Ips (pine engraver beetle): 1986 (heavy)
- Larch budmoth: 1986
- Fir engraver: 1969, 1976, 1988-90 (heavy to very heavy), 1991
- Western spruce budworm: 1977

Susceptibility of the Eagle MLSA to fires, insects, and pathogens is shown in the following table. Mortality from biotic disturbance agents will be greatest where host continuity across the landscape is high and where there is overlapping moderate to high risk among two or more disturbance agents that act synergistically. Risk associated with biotic disturbance agents generally elevates the risk of catastrophic fires by potentially increasing fuel levels; this is especially true in the dry forest vegetation group and in vegetation upslope from or surrounded by dry forests.

Table II-10, Disturbance Matrix, Eagle MLSA

Veg		DF	Root Decay									
Type	Fire	Dwarf Mistletoe	AROS	HEAN	PHWE	WSB	DFB	MPB	FE	WPB	Total Risk	
10	M	M	M	L	L	L	H	L	-	L	M	
11	M	M	M	L	L	M	M	-	-	H	M	
12	H	H	M	L	M	H	M	-	-	H	H	
13	H	H	M	L	M	H	M	L	-	M	H	
20	M	M	M	M	M	L	H	L	M	L	M	
21	H	M	M	M	M	M	M	M	M	L	H	
22	H	H	M	M	M	H	H	M	H	L	H	
23	H	H	M	H	M	H	H	L	H	L	H	
30	M	M	M	M	M	L	H	-	M	L	M	
31	H	M	M	M	M	L	M	-	M	L	H	
32	H	H	M	M	H	M	M	-	H	L	H	

Key to Column Headings: PP = Ponderosa Pine, DF = Douglas-fir, WL = Western Larch, PIPO = Ponderosa Pine; PSME = Douglas-fir; LAOC = Western Larch; AROS = Armillaria root disease; HEAN = Annosus root disease; WPBR = White Pine Blister Rust; WSB = Western Spruce Budworm; DFB = Douglas-fir Beetle; MPB = Mountain Pine Beetle; WPB = Western Pine Beetle.

Key to Letters “-” = no risk; “L” = low risk, “M” = moderate risk, “H” = high risk

Veg Type codes: refer to Appendix 3, in the "Forest-wide Assessment for Late Successional Reserves and Managed Late Successional Areas, Wenatchee National Forest".

Projects within the Eagle MLSA should focus on restoring ponderosa pine stands, especially on dry slopes. Where western red cedar exists, there may be opportunities for thinning out competing grand or Douglas-fir to perpetuate the cedar. Western red cedar may die back if adequate moisture is not available. Areas heavily infected by root and stem decay pathogens provide opportunities to regenerate to disease-resistant pine and larch.

5. Northern Spotted Owl

The recovery of the federally Threatened northern spotted owl is highlighted in management strategies within LSRs and MLSAs (See Appendix 1 - Northern Spotted Owl Module, Individual LSR/MLSA). This includes:

- LSRs and MLSAs will meet the goals for the numbers of owl pairs within each LSR or MLSA (NWFP 1994 B-4; NWFP C-9; FSEIS Appendix G, Biological Opinion, 1994; USDI. 1992. Northern Spotted Owl Recovery Plan, and USFWS Memorandum, 1991);
- Each spotted owl's 100 acre Activity Center will have the best quality habitat established and retained;
- Each spotted owl's 500 acre Core Area will have the best quality habitat and habitat will be retained;
- Each spotted owl home range will meet threshold acreage's (2,663 acres) as a minimum. Wetter owl sites in LSRs will meet target or optimal habitat of 3,994 acres;
- Sustainable, suitable spotted owl habitat outside home ranges will be maintained ;
- Dispersal habitat within and outside LSR/MLSA will be provided; (NWFP 1994, ROD pg. 19, C-3, C-10 to 11, C-39, C-45, D-9, App 3-4, pg. 240-241).
- Habitat conditions for long-term (> 50 years) sustainable nesting/roosting/foraging habitat will be improved (see DEC's and DC's in Forest-wide document, Chapter III PP 87-95); and
- The risk of habitat loss and nest site loss will be reduced (NWFP 1994, C-12 to 16, C-26);

The Eagle MLSA is mostly in the dry forest groups (62%), however the spotted owl pair is primarily in moist forest, and is considered a "wetter" spotted owl. Not all of the SO748 spotted owl home range is within this MLSA, it overlaps onto Matrix and private land habitat outside. The Desired Condition for spotted owl habitat in MLSAs is 40% of the 1.8 mile home range radius, which is 2,663 acres. This drier forest MLSA will be managed for risk and hazard reduction, over spotted owl habitat maintenance (after meeting threshold goals). MLSAs in general, accept more risk of hazards, than do lands outside in Matrix. Yet, MLSAs accept less risk of hazards than do LSRs.

The Northwest Forest Plan describes the spotted owl MLSA's to "be configured so that it contains an amount of suitable habitat that approximates at least the median amount observed in pair home ranges for the province" (NWFP C 23-25). The median home range size for pairs in the Eastern Cascades Province was estimated to be 7,124 acres (NWFP C-24). For this assessment, each MLSA was reviewed for spotted owl sites, acreage size, and connectivity to other LSR's and to Wilderness areas. There are 6 MLSA's that have fewer acres than the median home range size. These are Twin Lakes DM-1, Natapoc DM-2, Tumwater DM-3, Eagle DM-5, Camas DM-6, and Lost Lake DM-12. However, most of these are adjacent to other LSR's or Wilderness areas. There are two that are not,

Eagle MLSA and Camas MLSA. The acreage within the MLSA's may not sustain a spotted owl home range, surrounding matrix lands are probably used by spotted owl pairs within these MLSA's.

The following is the discussion and results of the Within MLSA Spotted Owl Module for the Eagle MLSA. This module reviews the home range sites for spotted owls, as well as connectivity within the MLSA. Appendix 1 further describes the order, explanations and process of modules, specifically the Northern Spotted Owl Module, Individual LSR/MLSA. See Suitable Spotted Owl/Dispersal Habitat and Activity Center map and tables, Forest Interior Map and tables, Riparian Reserve map and tables and Security Habitat map and tables at the end of this chapter.

a) Suitable Spotted Owl Habitat

The amount of nesting/roosting/foraging habitat within the Eagle MLSA is 2,363 acres (45% of the MLSA). Of this, 1,018 acres (19%) are in wet, moist, and subalpine fir forests. This wetter spotted owl habitat has a higher chance of Sustainability, than dry and mesic forest groups. The MLSAs predominate forest vegetation is dry (3,260 acres - 62%), of which only 958 acres (18%) is N/R/F spotted owl habitat. An additional 386 acres (7%) is mesic forest suitable habitat. There is a potential for the MLSA to reach 3,250 acres (62%) of suitable habitat. However, much of this potential habitat is in the drier/mesic forest groups, and not sustainable. Sustainable spotted owl habitat within this MLSA is approximately 1,057 acres of moist forest group habitat. It is doubtful that 1 pair of spotted owls can be sustained in this MLSA over the long-term (> 50 years). Dispersal habitat currently is 2,122 acres, and is a mix of dry and moist forest groups. (See appendix 13 Suitable Habitat Acreage's, appendix 4 & 5 Vegetation Acreage's, and Suitable Spotted Owl Habitat Maps). The most contiguous and sustainable suitable spotted owl habitat in the MLSA is in the main Eagle Creek (north aspect) and along the top of Entiat Ridge.

There is one spotted owl activity center found in wetter habitat. Habitat analysis for the Eagle MLSA is based on vegetation mapping, and a model of spotted owl habitat structure. The map and acreage's should be validated prior to project implementation.

Potential disruption to spotted owl habitat outside the MLSA is in the dry forest, with high risk to fire. Other potential disruptions are the private land fragmentation and development. To meet the recovery goals for the spotted owl, there is a need to increase/accelerate spotted owl dispersal habitat within the spotted owl core area and home range.

This LSR/MLSA is part of the reserves that are predicted to provide the needs for spotted owl recovery over time (50+ years). Coupled with the LSR/MLSA management, riparian reserve function, Wilderness areas, and Unmapped LSRs, the needs of the spotted owl will be met. The reserves function for connectivity and spotted owl home ranges. With the exception of a few LSR/MLSAs that are not sustainable, it is concluded that the LSR/MLSA reserves on the Wenatchee National Forest meet the function of the CHU system, as intended in the NWFP (NWFP C-9). Monitoring and maintaining connections, as well as meeting LSR goals will be ongoing. (See Appendix 1, "Forest-wide Spotted Owl Module" and "Individual LSR/MLSA Spotted Owl Module")

b) Spotted Owl Home Ranges

Within the Eagle MLSA, the estimated amount of habitat within a 1.8 mile radius of the activity center is shown in Table II-11. The spotted owl home range is below threshold acres, both within the core area of 0.7 miles radius (500 acres) and the home range of 1.8 miles radius (2,663 acres). The Eagle owl will need dry forest (1,096 acres) and dispersal habitat (180 acres) to reach it's threshold acreage. The majority of the home range for this owl is in the wetter forest groups (1,188 acres) and mesic (379 acres). The dispersal acres (184 acres) needed for threshold could be accelerated towards late successional structure and size. All spotted owl sites should be monitored and habitat verified. Of

note, to reach 2,663 acres habitat, acreage outside the MLSA is utilized within the 1.8 miles. The DNR Section 16 appears to have suitable habitat in moist forest group, which is part of the SO748 owl acres. Private land within this owl home range provides very little suitable habitat, but provides dispersal habitat.

There is some potential to restore sustainable habitat in the wetter forest groups for long-term population viability. There is also a need to protect existing habitat and home ranges, especially in sites below threshold and target acreage's. This will cause a higher risk to fire in the dry forest habitat maintained for the spotted owl. Overtime, it is expected that higher quality and more sustainable habitat will be restored to the MLSA and to the nearby Chiwawa LSR. The drier forests within the MLSA will eventually be managed for other late-successional species.

Table II-11, Suitable Spotted Owl Habitat, Eagle MLSA

SUITABLE SPOTTED OWL HABITAT ¹⁰													Restore
1.8 mile Circle Around Activity Center				0.7 mile Circle Around Activity Center				.33 mile Circle Around Activity Center				Opps	
Spotted owl	Dry	Mesic	Wet-ter	Total	Dry	Mesic	Wet-ter	Total	Dry	Mesic	Wet-ter	Total	*
SO748	932	366	1,181	2,479	125	59	285	469	24	18	115	157	M, P, C, A

Below Threshold: < 2,663 ac suitable spotted owl habitat in 1.8 mi. circle **OR** < 500 ac suitable spotted owl habitat in 0.7 mi. circle.

At Threshold: 2,663-3,994 total suitable spotted owl habitat acres in 1.8 mile circle.

Optimum/Target: > 3,994 total suitable spotted owl habitat acres in 1.8 mile circle.

¹⁰ **Dry suitable spotted owl habitat** includes vegetation code 12 where size/structure is multistory greater than 9" DBH;

mesic includes code 22; and

wet includes codes 32, 36, 62, 64, and 42.

* **Restoration Opportunities:** M = Monitor Habitat & Site; P= Protect Habitat From Fire; A = Accelerate Habitat Towards Nesting, roosting, Foraging; C = Coordinate Habitat and Site Management, or Acquire Habitat.

c) Spotted Owl Dispersal And Connectivity

The MLSA has only one spotted owl, there is not potential for more than one owl to be sustained on site. Connectivity within the MLSA is based on foraging and dispersal opportunities. Important connectivity habitat exists along upper Eagle Creek and upper Derby Canyon. Habitat quality for the MLSA is lower overall, except near the activity center of SO748.

Important connectivity corridors and patches between LSRs/MLSAs include Eagle Creek to East Van Creek to Railroad Creek to Dry Creek (Chiwawa LSR connection). Other connectivity's include: Eagle Creek to Freund Canyon. There appears to be no connectivity to the east or north directly onto the Entiat. An important linkage may have been disrupted in the 1994 fires, and no longer functions.

During dispersal - nesting, roosting, foraging habitat is used, as well as habitat of lower quality (dispersal habitat). Dispersal habitat includes single story stands, and smaller trees with at least 40% crown closure. Dispersal habitat within the Eagle MLSA is 2,122 acres (40%) and can grow up to be nesting/roosting/foraging habitat. Habitat providing dispersal/Connectivity corridors and patches

within the MLSA are primarily along riparian reserves and north aspects (see Forest Interior map and Suitable Spotted Owl Habitat Map).

The function of dispersal/connectivity habitat for spotted owls depends on the amount and juxtaposition of late-successional, forest interior, and dispersal habitat. The Eagle MLSA currently has 20% in late-successional/successionally advanced wetter forest habitat, this includes nearly all of moist forest available within this MLSA. Another 41% is in dry forest successionally advanced, which is not sustainable. There is a low amount of forest interior habitat (4%), the spotted owl activity center is located on the largest patch. The natural landscape accounts for much of the disruption to Forest Interior habitat. Some fragmentation is from created openings (9%). The moderate road densities (1.85 miles per square mile) and low Security Habitat (31%) effects connectivity, in that fragmentation usually occurs along roads, and snag reductions for road maintenance cumulatively effects habitat overtime.

Outside the LSR/MLSA network, dispersal habitat is found in all land allocations, and will be provided mainly in Riparian Reserves, in Unmapped LSRs in Matrix/AMA's, and in wilderness areas (NWFP 1994, ROD pg. 19, C-3, C-10 to 11, C-39, C-45, D-9, App 3-4, pg. 240-241).

d) Restoration Opportunities And Potential Projects - Within
MLSA

1. Meet goals of MLSA for 1 pair of spotted owls.
2. Validate spotted owl mapping, LSR acreage's, and home range acreage's. Field verify habitat and activity center locations.
3. Reconfigure spotted owl habitat home range, based on foraging pattern, rather than 1.8 mile circle. Suspect owl moves through moist/linear habitats rather than circular lower quality.
4. Protect spotted owl home ranges within MLSA, between owl circles, by implementing risk reduction first on non-suitable habitat, then on Dry and Mesic habitat.
5. Sustain spotted owl habitat inside MLSA in north aspects, riparian reserves of Eagle Creek and Derby Canyon.
6. Maintain dispersal/connectivity habitat and connectivity towards Chiwawa LSR.
7. Improve and accelerate N/R/F habitat, to maintain current number of spotted owl pairs.
8. Protect and/or create connectivity outside MLSA: Van Creek to Railroad Creek.
9. Fuels reduction and hazard reduction occur outside N/R/F habitat in short term, shift emphasis after 50 years. Accept more risk from fire, manage at high end of spotted owl habitat DC in wet sites. 500 Acre core area protected, 100 acre activity center protected.
10. Improve and accelerate N/R/F habitat in wet forest groups, to maintain number of spotted owl pairs. Accelerate dispersal habitat and old plantations.
 - Clear cuts in wet/moist vegetation groups predicted to be habitat in 100 years.
 - Clearcuts in mesic/dry vegetation groups will be habitat in 120 years.
 - Pole sized stands in wet/moist will be habitat in 50 years.
 - Pole sized stands in mesic/dry will be habitat in 70 years.
11. Cooperate and encourage private landowners to manage identified sites for owls.
12. Coordinate habitat and site management on private land OR acquire habitat from private ownership.

13. Monitor spotted owl activity centers, 500 acre core and home ranges of spotted owls. SO748 (Eagle) monitor and accelerate 184 acres of dispersal towards suitable.
14. Monitor/maintain connectivity outside MLSA.
15. Increase habitat effectiveness and connectivity by reducing open roads and revegetating road beds, especially in forest interior habitat patches.

6. Aquatic

The Eagle MLSA includes lands in the Eagle Creek, Derby and Olalla subwatersheds. Eagle Creek is a tributary to Chumstick Creek. Derby and Olalla are tributary to the Wenatchee River. This is a dry landscape with little surface water. Human development has greatly influenced the valley bottoms in these subwatersheds.

a) Geomorphology

The Eagle MSLA is located within the Wenatchee Swauk Sandstone Hills Subsection. The Chumstick Sandstone geologic formation dominates the subsection within the MLSA. The geomorphology is strongly influenced by folded, inter-bedded bedrock with dipslope/scarp slopes forming narrow, confined v-shaped valleys resulting in highly dissected landform. Surface erosion is the predominate erosion process with occasional mass wasting associated with the weaker, incompetent beds. Ponds associated with old slumps may be an important riparian habitat within the MLSA. The subsection is in the rain shadow of the crest of the Cascade Mountains thus, are dry landscapes.

The shallow, fine-grained soils are subject to moisture stress and very erosive. The watersheds have numerous first-order drainages, many of which are ephemeral. The soils have little moisture holding capacity thus precipitation runs-off the slopes rapidly through the dense first-order drainage network. Flows are flashy with steep peaks rapidly dropping to baseflow levels after storm events or snow runoff. With little near surface ground water, low flows can be very low compared with other areas on the Forest. The low summer flows and hot, dry summers create the potential for high stream temperatures. Many streams are ephemeral or intermittent and summer baseflows are very low. The valley bottoms have been heavily developed. Domestic water use probably exacerbates the low summer flows. The streams in Eagle, Derby and Olalla often become interrupted before they enter Chumstick Creek (Eagle) or the Wenatchee River (Derby and Olalla)

The numerous first-order tributaries within these fine-grained, erosive soils create watersheds with efficient downstream fine-sediment delivery. These landscapes are actively eroding. Natural events such as fire and/or high intensity rains, or management activities which remove the little soil protection offered by organic matter may greatly accelerate erosion. Summer thunderstorms may trigger flashfloods and mud flows. The streams are actively degrading (downcutting) through the fine textured material. Mainstem channels are associated with multiple terraces of recent origin.

Much of the Wenatchee Swauk Sandstone Hills, especially the lower elevations naturally experienced a high frequency, low intensity fire regime. Management actions such as fire suppression and selective timber harvest have changed much of the area to an unnaturally high intensity fire regime. When fires now occur followed by high intensity precipitation an accelerated rate of erosion may occur. It is also possible that summer low flows may be reduced below historic levels due to the increased conifer stocking resulting from fire suppression (Mission Creek Watershed Analysis).

(1) Management Concerns due to Geomorphology

Erosive soils combined with numerous first order channels create an efficient delivery system for fine sediment. Fires which consume much of the organic material may also accelerate surface erosion.

High intensity precipitation events may result in large pulses of fine sediment through surface erosion or mud/debris flows. Due to the sediment load, wood in the channels generally does not create large pools, as stream channels upstream of any obstruction may rapidly fill with fines. Wood though does provide hiding cover and habitat diversity for aquatic organisms. Bedrock controls can be important pool forming agents.

Given the rapid runoff characteristics and soil moisture stress, management actions need to protect the litter layer to slow surface runoff and erosion. Transportation system layout needs to minimize the interception and concentration of flows on roads or trails which may accelerate water delivery to stream channels.

Management of riparian areas for aquatic resources needs to focus on; maintaining bank stability given the rapid downcutting observed in these streams, providing a filter for fine sediment, providing shade to ameliorate high summer water temperatures and possible insulation against low winter temperatures. Riparian vegetation along perennial streams, springs and within this MLSA ponds, may be especially important riparian habitats in this dry landscape.

The lowlands of these watersheds have been developed for agriculture and urban uses. Water withdrawals not only reduce available aquatic habitat but exacerbate high summer water temperatures and present migration barriers to anadromous fish. Floodplain and riparian development for homes may have eliminated some wetland and side channel habitat. Given the private development at the lower portions of these subwatersheds, the riparian habitat on National Forest may be very important for riparian dependent wildlife such as amphibians.

b) Aquatic Resources - Eagle Creek subwatershed

Eagle Creek is a tributary to lower Chumstick Creek, joining the Chumstick approximately two miles upstream of the Chumstick-Wenatchee River confluence. Historic anadromous fish use in Eagle Creek is unknown. Low flows which often become interrupted before the confluence with Chumstick would limit anadromous fish use to steelhead and rearing spring chinook. Anadromous fish access to Eagle Creek is now blocked by an impassable culvert just upstream of the confluence of Chumstick Creek and the Wenatchee River. Resident trout are found in Eagle Creek but we do not know the species.

c) Aquatic Resources - Olalla and Derby subwatershed

Olalla and Derby canyons are small dry watersheds with little perennial flow and little year-around fish habitat. We do not know fish species distribution within the two watersheds.

d) Late Successional Habitat Management Implications

The present condition of aquatic and riparian resources in the Eagle, Olalla and Derby subwatersheds have been greatly influenced by human development. Given the number of homes in the area and the risk of "catastrophic" fire due to the dense-dry forest these watersheds may be good candidates to implement aggressive, landscape scale forest restoration, activities combined with watershed restoration. Potential short term impacts to aquatic resources that are designed to improve long term watershed health may be an acceptable risk. Some potential management options to reduce fine sediment introduction to streams includes reconstruction, resurfacing, obliteration or closing. Restoration activities will need to be assessed for potential downstream impacts not only to aquatic/riparian habitat but private lands and water use. The effectiveness of restoration efforts may be greatly increased if they can be coordinated with activities on private lands.

7. Noxious Weeds

Three noxious weed species were identified to occur within Eagle MLSAs. These species are discussed in priority order as identified by the noxious weed analysis module. There are no Class A presently documented from this area. Class B or B-designate weeds include: *Centaurea diffusa*, *Linaria dalmatica*, and *Chrysanthemum leucanthemum*. These species are found along roadsides within the LSR, particularly the Eagle Creek Road and connection to that road. Following through the noxious weed analysis module, all species are relatively widespread so the strategy is prevention of further spread. Prevention of spread should focus on areas of high recreation use such as the roadsides developed and dispersed sites. One important dispersed site is the pond in section 20. *Centaurea diffusa* should be controlled in this location to prevent further spread to other locations. Some methods might include herbicides, pulling, minimizing stock use, regulating stock use, or eliminating stock use. Survey for species presence and extent should be completed in order to develop a noxious management plan for this MLSA'S (refer to Harrod 1994).

8. Fire Management Plan

a) Overview

This plan is intended to provide guidance for the management of fire in the Eagle MLSA. It will supplement the Fire Management Plan for the Late-Successional Reserve System and will be incorporated into the Fire Management Action Plan for the Wenatchee National Forest.

The Sustainability and Disturbance modules for the vegetation groups have been described in a separate portion of this chapter. The intent of this plan is to provide adequate protection of the reserve. Management practices will be initiated to provide for the protection of the late-successional associated species and associated unique habitats. These management actions are expected to include the role of fire disturbance as an important process in the reserve.

b) Wildfire Prevention Actions

The following actions are site specific for the Eagle MLSA. They are intended to supplement the actions outlined in the Fire Prevention Plan, which is intended to be implemented on a Forest-wide basis:

1. Initiate campfire restrictions, as warranted, during periods of high fire danger.
2. Implement road restrictions and closures, as warranted, during periods of high fire danger.
3. Emphasize cooperative fire prevention activities.
4. Utilize cooperative law enforcement agreements to emphasize the inspection of spark arrestor and exhaust systems.
5. Continue and improve fire prevention signing program on roads and trails included in, or adjacent to, the MLSA.
6. Emphasize contact with special interest groups (e.g., ORV groups, summer home groups, local user groups, grazing permittees, and other special use permittees).
7. Emphasize fire prevention education for hunters.
8. Emphasize fire prevention and wildfire risk awareness education for the public.
9. Emphasize wildfire risk awareness education for home/landowners in urban/wildland interface areas (e.g., lower Eagle Creek, the Wenatchee River Valley, and the Chumstick Valley).
10. Seek opportunities to initiate hazard reduction actions around private lands.

11. Initiate hazard reduction actions along roads.

c) Fire Management Actions Intended to Keep Fire from Spreading into the MLSA

The following methods are proposed to protect the MLSA from fires originating outside MLSA boundaries:

1. Maintain and manage existing fuel breaks.
2. Complete pre-attack planning process for the MLSA. Utilize natural fuel breaks when possible.
3. Maintain existing pre-attack facilities/agreements (e.g., water chances, helispots, fire camps, etc.): Seek opportunities for more.

d) Fire Detection

1. Staffing of Sugarloaf Lookout, supplemented with aerial detection after lightning episodes, will provide the primary detection resource for this MLSA.
2. Aerial detection may be supplemented with emergency staffing at Boundary Butte.
3. Emphasize fire reporting procedures (e.g., with local residents, Forest users, and cooperators).

e) Wildfire Suppression

1. Spotted owl activity centers are the highest priority for protection of resources (following the protection of human life). All wildfires in the 1.8 mile buffer will be suppressed at minimum acres.
2. Pre-planned dispatch cards for initial attack will be prepared for the MLSA area.
3. The Fire Situation Analysis or the Escaped Fire Situation Analysis process will be used to guide extended attack and large fire-suppression. Utilize pre-attack plans and materials.
4. Consideration for private land, late-successional habitat, and riparian reserves will take place during the development of fire suppression strategies and the implementation of fire suppression tactics.
5. Emphasize the protection of improvements (e.g., historic/cultural sites).
6. Protect known threatened and endangered species habitat from wildfire (plant or animal).
7. Where appropriate, fire suppression actions will be implemented on an interagency basis.

f) Vegetation and Fuels Management

1. Manage for a mosaic of age classes and structural conditions across the landscape to support late-successional habitat.
2. Manage to sustain dry forest types.
3. Manage for mesic sites with high density, multi-story refugia.
4. Strategic fuel manipulation to reduce the size and intensity of fires within, and adjacent to, the MLSA boundaries (e.g., pruning, thinning, prescribed fire and fuel breaks). Provide a change in the continuity/arrangement of, at risk, vegetation/fuels. Emphasis to utilize existing fuel treatment areas, natural openings, roads, ridgetops, etc. Priority areas: Derby Canyon, Van/Eagle Creek, and the Chumstick Mountain area..

5. Work with Utilities on hazard reduction actions under power lines. Include BPA's major transmission lines (i.e., power line corridor between the Eagle MLSA and the Chiwawa LSR).
6. Emphasize roadside fuel modification and fuel wood collection (e.g., County Road 694, County Road 112/FS Road 7520, FS Road 7400, and County Road 59).
7. Suggested management tools to sustain, enhance, or produce the conditions for late-successional habitat and provide for wildfire hazard reduction may include: pruning, commercial and pre-commercial thinning, wood gathering, mechanical treatments, and prescribed fire.
8. Prevent the spread and/or introduction of noxious weeds.

g) Prescribed Fire Opportunities

1. Recognize the use of prescribed fire as a management tool in this MLSA and in areas adjacent to this MLSA.
2. Priority outcomes throughout the MLSA are to sustain, enhance, or produce the conditions for late-successional habitat and provide for wildfire hazard reduction.
3. Projects should be of scale/location to enhance landscape-level diversity tied to inherent disturbance regimes.
4. Projects should attempt to minimize the risk of future catastrophic wildfires (those outside the range of inherent disturbance regimes with respect to size and/or severity).

h) Summary

Fire prevention, fire detection, wildfire suppression, vegetation and fuels management, and prescribed fire are all appropriate, integral elements of the overall management of this MLSA.

D. Restoration Opportunities and Potential Project Summary

Table II-12, Restoration Opportunities and Potential Projects, Eagle LSR:

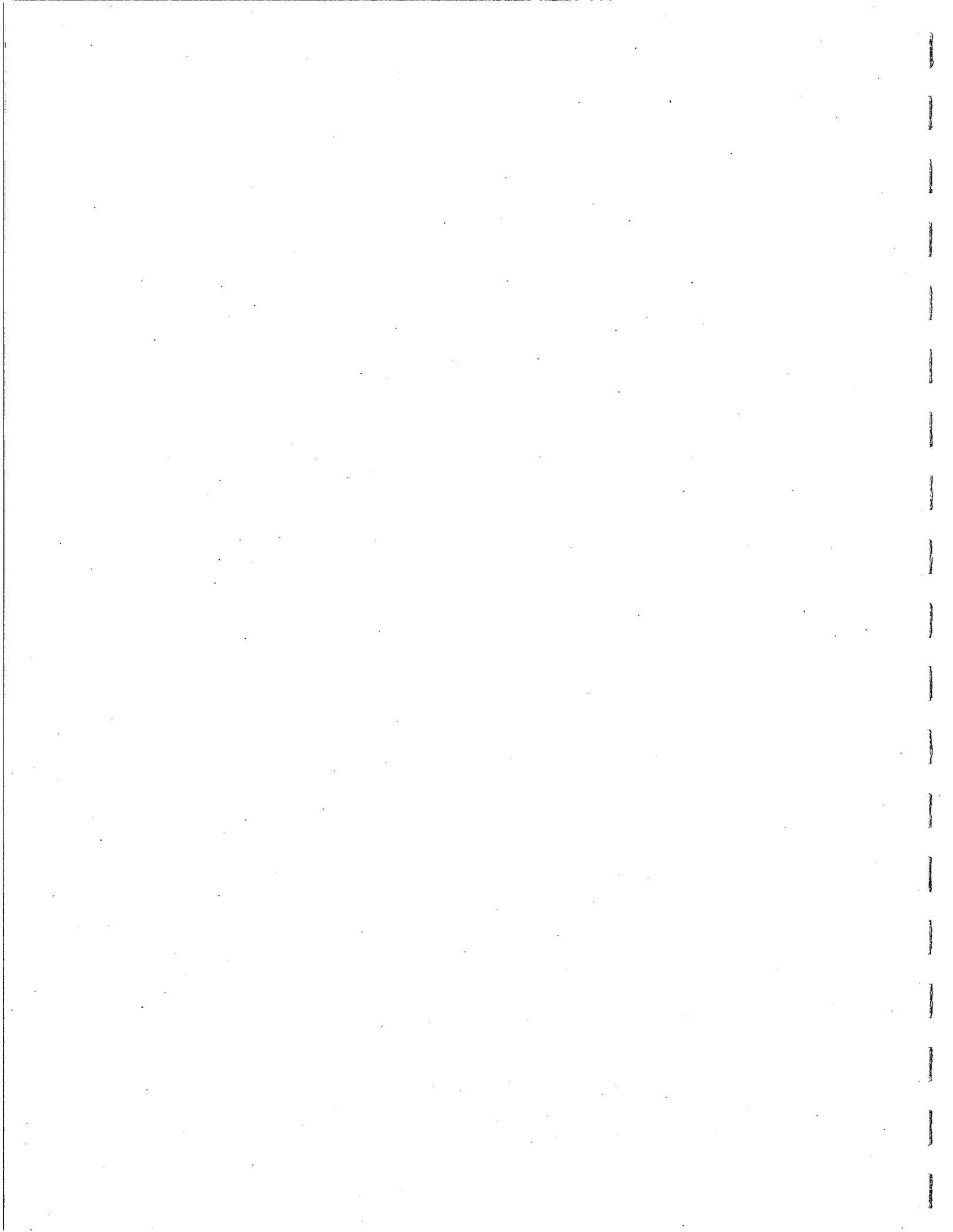
Analysis Module	Restoration Opportunity	Potential Projects	Schedule ¹
Forest-Wide Sustain-ability	1) Reduce fuel loading and stocking levels in dense successional advanced dry forest stands where they exist between the Eagle and Chiwawa and Deadhorse LSRs.	1) Use commercial thinning, pruning, fuelwood collection and prescribed fire as described in the disturbance module treatment key. Favor the development of seral species such as ponderosa pine and western larch. Locate and prescribe treatments to make landscape level changes in fire susceptibility.	A
	2) Encourage private landowners in the Chumstick Valley to take similar density management as described in 1 above	2) See 1 above.	B

Analysis Module	Restoration Opportunity	Potential Projects	Schedule¹
	3) Improve or maintain existing fuelbreaks (Chumstick Valley road and BPA power-line)	3) Piling of down fuels, firewood gathering, pruning, shaded fuel breaks, and encouragement of less flammable deciduous vegetation.	A
	4) Reduce fuel loading in young stands.	4) Pre-commercial thinning.	C
Forest-Wide Spotted owl	Not Applicable. (This LSR is not one of the 3 LSRs on the forest designated as a source population area.)	Not Applicable.	
Forest-Wide Connectivity	None Identified	None Identified	
Unique Habitats & Species	1) Reduce road densities in riparian reserves. (Focus on areas around "ponds")	Close or relocate roads as opportunities are identified in Access and Travel Management Planning.	A
	2) Promote the development of fire climax stands within the dry forest vegetation group.	2) Thin from below favoring ponderosa pine. Retain healthy large diameter pine if present.	C
	3) Emphasize pond area in management practices.	3) Consider amendment of the Forest Plan to designate a Special Interest area around the Eagle ponds.	B
Connectivity Within the LSR	1) Promote the development of fire climax stands within the dry forest vegetation group.	1) Thin from below favoring ponderosa pine. Use prescribed fire where current fuel loading permit the attainment of objectives.	A
	2) Increase the amount of interior forest area within the LSR.	2) Close roads near interior forest an in dry forest areas as opportunities are identified through Access and Travel Management Planning.	B
	3) Improve the function of Riparian Reserves as connectivity corridors.	3) Close roads and re-vegetate disturbed areas within Riparian Reserves as opportunities are identified through Access and Travel Management Planning.	B

Analysis Module	Restoration Opportunity	Potential Projects	Schedule¹
Disturbance	1) Reduce the risk of habitat loss to wildfire by reducing stand density, altering species composition and reducing vertical and horizontal fuel continuity in dry forest types.	1) Use commercial thinning, pruning, fuelwood collection and prescribed fire as described in disturbance module treatment key. Favor the development of seral species such as ponderosa pine. Priorities should be 1) Dispersal habitat, 2) NRF habitat within the LSR/MLSA but outside of owl circles, 3) NRF habitat within the owl circle above threshold acres (owl #SO748 is below threshold), 4) See item #3 under spotted owl for treatment of NRF habitat on threshold acres.	A
	2) Perpetuate isolated stands of western red cedar within the LSR.	2) Consider Silvicultural activities that promote the development of western red cedar.	C
Spotted Owl	1) See Appendix 39, "Northern Spotted Owl Nest Site Protection Within LSRs and MLSAs"		A
	2) Rehabilitate or accelerate habitat recovery around activity center #748.	2) Plant PP and DF in activity center SO748 Fertilize young trees to accelerate growth.	C
	3) Improve sustainability of dense dry forest (vegetation Type 12) within 0.7 to 1.8 mile home range area on threshold acres. Treatment should maintain suitability of habitat for nesting, roosting and foraging. (see spotted owl desired conditions)	3) Utilize commercial thinning, pruning and fuelwood collection.	A
	4) Obtain information on spotted owl locations.	4) Survey areas to 1994 spotted owl protocol.	B
	5) Accelerate the development of suitable spotted owl habitat.	5) Utilize Silvicultural activities that accelerate the development of multi-layered stands. Focus on single layered pole size stands in moist grand fir and wet forest groups. This option appears limited to only 13 acres for owl	C

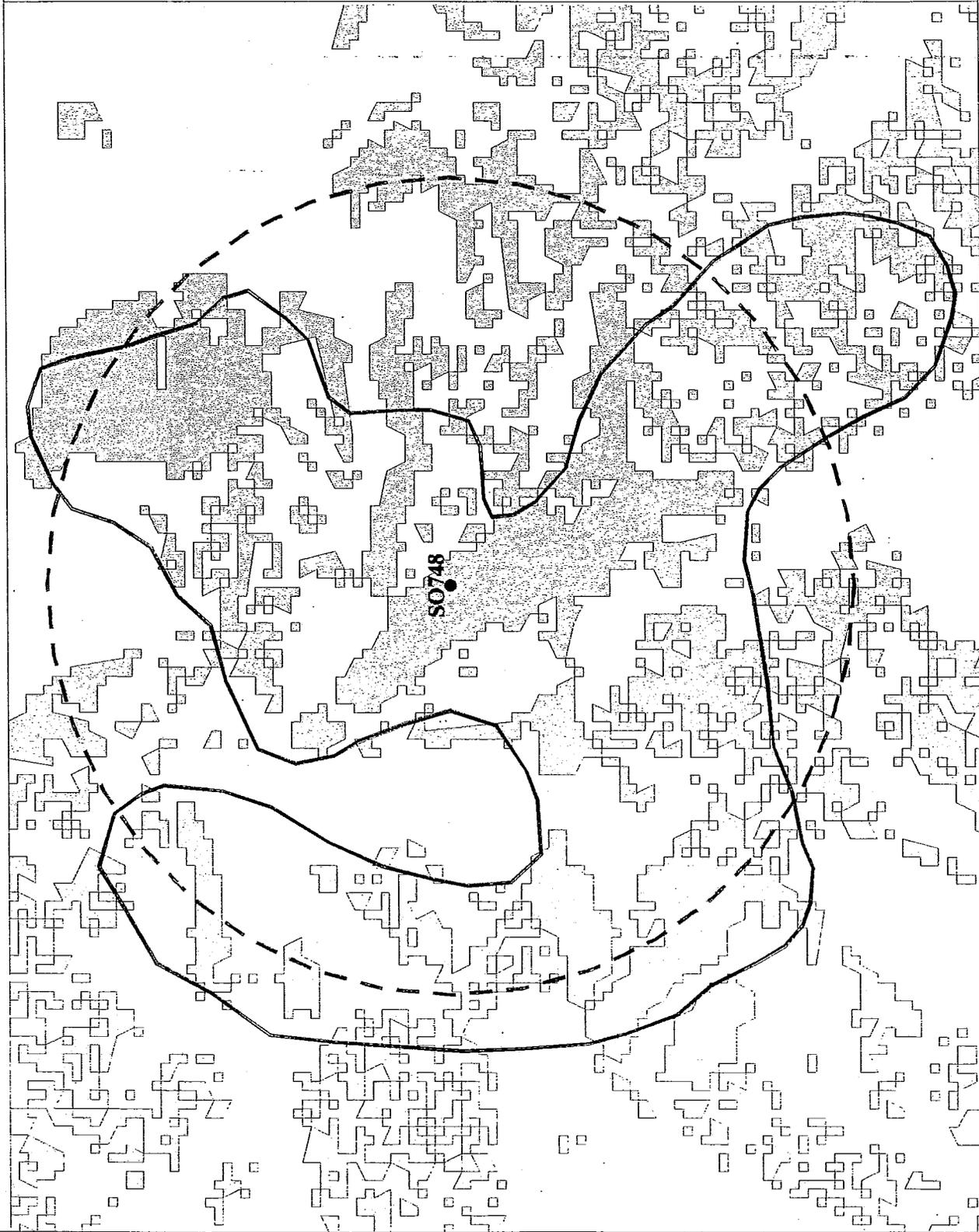
Analysis Module	Restoration Opportunity	Potential Projects	Schedule¹
		#SO748.	
Aquatic	1) See late successional habitat implications in Aquatic section.	1) Coordinate projects with Wenatchee Mainstem Watershed Assessment planned for completion in FY 97.	B
Noxious Weed	1) Limit the extent and spread of <i>Centauria diffusa</i> in the area around the ponds.	1) Consider treatments such as hand pulling and herbicides to limit extent and spread.	A
	2) Increase knowledge regarding noxious weed presence in the Eagle MLSA.	2) Survey MLSA for presence of noxious weeds.	C
Fire Plan	1) Protect LS values from loss due to wildfire	1) See fire plan for specific actions	

¹ Implementation Schedule; (A) = within 3 years; (B) = within 5 years; (C) = within 10 years



Eagle Managed Late Successional Area

SUITABLE SPOTTED OWL HABITAT



-  Suitable Spotted Owl Habitat (N/R/F)
-  Major Lakes
-  1.8 mile buffer around Spotted Owl Activity Centers
-  Spotted Owl Activity Centers
-  Managed Late Successional Area Boundary

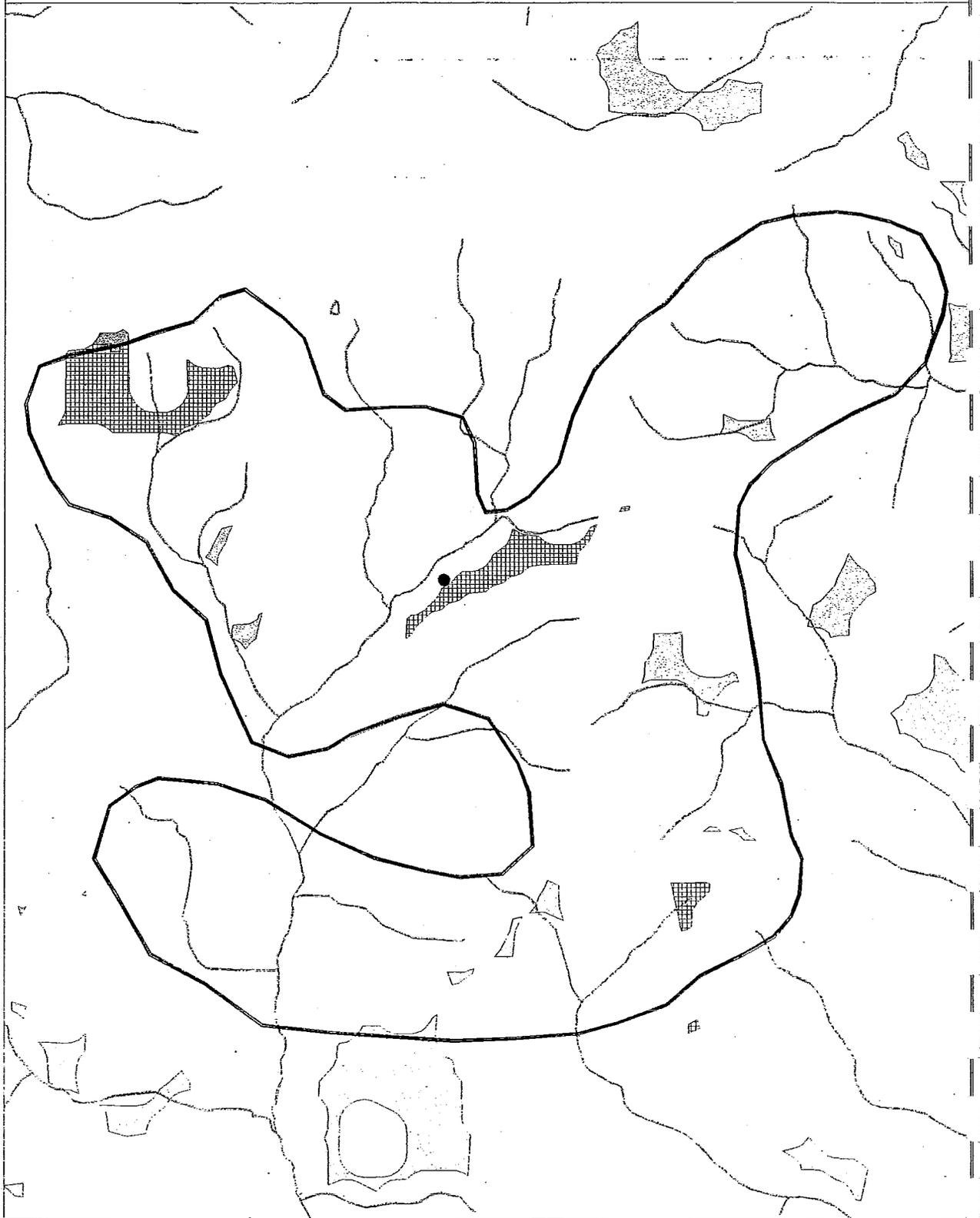


Map Scale: 1 inch = 1.512 miles

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Eagle Managed Late Successional Area

FOREST INTERIOR



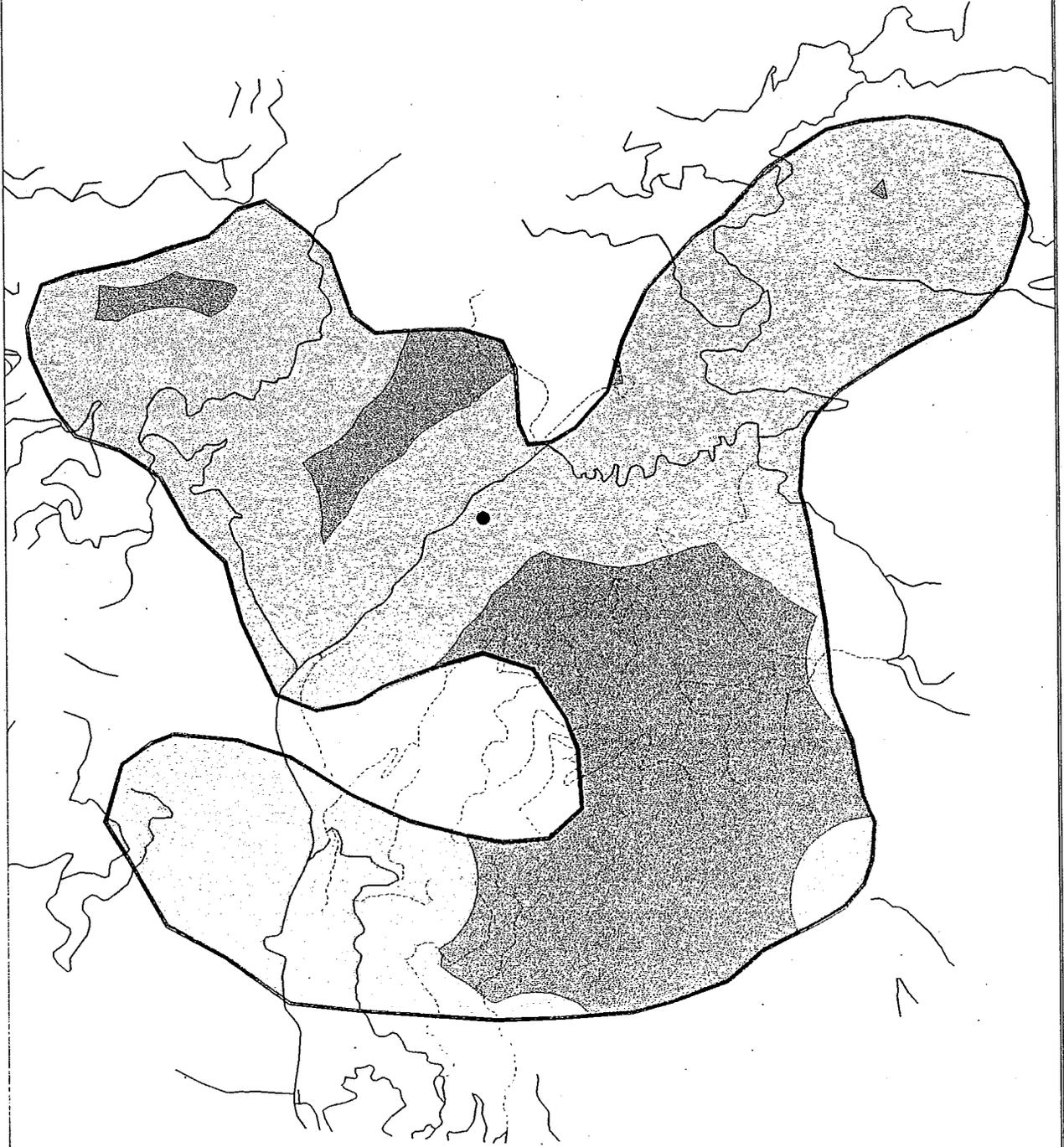
- DRY Forest Interior
- MOIST Forest Interior
- HIGH Forest Interior
- Major Lakes
- Streams
- Spotted Owl Activity Centers
- Wildlife PETS
- Managed Late Successional Area Boundary



Map Scale: 1 inch = 1.512 miles

Eagle Managed Late Successional Area

SECURITY HABITAT



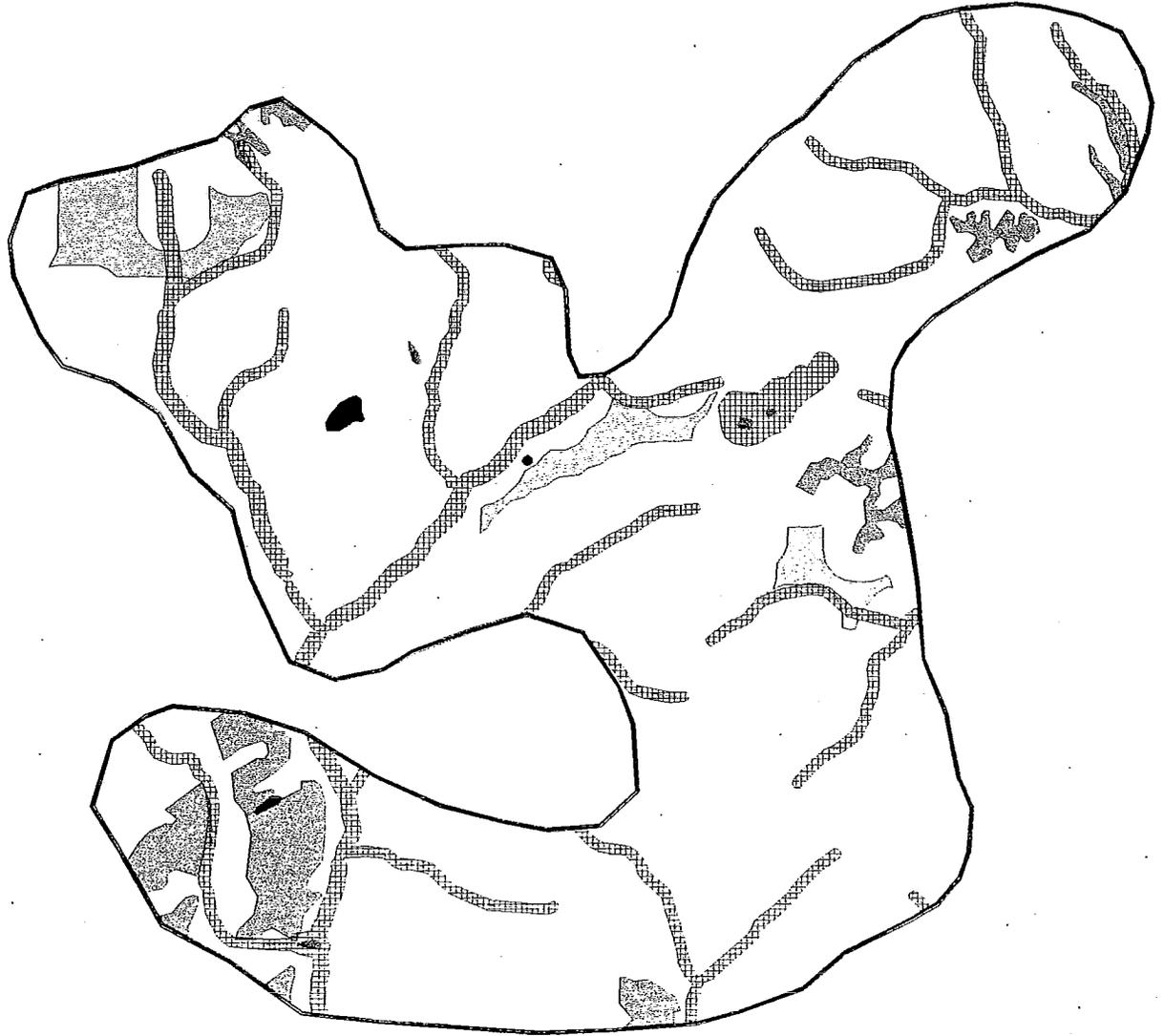
-  Security Habitat
-  NOT Security Habitat
-  Major Lakes
-  Open roads and motorized trails
-  Closed roads and non-motorized trails
-  Spotted Owl Activity Centers
-  Wildlife PETS
-  Managed Late Successional Area Boundary



Map Scale: 1 inch = 1.512 miles

Eagle Managed Late Successional Area

UNIQUE HABITATS



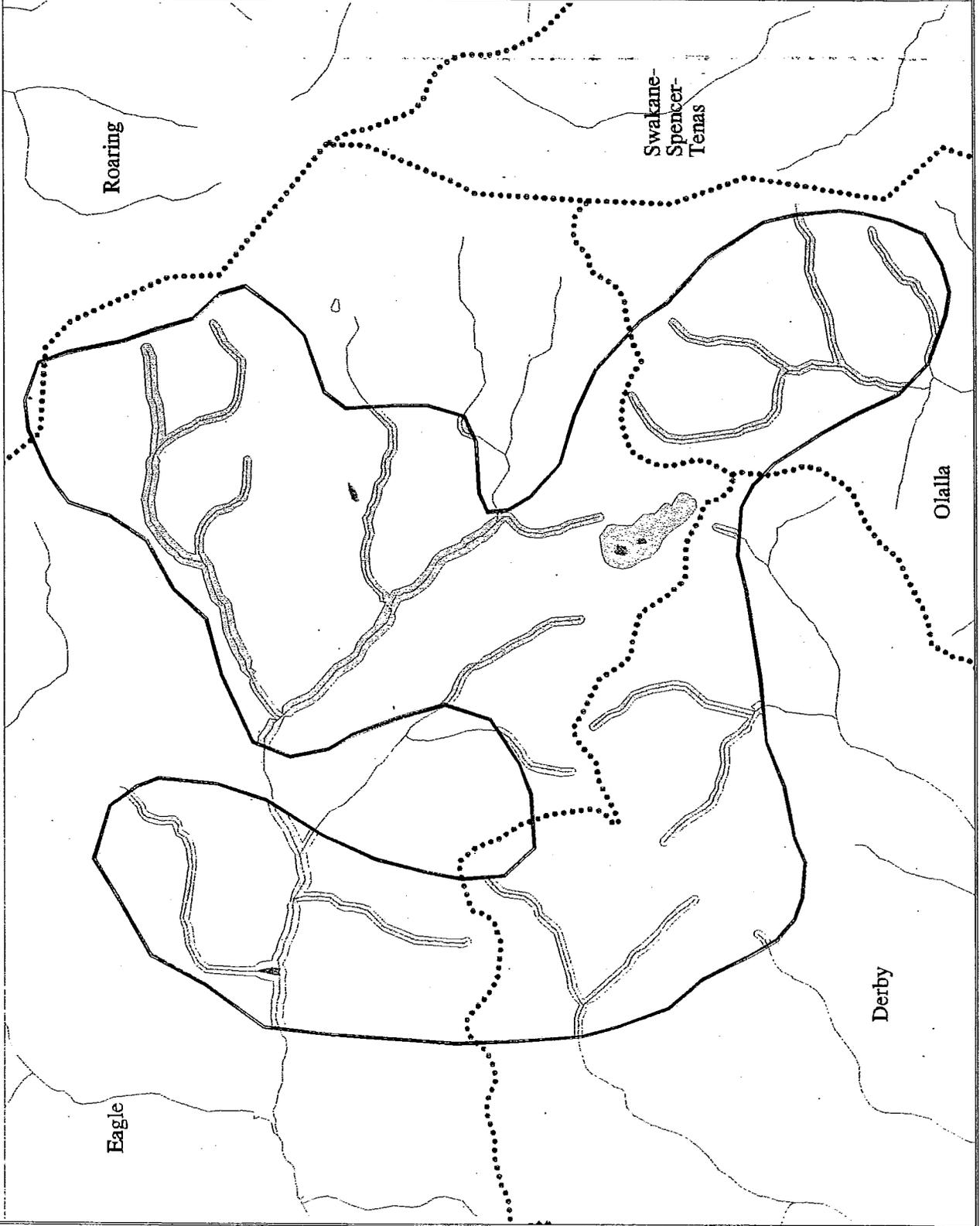
- Large Forest Interior Patches
- Whitebark Pine, Meadows, Shrub, Natural Opening, Deciduous Forest
- Talus, Scree, Bedrock, Cliff
- Wenatchee Forest Plan Allocations RN1, SI1, SI2
- Riparian Reserves
- Lakes and Wetlands
- Streams
- Spotted Owl Activity Centers
- Wildlife PETS
- Managed Late Successional Area Boundary



Map Scale: 1 inch = 1.512 miles

Eagle Managed Late Successional Area

FISH PRODUCTION UNITS (SUBWATERSHEDS)



- Riparian Reserves
- Lakes and Wetlands
- Streams
- Fish Production Units (Subwatersheds)
- Managed Late Successional Area Boundary



Map Scale: 1 inch = 1.512 miles

01/2/97

Eagle Managed Late Successional Area
VEGETATION SERIES



-  Dry and Mesic
-  Moist Grand Fir and Mesic Western Hemlock
-  Subalpine Fir and Lodgepole Pine
-  Wet Forest
-  Whitebark Pine and Subalpine Larch
-  Nonforest
-  Managed Late Successional Area Boundary



Map Scale: 1 inch = 1.512 miles

Eagle Managed Late Successional Area
VEGETATION STRUCTURE

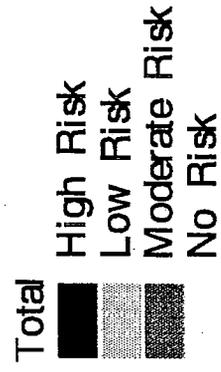


-  Created Opening
-  Low Density and Open Parkland
-  Single Layered
-  Layered or Mature
-  Partial Cut
-  Nonforest
-  Managed Late Successional Area Boundary

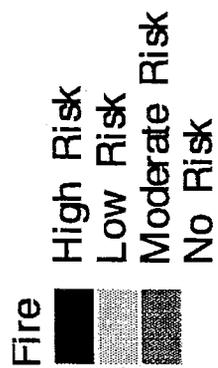


Map Scale: 1 inch = 1.512 miles

Eagle LSR



Eagle LSR



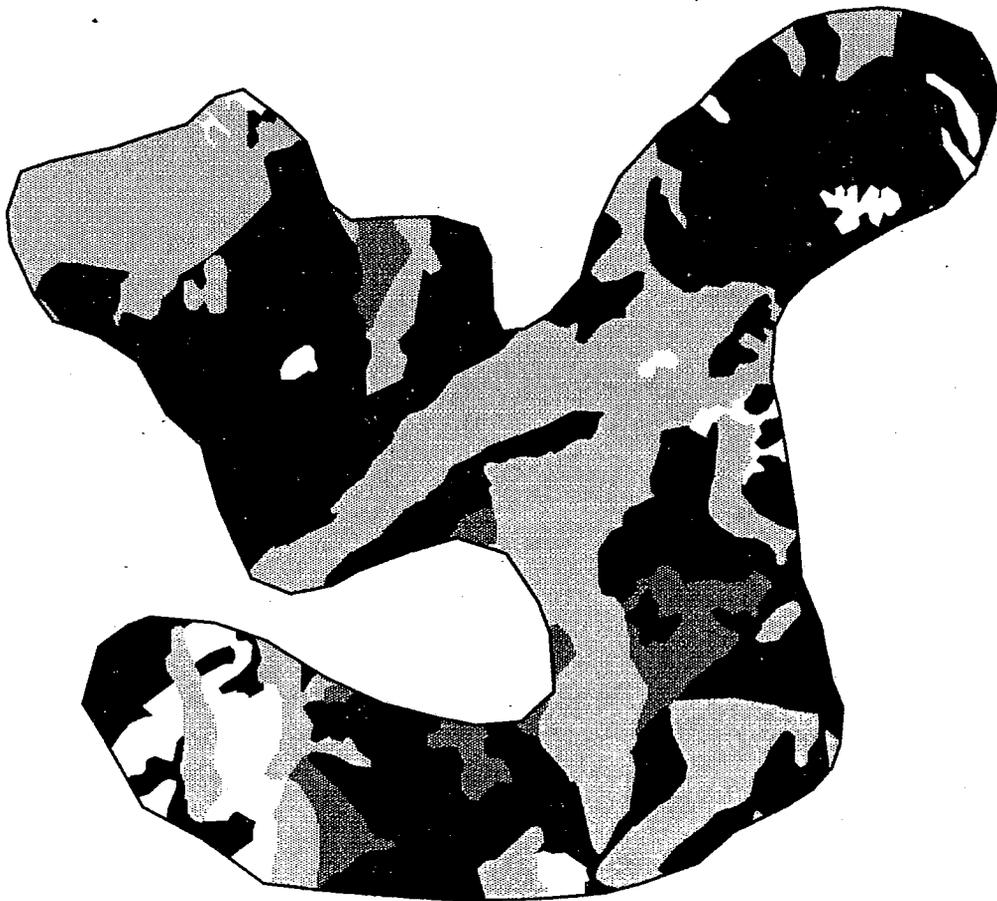
0.5 0 0.5 1 Miles



Eagle LSR



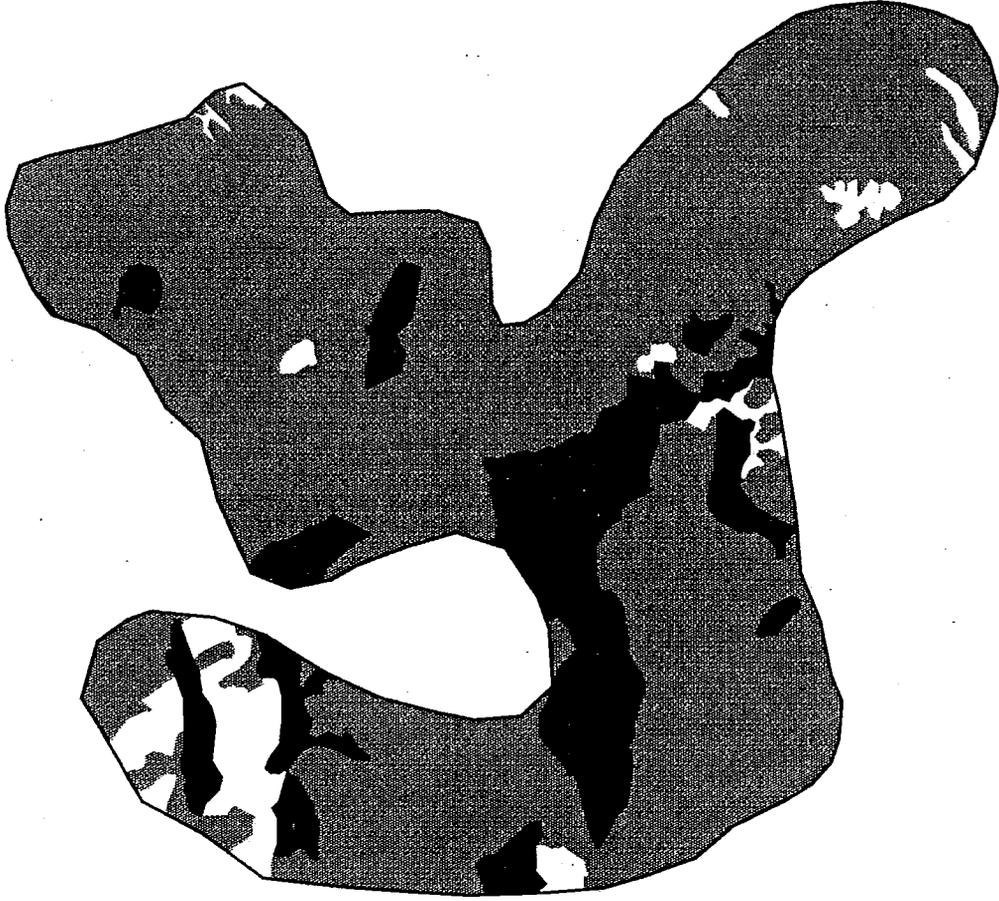
Eagle LSR



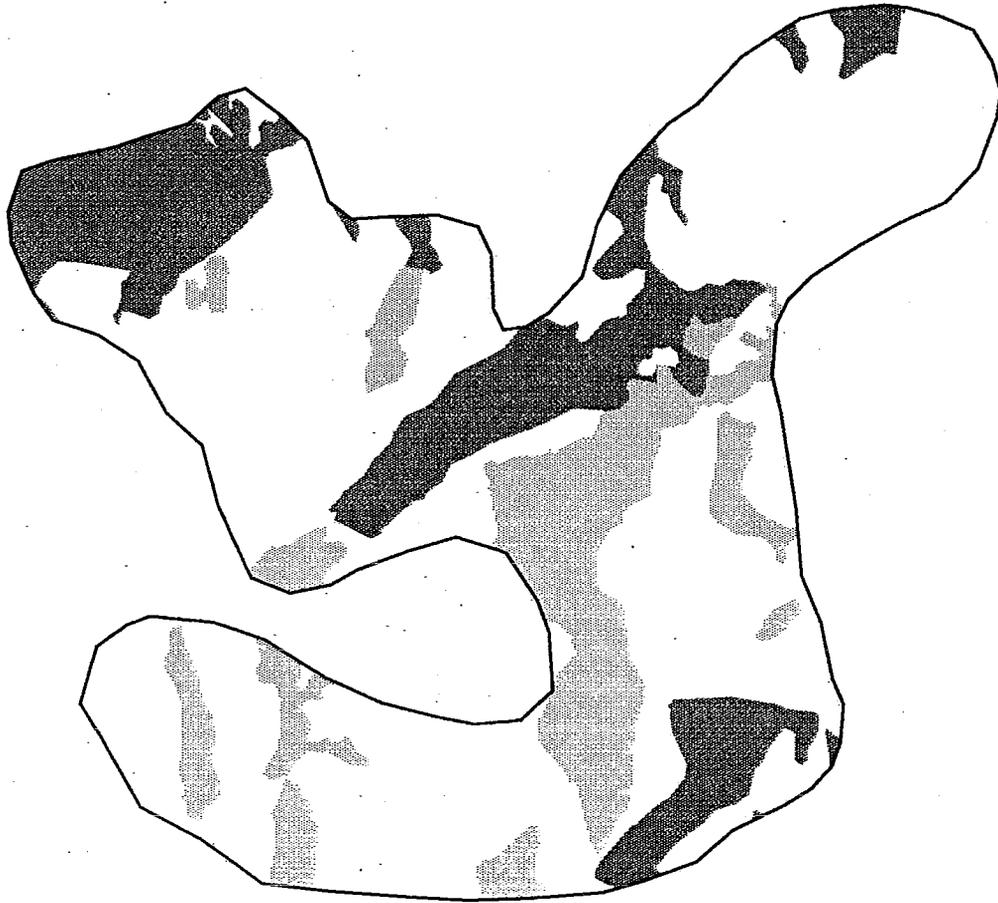
Eagle LSR



Eagle LSR



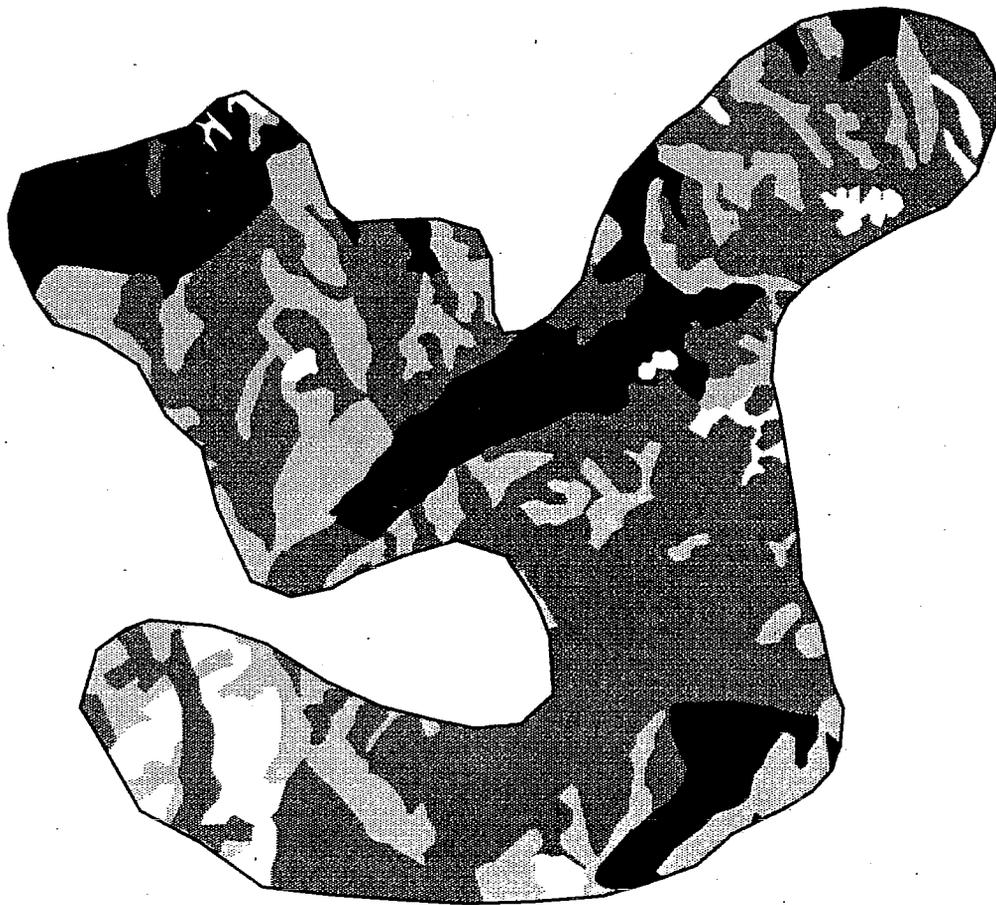
Eagle LSR



Eagle LSR



Eagle LSR



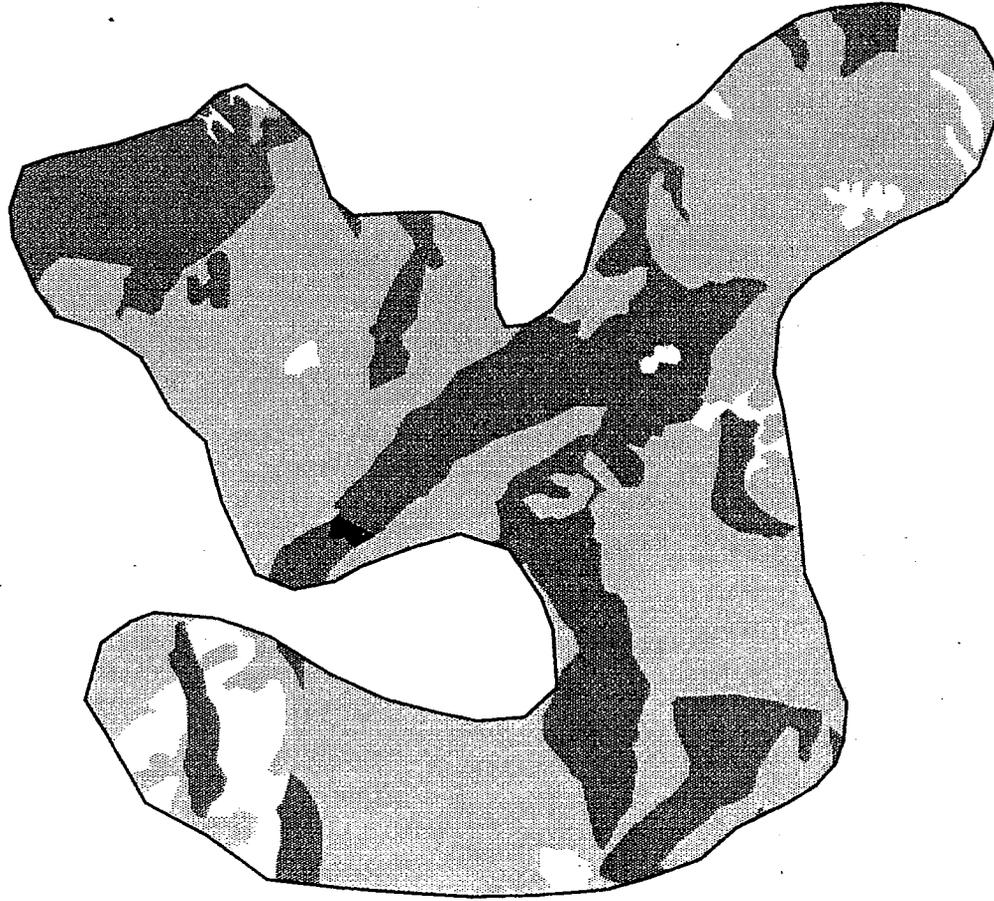
PHWE
High Risk
Low Risk
Moderate Risk
No Risk



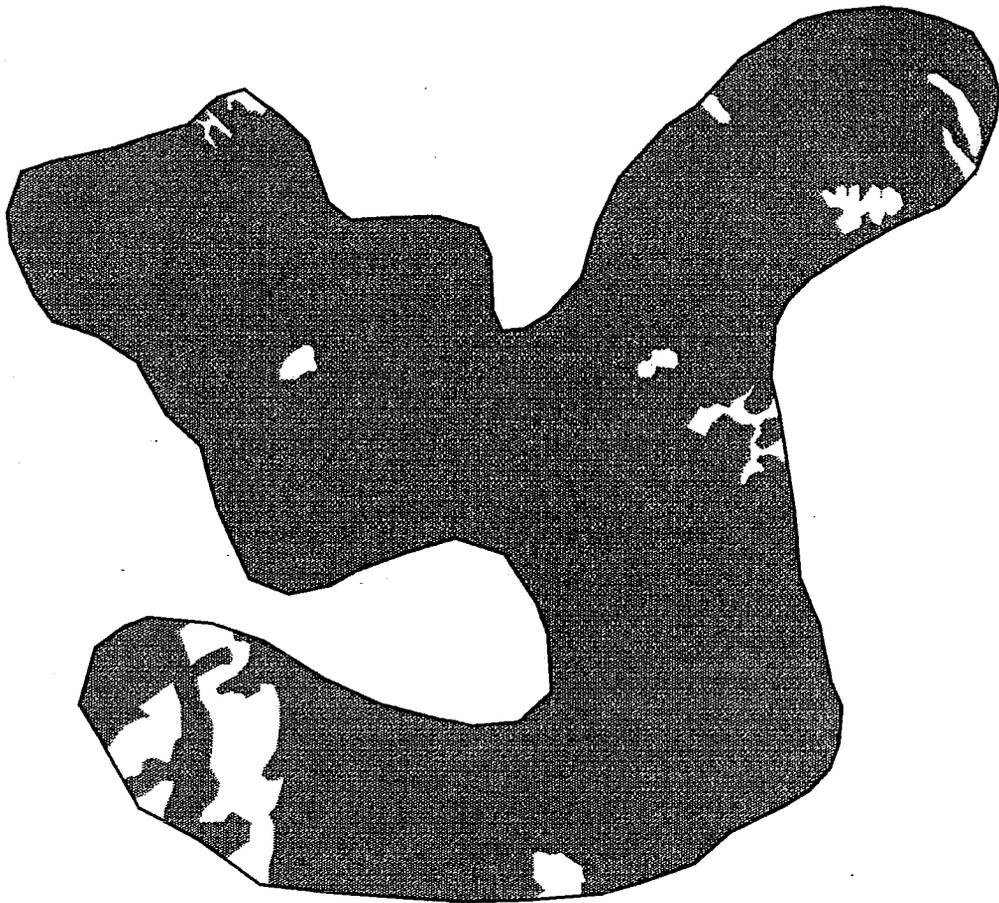
0.5 0 0.5 1 Miles



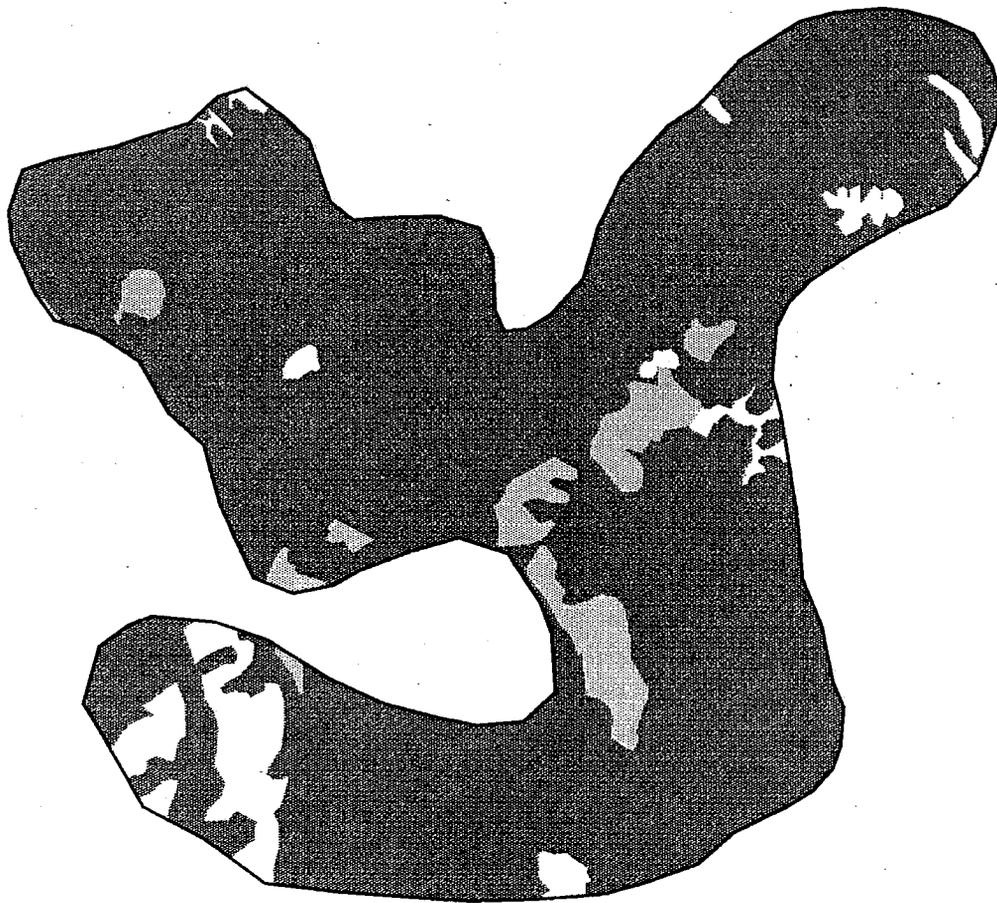
Eagle LSR



Eagle LSR



Eagle LSR

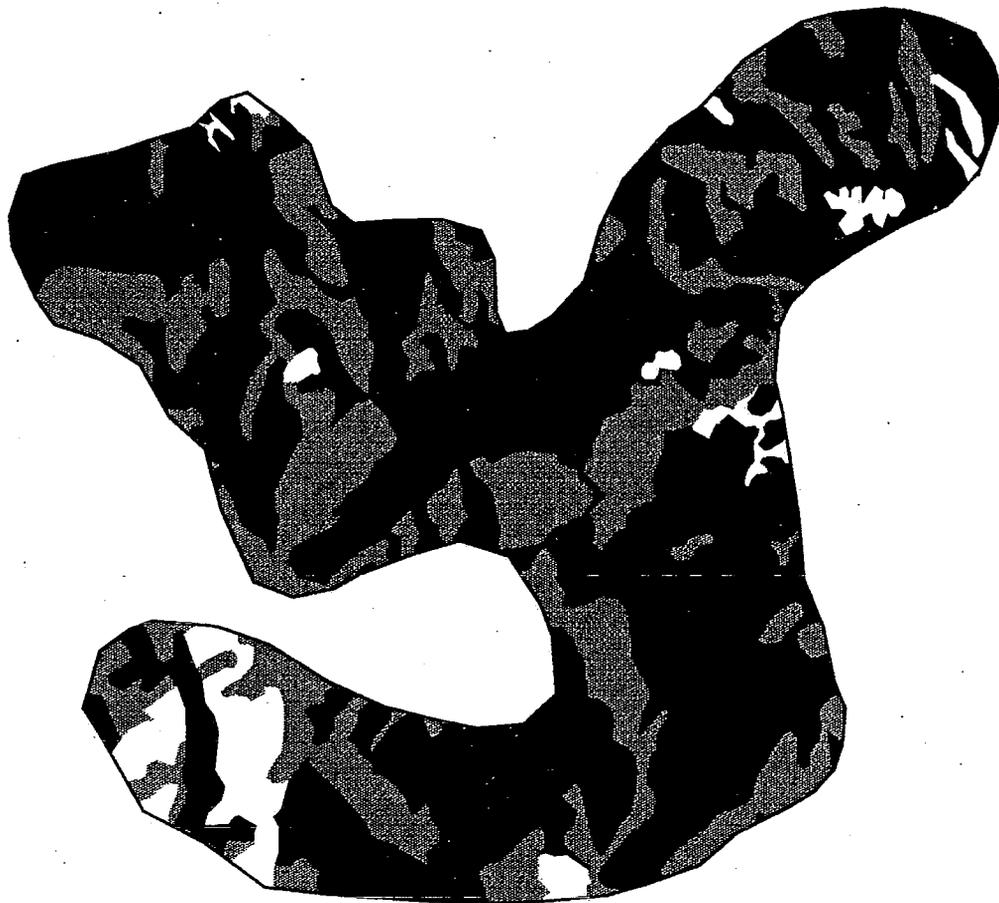


DmtPP
High Risk
Low Risk
Moderate Risk
No Risk



0.5 0 0.5 1 Miles

Eagle LSR



III. Icicle LSR

A. General Description of LSR

This portion of the document describes the vegetation and wildlife resources and human uses associated with this LSR.

1. Vegetation

This section describes the current condition of vegetation groups within the Icicle LSR. Data was derived from aerial photograph interpretation (Appendix 3). It should be noted that site-specific information regarding vegetation structure and distribution will need to be updated, as restoration projects are initiated. The idea would be to use the vegetation layer derived for this analysis as a starting point only.

The Icicle Watershed Assessment provides detailed vegetation description and should be referred to for supplementary information. As a result, the following descriptive information is somewhat brief.

a) Dry Forest Group and Grassland/Shrubland

Fifteen percent (2,103 acres) of the Icicle LSR consists of the dry forest group. Within this group, 60 percent (1,268 acres) of the Icicle LSR is mapped as high density and 0 percent (1 acre) is mapped as created openings (Appendix 4).

Within this forest group, the ponderosa pine series is limited within the LSR. In some locations, ponderosa pine exists as the sole overstory dominant, but more often is co-dominant with Douglas-fir. Shrub composition in the understory is dominated almost exclusively by *Purshia tridentata*. Grasses include *Agropyron spicatum*, *Calamagrostis rubescens*, *Carex geyeri*, and *Poa wheeleri*, and forbs present include *Achillea millefolium*, *Lupinus sereciuss*, *Balsamorhiza sagitata*, and *Lomatium* spp.

Grassland or shrubland vegetation is absent within the Icicle LSR.

b) Mesic Forest Sites (Embedded within the Dry Forest Group)

Mesic sites do not exist within the Icicle LSR.

c) Moist Grand Fir Group

Twenty-five percent (3,610 acres) of the Icicle LSR consists of the moist grand fir group. Within this group seventy-six percent (2,755 acres) is mapped as high density and 13 percent (452 acres) is mapped as created openings. Created openings are largely the result of timber harvest. This forest group is limited to the north aspect on the south side of the Icicle River. Grand fir becomes less important within the Icicle Watershed as one moves west of Trout Creek.

Understory composition is graminoid and forb dominated with such species as *Calamagrostis rubescens*, *Spiraea betulifolia*, *Rosa gymnocarpium*, *Linnaea borealis*, and *Chimaphila umbellata*.

d) Wet Forest Group

Thirty two percent (4,573 acres) of the Icicle LSR consists of the wet forest group (Appendix 4). The silver fir series is the most prominent component of this group within the LSR (Wenatchee National Forest, Ecology Plot Database). Wet forest communities are most prevalent in the southwestern portion of the LSR near the upper portion of the Icicle Creek drainage. The silver fir and western

hemlock series becomes more prevalent as one moves west within the Icicle Watershed. The majority (3,460 acres) of this group is currently mapped as layered or mature. Created openings account for 928 acres of this group.

Overstory composition throughout this forest group is variable, consisting largely of silver fir. However, western hemlock, western white pine, Douglas-fir, mountain hemlock, Engelmann spruce, and lodgepole pine are also represented. Understory composition is largely dominated by shrub species such as *Vaccinium membranaceum*, *Clintonia uniflora*, *Pyrola asarifolia*, *Linnaea borealis*, and *Adenocaulon bicolor*.

e) Subalpine Fir Series

Eleven percent (1,523 acres) of the Icicle LSR consists of the subalpine fir series (Appendix 4). This series is restricted to the higher elevations near Lake Victoria. Most of this series (1,093 acres) is mapped as layered or mature.

Subalpine fir is the most widespread species within the overstory. Common seral dominants include lodgepole pine and Engelmann spruce, but western white pine, mountain hemlock, and whitebark pine may also be present, particularly in ecotones between forest types. Understory composition is typically shrub dominated and common species include *Vaccinium myrtillus*, *Penstemon procerus*, *Lupinus latifolius*, *Festuca viridula*, and *Rubus lasiococcus*.

f) Whitebark Pine/Subalpine Larch Group and High Elevation Nonforest Types

The remainder of the forest vegetation within the Icicle LSR consists of high elevation whitebark pine and subalpine larch, with the majority being subalpine larch. Approximately 3 percent (413 acres) of the LSR is occupied by this forest group (Appendix 4) and 100 percent of this group consists of structures other than created openings.

Information regarding species composition and specific structure is lacking at this time.

g) Non-Forest Vegetation

Fourteen percent (2,066 acres) of the Icicle LSR was mapped as non-forest vegetation (Appendix 4) which includes 454 acres of upland meadow, mapped mainly in the whitebark pine/subalpine larch group. Brushfields (453 acres) were mapped in the central portion of the LSR. Talus (580 acres), scree (310 acres), and bedrock (264 acres) are other prominent mapping units.

h) Species with Special Status

Within the Icicle LSR, there is potential habitat for a number of special status species, but few surveys have been carried out to determine presence or absence. Surveys should be carried out in conjunction with restoration projects, as well as surveys independent of other activities. It is important that species ranges are known so that better estimates of species viability can be assessed. In addition, little is known about most special status species habitat and biological requirements, and inventories provide a first and necessary step in obtaining this information.

There are no known Forest Service sensitive (see Late-Successional Associated Plant Species, Chapter IV) species within the Icicle LSR (Appendix 6). A newly discovered population of the State endangered species *Hackelia venusta* occurs within a mile outside the LSR boundary.

There are two known survey and manage plant species within the Icicle LSR. One is a vascular plant species, *Allotropa virgata*. *Botrychium montanum* occurs just outside the LSR in Wilderness near Mountaineer Creek. One known non-vascular fungus, *Cantharellus subalbidus*, exists within the

LSR. The ROD provides standards and guidelines for survey and manage species, and these should be addressed within the Icicle LSR when restoration projects are implemented.

Few if any surveys have been carried out for non-vascular and vascular plants. Surveys should be a priority project within the Icicle LSR.

i) Noxious Weeds

Roads within the Icicle LSR were surveyed for noxious weeds species in 1992. *Centaurea diffusa*, *C. maculosa*, *Linaria dalmatica*, and *Potentilla recta* are known to occur along roadsides and at trailheads within the LSR. Main infestations occur along the Icicle Road, at the Icicle Gorge and Jack/Trout Trailheads, and campgrounds. Surveys for species presence and extent should be completed in order to develop a noxious management plan for this LSR (refer to Harrod 1994).

2. Late Successional Associated Wildlife Species

a) Introduction

In this chapter, information is presented about wildlife species that are associated with the late-successional habitats that are either present or would be managed for in the Icicle LSR. A total of 80 species have been identified as being associated with these kinds of forest conditions and are present, unknown or suspected to occur within the LSR. The list of these species can be found in Appendix 27.

In addition to consideration for the groups of species associated with the various kinds of late-successional forests, individual species assessments were also conducted. These assessments were completed for all threatened, endangered, sensitive, species of concern (USFWS), management indicator, protection and buffer, and survey and manage species. Collectively this group of species is referred to as species of special status. What information is available about the status of these species within the Icicle LSR is summarized in this chapter. However, relatively little is known about a number of them.

Inventories or surveys have been conducted for only a few of the wildlife as shown in Appendix 27. The most extensive of these were for mule deer, elk and bald eagles. Northern spotted owl inventories have been conducted over about 70% of the suitable habitat within the LSR.

b) Late Successional Species By Habitat Type

(1) Dry Forests

About 2,103 acres (15%) of the Icicle LSR is composed of the dry forest vegetation group. Fire climax ponderosa pine forests historically dominated these areas and 49 wildlife species are associated with these forests.

Currently, 1,268 acres (60%) of the dry forest is in a successional advanced condition. About 835 acres (40%) are in a low density condition and could be fire-climax.

Some species that are associated with the late successional or fire-climax conditions of these forests and that have special management status include: tailed frog, larch mountain salamander, northern goshawk, bald eagle, flammulated owl, pileated woodpecker, hairy woodpecker, white-headed woodpecker, black-backed woodpecker, Williamson's sapsucker, northern flicker, chestnut backed chickadee, pygmy nuthatch, elk, long-legged myotis, long-eared myotis, silver haired bat, fringed myotis, western big-eared bat, pallid bat, marten, and fisher.

Historically, only a minor portion of these areas provided the structures that are associated with suitable spotted owl habitat (Thomas et al. 1990, Buchanan et al. 1995). However, fire exclusion has allowed successional advancement for suitable spotted owl habitat to develop in some areas (Agee and Edmunds 1992, Buchanan et al. 1995). These areas are now being used by spotted owls, however the risk of large scale disturbances causing large scale habitat loss is of major concern (Agee and Edmunds 1992, Buchanan et al. 1995, Gaines et al. in press). No known spotted owl activity centers occur in the Dry Forests.

(2) Moist Grand Fir Group

The Moist Grand Fir group covers about 3,610 acres (25%) of the LSR. Historically, fire occurred less frequently than in the Dry and Mesic vegetation groups (refer to the Disturbance Chapter (Chapter III) in the Forest-wide Assessment), allowing successional advancement and complex habitat structure such as high crown closure, multilayering, and many snags and down logs. These conditions provide habitat for a wide array of wildlife species, including 73 species within the Icicle LSR.

Currently, about 2,755 acres (76%) of the Moist Grand Fir group in this LSR is in a late-successional condition. In the absence of any major disturbance, it is expected that in 50 years 3,159 acres (88%), and in 100 years 3,610 acres (100%) of this habitat would be in a late-successional condition.

Wildlife species associated with the late-successional conditions of this vegetation group and of special status include the northern goshawk, bald eagle, northern spotted owl, great gray owl, flammulated owl, pileated woodpecker, downy woodpecker, hairy woodpecker, white-headed woodpecker, black-backed woodpecker, three-toed woodpecker, red-breasted sapsucker, Williamson's sapsucker, northern flicker, little willow flycatcher, olive-sided flycatcher, red-breasted nuthatch, pygmy nuthatch, tailed frog, spotted frog, Cascades frog, larch mountain salamander, warty jumping slug, blue-gray tail-dropper, papillose tail-dropper, Columbia pebblesnail, long-legged myotis, long-eared myotis, fringed myotis, Yuma myotis, silver-haired bat, western big-eared bat, pallid bat, elk, lynx, marten and fisher.

The Moist Grand Fir vegetation group is capable of providing structures that compose suitable spotted owl nesting, roosting, and foraging habitat while remaining within the range of historic variability. One known spotted owl activity center is located within this vegetation group.

(3) Wet Forest Group

The Wet Forest Group covers about 4,573 acres (32%) of the Icicle LSR. Historically fire occurred relatively infrequently (refer to the Disturbance Chapter (Chapter III) in the Forest-wide Assessment) allowing for succession to result in complex forest structures such as high crown closure, multilayering, and high numbers of snags and down logs. These conditions provide habitat for about 54 species that are associated with the late-successional conditions of these forests.

Currently, 3,460 acres (76%) are in a late-successional condition. In the absence of any large scale disturbances in 50 years 3,603 acres (79%) would be in a late-successional condition, and in 100 years 4,531 acres (99%) would be late-successional.

Wildlife species that are associated with the late-successional conditions of this vegetation group and are of special status include northern goshawk, bald eagle, northern spotted owl, great gray owl, flammulated owl, pileated woodpecker, downy woodpecker, hairy woodpecker, white-headed woodpecker, black-backed woodpecker, three-toed woodpecker, red-breasted sapsucker, Williamson's sapsucker, northern flicker, little willow flycatcher, olive-sided flycatcher, red-breasted nuthatch, pygmy nuthatch, tailed frog, spotted frog, Cascades frog, larch mountain salamander, Warty jumping slug, blue-gray tail-dropper, papillose tail-dropper, Columbia pebblesnail, long-legged myotis, long-

eared myotis, fringed myotis, Yuma myotis, silver-haired bat, western big-eared bat, pallid bat, elk, lynx, marten, and fisher.

The Wet Forest Group is capable of providing structure that composes suitable spotted owl nesting, roosting and foraging habitat while remaining within the historic range of variability. One known spotted owl activity center is located within this vegetation group in the LSR.

(4) Subalpine Fir/White Bark Pine

Subalpine Fir covers about 1,523 acres (11%) of the LSR. Historically, fire frequency was relatively low but when fires did occur they were of high intensity. The longer fire return interval allowed for successional advancement that resulted in complex habitat structure such as high canopy closure, high numbers of snags and down logs. Landscape pattern was historically highly variable with a mosaic of seral stages providing habitat for a variety of wildlife species. About 41 wildlife species within the LSR are associated with the late-successional conditions of these forests.

Currently, about 1,093 acres (72%) of the Subalpine Fir forests are in a late-successional condition. In the absence of any large scale disturbances it is expected that in 50 years 1,271 acres (83%), and in 100 years 1,271 acres (83%) would be in a late-successional condition. About 413 acres (3%) of the LSR is comprised of white bark pine forests that are not created openings.

Wildlife species that are associated with the late-successional forest in this vegetation group and have special status include the tailed frog, Cascades frog, larch mountain salamander, northern goshawk, bald eagle, northern spotted owl, great gray owl, pileated woodpecker, downy woodpecker, hairy woodpecker, black-backed woodpecker, three-toed woodpecker, Williamson's sapsucker, little willow flycatcher, olive-sided flycatcher, pygmy nuthatch, long-eared myotis, Yuma myotis, lynx, and marten.

Spotted owls occasionally use these forests, however, usually they only provide foraging habitat.

c) Species Specific Information

The information presented in this section provides an overview of what is known about the species identified in Appendix 27 as species of special status. Information is provided on a species by species basis whenever it is available.

(1) Endangered Or Threatened Wildlife Species

(a) Bald Eagle and Peregrine Falcon

There are five wildlife species and one Critical Habitat Unit that are federally listed as Threatened or Endangered and could occur within the Icicle LSR. These include the bald eagle (*Haliaeetus leucocephalus*), peregrine falcon (*Falco peregrinus*), northern spotted owl (*Strix occidentalis caurina*), grizzly bear (*Ursus arctos*), gray wolf (*Canis lupus*) and Critical Habitat Unit for spotted owls.

The bald eagle is known to occur within the Icicle LSR and about 100% of the available habitat has been surveyed. It is unknown if peregrine falcons occur within the LSR and 50% of their habitat has been surveyed.

(b) Northern Spotted Owls

A total of two spotted owl activity centers occur within the Icicle LSR, an additional 4 activity centers are within the adjacent Alpine Lakes Wilderness to the west and southwest. There is 7,861 acres (55%) of spotted owl habitat for nesting/roosting and foraging within the LSR. There is potential for 10,680 acres (75%) in the LSR (see appendix 13 LSR/MLSA Suitable Spotted Owl Habitat Acreage's). Wetter forest groups (wet, moist and high subalpine fir), account for 68% of the LSR,

which is sustainable over time (see appendix 4 & 5 Vegetation in LSRs and MLSAs). Within the Icicle LSR, 70% of the spotted owl habitat has been surveyed for spotted owls.

The estimated amount of habitat within a 1.8 mile radius of the 2 activity centers is shown in Table II-1. Both spotted owl home ranges are above threshold acres of 2,663 acres nesting/roosting/foraging habitat. One (SO734) is above target amounts, the other (SO747) has enough dispersal habitat within 1.8 miles radius to reach above threshold. (See appendix 12 Spotted Owl Activity Centers, Reproductive Status and Habitat Availability.)

Table III-1, Spotted Owl Information for Icicle LSR

Spotted Owl	Repro Status ³	Ownership ⁴	Dry or Wetter Owl ⁵	Threshold ⁶	Critical Habitat ⁷ Unit (CHU)	Forest Interior? ⁸	Suitable Spotted Owl Habitat ¹⁰	Total Dispersal Habitat ⁹
SO734	PY	FS	Wetter	Optimum	WA-10	Inside	5,223	257
SO747	PY	FS	Wetter	At Threshold	WA-10	Near	3,910	625

¹ Activity Center is Near the LSR or MLSA, but not inside the LSR or MLSA map boundary (< 1/4 mile).

³ RS = Residential Single; P = Pair; PY = Pair with Young, based on highest Reproductive occupancy.

⁴ FS = Forest Service; PVT = Private Ownership (ownership at activity center).

⁵ If the majority of suitable spotted owl habitat in 0.7 mile circle is dry or mesic forest groups, then it is a "dry" spotted owl. If the majority is wetter forest groups, then it is a "wetter" spotted owl.

⁶ **Below Threshold:** < 2,663 total suitable spotted owl habitat acres in 1.8 mile circle **OR** < 500 total suitable spotted owl habitat acres in 0.7 mile circle.

At Threshold: 2,663-3,994 total suitable spotted owl habitat acres in 1.8 mile circle.

Optimum/Target: > 3,994 total suitable spotted owl habitat acres in 1.8 mile circle.

⁷ The activity center is within 1/2 mile of the CHU.

⁸ **Inside** = activity center is at least 600' inside (forest interior) late successional habitat.

Near = activity center is inside late successional habitat that creates a forest interior.

⁹ **Habitat** within 1.8 mile circle around activity center. Dry dispersal habitat includes vegetation codes 11, 13, and 52; mesic dispersal includes code 21; and wet dispersal includes codes 31, 35, 61, and 41.

¹⁰ **Habitat** within 1.8 mile radius. Dry suitable spotted owl habitat includes vegetation code 12 where size/structure is multistory greater than 9" DBH; mesic Suitable includes code 22; and wet Suitable includes codes 32, 36, 62, 64, and 42 (see appendix 2 GIS Veg Model & appendix 3 Veg Photo Mapping Key). Use the highest quality habitat available.

¹¹ A larger circle than 1/3 mile radius will be used to develop **100 Acre Activity Center**, if there is less than 100 acres of suitable habitat.

(c) Critical Habitat Unit for Northern Spotted Owls

There is a Critical Habitat Unit (CHU) for spotted owls within the Icicle LSR. The CHU WA-10, includes 37% of the LSR. The CHU WA-10 should support one pair of spotted owls. The CHU overlap with the Icicle LSR includes 5,222 acres. The CHU does not extend outside the Icicle LSR (see Appendix 13: LSR/MLSA S.Owl Acreage's, and Appendix 34: CHU Maps Wenatchee National Forest). This Critical Habitat Unit was developed to provide essential nesting, roosting, foraging and dispersal habitat.

The Alpine Lakes Wilderness acts as an important connectivity. However, much of the wilderness habitat to the south and north is high elevation (> 5,000 feet) and unsuitable for spotted owls. The

Icicle Creek habitat within the LSR is important because of checkerboard ownership and increasing residential development and other related habitat loss in the Icicle Creek valley. Breeding habitat connectivity is between Teanaway CHU, Little Wenatchee CHU, Deadhorse CHU, Boundary Butte' CHU, and CHUs on the Mount Baker-Snoqualmie National Forest. This CHU is important for range-wide distribution of spotted owl habitat. (USFWS Memorandum, 1991)

The adjacent forested habitats of the Alpine Lakes Wilderness areas are important for the functioning of this connectivity. Specifically Jack Creek, the upper Icicle Creek and Cabin Creek.

In all LSR/MLSAs, except the Swauk LSR, Shady Pass LSR, Deadhorse LSR, Boundary Butte LSR, Tumwater MLSA and Sand MLSA, these reserves are predicted to provide the needs for spotted owl recovery over time (50+ years). They will also provide the function the CHUs were designated for. Coupled with the LSR/MLSA management, riparian reserve function, Wilderness areas, and Unmapped LSRs, the needs of the spotted owl will be met. These reserves function for connectivity and spotted owl home ranges. It is concluded that the LSR/MLSAs meet the function of the CHU system, as intended in the NWFP (NWFP C-9). Monitoring and maintaining connections, as well as meeting LSR goals will be ongoing.

(d) Grizzly Bear and Gray Wolves

One class 1 grizzly bear observation has been made within the Icicle LSR (Almack et al. 1993). Grizzly bears are known to occur within the LSR and about 40% of their available habitat has been surveyed. Gray wolves are known to occur within the LSR (Gaines et al. 1995) and about 70% of their habitat has been surveyed.

(e) Marbled Murrelet

There are no known marbled murrelet sites in the Icicle LSR. Outside the LSR, 8 miles to the west, in the upper Icicle there is some "far range" marine foraging habitat. It is not expected that marbled murrelets would be located this far from marine foraging.

(2) Sensitive Wildlife Species and Species of Concern

There are 15 wildlife species that are on the R6 Sensitive Species list or are USFWS species of concern that could occur within the Icicle LSR. These include the goshawk (*Accipiter gentilis*), willow flycatcher (*Empidonax traillii*), olive-sided flycatcher (*Contopus borealis*), tailed frog (*Ascaphus trueii*), spotted frog (*Rana pretiosa*), Cascades frog (*Rana cascadae*), Columbia pebblesnail (*Fluminicola columbiana*), long-legged myotis (*Myotis volans*), long-eared myotis (*Myotis evotis*), fringed myotis (*Myotis thysanoides*), Yuma myotis (*Myotis yumanensis*), western big-eared bat (*Plecotus townsendii*), lynx (*Lynx canadensis*), fisher (*Martes pennanti*), and wolverine (*Gulo gulo*).

(a) Birds

The goshawk is known to occur in this LSR and no surveys have been completed. It is known that the little willow flycatcher and the olive-sided flycatcher occur (Piper 1996). Surveys have been completed on about 10% of the available habitat.

(b) Amphibians

Surveys for amphibians have been completed on about 5% of the habitat within the Icicle LSR. It is known that the tailed frog and Cascades frog occurs in the LSR (Piper 1996), and it is unknown if the spotted frog occurs in the LSR.

(c) Mollusks

No surveys for the Columbia pebblesnail have been conducted and it is unknown if they are present.

(d) Mammals

Surveys for bat species have not been completed. It is unknown or suspected that the long-legged myotis, long-eared myotis, fringed myotis, Yuma myotis or the western big-eared bat occur in the Icicle LSR.

Surveys for lynx have not been conducted. Surveys for fisher have been conducted on about 25% of the habitat in the LSR and on about 40% of the habitat for the wolverine. All three are suspected to occur in the LSR.

(3) Management Indicator Species

There are 12 wildlife species that are listed as management indicator species that occur or could occur within the Icicle LSR. These species include the pileated woodpecker (*Dryocopus pileatus*), downy woodpecker (*Picoides pubescens*), hairy woodpecker (*Picoides villosus*), three-toed woodpecker (*Picoides tridactylus*), red-breasted sapsucker (*Sphyrapicus ruber*), Williamson's sapsucker (*Sphyrapicus thyroideus*), northern flicker (*Colaptes auratus*), ruffed grouse (*Bonasa umbellus*), mule deer (*Odocoileus hemionus*), elk (*Cervus elephus*), beaver (*Castor canadensis*), and marten (*Martes americana*).

(4) Primary Cavity Excavators

Surveys for primary cavity excavators have been completed on about 10% of the habitat in the LSR. All but the Williamson's sapsucker are known to occur. The Williamson's sapsucker is suspected to occur.

(a) Ruffed Grouse and Beaver

Surveys for the ruffed grouse have been completed on about 10% of the available habitat and they are known to occur in the LSR. Surveys for beavers have been completed on about 60% of the available habitat and they are known to occur.

(b) Mule Deer, Elk

Surveys for mule deer and elk have covered about 100% of the available habitat and they are known to occur within the LSR.

(c) Marten

Marten are known to occur in the LSR and about 25% of their available habitat has been surveyed.

(5) Survey And Manage, Protection And Buffer Species

There are eight species that do or could occur within the Icicle LSR and are identified as survey and manage, or protection and buffer species. These include the great gray owl (*Strix nebulosa*), flammulated owl (*Otis flammeolus*), white-headed woodpecker (*Picoides albolarvatus*), black-backed woodpecker (*Picoides arcticus*), pygmy nuthatch (*Sitta pygmaea*), warty jumping slug (*Hemphillia glandulosa*), blue-gray tail-dropper (*Prophyaon coeruleum*), and papillose tail-dropper (*Prophyaon dubium*).

(a) Birds

It is unknown if the great gray owl occurs within the Icicle LSR and surveys have not been completed. No surveys have been completed for the flammulated owl and it is unknown if they occur. Surveys for the white-headed woodpecker, black-backed woodpecker, and pygmy nuthatch have been completed on about 10% of the available habitat. It is unknown if these species occur in the Icicle LSR.

(b) Mollusks

It is unknown if the warty jumping slug, blue-gray tail-dropper, or papillose tail-dropper occur in the LSR and no surveys have been completed.

(c) Habitat Effectiveness

Habitat effectiveness was measured using the current open road density and the amount of security habitat. The current open road density within the LSR is 1.45 mi./sq.mi. and the amount of area in security habitat is 51%. This information shows that habitat effectiveness is considered to be "moderate" (1-2 mi./sq.mi.) relative to roads and "moderate" relative to security habitat (50-70%). The long term management objective for LSR/MLSAs is to manage towards a "high" level of habitat effectiveness defined as <1mi./sq.mi. open road density and >70% security habitat.

3. Human Uses

a) Prehistoric and Historic Summary

Although considerable American Indian activity occurred in the vicinity of nearby, modern day Leavenworth, there are no known American Indian sites in this LSR.

The earliest exploration of this upper drainage probably occurred in the late 1800's with mining, trapping and sheep grazing interests. In the early 20th century the Forest Service developed trails accessing the area. In the 1930's, with the advent of the Civilian Conservation Corps, a road was built up the Icicle and the Chatter Creek guard station. In subsequent years the road has been extended and improved, much of this for harvest timber purposes.

b) Recreation

The Icicle drainage is one of the more popular and heavily used drainages on the Wenatchee National Forest.

(1) Campgrounds

The LSR includes Black Pine Horse Camp (10 campsites), Rock Island (22 campsites), Chatter Creek (12 campsites), Ida Creek (10 campsites), and Johnny Creek (65 campsites) Campgrounds. These campgrounds are all very heavily used during the summer season. These upper campgrounds generally open in late May (depending upon snow levels) and remain open until the snow closes it sometime in November. During the peak months of July and August they are filled on the weekends and generally at 70% occupancy during the week.

(2) Dispersed Camping

Almost all of the dispersed campsites are located above Rock Island Campground along the main Icicle road and the Grindstone Spur. In some locations the concentration of dispersed sites has contributed to loss of vegetation and soil disturbance. Many of these sites are quite popular and heavily used. From Rock Island downstream between the road and the river dispersed campsites are not permitted along the river.

(3) Trails

There are four trailheads in the LSR that provide access to the Alpine Lakes Wilderness, this includes the Chatter Creek, Icicle Creek, Jack Creek/Trout Creek and Blackjack Ridge trailheads. The latter three trailheads and associated trails receive heavy use from hiker (predominantly) and equestrian during the summer months.

The Icicle Gorge trail, a hiker trail finished in 1994, provides several loop trail options for day hikers. Although there are several small trailheads used to access this trail system, the primary trailhead is

located about 1/2 mile west of Chatter Creek Guard Station. This trail system is located in the non-wilderness corridor between Rock Island Campground and the Chatter Creek Guard Station. This trail is extremely popular and heavily used.

(4) Winter Use

During the winter months the road is closed by snow. Some snowmobile and cross country ski use occurs along this road.

(5) Other Recreation

Hunting and fishing are other recreational activities that occur within this LSR. Until a few years ago the upper Icicle was stocked (fish) around Rock Island Campground however the stocking program was eliminated due to concerns about spreading diseases to the Leavenworth Fish Hatchery which uses the Icicle as a water source and competition with native species.

Many area visitors and local residents enjoy driving the Icicle Road and using the area for day use due to its high scenic quality. The numbers of people enjoying this activity decreases as you move up the drainage, with a notable drop occurring at Ida Creek Campground where the paved surface ends.

c) Mining

There are no active mining operations within the LSR.

d) Social and Economic Considerations:

The recreation opportunities and high scenic quality contribute an important economic benefit to the tourism based economy of the Leavenworth area.

There are several small parcels of privately owned land within the LSR. These parcels may ultimately be developed for part time or full-time residential use.

B. Analysis Between LSR/MLSAs

1. Sustainability

a) Sustainability Analysis

The sustainability of LSRs/MLSAs across the Forest is displayed in Table 19 *Vegetation Hazard and Ignition Risk Ratings* of the "Forest-wide Assessment for Late Successional Reserves and Managed Late Successional Areas, Wenatchee National Forest". The Icicle LSR falls in the lower 1/3 of all LSR/MLSAs in terms of amount of vegetation at risk to loss from catastrophic fire. An important consideration in terms of sustainability is the relationship between this LSR and its neighboring LSR/MLSAs. This includes the amount of at risk vegetation within the LSR/MLSAs as well as the extent of at risk vegetation between them. For the purposes of this analysis five LSR/MLSAs are considered to be neighbors: Deadhorse; Tumwater; Camas; Boundary Butte; and Teanaway.

The following table shows a comparison of the acres at risk and the ignition risk determined in the Forest-wide sustainability analysis for the Icicle LSR and its five neighboring LSR/MLSAs.

Table III-2, Acres at Risk and Ignition Risk, Icicle LSR.

LSR/MLSA	% of LSR/MLSA at Risk	% of LS Forest at Risk	Ignition Risk
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	Acres	Pct.	Acres	Pct.	
Icicle	3,568ac	25%	3,268ac	38%	Moderate
Deadhorse	10,805ac	59%	9,843ac	100%	High
Tumwater	1,081ac	26%	1,054ac	100%	Moderate
Camas	941ac	61%	932ac	100%	High
Boundary Butte	No Inform.				
Teanaway	6,840ac	20%	6,340ac	35%	Moderate

When looking at sustainability issues between LSRs/MLSAs, the factor driving the analysis is the amount and location of at-risk vegetation between the Icicle LSR and its five neighbors. In other words, identifying linkages in at-risk vegetation that would facilitate the spread of fire from one LSR/MLSA to another. Most of the vegetation to the north and east of the Icicle LSR was much influenced by the 1994 Rat and Hatchery fires. These two fires burned much of the at risk vegetation linking the Icicle LSR to the Deadhorse and Boundary Butte LSRs and the Tumwater and Camas MLSAs, as well as burning significant portions within all four LSR/MLSAs. As a result of these fires and the follow-up salvage logging which reduced dead fuels, the likelihood of another fire burning across these landscapes is low in the short term.

There is no at risk vegetation between the Icicle and Teanaway LSRs and the likelihood of a fire occurring in one and threatening the other is very low.

(1) Implications

Due to the situation described previously there are no identified opportunities for improving the sustainability of these LSRs based on the condition of the vegetation between them.

2. Forest-Wide Northern Spotted Owl

The Icicle LSR is not one of the “big three” LSRs on the forest designated as a large population cluster/source center LSRs, for the recovery of the spotted owl. The Icicle LSR is part of the smaller “local population” centers, which are linked to the metapopulations through dispersing individuals (See Figures 1 and 2 with LSR and MLSA maps in the Forest-wide Assessment). The spotted owl is a Threatened species, with the recovery dependent on the implementation of the NWFP, especially in LSR/MLSAs (FSEIS Appendix G, Biological Opinion, 1994).

3. Connectivity (Plant, Wildlife, and Northern Spotted Owl)

a) Plant Connectivity

Connectivity can be addressed at several spatial scales when assessing an individual LSR. Connectivity of the LSR'S/MLSA network on the Wenatchee National Forest has been addressed above in the Forest-wide Assessment and in Appendix 1 of the Forest-Wide Document. Vascular plant connectivity with surrounding LSRs or MLSAs is analyzed in this section (Table III-3). Refer to Forest-wide Assessment discussions for connectivity descriptions of lichens, bryophytes and fungi.

Primarily, connectivity by vegetation group to the Icicle LSR only exists for species with high dispersal capabilities because of topography and distance to surrounding LSRs or MLSAs. The only direct linkages are for high dispersal species with the Tumwater MLSA in the dry and moist grand fir groups. No connectivity exists for the low dispersal species associated with dry forest group with Deadhorse, Boundary Butte, and Teanaway LSRs. No connectivity exists for low dispersal species in

moist grand fir group with Deadhorse and Teanaway LSRs and the Tumwater MLSA. In the subalpine fir series, no connectivity exists for low dispersal species with the Boundary Butte LSR and the Tumwater MLSA. Regarding the Teanaway LSR, low dispersal species associated with the wet forest group are not connected and low and moderate dispersal species in the whitebark pine series are not connected. In all other cases, species connectedness is dependent on vegetation outside the network or the vegetation group is absent in the surrounding LSRs or MLSAs.

No projects were identified to improve connectedness since the deficiencies are due to inherent vegetation patterns in the landscape.

Table III-3, Icicle LSR - Vascular Plant Connectivity

LSR/MLSA	Vegetation Group														
	Dry/Mesic			Moist GF			Subalpine			Wet			Whitebark		
Dispersal Class	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Deadhorse	N	D	D	N	D	D	A	A	A	A	A	A	A	A	A
Tumwater	D	D	Y	N	D	Y	N	D	D	A	A	A	A	A	A
Boundary Butte	N	D	D	D	D	D	N	D	D	A	A	A	A	A	A
Teanaway	N	D	D	N	D	D	D	D	D	N	D	D	N	N	D

Dispersal Codes = Y=Yes (Connectivity); N=No (Not Connected); A=Veg Group Absent; D=Dependent (Connectivity Depends on Outside Habitat)

b) Wildlife Connectivity

Connectivity between late-successional patches is important to providing movement between patches, minimizing local extinctions, and reducing genetic isolation (Harris 1984, Noss and Harris 1986). In order to assess connectivity between the Icicle LSR and adjacent LSR/MLSAs the dispersion index was used (as described in Appendix 1). A total of three potential linkages were evaluated: Icicle to Little Wenatchee LSR, Icicle to Boundary Butte LSR, and Icicle to the Tumwater MLSA. The overall dispersion index for this LSR was 1.3.

Table III-4, Dispersion Indices for the Icicle LSR

Linkage	Distance(km)	High	Moderate	Low	Index
Icicle-Little Wenatchee	10	Yes	No	No	1
Icicle -Boundary Butte	8	Yes	No	No	1
Icicle -Tumwater	3	Yes	Yes	No	2
Overall					1.3

c) Northern Spotted Owl

The Icicle LSR was established around the spotted owl pairs, for connectivity to the north and south, and to continue to provide habitat in the Icicle Valley which has private land related habitat loss. This LSR also includes a CHU for spotted owls. For final recovery of the northern spotted owl, these smaller LSRs/MLSAs contribute to the goal of occupied home ranges (See table below). The Icicle LSR has a goal of 1 pair of spotted owls.

Table III-5, Connectivity Between LSRs: Spotted Owl Pair Goals for LSRs and MLSAs, and CHU's

LSR or MLSA Status and Connectivity	S.Owl Pairs --1994, FSEIS Appendix G, Table G-3	Highest Occupancy and Reproductive Status, for Field Seasons, 1995 - 1996		Number of Owl Pairs CHU Should Support, as per USFWS - CHU discussion.	
Little Wenatchee RW134	3 Pr	9 Pr	9 Pr	7+ Pr	WA-7 & WA-8
Deadhorse RW133	4 Pr	7 Pr + 2 RS	9 sites (2 Sites ¹)	4+ Pr	WA-9
Tumwater DM3	--	1 Pr	1 sites ¹	1 Pr	WA-9
Icicle RW132	1 Pr	2 Pr	2 sites	1 Pr	WA-10
Boundary Butte RW131	3 Pr	2 Pr	2 sites ¹	3 Pr	WA-11
Teaaway RW130	2 Pr	5 Pr	5 sites +1 site ²	5 Pr	WA-13 WA-12

¹ Spotted owl activity center may have been lost, due to 1994 Chelan Forest Fires, monitoring is underway.

² Spotted owl activity center within ¼ mile of LSR/MLSA boundary.

Objectives in the Icicle LSR should protect and enhance conditions of late successional and old growth forest ecosystems, while serving as habitat for late successional forest related species, including the northern spotted owl (NWFP A-4, 1994). LSRs and MLSAs are important for maintaining well distributed and well-connected spotted owl populations.

The five nearest LSR/MLSAs were evaluated to determine their potential for dispersal to occur. This analysis showed that spotted owls could likely disperse to the Little Wenatchee LSR through the upper Icicle into Mill Creek. Connection will occur to the Deadhorse LSR through Frosty Creek to Chiwaukum Creek. Connection is fragmented, but may occur to the Tumwater MLSA from Johnny Creek to Cabin Creek. Dispersal and connectivity habitat to Boundary Butte LSR is severely disrupted from the 1994 fires, along the lower Icicle. Connectivity to the Teaaway LSR will likely occur from Jack Creek to Van Epps Creek to Fortune Creek to North Fork Teaaway. See Forest Interior Map and Suitable Spotted Owl Habitat Maps. These connectivity corridors should be monitored for effectiveness, and should overlap into Riparian Reserves, unmapped LSRs, wilderness, etc.

(1) Restoration Opportunities And Potential Projects Between LSRs

1. Meet pair goals of LSR for spotted owls.
2. Protection of LSR from fires originating outside the LSR on Matrix lands, in the Bridge Creek area.
3. Monitor/maintain connectivity outside the LSR particularly along the Icicle River valley, lower Chiwaukum Creek, and in upper Fortune Creek areas.

C. Analysis Within the LSR

1. Unique Habitats And Species

The following is the discussion and results of the Unique Habitat and Species module for the Icicle LSR. For more information see Unique Habitats Maps, Unique Habitats and Species Table (page 117-120), Forest Interior Map and Tables (appendix 19), Riparian Reserves Map, Road Density tables

(appendix 20). For process see Unique Habitats and Species Module in Appendix 1 for order, explanations and process of modules.

a) Overview of Unique Habitats and Species

(1) Unique Ecosystems Landscape Analysis

Each LSR/MLSA is compared Forest-wide for unique habitats and species abundance, connectivity and function (see Forest-wide Assessment). The Icicle LSR has comparatively high amounts of habitats and species: 14% in non-forested vegetation types (high amounts of rock, talus, cliffs, and subalpine meadows); 17% in Forest Interior habitat; 43% in Late Successional habitat; 40 wildlife late-successional associated species and species of Special Status and 35 plant late-successional associated species and species of special status.

The Icicle LSR is within the Spine of the Cascades area of plant and animal rarity or endemism along the eastern Cascades, as per Columbia Basin Ecosystem Plan (Marcot et al, 1995 Draft). The Icicle/Frosty Potential RNA (WNF LRMP 1990) for western red cedar/western hemlock forest community is within the Alpine Lakes Wilderness, two miles to the west of the Icicle LSR. There are no Special Interest Areas identified in the WNF Plan.

Identified areas of high abundance, connectivity and function for unique habitats and species within the Icicle LSR are:

- **Slopes off MT Cashmere from Victoria Creek to Doctor Creek:** Subalpine larch/whitebark pine, Talus/Scree, Rock/Cliff, Shrub fields, Subalpine Meadows, Security Habitat, Riparian Reserves.
- **Icicle River** (from Icicle trailhead to Bridge Creek): wetlands, gravel bars, Riparian Reserves, Forest Interior, PETS spp, MIS spp, bald eagles, American Indian roots and cedar basket trees.
- **Chatter Creek to Jack Creek:** Forest Interior, Riparian Reserves, Wetlands, spotted owls, and PETS plant and animal spp.
- **Headwaters and Slopes of Johnny/Big Slide/Ida and Hoxsey Creeks:** Subalpine Meadows, Rock/Cliffs and Talus, Whitebark pine/Subalpine larch, Shrub fields, Riparian Reserves, Security Habitat, PETS spp.
- **Midslopes-Headwaters Trout/Doctor/Bob/Victoria Creeks:** Talus, Riparian Reserves, Forest Interior, PETS Spp, Security Habitat.

Each LSR/MLSA can be evaluated for biodiversity, connectivity and function (see Function of Unique Habitats in the Forest-wide Assessment). Past management activities affect the function of unique habitats and species. This includes open roads, roading of riparian reserves, and past harvest activities. For the Icicle LSR: total open road density of 1.45 miles per square mile; security habitat of 51%; roads and trails in riparian reserves of 4.23 miles per square mile; and past harvest activities of 10% in the LSR.

(2) Abundance and Ecological Diversity

Compared to the rest of the LSR/MLSAs, the Icicle LSR has high amounts of unique habitats and species abundance. This includes acreage for unique plant and animal habitats, juxtaposition of habitats, availability of wilderness or areas of rarity, and known observations from the plant and animal species list. There is 14% of the LSR in non-forested vegetation types, and there are 40 wildlife species of Special Status and 35 plant species of special status.

(3) Connectivity for Unique Habitats and Species

This LSR provides moderately high amounts of connectivity for unique habitats and species. This includes the amount, percent and number of patches of late successional habitat, forest interior habitat patches, and the juxtaposition of wilderness and areas of rarity. The Icicle is among the LSRs with the high amounts of Forest Interior and Late Successional habitat, as well as having wilderness on three sides.

(4) Process and Function of Unique Habitats and Species

The LSR has a high degree of function for unique habitats and species, as determined by the amounts of Special Status plants and animals, juxtaposition to wilderness and areas of rarity. This includes development and maintenance of unique ecosystems, including ecological values for unique species and populations. The plant and animal species list for known observations makes up a large part of this analysis, as well as proximity to wilderness and areas of rarity, which sustain habitat function. See Chapter VII, Forest-Wide Function of the Network for Unique Habitats and Species and Appendix 37 Forest-wide Unique Habitats and Species by LSR/MLSA.

b) Unique Habitats and Species Known Within LSR

(1) Unique Habitats and Species Site Specific Analysis

The following is a summary of the Unique Habitats and Species Module for the Icicle LSR. For more information see Unique Habitats Map and Tables, Forest Interior Map and Tables, Riparian Reserves and Roding Map and Tables.

Table III-6, Unique Habitats and Species Summary

	Icicle LSR
Riparian Reserves	Over-all 13% of LSR in Riparian Reserves, moderate amounts.
	Streams (1,820 acres), Open water, Wetlands and Seeps.
Non-Forested Vegetation	14% (2,066 acres) of LSR
	8% in rock/talus/cliff: Rock 4% (580 acres), Talus/Cirques 2% (314 acres), Cliff 2% (264 acres)
	Subalpine Meadows 3% (454 acres) one of the highest percentages on the Forest,
	Shrub/brush fields 3% (453 acres) one of the highest percentages on the Forest
Unique Forest Groups	Forest Interior Patches 18% (2,504 acres) higher percentages, mostly wet/moist.
	Dry Forest Interior - 1 patch Big Slide to Mac Creek.
	Whitebark Pine/Subalpine Larch 3% (413 acres),
	Disjunct Alaska Yellow Cedar, Pacific Yew, Western Red Cedar, Black Cottonwood.
	Late-successional Habitat (52% moist) and Successionally Advanced (9% dry).
	Snags/Logs Moderate-High Quality from Landscape Level (see

	Icicle LSR
	Snag sub-module)
Animal - Late Successional Associated Species and Species of Special Status	40 Species of Special Animals
PETS - Animals	7 species: Spotted Owl, Bald Eagle, Grizzly Bear, Gray Wolf, CHU, Bull Trout, Red Band Trout.
Survey & Manage and Protection & Buffer	0 species:
Management Indicator Species (WNF)	14 Species: Bald Eagle, Spotted Owl, Marten, Pileated Woodpecker, Three-toed Woodpecker, Primary Cavity Excavators, Beaver, Ruffed Grouse, Elk, Mule Deer, Mt. Goat, Cutthroat Trout, Bull Trout, Red Band Trout.
Other Animal Species of Special Status	6 Species of Concern: Harlequin Duck, Northern Goshawk, Little Willow & Olive-sided Flycatchers, Tailed Frog, Cascades Frog.
	Birds: along the streams, rivers, shrub fields, meadows.
	6 + Late Successional Species: Pacific Giant Salamander, Brown Creeper, Clark's Nutcracker (whitebark pine associate), Barrow's Goldeneye, Barred Owl, Little Brown Myotis, Brook Trout.
	Significant Fish Populations: Cutthroat Trout in Jack Creek and Upper Icicle, Maybe Bull Trout in Jack Creek.
Plants - Late Successional Associated Species and Species of Special Status	32 Species of Special Plants (known to exist in the LSR)
PETS - Plants	0 surveys done, suspect <i>Botrychium</i> spp and <i>Hackelia venusta</i> .
Survey & Manage and Protection and Buffer Plants	Fungi, Lichens, Vascular Plants, Candy Stick, Chantrelles.
Other Plant Species of Special Status	30 late-successional associated species
American Indian Uses	Traditional Use Sites: Trade routes to the westside along the Icicle, Cedar Basket Trees on the Icicle.
	Vision Quest Sites: Potential in talus, and off major ridges and peaks.
	Traditional Food Plants: Huckleberry, Roots, wild ginger.
	Food Gathering: Elk, Deer, Mountain Goat, Fish.

c) Restoration Opportunities and Potential Treatments Unique Habitats and Species Within LSR/MLSA:

Weeds (Diffuse and Spotted Knapweed, Sulfur Cinquefoil, Dalmation Toadflax):

1. Keep weeds from encroaching into LSR, especially into meadows and natural openings;
2. Reduce noxious weed spread in clearcuts, partial cuts, trailheads, and roads through-out the LSR;

Roads:

1. Reduce roads/trails/campgrounds in Riparian Reserves and wet meadows both inside and outside of the LSR;
2. Reduce roads and trails talus and cirques;
3. Increase Security Habitat;
4. Reduce open road density.
5. Reduce roads in forest interior patches;
6. Reduce roads and trails in Mountain Goat Habitat (summer & winter ranges);

Access:

1. Retain American Indian access to traditional use sites;

Habitat Improvement:

1. Use prescribed fire or prescribed natural fire in whitebark pine forests, shrub fields and subalpine meadows, adjacent Wilderness to maintain habitat over time;
2. Reduce encroaching trees in subalpine meadows and shrubfields; where fire historically maintained them as meadows;
3. Use prescribed fire in ponderosa pine for low density and large tree sizes;
4. Thin to accelerate late successional characteristics in clearcuts and areas near private land;
5. Use of Prescribed Fire to improve ponderosa pine fire climax forests, between LSRs along the Icicle Valley.

Protect:

1. Protect and/or enhance riparian areas, wetlands, intermittent streams, and dispersal corridors in Riparian Reserves;
2. Protect large trees and screen near talus, cliffs, caves, meadows;
3. Protect/maintain/enhance/monitor PETS species;
4. Meet high end snag levels and spp;
5. Protect caves and cliff/caves for 250' around (roads/trails/cutting) to benefit bat species.
6. Protect 300' around subalpine meadows..

Coordinate and/or Acquire:

1. Acquire non-Forest System lands with high degree of unique species or habitat.
2. Coordinate unique habitat management on private lands OR acquire habitat from private ownership, along the Icicle River for connectivity.

Interpret:

1. Interpret values and protection/maintenance of unique habitats and species.

Monitor:

1. Monitor and maintain unique habitat concentrations;

2. Monitor and maintain connectivity corridors.
3. Monitor large old clearcuts for snag levels and wildlife/plant species use;
4. Monitor for wolverine in cirques with winter track or aerial surveys;
5. Survey & Manage prior to activities: Great Gray Owl, Larch Mt. Salamander, Lynx, Mollusks and other S&M or P&B species;.
6. Survey & Manage prior to activities: fungi, lichen, bryophytes, vascular plants.
7. Follow PETS, Species of Concern, Species of Special Status guidelines in Biological Evaluations for projects.
8. Inventory and monitor Icicle/Frosty Potential RNA in Wilderness to the west.

d) Snag/Log/Green Tree Recruitment Module

The following is the discussion and results of the Snag/Log/Green Tree Recruitment sub-set module of the Unique Habitats module for the Icicle LSR. Over-all, the Icicle LSR has a Moderate to High quality of available snags and future green tree recruitment snags and logs. See appendix for order, explanations and process of modules. Snag quality can be judged by a continual supply of tree structure in various stages of decay, size and species. This can be best provided in the moist and wet vegetation groups, areas with large amounts of late-successional habitat, areas with little fragmentation, areas with high amounts of forest interior, and areas with high functioning riparian reserves. (See Appendix 38, "LSR?MLSA Snag/Downed Logs/Green Tree Recruitment Analysis" in the Forest-wide Assessment)

Table III-7, Snag Habitat Quality/Landscape Scale

<u>HIGH QUALITY *</u>	<u>***MEDIUM QUALITY</u>	<u>LOW QUALITY</u>
Moist & Wet Veg Groups 57%	Subalpine Fir & Mesic Veg 11%	Dry & Whitebark Veg 15%
>60% LS (non-dry) Habitat	15% - 60% LS Habitat 43%	<15% LS Habitat
80% - 100% LS (all) Habitat	40% - 80% LS/M Habitat 61%	<40% LS/M Habitat
> 30% Forest Interior (non-dry)	15% -29% Forest Interior Non-dry 18%	<15% Forest Interior Non Dry
>10% Forest Interior Dry	5% - 9% Forest Interior Dry	< 5% Forest Interior Dry 0%
>16% in Riparian Reserves	10% to 16% in Riparian Reserves 13%	<10% in Riparian Reserves
0 Miles/Square Mile Any Roads in Riparian Reserves	0 to 1 Miles/Square Mile Roads in Riparian Reserves	> 1 Mi/Sq Mi Rd Rip Res 4.23 mi/sq/mi
< 1 Miles/Square Mile Open Roads	1 Mile to 2.5 Miles/Square Mile Roads 1.45 mi/sq/mi	> 2.5 Miles/Square Mile Roads
>70% Security Habitat	50% to 70% Security Habitat 51%	<50% Security Habitat
>10% in Past Burns-snags available		<10% in Past Burns < 10%
>50% Insect/Pathogens	25% - 50% Insect/Pathogens	< 25% Insect/Pathogens

<u>HIGH QUALITY *</u>	<u>***MEDIUM QUALITY</u>	<u>LOW QUALITY</u>
(See the Disturbance Section in the Chapter)	25% to 50%	
<10% Past Clearcut Harvest 10%	11% - 25% Past Clearcut Harvest	>25% Past Clearcut Harvest
<10% Past Partial Cut Harvest 10%	11% - 50% Past Partial Cut Harvest	>50% Past Partial Cut Harvest

(Percentages in bold indicate values for LSR)

* Denotes the quality present in this LSR.

(1) Restoration Opportunities And Potential Projects For Snags/Logs:

1. Reduce roads in Forest Interior patches;
2. Increase Security Habitat;
3. Reduce roads in Riparian Reserves;
4. Manage at endemic insect/disease levels;
5. Complete snag analysis on 40 acre grid;
6. Retain snags at high end of range.

e) Species with Special Status (Plant)

There are two known species with special status within the Icicle LSR. There are other species thought to be associated with late-successional forests that are known to occur within this LSR. There is potential habitat for a number of species with special status, but few surveys have been carried out to determine presence or absence. Plant surveys should be carried out in conjunction with restoration projects, as well as surveys independent of other activities. It is important that species ranges are known so that better estimates of species viability can be assessed. In addition, little is known about most species habitat and biological requirements, and inventories provide a first and necessary step in obtaining this information.

Following through the model, there are no known immediate viability concerns for *Allotropa virgata* or *Cantharellus subalbidus*. Therefore, known populations should be monitored paying particular attention to population numbers. No other projects have been identified.

There are no known survey and manage plant species within the Icicle LSR (See Appendix 6 & 7). Although a few species are suspected, even more are simply unknown. The ROD provides standards and guidelines for survey and manage species.

2. Plant Connectivity

Connectivity can be addressed by analyzing the connectedness of habitats within the LSR. Within the Icicle LSR, most forest groups are fairly well connected. Many disjunct populations result from inherent breaks or openings in the landscape. However, it is noted that created opening within the wet forest group are concentrated in a north/south direction between Trout and Bob Creek. Species associated with late-successional wet forest communities would benefit by encouraging late-successional structure. However, this is not seen as a detriment. At this time, information is not available to complete this type of analysis for the Icicle LSR.

3. Wildlife Connectivity

The following is a result of applying the "within LSR/MLSA connectivity assessment process" to the Icicle LSR.

Table III-8, Connectivity Rankings for Icicle LSR

Connectivity Variable	Dry	MGF	WET	SAF	RR	Overall
% Late-success or Fire Climax	L	H	H	H	M	M
Open Road Density	M	M	M	H	L	M
Security Habitat	M	M	M	H	L	M
Forest Interior Roads	L	L	L	H	L	L
% Forest Interior*	L	L	M	L	L	L

Currently, the availability of habitat in a late-successional or fire-climax condition is high in all vegetation groups except the dry forests. Restoration projects that promote the development of fire-climax conditions would increase the connectivity in this forest group. The overall open road density and level of security habitat provides for a moderate level of connectivity. However, the existing roads are concentrated in Riparian Reserves where the current open road density is 3.5 miles/sq mi.. The current level of forest interior connectivity is considered to be low, as a result of habitat patches being fragmented by roads except in the SAF vegetation group which largely occurs in wilderness. This is a concern for species with low mobility. The percent of each vegetation type in a forest interior will increase over time unless a large-scale disturbance occurs. It should be noted that the ranking for this variable may never be high as a result of natural landscape fragmentation. The amount of habitat within a forest interior needs to be evaluated based upon the ecological capabilities of the site and sustainability on a site-specific basis. Site-specific analysis is also necessary to more adequately address connectivity for the less mobile species. This was not adequately addressed at the coarse/moderate filter approach used in this assessment. The Icicle Creek and Icicle Road dissect this LSR nearly in half. These provide formidable barriers for low and some moderate mobility wildlife species.

(1) Restoration Opportunities

(a) Dry Forest Group

There is an opportunity to improve connectivity within the dry forest vegetation group through the implementation of thinning, prescribed fires, and road closures with associated revegetation.

(b) Wet Forest Group, Riparian Reserves and Subalpine Fir Forests

There is an opportunity to improve habitat connectivity within riparian reserves and interior forest patches by reducing the number of roads. This could include relocating roads or revegetating them to provide for connectivity for low mobility wildlife species. Of particular concern for low mobility species is the Icicle Road. Relocation of this road away from the river may reduce the combined effects of the road and the river acting as a barrier. It may be possible to use silvicultural methods, such as thinning, to promote the development of late-successional forest structures in areas not currently in a late-successional condition.

4. Disturbance Risk Analysis

The Icicle Creek LSR contains 14,289 acres. Only 9% is successional advanced dry or mesic forest. Private landholdings within the LSR boundaries have recently been obtained by the USFS; only a small amount of private land remains in the vicinity of Trout Creek. Near the Rock Island bridge is a

shelterwood / seedtree harvest in which the overstory was been retained. Other past harvests occurred along both spurs at the headwaters of Icicle Creek; these were small regeneration cuts (clearcuts). The area north of Icicle Road in the vicinity of Rock Island was harvested during the 1970s. None of this past harvest activity appears to have increased pathogen levels from endemic levels, although laminated root disease is somewhat prevalent in midslope stands of Douglas-fir.

Future snag recruitment in the LSR has been somewhat compromised by the heavy mortality of western white pine from 1984-1991. These trees were killed by the mountain pine beetle, but were likely also infected by white pine blister rust. This mortality created a one-time pulse of high-quality pine snags, but with young individuals of pine killed by the disease or by a combination of the disease and insect attack, there will be a very limited supply of large pines for future snags. Prior to the epidemic and outbreak, the area contained a substantial number of living western white pines; their loss will accelerated successional processes and future stands will be composed of a greater percentage of shade tolerant species that are less able to withstand periodic droughts such as occurred during the 1970s and 1980s. The District silviculturist reported that fir engraver mortality in the LSR was fairly high during that period. As stands move forward in successional trajectories they will be an increasingly greater risk to this insect, especially where root or stem pathogens disease are also present. Douglas-fir dwarf mistletoe is present at low or moderately severe levels. There are also occasional outbreaks of larch casebearer, a non-native insect that feeds on the foliage of western larch.

Several campgrounds occur along the upper Icicle Road; hazard tree surveys within these campgrounds found endemic levels of several pathogens; while these agents appear to be causing little damage to the forest as a whole, they do pose a problem around campgrounds where infected trees are a risk to humans.

The following information on insect activity in the Icicle Creek LSR is from data collected during the aerial surveys conducted by Region 6 Insect and Disease Group. Light infestations or damage on less than 100 acres are not reported.

- Mountain pine beetle (lodgepole): 1951, 1954, 1987, 1989
- Mountain pine beetle (whitebark pine): 1995
- Mountain pine beetle (western white pine): 1962, 1979, 1981-82, 1984-91
- Mountain pine beetle (ponderosa):
- Western pine beetle: 1989
- Pine ips: 1979
- Fir engraver: 1975, 1979, 1990
- Douglas-fir beetle: 1952, 1954, 1958, 1990
- Western spruce budworm: 1951-53, 1973-76, 1978
- Western blackheaded budworm: 1985 (over 15,000 acres within and adjacent to LSR affected)
- Douglas-fir tussock moth: 1972

Susceptibility of the Icicle LSR to fires, insects, and pathogens is shown in the following table. Mortality from biotic disturbance agents will be greatest where host continuity across the landscape is high and where there is overlapping moderate to high risk among two or more disturbance agents that act synergistically. Risk associated with biotic disturbance agents generally elevates the risk of catastrophic fires by potentially increasing fuel levels; this is especially true in the dry forest vegetation group and in vegetation upslope from or surrounded by dry forests.

Table III-9, Disturbance Matrix, Icicle LSR

Veg		Dwarf Mistletoe	Root Decay									Total
Type	Fire	DF	AROS	HEAN	PHWE	WPBR	WSB	DFB	MPB	FE	Risk	
10	L	L	M	L	L	-	L	H	L	L	L	
11	L	M	M	L	L	-	M	L	L	L	L	
12	M	L	M	L	M	-	H	M	M	M	M	
30	L	L	M	M	M	M	L	L	-	L	L	
31	L	L	M	M	M	M	L	L	-	M	L	
32	M	M	M	M	M	M	M	M	-	M	M	
41	M	L	L	L	L	M	L	L	L	L	M	
42	M	L	L	L	L	M	L	M	H	M	M	
43	H	L	L	L	L	M	L	M	H	M	H	
44	M	M	L	L	L	-	L	M	M	M	M	
60	L	L	L	L	M	H	L	L	L	L	L	
61	L	L	L	L	M	H	L	L	L	L	L	
62	L	L	L	M	M	H	L	M	M	M	L	
63	L	-	L	L	L	H	L	L	L	L	L	
71	M	-	L	L	L	H	-	L	M	M	M	

Key to Column Headings: PP = Ponderosa Pine, DF = Douglas-fir, WL = Western Larch, PIPO = Ponderosa Pine; PSME = Douglas-fir; LAOC = Western Larch; AROS = Armillaria root disease; HEAN = Annosus root disease; WPBR = White Pine Blister Rust; WSB = Western Spruce Budworm; DFB = Douglas-fir Beetle; MPB = Mountain Pine Beetle; WPB = Western Pine Beetle.

Key to Letters “-” = no risk; “L” = low risk, “M” = moderate risk, “H” = high risk

Veg Type codes: refer to Appendix 3, in the “Forest-wide Assessment for Late Successional Reserves and Managed Late Successional Areas, Wenatchee National Forest”.

Most of the Icicle LSR is not at a high risk for fire. Areas where protection activities are warranted include mature lodgepole pine forests, especially where they are located near owl activity centers. Opportunities exist in created openings in the wet forest group for using thinning to develop later successional structures. A diversity of species will help prevent the formation of extensive root disease pockets. Single-layered stands will benefit from commercial thinning and group selection harvests to accelerate succession and create structural diversity.

5. Northern Spotted Owl

The recovery of the federally Threatened northern spotted owl is highlighted in management strategies within LSRs and MLSAs (See appendix 1 - Northern Spotted Owl Module, Individual LSR/MLSA). This includes:

- LSRs and MLSAs will meet the goals for the numbers of owl pairs within each LSR or MLSA (NWFP 1994 B-4; NWFP C-9; FSEIS Appendix G, Biological Opinion, 1994; USDI. 1992. Northern Spotted Owl Recovery Plan, and USFWS Memorandum, 1991);
- Each spotted owl’s 100 acre Activity Center will have the best quality habitat established and retained;
- Each spotted owl’s 500 acre Core Area will have the best quality habitat and habitat will be retained;

- Each spotted owl home range will meet threshold acreage's (2,663 acres) as a minimum. Wetter owl sites in LSRs will meet target or optimal habitat of 3,994 acres.;
- Sustainable, suitable spotted owl habitat outside home ranges will be maintained ;
- Dispersal habitat within and outside LSR/MLSA will be provided; (NWFP 1994, ROD pg. 19, C-3, C-10 to 11, C-39, C-45, D-9, App 3-4, pg. 240-241).
- Habitat conditions for long-term (> 50 years) sustainable nesting/roosting/foraging habitat will be improved (see DEC's and DC's in Forest-wide document, Chapter III PP 87-95); and
- The risk of habitat loss and nest site loss will be reduced (NWFP 1994, C-12 to 16, C-26);

The Icicle LSR is a mapped LSR, primarily in wetter forest habitats. The Desired Condition for spotted owl habitat in wetter LSRs is 60% of the 1.8 mile home range radius, which is 3,994 acres. This wetter LSR emphasizes spotted owl habitat, over risk and hazard reduction. LSRs, in general, accept more risk than does management in MLSAs.

The following is the discussion and results of the within LSR Spotted Owl Module for the Icicle LSR. This module reviews the home range sites for spotted owls, as well as connectivity within the LSR. See Appendix 1, which describes the order, explanations and process of modules, specifically the Northern Spotted Owl Module, Individual LSR/MLSA. See the Suitable Spotted Owl/Dispersal Habitat and Activity Center map and tables, Forest Interior Map and tables, Riparian Reserve map and tables and Security Habitat map and tables in the Appendices of the Forest-wide Assessment.

a) Suitable Spotted Owl Habitat

The amount of nesting/roosting/foraging habitat within the Icicle LSR is 7,861 acres (52% of the LSR). Of this, 7,366 acres are in wet, moist, and subalpine fir forests. This wetter spotted owl habitat has a higher chance of being sustained, than dry and mesic forest groups. There is a potential for the LSR to have 10,680 acres (75%) of suitable habitat, mostly in the wetter forest groups. Dispersal habitat currently is 2,333 acres, a mix of dry, moist and wet forest groups. There are 2 activity centers, both in wetter habitat. This LSR can support 2 pairs of spotted owls over the long-term. Habitat analysis for the Icicle LSR is based on vegetation mapping, and a model of spotted owl habitat structure (see Appendix 13: Suitable Habitat Acreages, Appendix 4 & 5: Vegetation Acreage's for LSRs/MLSAs, and Suitable Spotted Owl Habitat Maps). The map and acreage's should be validated prior to project implementation.

The most contiguous and sustainable suitable spotted owl habitat in the LSR is along the Icicle River and on the north aspects of Jack, Trout, Doctor, Bob, and Victoria Creeks.

Potential disruptions to spotted owl habitat, outside the LSR, are in the Icicle valley with private land fragmentation and development, and dry forest at risk to fire. To meet the recovery goals for the spotted owl, there is a need to increase/accelerate spotted owl dispersal habitat, especially accelerating old plantations in the Trout Creek, Doctor/Bob Creeks, Johnny Creek, and Hoxsey Creek..

This LSR is part of the reserves that are predicted to provide the needs for spotted owl recovery over time (50+ years). Coupled with the LSR/MLSA management, riparian reserve function, Wilderness areas, and Unmapped LSRs, the needs of the spotted owl will be met. The reserves function for connectivity and spotted owl home ranges. With the exception of a few LSR/MLSAs that are not sustainable, it is concluded that the LSR/MLSA reserves on the Wenatchee National Forest meet the function of the CHU system, as intended in the NWFP (NWFP C-9). Monitoring and maintaining

connections, as well as meeting LSR goals will be ongoing. (See Appendix 1, "Forest-wide Spotted Owl Module" and "Individual LSR/MLSA Spotted Owl Module")

b) Spotted Owl Home Ranges

Within the Icicle LSR, the estimated amount of habitat within a 1.8 mile radius of the two activity centers is shown in the Table below. Both spotted owl home ranges are above threshold acres and are within the wetter forest groups. One, SO734, is above target amounts. The other, SO747, has enough dispersal habitat within 1.8 miles radius to reach above threshold. Those acres (84 acres) could be accelerated towards late successional structure and size. All spotted owl sites should be monitored and habitat verified. Of note, the 2 home range acreage's include habitat on private land in the Chatter Creek and Ida-Johnny Creek areas.

There is great potential to restore sustainable habitat in the wetter forest groups for long-term population viability. There is also a need to protect existing habitat and home ranges, especially in sites below threshold and target acreage's. Overtime, it is expected that higher quality and more sustainable habitat will be restored to LSR. The drier forests within the LSR will eventually be managed for other late-successional species.

The adjacent forested habitats of the Alpine Lakes Wilderness are important for the functioning of this connectivity; this is particularly pertinent for Jack Creek, upper Icicle Creek and Cabin Creek.

Table III-10, Suitable Spotted Owl Habitat, Icicle LSR

	SUITABLE SPOTTED OWL HABITAT ¹⁰												Restore
	1.8 mile Circle Around Activity Center				0.7 mile Circle Around Activity Center				.33 mile Circle Around Activity Center				Opps
Spotted owl	Dry	Mesic	Wet-ter	Total	Dry	Mesic	Wet-ter	Total	Dry	Mesic	Wet-ter	Total	*
SO734	7	0	5,215	5,223	0	0	833	833	0	0	186	186	m,c,p
SO747	8	0	5,436	5,444	0	0	724	724	0	0	178	178	m,a,c,p

Below Threshold: < 2,663 ac suitable spotted owl habitat in 1.8 mi circle **OR** < 500 ac suitable spotted owl habitat in 0.7 mi circle.

At Threshold: 2,663-3,994 total suitable spotted owl habitat acres in 1.8 mile circle.

Optimum/Target: > 3,994 total suitable spotted owl habitat acres in 1.8 mile circle.

¹⁰ **Dry suitable spotted owl habitat** includes vegetation code 12 where size/structure is multistory greater than 9" DBH;

mesic includes code 22; and

wet includes codes 32, 36, 62, 64, and 42.

* **Restoration Opportunities:** M = Monitor Habitat & Site; P= Protect Habitat From Fire; A = Accelerate Habitat Towards Nesting, Roosting, Foraging; C = Coordinate Habitat and Site Management, or Acquire Habitat.

c) Spotted Owl Dispersal And Connectivity

The LSR can sustain two pairs of owls over time, and provide genetic exchange within the Icicle LSR and between other LSRs and MLSAs. Important connectivity between home ranges are habitat fragments in the Bob Creek area.

Important connectivity corridors and patches between LSRs/MLSAs include Jack Creek to upper Icicle (one of the largest blocks of wet forest interior habitat on the Forest). Other connectivity's

include: Cabin Creek-Johnny Creek; Chiwaukum Creek-Frosty Creek-Icicle Creek; Jack Creek-Van Epps Creek-Fortune Creek; upper Icicle-Mill Creek. An important linkage that was disrupted in the 1994 fires, and no longer functions, is the lower Icicle valley (Bridge Creek to Wedge Mountain to Boundary Butte). Jack Creek and upper Icicle are important linkages for north-south and east-west dispersal and genetic interchange.

During dispersal, nesting, roosting, foraging habitat is used, as well as habitat of lower quality (dispersal habitat). Dispersal habitat includes single story stands, and smaller trees with at least 40% crown closure. Dispersal habitat within the Icicle LSR is 2,333 acres (16%) and will become nesting/roosting/foraging habitat. Habitat providing dispersal/Connectivity corridors within the LSR include: Johnny Creek to Doctor Creek, Jack Creek to Doctor Creek, Jack Creek to upper Icicle. (see Forest Interior map and Suitable Spotted Owl Habitat Map at the end of the chapter).

The function of dispersal/connectivity habitat for spotted owls depends on the amount and juxtaposition of late-successional, forest interior, and dispersal habitat. The Icicle LSR has 43% in late-successional wetter forest habitat, this could increase to 57%. There is good amount of wetter forest interior habitat (17% or 2,478 acres), it's location is disrupted as a result of: created openings (10%) in wet forest groups; natural barriers on south exposures of Icicle Ridge; and along private land development on the Icicle. There is very little forest interior, dry habitat (<1%). This forest interior dry habitat may currently provide good connectivity for spotted owls, but over time is not sustainable. The moderate road densities (1.45 miles per square mile) and moderate security habitat (51%) effects connectivity, in that fragmentation usually occurs along roads, and snag reductions for road maintenance cumulatively effects habitat overtime.

Outside the LSR/MLSA network, dispersal habitat is found in all land allocations, and will be provided mainly in Riparian Reserves, in Unmapped LSRs in Matrix and in AMA's, and in wilderness areas (NWFP 1994, ROD pg. 19, C-3, C-10 to 11, C-39, C-45, D-9, App 3-4, pg. 240-241).

d) Restoration Opportunities And Potential Projects Within LSR

1. Meet goals of LSR for 1-2 pairs of spotted owls.
2. Validate spotted owl mapping, LSR acreage's, and home range acreage's. Field verify habitat and activity center locations. Especially in the Moist forest groups #32 & 36.
3. Protect spotted owl home ranges within LSR, between owl circles, by implementing risk reduction first on non-suitable habitat, then on Dry and Mesic habitat.
4. Sustain spotted owl habitat inside LSR from Icicle/Jack to Victoria Creeks.
5. Maintain dispersal/connectivity habitat. Sustain and maintain Jack Creek, upper Icicle and Cabin Creek forested connectivity.
6. Improve and accelerate N/R/F habitat, to maintain high number of spotted owl pairs. Current habitat is 7,861 acres, potential to increase to 10,680 acres.
7. Protect and/or create connectivity outside LSR in: Lower Icicle to Wedge; wilderness habitats; Fortune Creek.
8. Fuels reduction and hazard reduction occur outside N/R/F habitat in short term, shift emphasis in 50 years. Accept more risk from fire, manage at high end of spotted owl habitat desired condition in wet sites. Spotted owl habitat maintained at 60% of home range in wet and 40% in dry, 500 Acre core area protected, 100 acre activity center protected.
9. Improve and accelerate N/R/F habitat in wet forest groups, to maintain number of spotted owl pairs. Accelerate dispersal habitat and old plantations at Doctor and Bob Creeks, highest priority.

- Clear cuts in wet/moist vegetation groups predicted to be habitat in 100 years.
 - Pole sized stands in wet/moist will be habitat in 50 years.
 - Clearcuts in mesic/dry vegetation groups will be habitat in 120 years.
 - Pole sized stands in mesic/dry will be habitat in 70 years.
10. Cooperate and encourage private landowners to manage identified sites for owls.
 11. SO747 (first priority) and SO734 (second priority): Coordinate habitat and site management on private land OR acquire habitat from private ownership.
 12. Monitor spotted owl activity centers, 500 acre core and home ranges of spotted owls. SO734 (Jack) monitor. SO747 (Skydoc) monitor and accelerate 84 acres of dispersal towards suitable.
 13. Monitor/maintain connectivity outside LSR..
 14. Increase habitat effectiveness and connectivity by reducing open roads and revegetating road beds. Especially in forest interior habitat patches.

6. Aquatic

The Icicle LSR is located in the Icicle Watershed. Icicle Creek is a major tributary to the Wenatchee River, joining the Wenatchee at the town of Leavenworth. Much of the watershed is within the boundaries of the Alpine Lakes Wilderness.

a) Geomorphology

The Icicle watershed is located within the Wenatchee Highlands Subsection. The predominate landtypes in the watershed are Glacial Cirque Headwaters, and Glacial Troughs. The Glacial Trough landforms are generally located below the Glacial Cirque landforms. The cirque landforms usually have exposed bedrock or very shallow soils. The bedrock and shallow soils have little moisture holding capacity thus water is rapidly delivered downslope through numerous first order drainages. Unlike the cirques, the troughs, due to till material on the slopes, are well regulated hydrologically. Water rapidly runs off the cirques, into the till material where it moves slowly downslope into stream channels. The regulating capacity of the troughs due to the till results in relatively well regulated summer flows with relatively low summer stream temperatures. Stream temperatures during low summer flows though, can approach the upper thermal limits preferred by native salmonids. Debris flows are an important mechanism for the transport of sediment (coarse and fine) and woody material to stream systems. As such debris flows are an important factor in shaping the streams and aquatic habitat.

The valley bottoms often are dominated by broad, well-developed floodplains. The streams will meander across these floodplains except, as is the case in much of the Icicle Creek, where the channel is naturally confined by debris fans or bedrock. Bank erosion is an important mechanism for delivery of coarse and fine sediment, depending on the bank material, and the delivery of organic material to streams.

(1) Management Concerns due to Geomorphology

Management concerns include the effects of activities such as road construction which may increase debris flow occurrence. Roads need to be located to avoid significant capture of ground water in till material thus altering the hydrologic regime and increasing potential for road prism failure. Large organic material needs to be maintained next to streams not only for benefits to the stream and riparian habitat but also so when debris flows occur this material can be delivered downstream. Concern for maintaining material for delivery downstream adds importance to careful management of riparian reserves adjacent to first order non fish-bearing streams. Within the mainstem valley bottom

management needs to recognize that the streams will tend to meander across the floodplains and tributary streams may change their courses on the debris fans. Management of riparian reserves needs to recognize how the stream channels and debris flow fans will interact. A key consideration in this subsection is that organic material is entering the streams through bank erosion and debris flows.

b) Aquatic Resources - Icicle Watershed

A dam constructed with the Leavenworth National Fish Hatchery near the confluence with the Wenatchee River blocks anadromous fish and migratory bull trout access to most all the watershed. It is not known to what extent the drainage was historically inhabited by anadromous fish or bull trout. A steep gradient reach in the vicinity of Snow Creek is likely a barrier to spring chinook. Steelhead and bull trout though may have been able to negotiate the reach. Resident bull trout are found in some streams above Snow Creek indicating migratory bull trout at one time did exist through much of the watershed. Rainbow and cutthroat trout have been stocked throughout the watershed which has undoubtedly altered the native aquatic community. Brook trout have also been introduced into the watershed. The brook trout may pose a risk to the existing bull trout populations, especially if a migratory population cannot be reestablished. The Icicle River is included on the Environmental Protection Agency's 303(d) list of water quality limited waters for temperature, dissolved oxygen and pH.

The Icicle LSR is located predominately within lands contained in the Lower and Middle Icicle subwatersheds, and a small portion of the Upper Icicle subwatershed.

Table III-11, Key Salmonid Population Status in Icicle subwatersheds in LSR

subwatershed	Bull	Soc	Cut	Red	Steel	SPC
Lower Icicle	P	P	P	P	P	P
Middle Icicle	P	A	P	P	A	A
Upper Icicle	P	A	Ps	P	A	A

soc = sockeye, Cut = westslope cutthroat, Red = redband trout, Steel = steelhead, SPC = spring chinook, P = Present, A = Absent, s = significant

(1) Lower Icicle subwatershed

The Lower Icicle subwatershed includes the mainstem Icicle from the mouth upstream to and including the Big Slide and Victoria Creek drainages, exclusive of Snow Creek and Eightmile Creek which are within their own namesake subwatersheds. Tributary streams such as Jay, Johnny, Mac, Fourth of July and Bridge Creeks are small, steep gradient first or second order streams

The Lower Icicle subwatershed includes the mainstem Icicle downstream of the dam at the fish hatchery, thus steelhead and spring chinook are shown as present. Both the steelhead and chinook are primarily of hatchery origin. Sockeye are not thought to be native to the Icicle. A small number of sockeye are occasionally observed spawning in the lower Icicle. These fish are likely the result of past hatchery outplanting (Mullan 1986). Summer chinook are confined to the mainstem Wenatchee River. No anadromous fish are present in the Lower Icicle subwatershed within the LSR.

Redband/rainbow-type trout predominate in Icicle Creek within the Lower Icicle subwatershed. A few cutthroat and bull trout have also been observed (Free 1995). Due to the past stocking history it is likely that many of the redband/rainbow and cutthroat trout observed are hybrids with non-native rainbow.

Pacific tree frogs have been found in the Lower Icicle subwatershed.

(2) Middle Icicle subwatershed

As with the Lower Icicle, the Middle Icicle subwatershed includes the mainstem Icicle and small first and second order drainages. Other streams include Chatter, Ida and Horsey and Trout Creeks.

The predominate salmonid in the Middle Icicle subwatershed is the redband/rainbow trout. As with the Lower Icicle, it is entirely possible that many of the redband observed are hybrids between redband and coastal rainbow or cutthroat. A few bull trout have been observed in Icicle Creek within the subwatershed. Cascade frogs and tailed frogs have been documented in the Middle Icicle subwatershed.

Trout Creek originates at Trout Lake. Both redband/rainbow and cutthroat trout have been stocked in Trout Creek and Trout Lake. Redband/rainbow trout are the dominate salmonid but cutthroat trout have been observed.

Amphibian species known to inhabit the subwatershed include the Pacific tree frog, Cascade frog, and tailed frog.

(3) Upper Icicle subwatershed

A small portion of the lower reaches of the Upper Icicle subwatershed is included within the Icicle LSR. Bull trout, redband/rainbow trout and westslope cutthroat are present within the subwatershed. Westslope cutthroat begin to predominate in the upstream portions of the subwatershed although redband/rainbow are present in the lower reaches. The subwatershed is considered significant for cutthroat because of the presence of what appears to be a strong westslope cutthroat population, although genetic integrity is not known. Besides the mainstem Icicle, other streams include, Blackpine, Frosty, Spanish Camp, Doughgod and Cuttin Creeks.

Cascade frogs and tailed are present in the subwatershed.

c) Late Successional Management Implications

Much of the Icicle watershed is included within the boundaries of the Alpine Lakes Wilderness. Recreation use, road construction and timber harvest have had some impact on watershed processes, aquatic and riparian habitat but for the most part the fish habitat probably has not been greatly impacted by management activities, on a watershed scale. Probably the biggest impact on aquatic resources has been the loss of connectivity with the Wenatchee River and subsequent loss of migratory bull trout life histories and anadromous fish. Extensive trout planting has altered the native fish community. Trout are no longer stocked in the mainstem Icicle. Present fish stocking is confined to the high lakes. Because the watershed is in a fairly natural condition, the Icicle may offer opportunities for reintroduction of anadromous fish and migratory bull trout, if passage around the fish hatchery dam were provided. Management activities should emphasize conservation and restoration of watershed processes and aquatic habitat to compliment potential bull trout and anadromous recovery efforts. Bull trout still inhabit the drainage and there may be populations of native redband and westslope cutthroat. Maintenance of these populations may be very important to recovery efforts therefore management actions should probably avoid activities that may put these populations further at risk

7. Noxious Weeds

Four noxious weed species are known to occur within this LSR. These species are discussed in priority order as identified by the noxious weed analysis module. There are no Class A presently documented from this area. Class B or B-designate weeds include: *Centaurea diffusa*, *C. maculosa*, *Linaria dalmatica*, and *Chrysanthemum leucanthemum*. There are no Class C species present. These

species are found along roadsides within the LSR, particularly the main Icicle River Road. Following through the noxious weed analysis module, these species are limited in extent and should be controlled or eradicated. Survey for species presence and extent should be completed in order to develop a noxious management plan for this LSR (refer to Harrod 1994).

8. Fire Management Plan

a) Overview

This plan is intended to provide guidance for the management of fire in the Icicle LSR. It will supplement the Fire Management Plan for the Late-Successional Reserve System and will be incorporated into the Fire Management Action Plan for the Wenatchee National Forest.

The Sustainability and Disturbance modules for the vegetation groups have been described in a separate portion of this chapter. The intent of this plan is to provide adequate protection of the reserve. Management practices will be initiated to provide for the protection of the late successional associated species and associated unique habitats. These management actions are expected to include the role of fire disturbance as an important process in the reserve.

b) Wildfire Prevention Actions

The following actions are site specific for the Icicle LSR. They are intended to supplement the actions outlined in the Fire Prevention Plan, which is intended to be implemented on a Forest-wide basis:

1. Initiate campfire restrictions, as warranted, during periods of high fire danger.
2. Implement road restrictions and closures, as warranted, during periods of high fire danger.
3. Emphasize cooperative fire prevention activities.
4. Utilize cooperative law enforcement agreements to emphasize the inspection of spark arrestor and exhaust systems.
5. Continue and improve fire prevention signing program on roads and trails included in, or adjacent to, the LSR.
6. Emphasize contact with special interest groups (e.g., ORV groups, summer home groups, organization camps, organized rockhounding groups, local user groups, and other special use permittees).
7. Emphasize fire prevention education for hunters.
8. Emphasize fire prevention and wildfire risk awareness education for the public.
9. Emphasize wildfire risk awareness education for home/landowners in urban/wildland interface areas (e.g., Icicle Canyon).
10. Seek opportunities to initiate hazard reduction actions around private lands (e.g., Icicle Canyon).
11. Initiate hazard reduction actions around developed and dispersed recreation sites, such as:
 - Black Pine Horse Camp
 - Rock Island Campground
 - Chatter Creek Campground
 - Ida Creek Campground

- Johnny Creek Campground
 - Bridge Creek Campground
12. As a hazard reduction measure emphasize fuel wood collection in designated areas around recreation use sites.
 13. Initiate hazard reduction actions around the Chatter Creek Guard Station.
 14. Initiate hazard reduction actions along roads.

c) Fire Management Actions Intended to Keep Fire from Spreading into the LSR

The following methods are proposed to protect the LSR from fires originating outside LSR boundaries.

1. Maintain and manage existing fuel breaks.
2. Complete pre-attack planning process for the LSR. Utilize natural fuel breaks when possible.
3. Maintain existing pre-attack facilities/agreements (e.g., water chances, helispots, fire camps, etc.): Seek opportunities for more:

d) Fire Detection

1. Aerial detection, after lightning episodes, will provide the primary detection resource for this LSR.
2. Aerial detection may be supplemented with emergency staffing at Boundary Butte.
3. Emphasize fire reporting procedures (e.g., with local residents, Forest users, and cooperators).
4. Maintain low fuel levels through the use of prescribed fire in the Rat Creek Fire area, to the east of the LSR.

e) Wildfire Suppression

1. Spotted owl activity centers are the highest priority for protection of resources (following the protection of human life). All wildfires in the 1.8 mile buffer will be suppressed at minimum acres.
2. Pre-planned dispatch cards for initial attack will be prepared for the LSR area.
3. The Fire Situation Analysis or the Escaped Fire Situation Analysis process will be used to guide extended attack and large fire-suppression. Utilize pre-attack plans and materials.
4. Consideration for private land, late-successional habitat, and riparian reserves will take place during the development of fire suppression strategies and the implementation of fire suppression tactics.
5. Emphasize the protection of improvements (e.g., historic/cultural sites).
6. Protect known threatened and endangered species habitat from wildfire (i.e., plant or animal).
7. Where appropriate, fire suppression actions will be implemented on an interagency basis.

f) Vegetation and Fuels Management

1. Manage for a mosaic of age classes and structural conditions across the landscape to support late-successional habitat.

2. Manage to sustain dry forest types.
3. Strategic fuel manipulation to reduce the size and intensity of fires within, and adjacent to, the LSR boundaries (e.g., pruning, thinning, and fuel breaks). Provide a change in the continuity/arrangement of, at risk, vegetation/fuels. Emphasis to utilize existing fuel treatment areas, natural openings, roads, ridgetops, etc.
4. Emphasize roadside fuel modification and fuel wood collection (e.g., in the lower Icicle Canyon area).
5. Suggested management tools to sustain, enhance, or produce the conditions for late-successional habitat and provide for wildfire hazard reduction may include: pruning, commercial and pre-commercial thinning, wood gathering, mechanical treatments, and prescribed fire.
6. Prevent the spread and/or introduction of noxious weeds.

g) Prescribed Fire Opportunities

1. Recognize the use of prescribed fire as a management tool in this LSR and in areas adjacent to this LSR.
2. Priority outcomes throughout the LSR are to sustain, enhance, or produce the conditions for late-successional habitat and provide for wildfire hazard reduction.
3. Projects should be of scale/location to enhance landscape-level diversity tied to inherent disturbance regimes.
4. Projects should attempt to minimize the risk of future catastrophic wildfires (those outside the range of inherent disturbance regimes with respect to size and/or severity).

h) Summary

Fire prevention, fire detection, wildfire suppression, vegetation and fuels management, and prescribed fire are all appropriate, integral elements of the overall management of this LSR.

D. Restoration Opportunities and Potential Project Summary

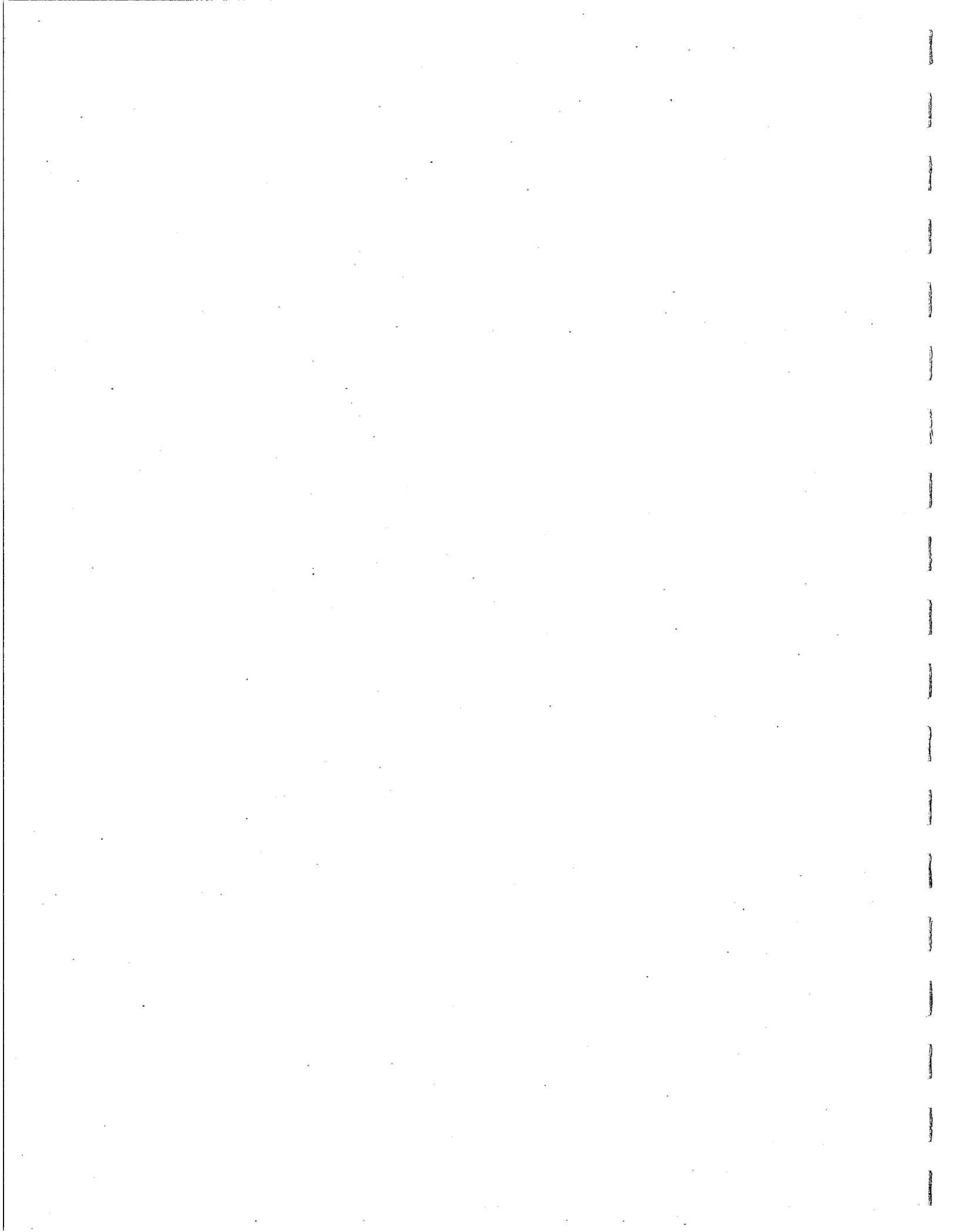
Table III-12, Restoration Opportunities and Potential Projects, Icicle LSR

Analysis Module	Restoration Opportunity	Potential Projects	Schedule ¹
Forest-Wide Sustainability	None Identified. The Rat and Hatchery fires and follow-up salvage removed most of the at risk vegetation between Icicle and its neighboring LSR/MLSAs.	None Identified.	
Forest-Wide Spotted owl	Not Applicable. (This LSR is not one of the 3 LSRs on the forest designated as a source population area.)	Not Applicable.	
Forest-Wide	None Identified. Breaks in connectivity identified are	None Identified	

Analysis Module	Restoration Opportunity	Potential Projects	Schedule¹
Connectivity	inherent to the landscape.		
Unique Habitats & Species	1) Reduce road densities in riparian reserves.	Close or relocate roads as opportunities are identified in Access and Travel Management Planning.	A
	2) Coordinate unique habitat management on private lands along the Icicle River.	2) Inform private landowners of unique habitats along the Icicle. Pursue land acquisition where landowners are willing.	C
	3) Retain whitebark pine forests and subalpine meadows.	3) Prescribed fire.	B
Connectivity Within the LSR	1) Promote the development of fire climax stands within the dry forest vegetation group.	1) Thin from below favoring ponderosa pine. Use prescribed fire where current fuel loading permit the attainment of objectives.	A
	2) Increase the amount of interior forest area within the LSR.	2) Close roads near interior forest an in dry forest areas as opportunities are identified through Access and Travel Management Planning.	B
	3) Improve the function of riparian reserves as connectivity corridors.	3) Close roads within riparian reserves as opportunities are identified through Access and Travel Management Planning.	B
Disturbance	None Identified	None Identified.	
Spotted Owl	1) See Appendix 39, "Northern Spotted Owl Nest Site Protection Within LSRs and MLSAs"		A
	3) Obtain information on spotted owl locations.	3) Survey areas to 1994 spotted owl protocol.	B
	4) Accelerate the development of dispersal spotted owl habitat in Doctor and Bob creeks and other newly acquired areas.	4) Utilize Silvicultural activities that accelerate the growth of young plantations in these areas.	C
	5) Accelerate the	5) Utilize Silvicultural activities	C

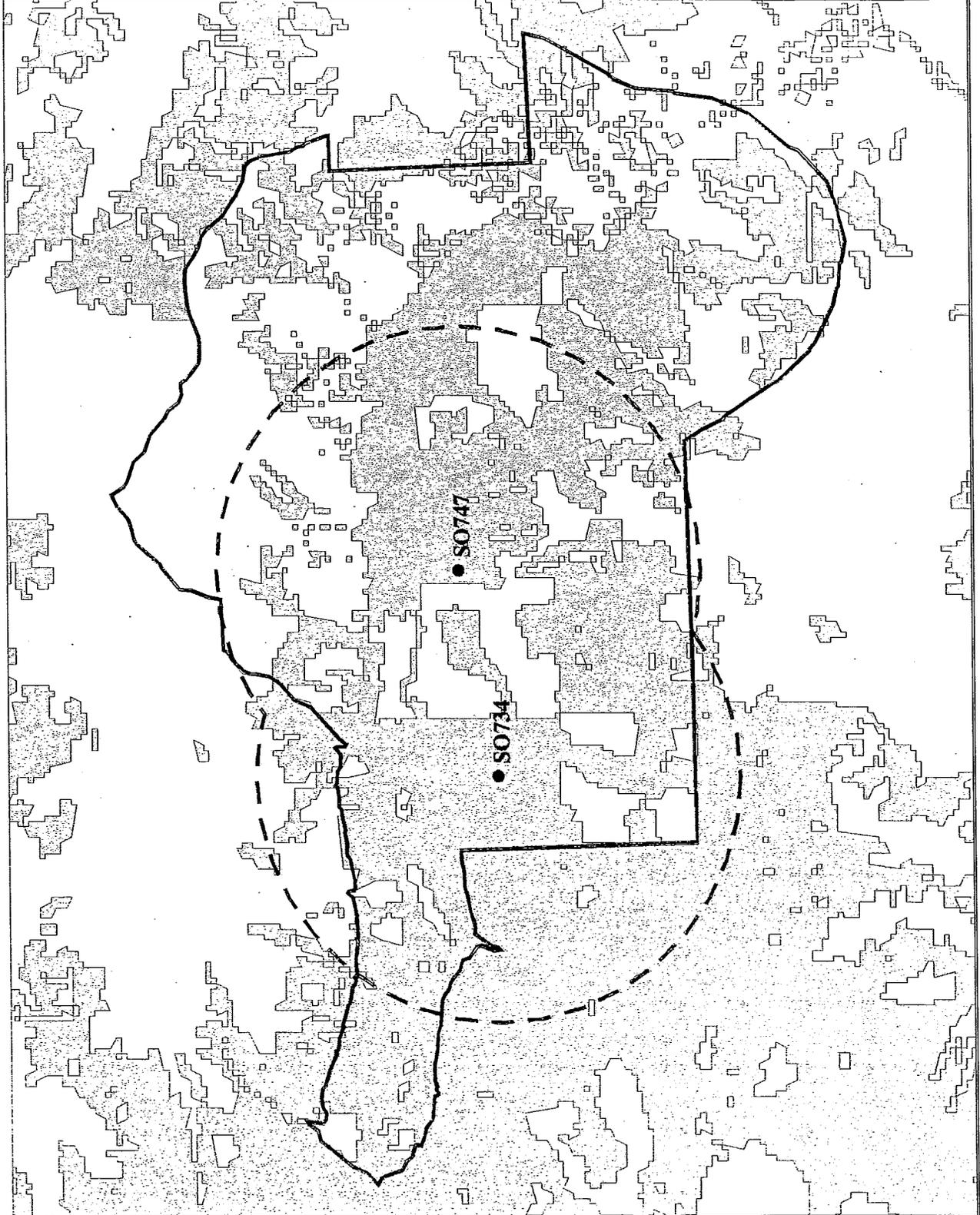
Analysis Module	Restoration Opportunity	Potential Projects	Schedule¹
	development of suitable spotted owl habitat. (84 acres owl #747.)	that accelerate the development of multi-layered stands. Focus on single layered pole sized stands in moist grand fir and wet forest groups.	
Aquatic	1) See late successional habitat implications in Aquatic section.	1) Coordinate projects with Icicle Watershed Assessment.	A
Noxious Weed	1) Limit the extent and spread of <i>C. diffusa</i> L. <i>dalmatica</i> and <i>C. leucanthemum</i> .	1) Consider treatments such as hand pulling and herbicides to limit extent and spread.	A
	2) Increase knowledge regarding noxious weed presence in the Icicle LSR.	2) Survey LSR for presence of noxious weeds.	C
Fire Plan	1) Protect LS values from loss due to wildfire	1) See fire plan for specific actions	

¹ Implementation Schedule; (A) = within 3 years; (B) = within 5 years; (C) = within 10 years



Icicle Late Successional Reserve

SUITABLE SPOTTED OWL HABITAT

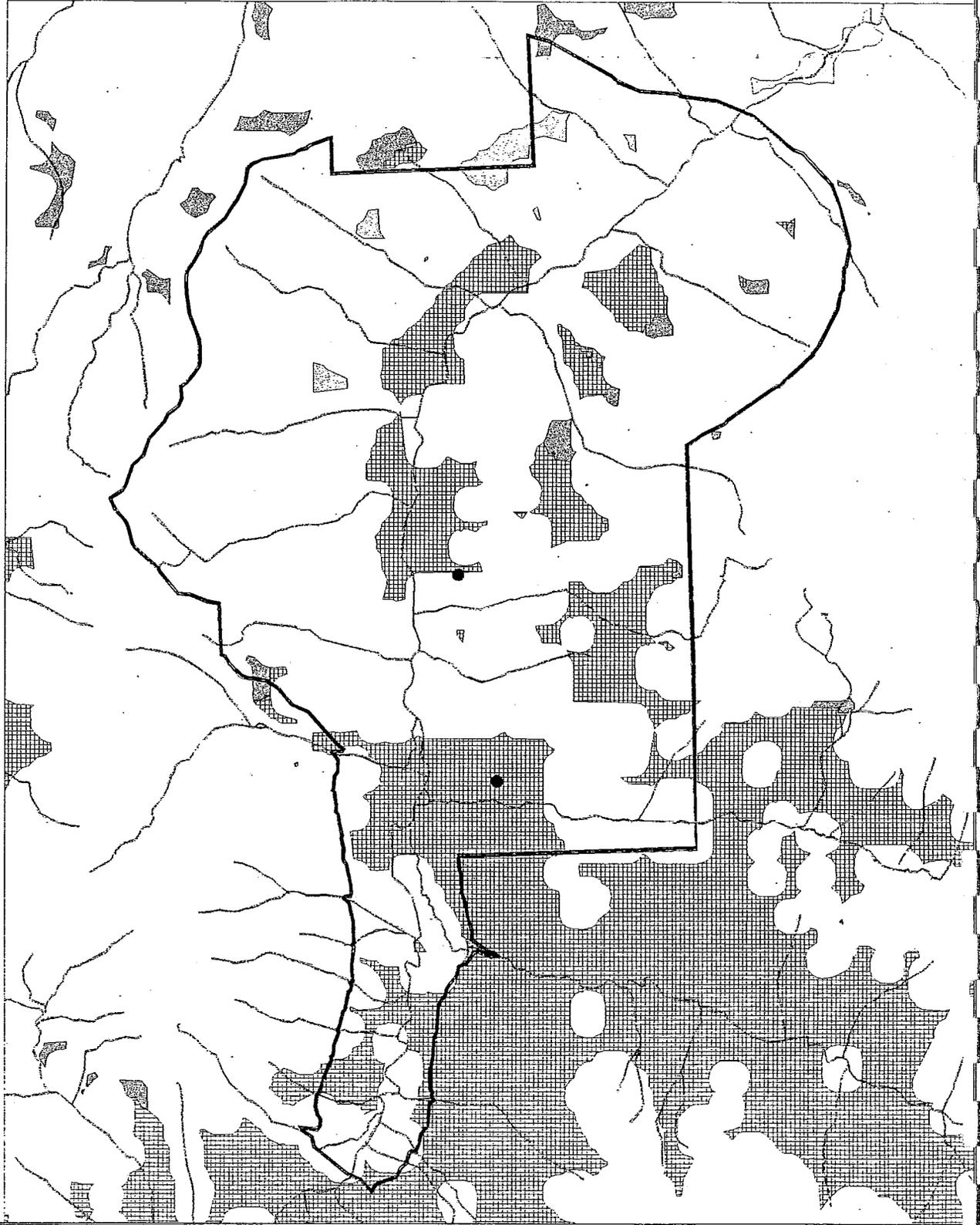


-  Suitable Spotted Owl Habitat (N/R/F)
-  Major Lakes
-  1.8 mile buffer around Spotted Owl Activity Centers
-  Spotted Owl Activity Centers
-  Late Successional Reserve Boundary



Map Scale: 1 inch = 0.918 miles

Icicle Late Successional Reserve
FOREST INTERIOR



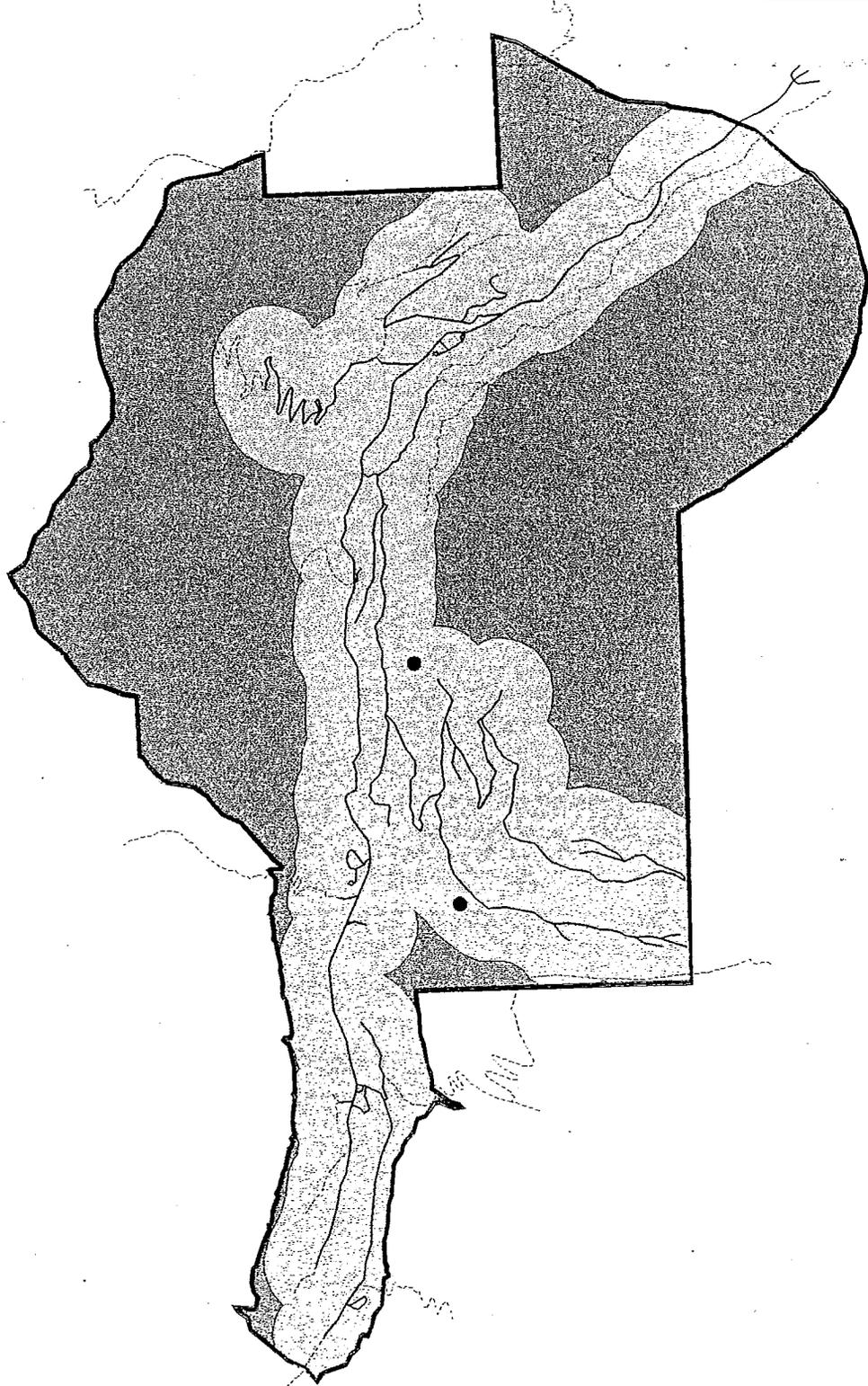
- DRY Forest Interior
- ▣ MOIST Forest Interior
- ▤ HIGH Forest Interior
- Major Lakes
- ~ Streams
- Spotted Owl Activity Centers
- ▲ Wildlife PETS
- ⌞ Late Successional Reserve Boundary



Map Scale: 1 inch = 0.918 miles

Icicle Late Successional Reserve **SECURITY HABITAT**

-  Security Habitat
-  NOT Security Habitat
-  Major Lakes
-  Open roads and motorized trails
-  Closed roads and non-motorized trails
-  Spotted Owl Activity Centers
-  Wildlife PETS
-  Late Successional Reserve Boundary

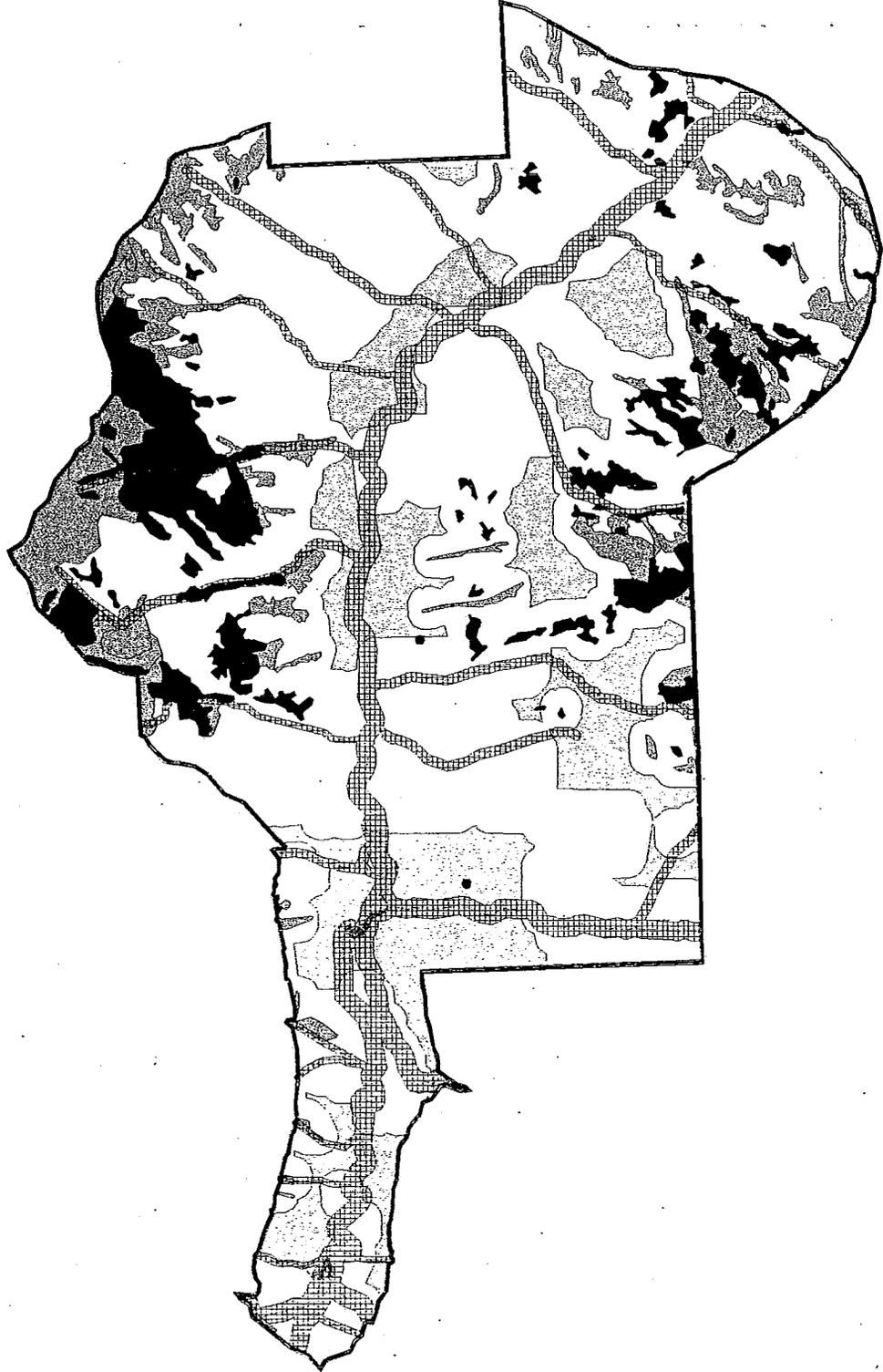


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Icicle Late Successional Reserve

UNIQUE HABITATS

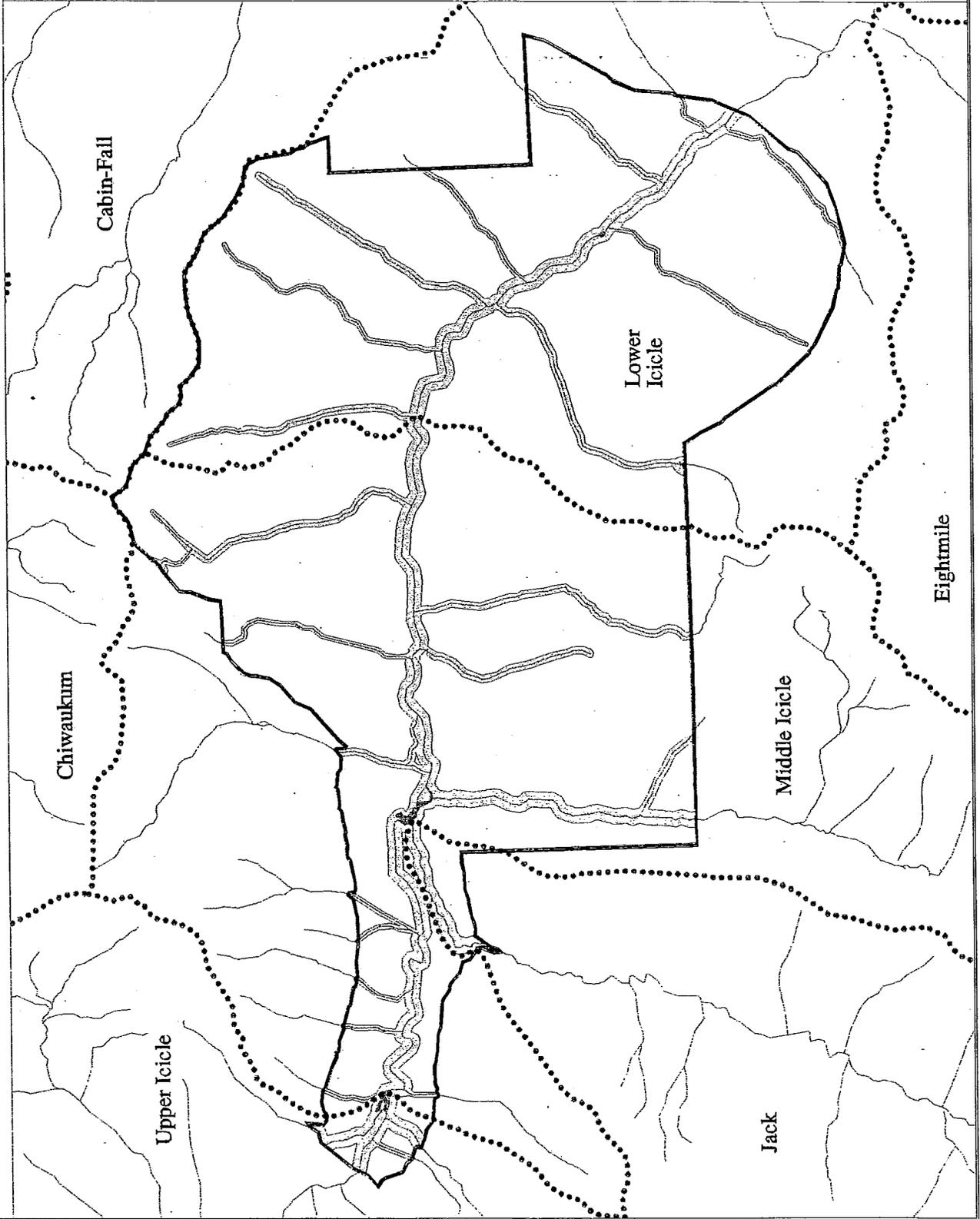
-  Large Forest Interior Patches
-  Whitebark Pine, Meadows, Shrub, Natural Opening, Deciduous Forest
-  Talus, Scree, Bedrock, Cliff
-  Wenatchee Forest Plan Allocations RN1, SI1, SI2
-  Riparian Reserves
-  Lakes and Wetlands
-  Streams
-  Spotted Owl Activity Centers
-  Wildlife PETS
-  Late Successional Reserve Boundary



Map Scale: 1 inch = 0.918 miles

Icicle Late Successional Reserve

FISH PRODUCTION UNITS (SUBWATERSHEDS)

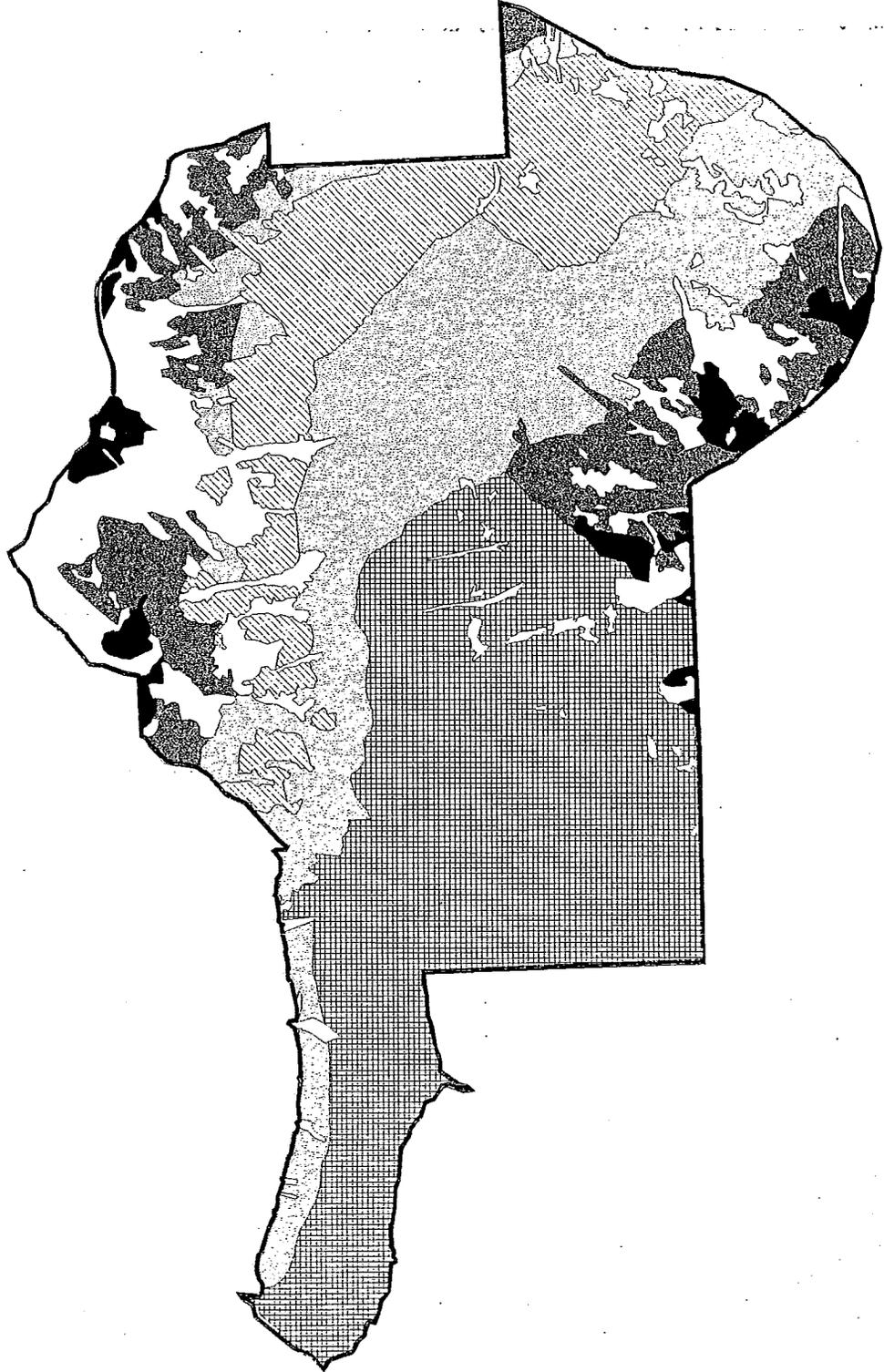


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Icicle Late Successional Reserve
VEGETATION SERIES

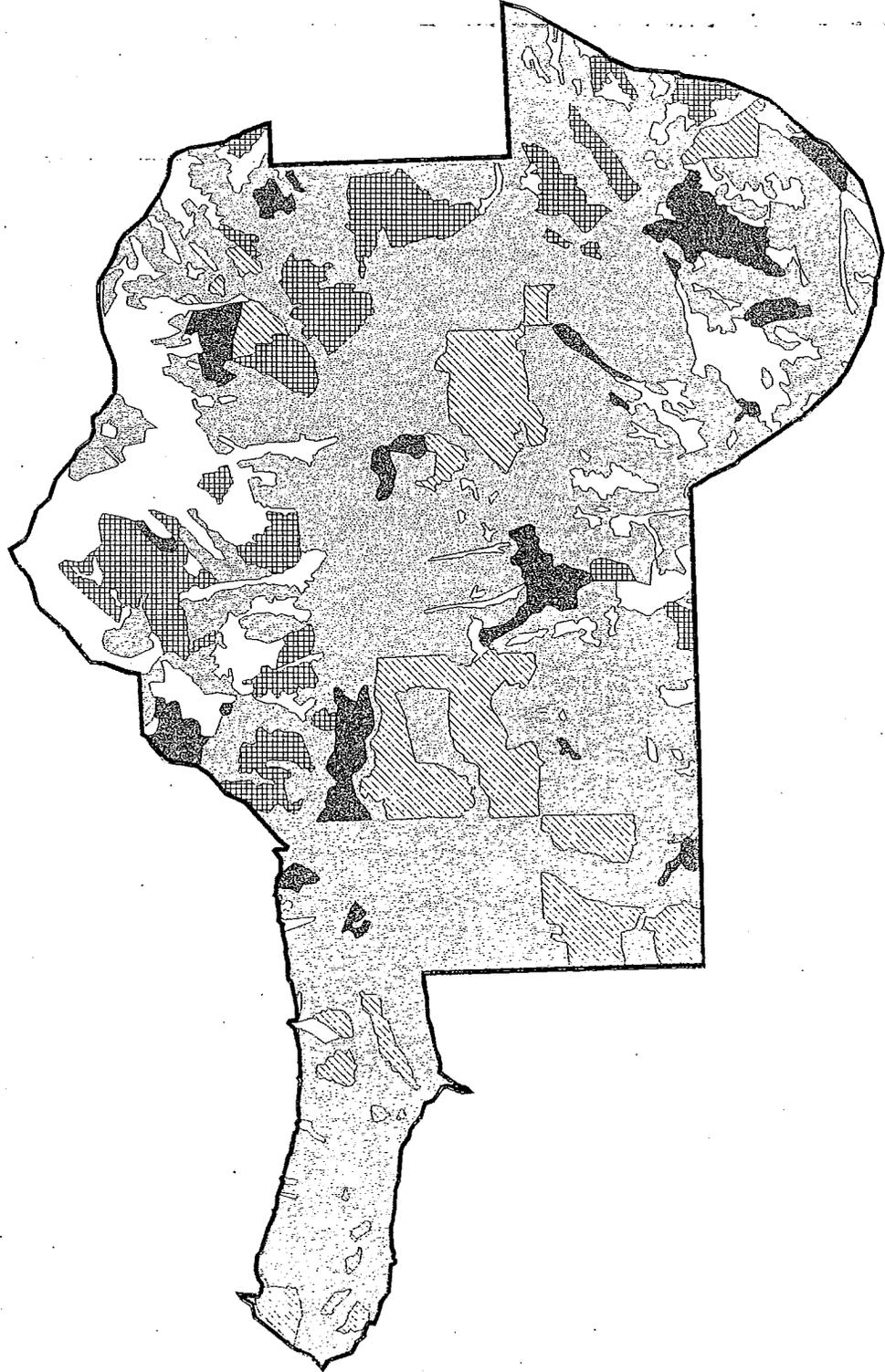
-  Dry and Mesic
-  Moist Grand Fir and Mesic Western Hemlock
-  Subalpine Fir and Lodgepole Pine
-  Wet Forest
-  Whitebark Pine and Subalpine Larch
-  Nonforest
-  Late Successional Reserve Boundary



Map Scale: 1 inch = 0.918 miles

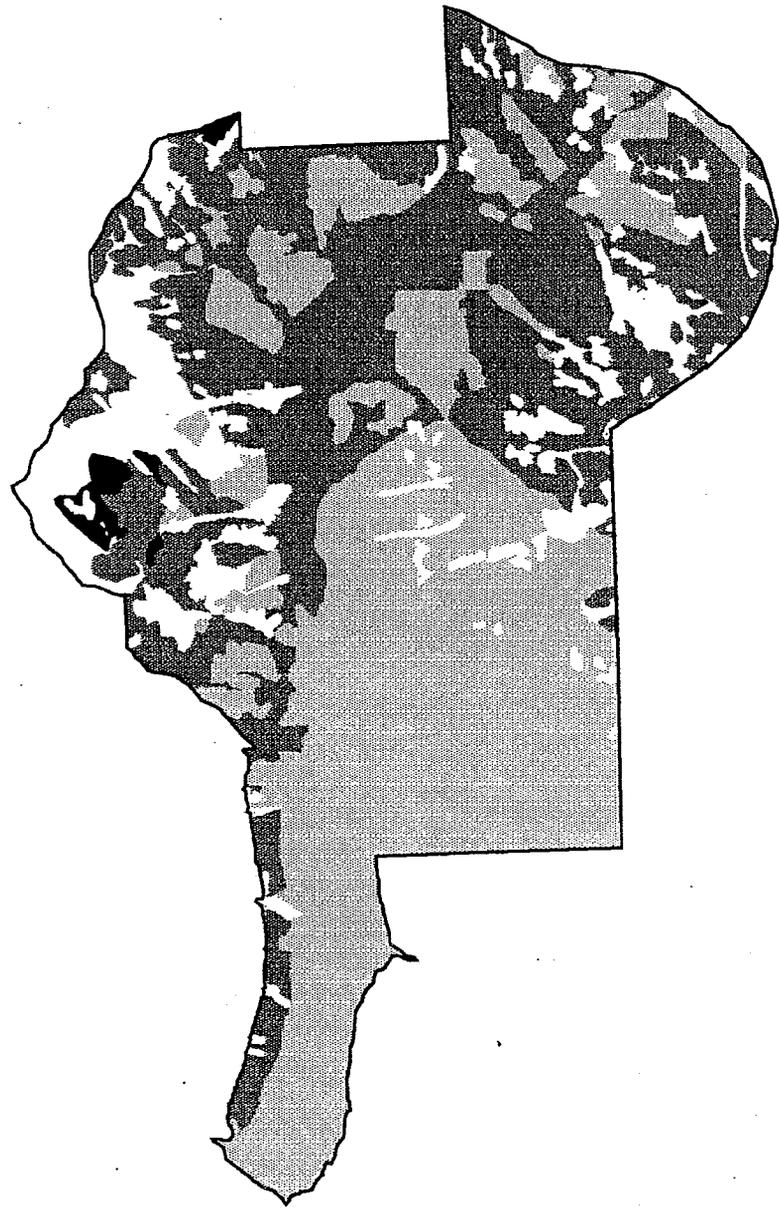
Icicle Late Successional Reserve
VEGETATION STRUCTURE

-  Created Opening
-  Low Density and Open Parkland
-  Single Layered
-  Layered or Mature
-  Partial Cut
-  Nonforest
-  Late Successional Reserve Boundary

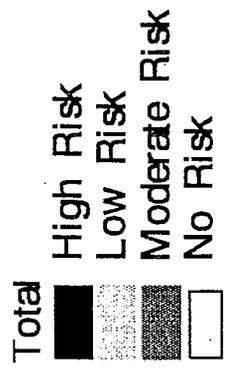


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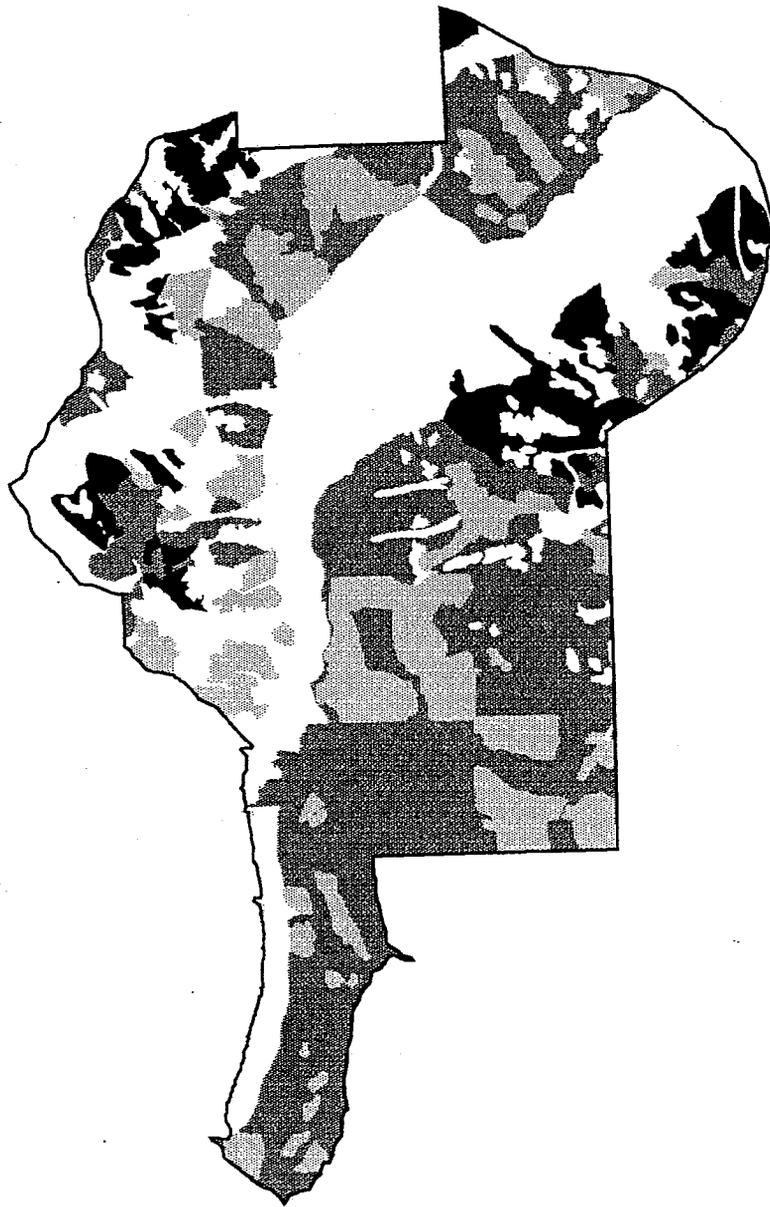
Icicle LSR



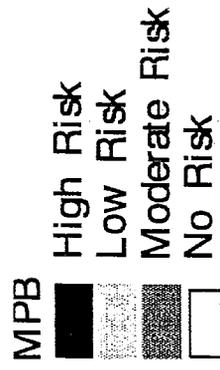
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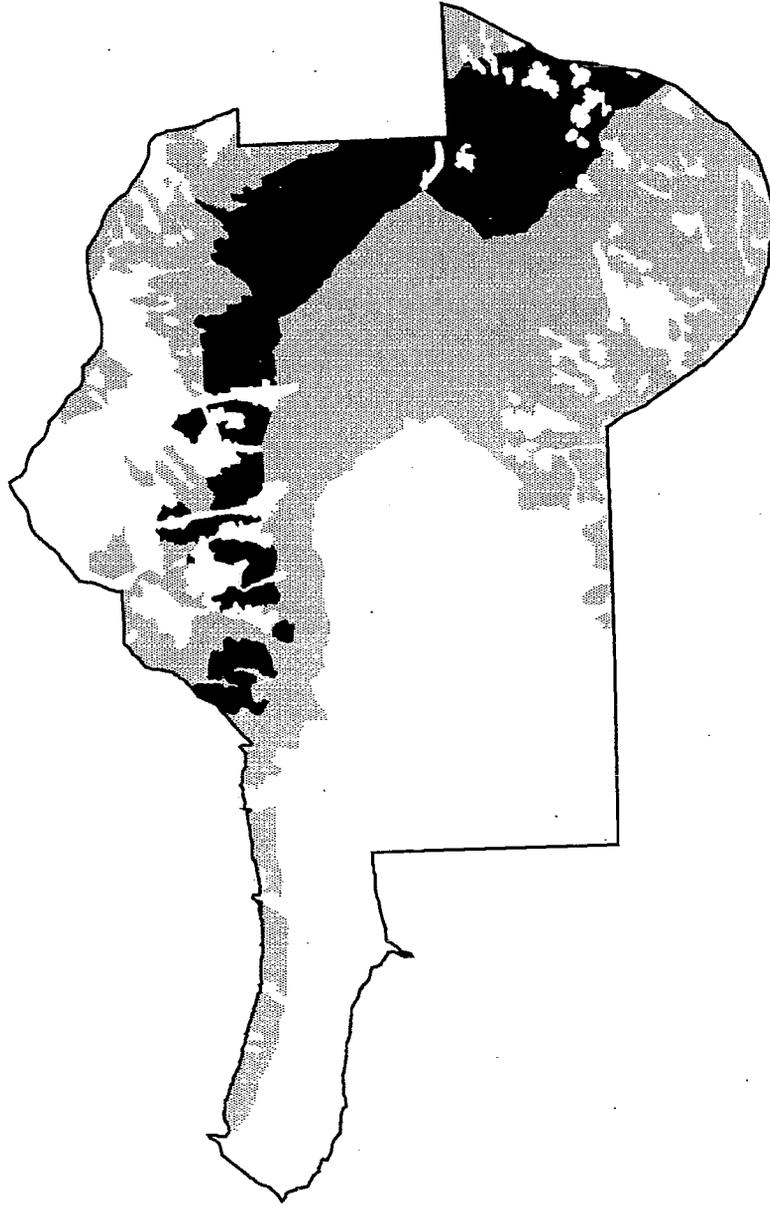
Icicle LSR



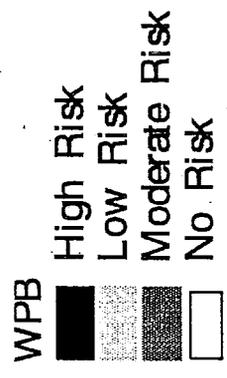
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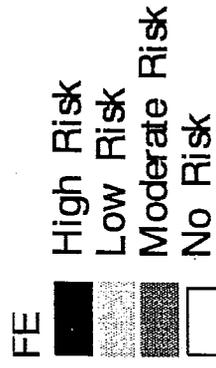
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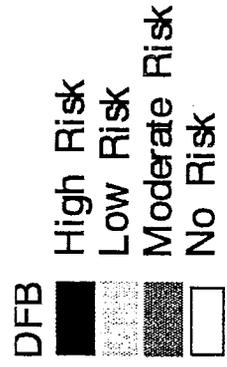
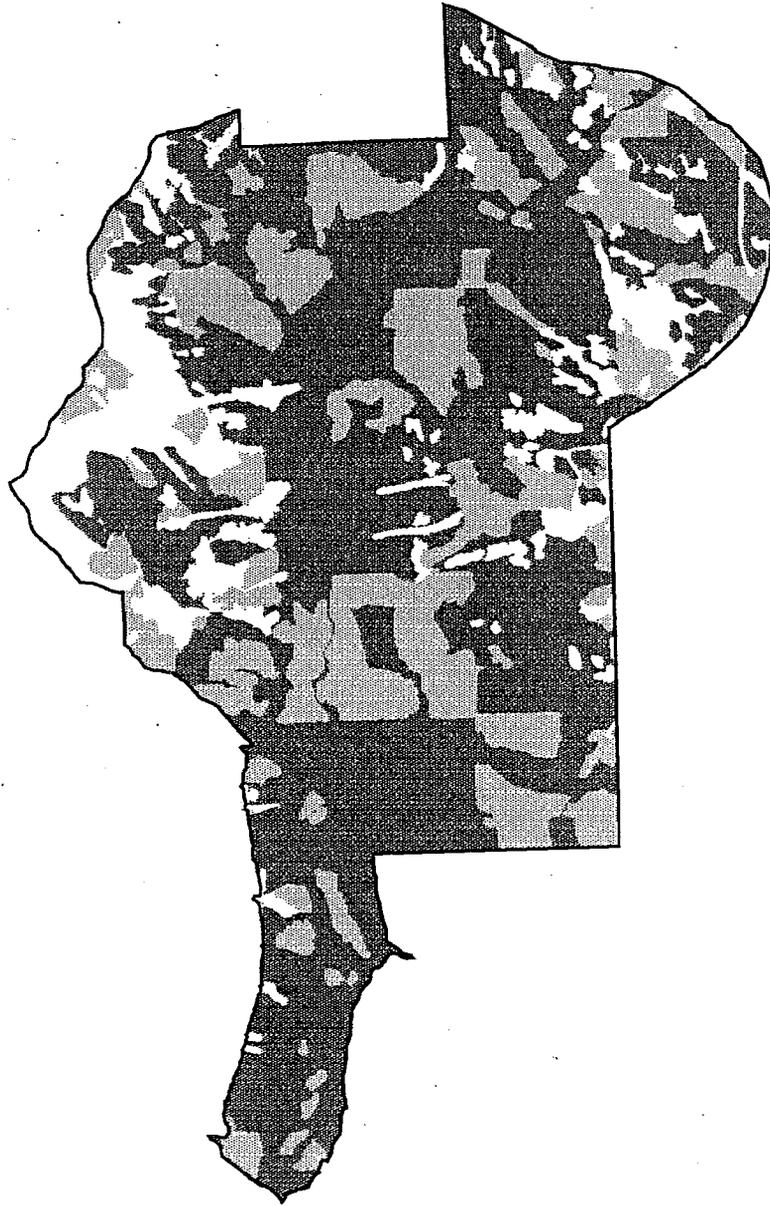
Icicle LSR



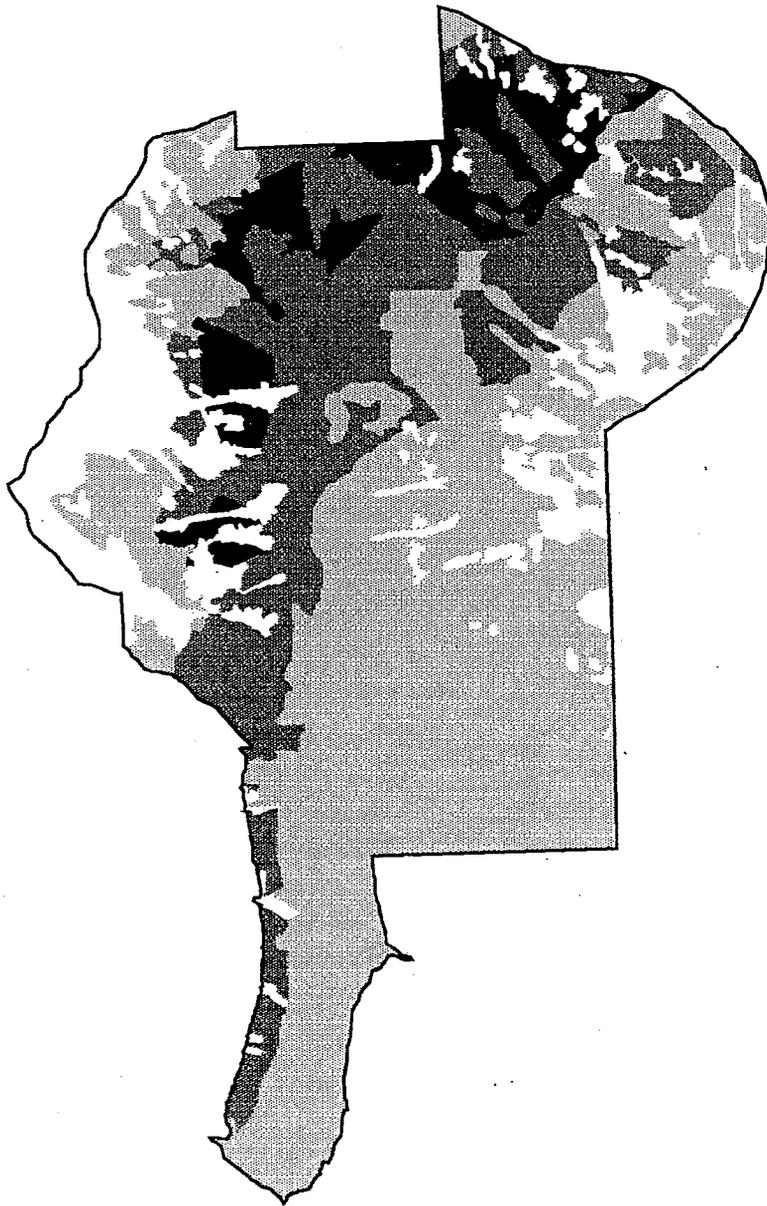
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Icicle LSR



Icicle LSR



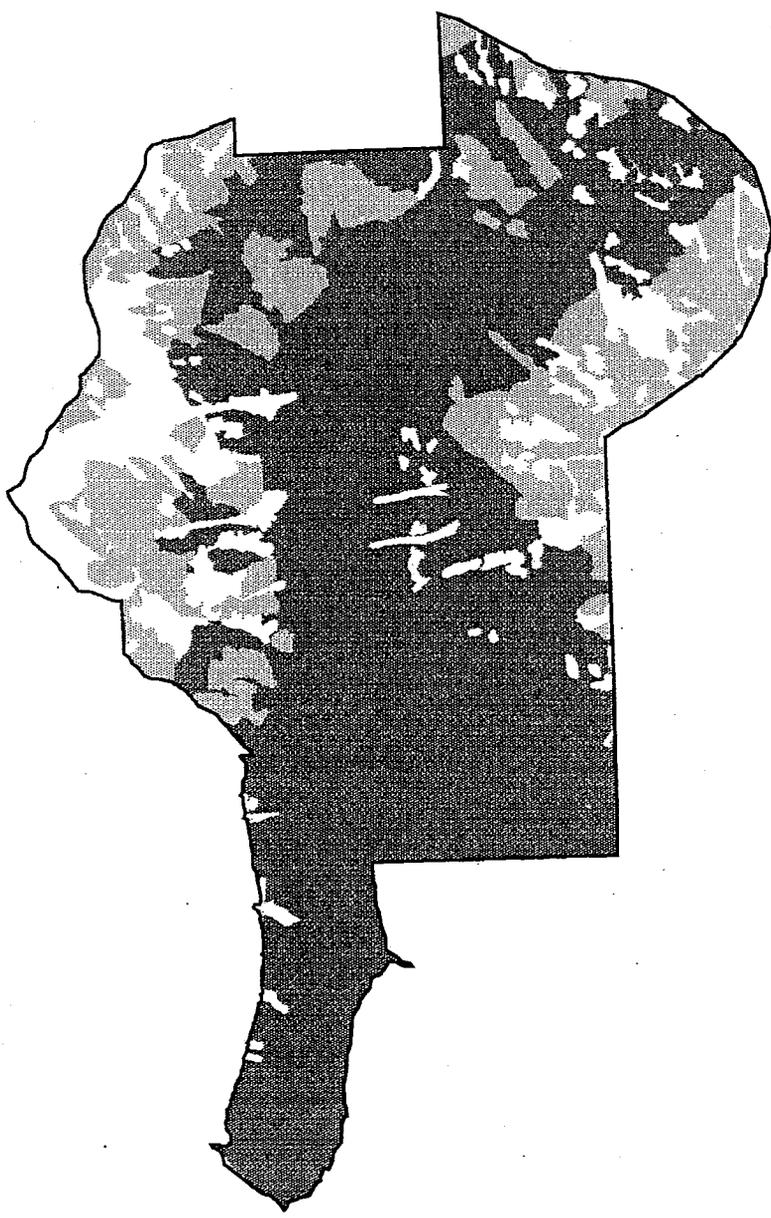
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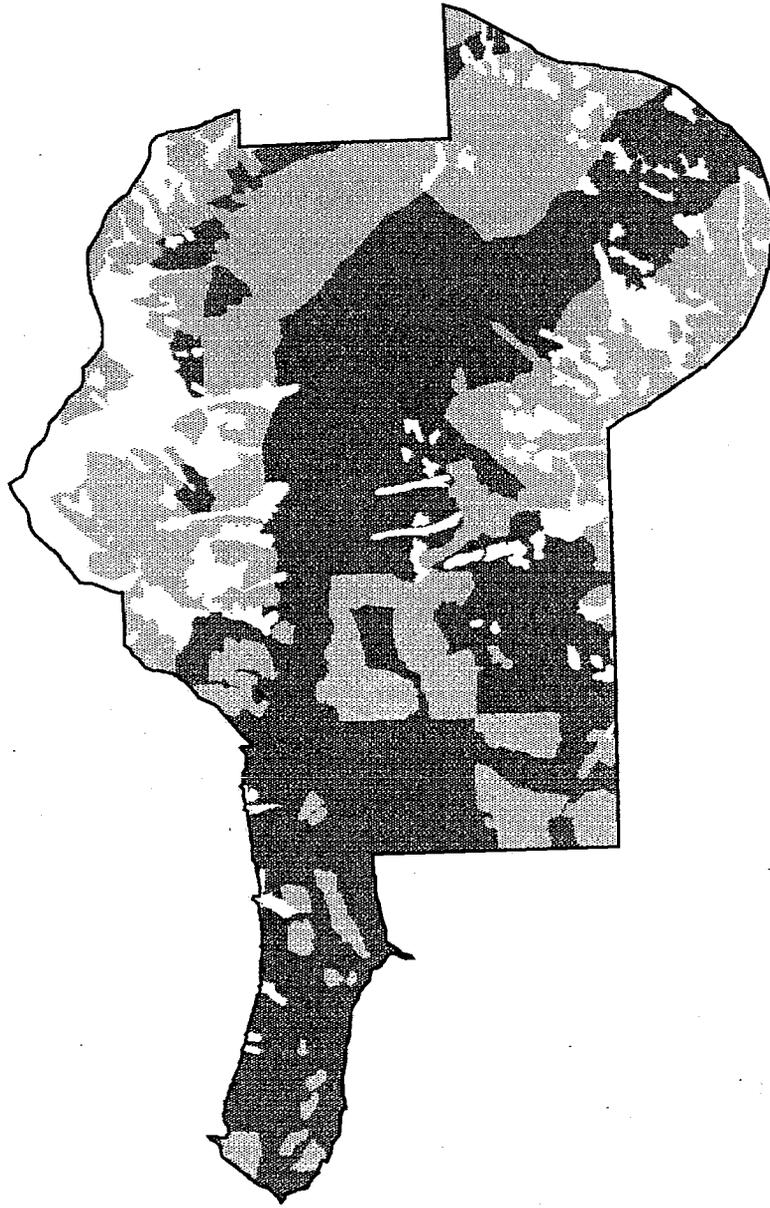
Icicle LSR



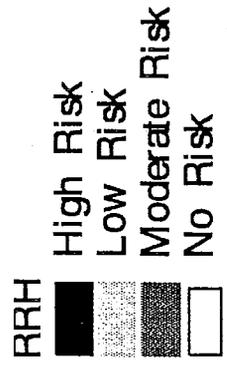
Icicle LSR



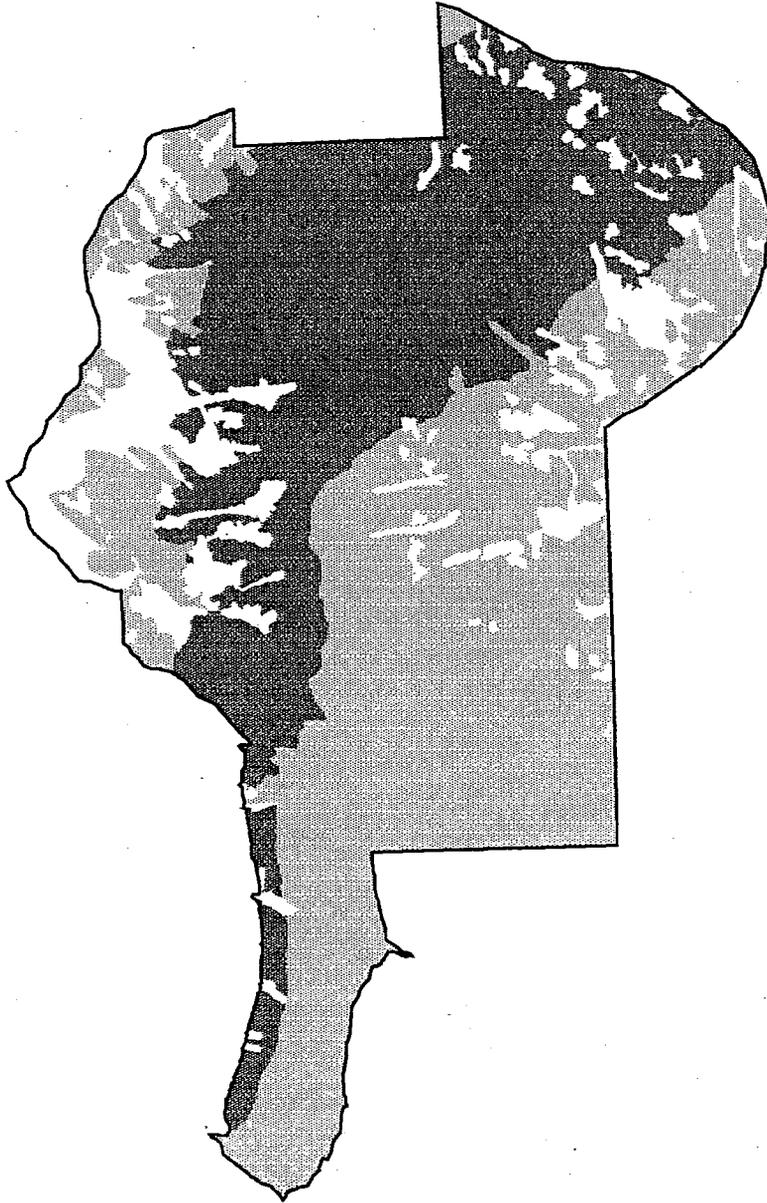
Ice LSR



0.5 0 0.5 1 1.5 2 Miles



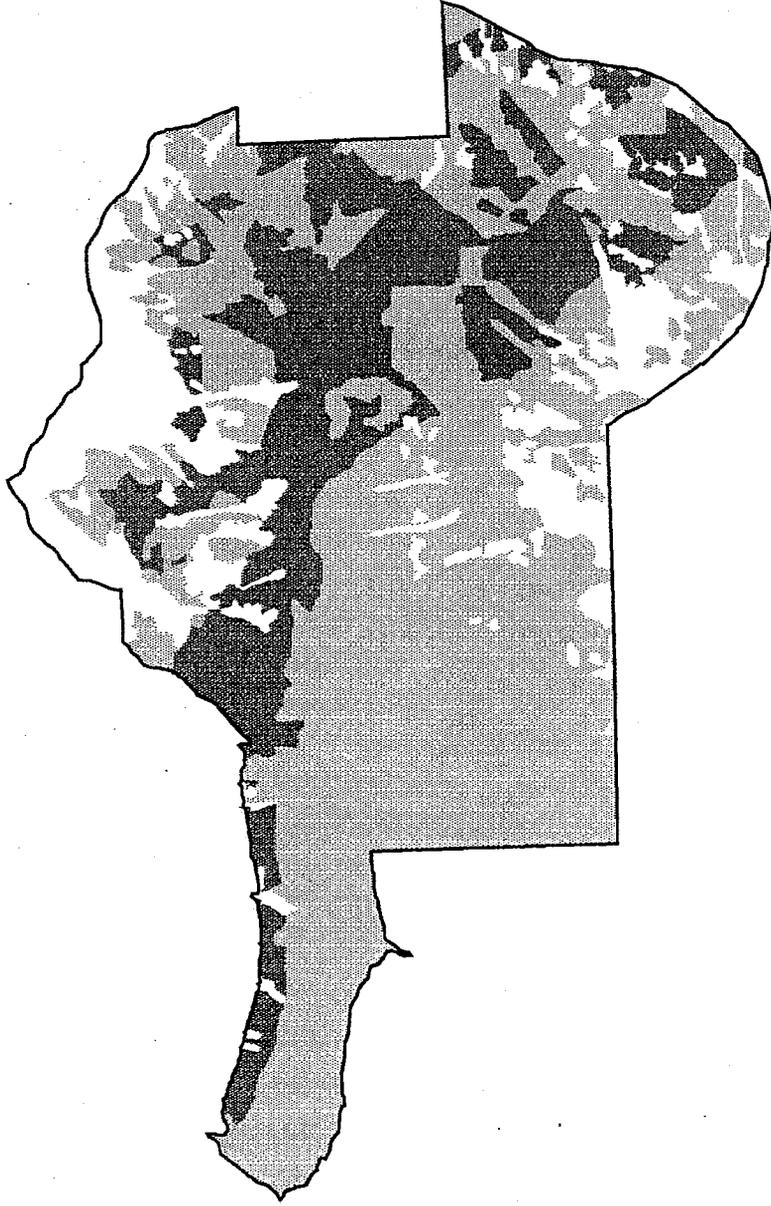
Icicle LSR



0.5 0 0.5 1 1.5 2 Miles



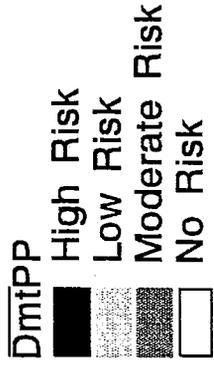
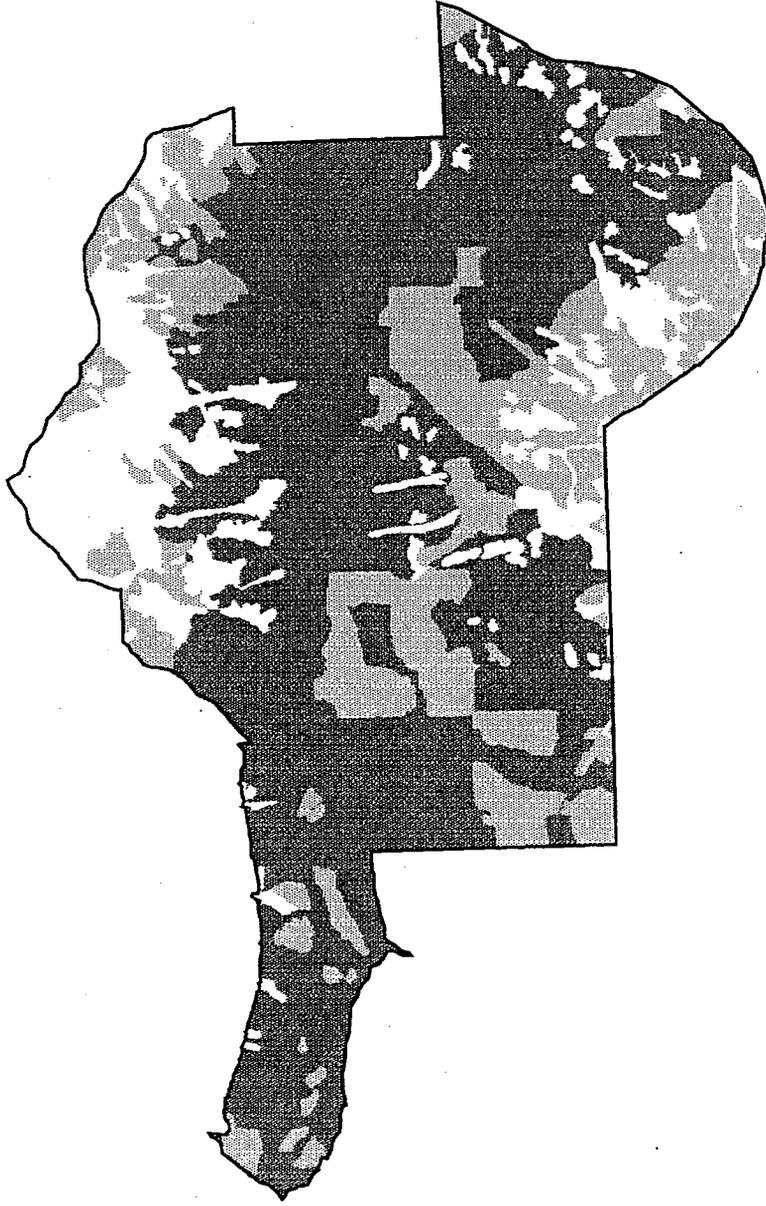
Icicle LSR



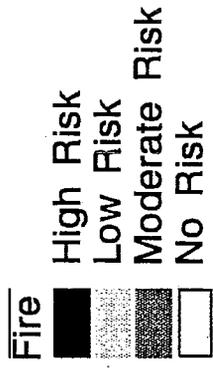
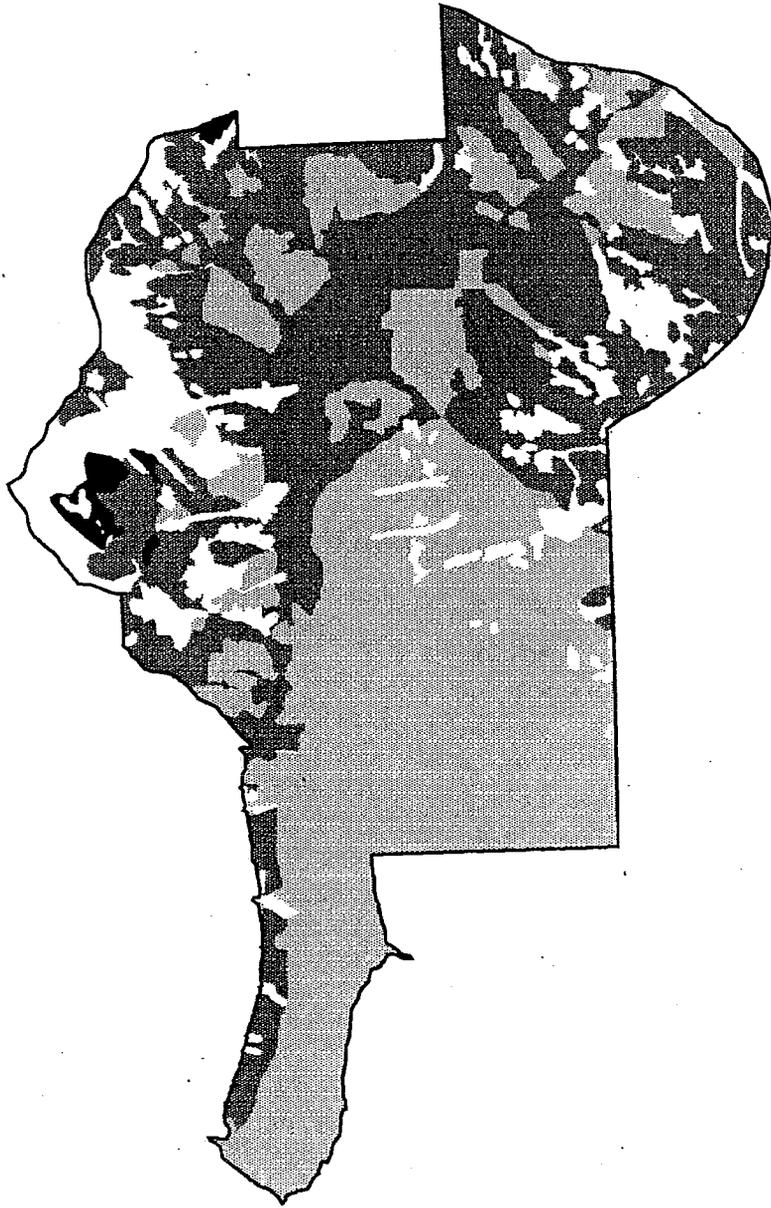
0.5 0 0.5 1 1.5 2 Miles



Icicle LSR



Icicle LSR



0.5 0 0.5 1 1.5 2 Miles

