IX. Haystack MLSA and Upper Nile LSR

The Haystack MLSA and Upper Nile LSR were grouped together for assessment purposes due to their adjacent proximity and similar vegetation types.

This individual chapter focuses on the Haystack MLSA and Upper Nile 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.

A. General Description of the LSR and MLSA

1. Vegetation Description

This section describes the current condition of vegetation groups (see Vegetative Landscape section) within the Haystack MLSA and Upper Nile LSR. Data was derived by aerial photo interpretation, stand exam information, and field validation (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 provided below regarding each vegetation group.

a) Dry Forest Group

Sixty-one percent (14,979 acres) of the Haystack MLSA and 7 percent (659 acres) of the Upper Nile LSR consists of the dry forest group. Within this group in the Haystack MLSA, 94 percent (14,122 acres) is mapped as high density and 4 percent (600 acres) as created openings (Appendix 5). Within the Upper Nile LSR, 85 percent (558 acres) is mapped as high density and 15 percent (101 acres) as created openings.

In the Haystack MLSA, the Douglas-fir series comprises approximately 15 percent of the dry forest group, with dry grand fir communities supported on the remaining 85 percent of the area. In the Upper Nile LSR, the Douglas-fir series does not occur and the dry forest group is comprised entirely of the dry grand fir plant association. In a few limited sites, ponderosa pine exists as the sole overstory dominate, but more commonly is co-dominant with Douglas-fir and in some locations, grand fir. In the driest associations, shrub understory composition is dominated almost exclusively by *Purshia tridentata* (Naches Mainstem Watershed Assessment 1995). Shrubs such as *Artemisia tridentata, Berberis aquifolium, Arctostaphylos nevadensis,* and *Phlox speciosa* may also occur as

subordinate members of these communities. Grasses include *Agropyron spicatum, Calamagrostis rubescens, and Carex geyeri.* Forb composition is represented by *Balsamorhiza caryana, Achillea millefolium, Lupinus sulphureus,* and *Lomatium* spp. (Naches Mainstem Watershed Assessment, 1995).

b) Mesic Sites-

Mesic sites were only mapped on the northern portion of the Wenatchee National Forest. In contrast, on the southern portion of the forest, these mesic sites are replaced by moist grand fir plant associations (see Vegetative Landscape section above). In general, these sites occur on steep (>40% slope), northerly aspects and as stringer riparian areas within the dry forest group. This vegetation will be described in the following section.

c) Moist Grand Fir/Mesic Western Hemlock Vegetation Group

Approximately 27 percent (6,763 acres) of the Haystack MLSA supports moist grand fir or mesic western hemlock plant communities. The majority, or 89 percent (6,009 acres) of this forest group is currently layered and/or mature (mid- to late-successional). Created openings comprise approximately ten percent (682 acres) of this group (Appendix 5). Relative to the Upper Nile LSR, 42 percent (3,841 acres) of the area supports moist grand fir or mesic western hemlock plant associations. Approximately, 2,935 acres (76 percent) is mapped as layered and/or mature. There are 882 acres (23 percent) mapped as created openings in the Upper Nile LSR.

Within this forest group, there is a moisture/temperature gradient which results in development of plant associations from dry, cool conditions adjacent the dry forest group to moist, cool adjacent the subalpine fir series. At the dry end of the moisture gradient, association are dominated in the understory by herbaceous species such as *Calamagrostis rubescens, Festuca occidentalis, Carex concinnoides, Carex geyeri, Arnica latifolia, Lupinus latifolius,* and *Arenaria macrophylla.* Moister associations typically include a shrub component typified by species such as *Spirea betulifolia, Rosa gymnocarpium, Vaccinium* spp., *Symphoricarpos albus, Linnaea borealis, Chimaphila umbellata, Ribes lassiococcus,* and *Pyrola* spp. Forb composition in moister plant associations is lush and includes diverse species including *Achlys triphylla, Clintonia uniflora, Adenocaulon bicolor, Smilacina stellata, Rubus parviflora* and *Trillium ovatum* (Wenatchee National Forest, Ecology Plot Database, and Naches Mainstem Watershed Assessment, 1995).

d) Subalpine Fir Series

The subalpine fir series comprises approximately 22 percent (1,997 acres) of the Upper Nile LSR. This vegetative series is not supported within the Haystack MLSA (Appendix 5). In the Upper Nile LSR, the series occurs primarily in the upper elevations in the vicinity of Little Bald and Clover Springs (Fig. ?). The majority (74%, 1,477 acres) of this series is mapped as layered and/or mature, and 12 percent (230 acres) as created openings. Thirteen percent (264 acres) of this series is mapped as park-like and one percent (27 acres) as single layered stands (Appendix 5).

Subalpine fir is the most widespread species within the overstory of this series (Wenatchee National Forest, Ecology Plot Database). Common seral dominants include Douglas-fir, lodgepole pine, Engelmann spruce, and western larch. Understory composition is commonly lush with species such as *Valeriana sitchensis, Lupinus polyphyllus, Lupinus latifolius*, and *Calamagrostis rubescens. Arnica latifolia, Carex* spp., and *Luzula hitchcockii* are often dominate herb associates. These communities may be also be shrub dominated with common species such as *Rhododendron albiflorum, Vaccinium myrtillus, Vaccinium membranaceum, Vaccinium scoparium, Rubus lassiococcus, Chimaphila umbellata, Pachistima myrsinites, Pyrola* spp, and *Sorbus sitchensis.* Subordinate community associates may include *Poelmonium pulcherrimum, Pedicularis racemosa,* and *Elymus glaucus.* (Wenatchee National Forest, Ecology Plot Database).

e) Wet Forest Group

This vegetation group only occurs within the Upper Nile LSR, representing 19 percent (1,750 acres) of the area. The majority (96%, 1,686 acres) is mapped as layered and/or matured, while the remaining four percent (64 acres) are created openings. This group occurs primarily in the vicinity of Clover Springs.

In the wet forest group, tree overstory composition is generally dominated by mountain hemlock, Pacific silver fir, and subalpine fir. Subordinate species include lodgepole pine and whitebark pine. Undergrowth composition may vary from relatively lush and dense to scarce. Species representing the shrub component of these communities typically include *Rhododendron albiflorum, Rubus lassiococcus, Vaccinium* spp., *Ribes viscosissimum, Pyrola* spp., *Lutkea pectinata and Xerophyllum tenax*. Representative herb composition includes *Luzula hitchcockii, Arnica latifolia, Achlys triphylla, Clintonia uniflora,* and *Polemonium pulcherrimum.*

f) Whitebark Pine/Subalpine Larch Group

No whitebark pine or subalpine larch series were mapped within the Haystack MLSA or Upper Nile LSR. However, individual clumps of whitebark pine can be found in the Upper Nile LSR near Clover Springs. Whitebark pine occurs as an early seral dominant in the mountain hemlock on drier sites (see Vegetative Landscape section).

g) Non-Forest Vegetation

There are approximately 2,871 acres (12 percent) of non-forest vegetation in the Haystack MLSA. Included within this group are: bedrock (1,094 acres), talus (862 acres), grassland/shrubland (426 acres), deciduous forest (141 acres), agricultural/residential (131 acres), scree (102 acres), dry meadow (49 acres), water (47 acres), wet meadow (15 acres), and cliff (4 acres).

Relative to the Upper Nile LSR, there are a total of approximately 943 acres (10 percent). Included within this group are: talus (501 acres), grassland/shrubland (369 acres), dry meadow (71 acres), and wet meadow (2 acres). Refer to the Vegetative Landscape section discussion for descriptions of these vegetation types.

h) Species of Special Status

Within the Haystack MLSA and the Upper Nile LSR, there is potentially suitable habitat for a number of species with special status. However, relatively few surveys have been conducted to determine presence or absence. Species with special status surveys should be carried out in conjunction with restoration projects, as well as, independently of other activities. It is important that species ranges are identified so that accurate estimates of species viability can be assessed. In addition, little is known relative to the majority of species with special status habitat and biological requirements, and inventories provide a first and necessary step in obtaining this information.

There are two Forest Service sensitive species within the Haystack MLSA (see Late-Successional Associated Plant Species, Appendix 6). *Orobanche pinorum* is known from four independent locations. In general, *O. pinorum* occurs on steep, exposed slopes with loose shallow soils. This species is most closely associated with Douglas-fir and grand fir plant communities. The occurrence of *O. pinorum* is largely dependent on the occurrence of *Holodiscus discolor*, as *O. pinorum* is a parasite on the roots of the *Holodiscus*. *Cypripedium montanum* is also documented to occur in the Haystack MLSA, and is known from two independent locations. Based on it's occurrence on the Naches Ranger district, *C. montanum* appears to favor light disturbance such as low severity fire and light soil disturbance (Engle, personal observation).

There are two Forest Service sensitive species known to occur within the Upper Nile LSR, as well. *Cypripedium montanum* occurs in similar sites as those identified in the Haystack MLSA. *Agoseris elata* has been documented from two individual sites within the Upper Nile LSR. *A. elata* appears to be most closely associated with moist meadows and openings at relatively high elevations.

i) Survey and Manage Species

There are two known survey and manage plant species within the Haystack MLSA; *Cypripedium montanum* (refer to discussion above) and the lichen species *Cyphelium inquinans* which is documented to occur on ponderosa pine bark. Several additional species are suspected to occur, and the presence or absence of others is simply unknown. The ROD provides standards and guidelines for survey and manage species, and should be referred to for management of these species within the Haystack MLSA.

Although potentially suitable habitat for survey and manage species occurs within the Upper Nile LSR, no species have been documented as of this date.

Table 38, Sensitive and Survey and Manage Species in Haystack MLSA and Upper Nile LSR

Group	Latin name	Common name	Federal +	State +	Forest Service ++	Presence in Upper Nile **	Presence in Haystack MLSA **
VASCULAR PLANTS	*Agoseris elata*	tall agoseris		S		K	S
VASCULAR PLANTS	*Anemone nuttalliana*	pasqueflower		S		S	U
VASCULAR PLANTS	*Antennaria parvifolia*	Nutall's pussytoes		S		U	S
VASCULAR PLANTS	*Astragalus arrectus*	Palouse milk-vetch		S		U	S
VASCULAR PLANTS	*Carex interrupta*	green-fruited sedge		M3		U	S
VASCULAR PLANTS	*Carex proposita*	smoky mountain sedge		S		S	U
VASCULAR PLANTS	*Carex saxatilis var. major*	russet sedge		S		S	U
VASCULAR PLANTS	*Carex scopulorum var. prionophylla*	saw-leaved sedge		M3		S	U
VASCULAR PLANTS	*Cicuta bulbifera*	bulb-bearing water-hemlock		S		U	S
VASCULAR PLANTS	*Cryptogramma stelleri*	Steller's rockbrake		S		S	S
VASCULAR PLANTS	*Cypripedium montanum*	mountain ladyslipper			SM	K	K
VASCULAR PLANTS	*Githopsis specularioides*	common blue-cup		S		U	S
VASCULAR PLANTS	*Orobanche pinorum*	pine broomrape		S		K	K
VASCULAR PLANTS	*Spirannthes porrifolia*	western ladies-tresses		S		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

j) Noxious Weeds

Although systematic surveys have not been completed, portions of the Haystack MLSA and Upper Nile LSR have been surveyed for noxious weed species. Documentation of noxious weed species has resulted from roadside surveys (McRae and Harrod unpubl.) and various vegetative reconnaissance.

High densities of *Centaurea diffusa* are present along roads, particularly Highway 410. *Linaria dalmatica* is abundant throughout the Haystack MLSA. *Cirsium vulgare* and *C. arvense* are prevalent in areas with relatively recent ground disturbance. *Chrysanthemum leucanthemum, Hypericum perfoliatum, Verbascum thapsus*, and *Convolvulus arvense* occur with relatively low frequency throughout the analysis areas. Survey for species presence and extent should be completed in order to develop a noxious weed management plan for these late-successional reserves (refer to Harrod 1994).

2. Late Succesional 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 Haystack MLSA and Upper Nile 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 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, candidate, 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 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 species as shown in Appendix 27. The most extensive of these were for the northern spotted owl, elk and barred owl. Surveys for these species have been conducted over 100% of their available habitat within the MLSA/LSR.

b) Late Successional Species By Habitat Type

(1) Dry Forests

About 15,638 acres (46%) of Haystack and Upper Nile 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, 11,130 acres (71%)of the dry forest is in a successionally advanced condition. About 293 acres (2%) 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 that have special management status include: tailed frog, larch mountain salamander, northern goshawk, bald eagle, Van Dyke's salamander, flammulated owl, pileated woodpecker, hairy woodpecker, white-headed woodpecker, black-backed woodpecker, Williamson's sapsucker, northern flicker, 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). Six spotted owl activity centers occur in the dry forests. This comprises 60% of the total known spotted owl activity centers within Haystack and Upper Nile.

(2) Mesic Sites Within the Dry Forest

The mesic sites within the Dry Forest group were not mapped. Mesic sites within the dry forests provide important wildlife habitat and add diversity across the landscape. It is suggested that these sites be identified during project level analysis and that the appropriate treatment criteria be applied.

Historically, fire occurred less frequently at these sites (refer to Chapter III) 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.

Wildlife species that occur are associated with the late-successional condition of these forests and are of special management status include: tailed frog, Van Dyke's salamander, 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, silver-haired bat, pallid bat, marten, and fisher.

These sites are capable of providing habitat structure that typically composes spotted owl foraging and dispersal habitat, while remaining within the historic range of variability.

(3) Moist Grand Fir Group/Mesic Western Hemlock

The Moist Grand Fir/Mesic Western Hemlock group covers about 10,604 acres (31%) of these areas. Historically, fire occurred less frequently than in the Dry and Mesic vegetation groups (refer to Chapter III), 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 on the Wenatchee National Forest.

Currently, about 8,136 acres (77%) of this vegetation group that is in a late-successional condition. In the absence of any major disturbance, it is expected that in 50 years 8,230 acres (78%), and in 100 years 9,794 acres (92%) of this habitat would be in a late-successional condition.

Wildlife species associated with the late-successional conditions of this vegetation group and are 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, ruffed grouse, little willow flycatcher, olive-sided flycatcher, chestnut backed chickadee, black-capped chickadee, red-breasted nuthatch, pygmy nuthatch, tailed frog, spotted frog, Cascade frog, larch mountain salamander, Van Dyke's 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/Mesic Western Hemlock 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. Four (40%) of the spotted owl activity centers located within this LSR are located within this vegetation group or in the Wet Forest Group.

(4) Wet Forest Group

The Wet Forest Group covers about 1,781 acres (5%) of Haystack and Upper Nile. 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 species that are associated with the late-successional conditions of these forests.

Currently, 1,717 (96%) acres are in a late-successional condition.

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, ruffed grouse, little willow flycatcher, olive-sided flycatcher, red-breasted nuthatch, pygmy nuthatch, tailed frog, spotted frog, Cascades frog, larch mountain salamander, Van Dyke's 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. There are four spotted owl activity centers located within the Wet Forest and Moist Grand Fir/Mesic Western Hemlock groups. This is 40% of the total known activity centers within these LSR/MLSA's.

(5) Subalpine Fir

Subalpine Fir covers about 1,997 acres (6%) of these areas. 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 1,477 acres (74%) 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 1,504 acres (75%), and in 100 years 1,734 acres (87%) would be in a late-successional condition.

Wildlife species that are associated with the late-successional forests in this vegetation group and have special status include the tailed frog, Cascade frog, larch mountain salamander, Van Dyke's 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. No spotted owl activity centers were located in the subalpine fir forest 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.

d) Endangered Or Threatened Wildlife Species

There are five wildlife species that are federally listed as Threatened or Endangered and could occur within the Haystack MLSA or Upper Nile LSR. 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*).

The bald eagle is known to occur within the Haystack MLSA and is absent from the Upper Nile LSR. No surveys for bald eagles have been completed in either of these areas. Peregrine falcons are known to occur within the Haystack MLSA and are suspected to occur within the Upper Nile LSR. No surveys for peregrine falcons have been completed in the Upper Nile LSR and about 25% of the habitat within the Haystack MLSA has been surveyed. An active peregrine nest site is located in the Haystack MLSA.

A total of 8 spotted owl activity centers occur within the Haystack MLSA and two activity centers occur within the Upper Nile LSR. There is 9,998 acres (41%) of spotted owl habitat for nesting/roosting and foraging within the Haystack MLSA and 6,136 acres (67%) of spotted owl habitat within the Upper Nile LSR. There is potential for 17,665 acres (76%) in Haystack and 7,354 acres (80%) in Upper Nile, for suitable habitat. All of the spotted owl habitat has been inventoried. The estimated amount of habitat within a 1.8 mile radius of the 10 activity centers is shown in Appendix 12. Six (60%) of these activity centers are currently below threshold habitat levels, three (30%) are at threshold, and one is above threshold levels. The tables below display information about the spotted owl associated with the Upper Nile LSR and Haystack MLSA. Four of the spotted owl sites below threshold need to be monitored for habitat verification.

Table 39, Spotted Owl Information for Upper Nile LSR & Haystack MLSA

Spotted Owl	Status[3]	Ownership[4]	Dry or Wet Owl[5]	Threshold[6]	Critical Habitat Unit (CHU)	Forest Interior?[8]	Suitable Spotted Owl Habitat	Total Dispersal Habitat
SO814	P	FS	Wet	At Threshold			**3,137**	**709**
SO862	RS	FS	Wet	Optimum			**4,270**	**344**
SO863	P	FS	Wet	At Threshold		Inside	**3,944**	**616**
Haystack MLSA								
SO806	P	FS	Dry	Below Threshold		Near	**3,046**	**475**
SO814	P	FS	Wet	At Threshold			**3,137**	**709**
SO846	P	FS	Dry	Below Threshold			**2,898**	**776**
SO866	P	FS	Wet	At Threshold		Near	**3,138**	**699**
SO868	P	FS	Dry	Below Threshold		Near	**1,694**	**1,531**
SO879	RS	FS	Dry	Below Threshold		Near	**2,707**	**1,077**
SO883	P	FS	Dry	Below Threshold		Inside	**2,857**	**825**
SO890	P	FS	Dry	Below Threshold		Near	**2,483**	**890**

[1] Near the LSR or MLSA but not inside the LSR or MLSA.
[2] Spotted owl site overlaps with other Upper Nile LSR/ Haystack 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

(1) Birds

The goshawk is known to occur in both of these areas. No surveys have been completed. The little willow flycatcher and olive-sided flycatcher are known to occur in the Upper Nile LSR and suspected to occur in the Haystack MLSA. No surveys have been completed for these species in the Upper Nile LSR and <5% of their habitat has been surveyed in the Haystack MLSA.

(2) Amphibians

No surveys for the tailed frog have been completed in either of these areas, however, they are known to occur in both areas. It is unknown if the spotted frog occurs in these areas. About 10% of the habitat in the Haystack MLSA have been surveyed and none of the Upper Nile has been surveyed. Cascades frogs are known to occur in both areas. Surveys have been completed in 10% of the Haystack MLSA and none of the Upper Nile LSR.

(3) Mollusks

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

(4) Mammals

The long-legged myotis and long-eared myotis are suspected to occur in both of these areas. Surveys have been completed over <5% of their habitat in the Haystack MLSA and none within the Upper Nile LSR. The fringed myotis and Yuma myotis are both unknown in these areas. Surveys have been completed over <5% of their habitat within the Haystack MLSA and none within the Upper Nile LSR. The western big-eared bat is suspected to occur within the Haystack MLSA where <5% of their habitat has been surveyed. In the Upper Nile LSR it is unknown if the western big-eared bat occurs and no surveys have been completed.

No surveys for the lynx, wolverine or fisher have been completed in either of these areas. The lynx is suspected to occur in the Upper Nile LSR and it is unknown if it occurs in the Haystack MLSA. The fisher and wolverine are suspected to occur in both areas.

e) Management Indicator Species

There are 12 wildlife species that are listed as management indicator species that occur or could occur within the Upper Nile LSR and Haystack 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 (*Sphyrapicua ruber*), Williamson's sapsucker (*Sphyrapicua thyroideus*), northern flicker (*Colaptes auratus*), ruffed grouse (*Bonasa umbellus*), mule deer (*Odocoileus hemnionus*), elk (*Cervus elephus*), beaver (*Castor canadensis*), and marten (*Martes americana*).

(1) Primary Cavity Excavators

Surveys for primary cavity excavators have been completed over <5% of their habitat within the Haystack MLSA and none have been completed within the Upper Nile LSR. The pileated woodpecker, three-toed woodpecker, and northern flicker are known to occur on both of these areas. The downy woodpecker is suspected to occur in the Haystack MLSA and it is unknown if they occur in the Upper Nile LSR. The hairy woodpecker is known to occur in the Haystack MLSA and is suspected in the Upper Nile LSR. The red-breasted sapsucker is suspected to occur in both areas. The Williamson's sapsucker is known to occur in the Haystack MLSA and suspected to occur in the

(2) Ruffed Grouse and Beaver

Surveys for the ruffed grouse have been completed on <5% of their available habitat within the Haystack MLSA and they are known to occur. Surveys for ruffed grouse have not been completed in the Upper Nile LSR and it is unknown if they are present. Beaver are suspected to occur in the Haystack MLSA and it is unknown if they occur in the Upper Nile LSR. No surveys for beaver have been completed in either area.

(3) Mule Deer, Elk

Mule deer and elk are known to occur within both areas. No surveys for either species have been completed. A winter feeding station for elk is located in the Haystack MLSA.

(4) Marten

Marten are suspected to occur in both areas and no surveys have been completed.

f) Survey And Manage, Protection And Buffer Species

There are eight species that do or could occur within the Haystack MLSA or Upper Nile 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 (Prophysaon coeruleum), and papillose tail-dropper (Prophysaon dubium).

(1) Birds

It is unknown if the great gray owl occurs within the Haystack MLSA and they are suspected to occur in the Upper Nile LSR. No surveys have been completed in either area for great gray owls. No surveys have been completed for the flammulated owl, however, they are known to occur in both areas. No surveys for the white-headed woodpecker, black-backed woodpecker, or pygmy nuthatch have been completed in the Upper Nile LSR and <5% of their habitat has been surveyed in the Haystack MLSA. The white-headed woodpecker is known to occur in the Haystack MLSA and is absent from the Upper Nile LSR. The black-backed woodpecker is known to occur in both areas. The pygmy nuthatch is suspected to occur in both areas.

(2) Mollusks

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

(3) Amphibians

No surveys of the larch mountain salamander or the Van Dyke's salamander have been conducted within the LSR/MLSA and it is unknown if they occur here.

g) Habitat Effectiveness

Habitat effectiveness was assessed using the current open road density and the amount of security habitat. The current open road density is 3.65 mi./sq.mi. in the Upper Nile LSR and is 5.04 mi./sq.mi. in the Haystack MLSA. The amount of security habitat is 2% in the Upper Nile LSR and 6% in the Haystack MLSA. Based upon these variables, the current level of habitat effectiveness for late-successional species in these areas is considered to be "low". This situation could be greatly improved through road obliterations identified during access and travel management planning.

3. Aquatic

The lands within the Haystack MLSA and Upper Nile LSR contain portions of 5 fish production units (FPU's). These FPU's are Mainstem Naches, Devil-Swamp, Nile-Dry, Lower Rattlesnake, North Fork Rattlesnake. Of the 9,191 acres in Upper Nile LSR, 1,108 acres (12%) are estimated to be contained within Riparian Reserves. In Haystack MLSA an estimated 6,832 acres (13%) of 76,502 acres are estimated to be within the Riparian Reserve. The average annual precipitation in Haystack MLSA ranges between 30 and 40 inches. In Upper Nile LSR the average annual precipitation is between 35 and 45 inches. The "Land Type Associations" within the LSR and MLSA are described as having high deep seated failure hazard and/or high moisture stress.

The Naches - Little Naches and the Rattlesnake are key watersheds. The streams that drain from Haystack MLSA and Upper Nile LSR include Devil, Swamp, Lost, Nile, Orr, Glass, Rattlesnake creeks and the Naches River. .

4. Human Uses

a) Overview

The Upper Nile LSR and Haystack MLSA are located on the Naches Ranger District. The primary access is via Highway 410 which is open year round. This Highway passes through the Haystack MLSA. Highway 410 is designated as the Mather Memorial Parkway which extends one half mile on either side of the highway. This designation reflects the importance of the travelway for recreational activities.

b) Prehistoric and Historic Summary

There is a very high density (the highest density on the Wenatchee National Forest) of American Indian sites within this LSR and MLSA. These sites are particularly prevalent along the main rivers and open ridgetops.

c) Recreation Use

(1) Camping

There are no campgrounds within either area, although Cottonwood Campground with sixteen units is located just outside of the Haystack MLSA. Some popular areas have had toilets installed to lessen sanitation problems. This includes sites at Clover Springs, Lindsay Camp, McDaniel Lake, and Rattlesnake Springs. Dispersed camping occurs throughout the this area adjacent to roads and water, it is especially heavy during hunting season.

(2) Trails

There are about two miles of a single tread, motorized trail within Haystack MLSA (Trail #964/964A) There are approximately another 14 miles of system roads that are popular with four wheel drive recreationists. This includes road #'s 696, 665, and 697. Dry Ridge is another popular four wheel drive area that is not on the road system inventory. In addition to these routes there are a number of high clearance roads in the southern portion of the MLSA used by recreationists.

(3) Recreation Special Uses

There are a number of recreation residences (privately owned cabins on National Forest land authorized by special use permit) along the Naches River. One organization camp, the Lost Creek Christian Camp, (also authorized by special use permit) is located within the Haystack MLSA.

(4) Other Recreation Activities

Other recreational use occurring in this area includes driving for pleasure, wood cutting, fishing, and picnicking. Edgar Rock and Little Bald Lookout site (lookout has been removed) are popular vista points. Snowmobiling is a popular activity throughout the area in the winter months.

d) Minerals

There is very little mining activity in this area.

e) Landownership

The town of Cliffdell and other private land follows the Naches River, the remainder of Haystack MLSA is in federal ownership.

f) Roads

Most of the Upper Nile LSR and Haystack MLSA are accessible by car or jeep.

g) Social and Economic Considerations

Outside of the privately owned land and year round residences along the Naches River, recreation is the primary use of the area. Businesses in Cliffdell cater to the recreationists using the area.

B. Analysis Between the LSR/MLSA's

1. Sustainability

The sustainability of LSR's/MLSA's across the forest is displayed in Table 19. Both the Nile LSR and Haystack MLSA fall in the upper 1/3 of all LSR's/MLSA's in terms of the amount of at risk vegetation which puts them in the lower 1/3 in terms of overall sustainability. Haystack has a higher amount of at risk vegetation than any other LSR/MLSA on the forest. An important consideration in terms of sustainability is the relationship of Haystack/Upper Nile compared to their neighboring LSR's/MLSA's. Three LSR's (Manastash, Bumping and Rattlesnake) and one MLSA (Milk 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 Haystack/Upper Nile and its four neighboring LSR's/MLSA's.

Table 40, Sustainability for Haystack/Upper Nile MLSA (Acreage and Percent at Risk)

	LSR/MLSA at Risk		LS Forest at Risk		
LSR/MLSA	**Acres**	**Pct.**	**Acres**	**Pct.**	**Ignition Risk**
Haystack	20,079	81%	16,154	100%	Moderate
Upper Nile	4,979	54%	4,589	73%	Moderate
Manastash	38,858	37%	33,684	49%	Moderate
Bumping	165	1%	165	2%	Moderate
Milk Creek	11,432	73%	8,513	100%	Moderate
Rattlesnake	6,641	63%	4,846	82%	Moderate

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 Haystack and Upper Nile and its four 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 Haystack/Upper Nile and all four of the neighboring LSR/MLSA's.

This creates a situation where fire burning within or between any of these LSR/MLSA's presents a risk to the others. The Bumping LSR is however comprised mostly of moist and wet vegetation groups and it is not likely that any large portion of this LSR would be affected by this situation. All of the others do have significant amounts of at risk vegetation within as well as between them. The potential for fire occurring with resultant effects on several of these LSR's/MLSA's at one time is very high, similar to what happened on the north end of the forest in 1994.

a) Implications

1. Reduce stand density in dense dry successionally advanced vegetation types (types 12 and 22) where they exist between the Haystack/Upper Nile and all four neighboring LSR/MLSA's. Of highest priority are those areas between Haystack/Nile and Milk Creek MLSA and between Haystack/Nile and Rattlesnake LSR.

Potential Projects - Commercial Thinning

2. Reduce fuel loadings along roads that exist between these LSR's/MLSA'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.

3. Reduce fuel loadings in young stands.

   Potential Projects - Precommercial thinning.

2. Northern Spotted Owl

The Upper Nile LSR and the Haystack MLSA are not one of the "big 3" large population cluster/source center LSR's, for the recovery of the spotted owl. They are part of the smaller "local population" centers, which are linked to the metapopulations through dispersing individuals. The spotted owl is a Threatened species, with the recovery dependent on the implementation of the NWFP, especially in LSR/MLSA's (FSEIS Appendix G, Biological Opinion, 1994).

Objectives in the Upper Nile 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). The objectives in the Haystack MLSA are similar, however, MLSA's were identified for certain owl locations in drier provinces, where regular and frequent fires are a natural part of the ecosystem (NWFP A-4, C-23).

The Upper Nile and Haystack are important for maintaining well distributed and well-connected spotted owl populations. The five 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 Bumping LSR, Rattlesnake LSR, Milk MLSA, and the Upper Nile and Haystack respectively.

Habitat providing dispersal/connectivity corridors between LSR's (outside LSR/MLSA's) include: William O. Douglas Wilderness for Upper Nile and somewhat for Haystack; upper Devil's Creek; Edgar Rock to Boulder Caves; Flat Iron Mountain to Soda Spring; upper Rattlesnake; Devils' Canyon; North Fork Nile; and Lefthand Creek (see Forest Interior map). These connectivity corridors should be monitored for effectiveness, and should overlap into Riparian Reserves, unmapped LSR's, wilderness, etc.

3. Connectivity (Plant and Wildlife)

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 titled "Function of the LSR/MLSA Network." Connectivity specific to the Haystack MLSA and Upper Nile LSR for vascular plants is analyzed from two perspectives here. The Haystack MLSA and Upper Nile LSR are referred to below as a single connected area. Refer to forest overview discussions for connectivity description for lichens, bryophytes and fungi.

First, connectivity relative to the Haystack MLSA and Upper Nile LSR can be viewed from how well habitat is connected to surrounding LSR's or MLSA's. Species and the habitats they're associated with are presented in Appendix 6. Firstly, connectivity between Haystack MLSA/Upper Nile LSR and the Bumping LSR only exists within the dry and moist grand fir vegetation groups for species with high dispersal capabilities. Species with moderate and low dispersal capabilities are dependent on vegetation which occurs between these two areas. No connectivity exists for any dispersal class for the subalpine fir series, the wet forest, or the whitebark pine/subalpine larch vegetation groups. This is a consequence of the absence of these vegetation groups in one or the other MLSA/LSR.

Connectivity between the Haystack MLSA/Upper Nile LSR and the Milk MLSA occurs for all dispersal classes in the dry and moist grand fir vegetation groups. No connectivity exists for any dispersal class for any other vegetation group, as all other vegetation groups are limited or absent.

Relative to the Manastash LSR, in the dry and moist vegetation groups all dispersal classes are dependent on vegetation between areas. In general, dispersal is dependent on the vegetative network provided by the Milk MLSA. No connectivity exists within the subalpine fir series. This is a consequence of the inherent landscape pattern, or the juxtaposition of this vegetation series on the landscape. Additionally, no connectivity exists for the wet or whitebark pine/subalpine larch vegetation groups as these groups are limited or not present in one or more of the MLSA's/LSR's.

Regarding the Rattlesnake LSR, connectivity within the dry and moist grand fir vegetation groups exists for species with moderate and high dispersal capabilities. Species with low dispersal capabilities are dependent on vegetation outside of this network. In the subalpine fir series, species with moderate and high dispersal capabilities are dependent on vegetation outside of the network, primarily vegetation which occurs within the wilderness. No connectivity exists for species with low mobility. Again, this is the result of inherent landscape pattern and juxtaposition of vegetation patches on the landscape. Due to the absence of the wet and whitebark pine/subalpine larch vegetation groups, a discussion of connectivity is unwarranted.

In general, few opportunities to improve habitat connectivity for vascular plant species associated with a particular forest vegetation group were identified as a result of this analysis. In the dry/mesic vegetation group, the lack of connectiveness is primarily a result of inherent landscape patterns. In the moist grand fir vegetation group, maintenance of existing dispersal corridors and promotion of mature/late-successional vegetation may provide opportunities for improving connectivity.

b) Wildlife Connectivity

The following are the results of applying the forest wide connectivity module to the Haystack MLSA and Upper Nile LSR (refer to the Dispersion Index in Appendix A). A total of three linkages for Haystack and two for Upper Nile were evaluated.

Table 41, Dispersal Indices for Haystack MLSA Forest Wide Connectivity Module.

Linkage	Distance (MI)	Low	Moderate	High	Index
HS-Milk Creek	0.6	No	Yes	Yes	2
HS-Upper Nile	0	Yes	Yes	Yes	3
HS-Rattlesnake	1.9	No	No	Yes	1
Overall Rating					2.0
Upper Nile					
UN-Bumping	1.9	No	Yes	Yes	2
UN-Haystack	0	Yes	Yes	Yes	3
Overall Rating					2.5

Restoration Opportunities
No restoration projects were identified to address connectivity outside of these areas. A more site specific analysis may provide information to develop such strategies.

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 Upper Nile LSR and the Haystack MLSA. See appendix for order, explanations and process of modules.

a) Forest-wide Overview of Unique Habitats and Species

Over all, these two sites are not as high as others on the Forest for unique habitats and species. The Meeks Table RNA is adjacent to the Haystack MLSA. Meeks Table is an RNA for ponderosa pine, pine grass plant community without co-dominance of Douglas-fir. The William O. Douglas Wilderness is to the west of the Upper Nile LSR and to the southwest of the Haystack MLSA.

The Haystack MLSA has one of the highest amounts of rock/talus, natural openings, and deciduous trees compared to all the other LSR/MLSA's (see Table 27 "Unique Habitats and Species" for all LSR/MLSA's in the main body of the assessment). It has a high number of known special wildlife species, 41 species and a fair amount of known special plant species, 26 species (see same table 27 noted above, and Appendix 6 Plant Species Lists and Appendix 27 Wildlife Species List). There are more roads and trails in riparian reserves (5.16 mi./sq. mi.) than the whole MLSA (3.78 mi./sq. mi.). There is fairly low amounts of forest interior (9%) and late-successional habitat (21%), with much in forest dry.

For LSR's, the Upper Nile has less unique habitats and species evident. It is higher in talus, and dry meadows and has 25 special wildlife species and 30 special plant species known on the LSR. The Upper Nile, has the reverse trend in riparian areas from all the other LSR/MLSA's, it has fewer roads and trails within riparian reserves (2.19 miles per square mile) than in the whole LSR (3.65 mi./sq. mi.). There is very low amounts of forest interior (9%) and very high amounts of late successional habitat (66%).

The Haystack MLSA is in a transition zone between wet and dry vegetation, and has some disjunct forest populations. Overall, the Upper Nile LSR has moderate to high quality of snags, and the Haystack MLSA has low quality of snags.

American Indian food gathering and other material collections would be moderate to high for the Forest. Cedar trees for baskets in the bottom lands, salmon along the Naches River, elk and deer are found in this LSR and MLSA.

b) Unique Habitats and Species Within

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 Upper Nile LSR these include: total open road density of 3.65 miles per square mile: security habitat of 2%; roads and trails in riparian reserves of 2.19 miles per square mile; and past harvest activities of 45% in the LSR.

The Haystack MLSA has total open road density of 3.78 miles per square mile: security habitat of 6%; roads and trails in riparian reserves of 5.16 miles per square mile; and past harvest activities of 95% in the MLSA.

(1) Abundance and Ecological Diversity

Compared to all the other LSR/MLSA's, the Upper Nile LSR and the Haystack MLSA is moderate 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.

(2) Connectivity for Unique Habitats and Species

The Upper Nile LSR is moderate and the Haystack MLSA is low in 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.

(3) Process and Function of Unique Habitats and Species

The Upper Nile LSR and the Haystack MLSA are moderate in 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. Rattlesnake to Meeks Table: Rock/Talus, wetlands, meadows, shrubs, riparian reserves, PETS, RNA and wilderness..
2. Little Bald Mt. to Clover Springs to Schneider Springs: Wetlands, talus/rock, Forest interior, snags, wilderness.
3. Naches River (Cliffdale to Cottonwood, Edgar Rock, Haystack): talus/rock, wetlands, riparian reserves, forest interior, natural openings, PETS
4. Upper Nile: riparian reserves, natural openings, rock/talus, forest interior, PETS spp..
5. Lower Nile: wetlands, deciduous, meadows, natural openings.
6. Glass Creek: Talus, rock, riparian reserves, forest interior.

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

1. Reduce road and trail densities in riparian reserves.
2. Reduce open road densities throughout the LSR.
3. Increase amount of security habitat.
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 fire in ponderosa pine.
11. Reduce Fragmentation of Wet Forest.
12. Protect riparian from grazing.
13. Provide American Indian site access.
14. Maintain black-backed woodpecker nesting/roosting/foraging habitat.
15. Meet high end snag levels.
16. Create log den sites in low quality roaded/forest for marten, fisher, lynx.
17. Protect/maintain/enhance/monitor PETS.
18. Prescribed fire in natural openings as part of fire climax.
19. Interpret values and protection/maintenance of unique habitats and species.
20. Acquire non-Forest System lands with high degree of unique species or habitat.

d) 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. 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.

A landscape level approach was used to analyze snag, green tree recruitment, and downed wood habitat. The landscape approach reviews the quality of snag, down logs, and green tree recruitment for the LSR's. GIS and specific knowledge was used: including: forest vegetation types and acreages, amount of forest burned, percentage of past timber harvest (clearcuts and partial cuts), road densities, security habitat, Riparian Reserve acreages, pathogens, the number of spotted owl home ranges, forest interior amounts, and the percentage of late successional habitat. The qualitative analysis for the LSR/MLSA included green tree availability, short term and long term snag/log availability, burn intensity, site specific wildlife needs, land allocation goals, and the quality of refugia/security habitats.

(1) Quality Rating

Each attribute for snag/downed log/green tree recruitment has a rating (see chart), a final rating incorporates all values towards one rating for the LSR/MLSA. Actual snag, downed log and green tree recruitment numbers, sizes, stages of decay and species is not practical to analysis on a landscape basis. This can also be done on a 40 acre grid, or sub-watershed basis. When data is available, incorporate actual availability data into the analysis. Snag and Downed Log levels are based on Wenatchee National Forest Snag Levels, Fire Recover y Snag Levels, Everett et al Spotted owl and Snag studies, and wildlife needs. Qualitative ratings are based on habitat needs for snag, downed log, and recruitment tree wildlife and plant species needs. Species using these habitats include:

pileated woodpecker	spotted owl	hoary bat	marten & fisher	tailed frog
black-backed woodpecker	flammulated owl	silver-haired bat	flying squirrel	NW & PG salamander
white-headed woodpecker	great gray owl	big brown bat	lynx	lichens & fungi
olive-sided flycatcher V	Vaux's swift	voles, shrewmole	bald eagle	land snails

**** UPPER NILE SNAG ANALYSIS****

HIGH QUALITY	MEDIUM QUALITY	LOW QUALITY
Moist & Wet Veg Groups 61%	Subalpine Fir & Mesic Veg 22%	Dry & Whitebark 7%
>60% LS (non-dry) Habitat	15% - 60% LS Habitat 65%	<15% LS Habitat
80% - 100% LS (all) Habitat	40% - 80% LS/M Habitat 69%	<40% LS/M Habitat
> 30% Forest Interior (non-dry)	15% -29% Forest Interior Non-dry	<15% Forest Int ND 9%
>10% Forest Interior Dry	5% - 9% Forest Interior Dry	< 5% Forest Int Dry 0%
>16% in Riparian Reserves	10% to 16% in Riparian Reserves 12%	<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 RR 2.19 mi/sq/mi
< 1 Mi/Sq Mi Open Roads	1 Mi to 2.5 Mi/Sq Mi Roads	> 2.5 Mi/Sq Mi Rds 3.65 mi/sq/mi

>70% Security Habitat	50% to 70% Security Habitat	<50% Security Hab 2%
>10% in Past Burns		<10% in Past Burns <10%
>50% Insect/Pathogens	25% - 50% Insect/Pathogens (see Insect/Disease Write Up)	< 25% Insect/Pathog
<10% Past CC Harvest <10% ?	11% - 25% Past CC Harvest	>25% Past CCs
<10% Past PC Harvest	11% - 50% Past PC Harvest 35%	>50% Past PC

**** HAYSTACK SNAG ****

HIGH QUALITY	MEDIUM QUALITY	LOW QUALITY
Moist & Wet Veg Groups 27%	Subalpine Fir & Mesic Veg 0%	Dry & Whitebark 61%
>60% LS (non-dry) Habitat	15% - 60% LS Habitat 21%	<15% LS Habitat
80% - 100% LS (all) Habitat	40% - 80% LS/M Habitat 67%	<40% LS/M Habitat
> 30% Forest Interior (non-dry)	15% -29% Forest Interior Non-dry	<15% Forest Int ND 2%
>10% Forest Interior Dry	5% - 9% Forest Interior Dry 9%	< 5% Forest Int Dry
>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 RR 5.16 mi/sq/mi
< 1 Mi/Sq Mi Open Roads	1 Mi to 2.5 Mi/Sq Mi Roads	> 2.5 Mi/Sq Mi Rds 3.6578i/sq/mi
>70% Security Habitat	50% to 70% Security Habitat	<50% Security Hab 6%
>10% in Past Burns		<10% in Past Burns <10%
>50% Insect/Pathogens	25% - 50% Insect/Pathogens	< 25% Insect/Pathog (see Insect/Disease Write Up)
<10% Past CC Harvest	11% - 25% Past CC Harvest	>25% Past Ccs >25% ?
<10% Past PC Harvest	11% - 50% Past PC Harvest	>50% Past PC 70%

e) Restoration Opportunities And Potential Projects For Snags/Logs

Reduce roads in riparian reserves;

Retain Snags at High End of Range;

Complete snag analysis on 40 acre grid

Reduce Roads in Forest Interior Patches

Incorporate Healthy Insect/Disease Levels,

f) Plant Species with Special Status

Three species with special status were identified to occur with in the Haystack MLSA/Upper Nile LSR (Appendix ??). There are not immediate viability concerns associated with *Orobanche pinorum* or *Cypripedium montanum*. This is based on the relatively frequent occurrence of these species on the Naches Ranger District. Furthermore, *Orobanche pinorum* is well documented from the Wenatchee National Forest and other forests within the Pacific Northwest Region. Consequently, the Species with Special Status Module would recommend monitoring these species and subsequent development of a Conservation Strategy. Regarding the lichen species *Cyphelium inquinans*, very little information is available on the biology and ecology of this species. Documentation of this species from the Naches Ranger District suggests that this species is associated with various vegetation types and various substrates. Therefore, it is cautiously concluded that no immediate viability concerns exist for this species and monitoring and development of a conservation strategy be completed for this species.

2. Connectivity (Plant and Wildlife)

a) Plant Connectivity

Connectivity can also be addressed by analyzing the connectedness of habitats or species populations within the MLSA/LSR. Within the Haystack MLSA/Upper Nile LSR, most forest groups are fairly well connected.

Disjunct species populations result from inherent breaks or openings in the landscape. At this time, information is not available to complete this type of analysis for survey and manage species within the Haystack MLSA/Upper Nile LSR.

b) Wildlife Connectivity

The results of applying the within LSR/MLSA connectivity module are presented in this section for the Haystack MLSA and Upper Nile LSR.

Table 42, Haystack MLSA Wildlife Connectivity

Connect Variable	Dry	MGF/MH	Rip. Res.	Overall
%LS or Fire Climax	LS=H,FC=L	H	M	M
Open Road Density	L	L	L	L
Security Habitat	L	L	L	L
Forest Int. Roads	L	L	L	L
% Forest Interior	L	L	L	L

(1) Restoration Opportunities

There is an opportunity to improve the connectivity within the Haystack MLSA through access and travel management that would reduce the road density, especially within the Riparian Reserves (current density is 5.04 mi./sq.mi.). Revegetation of closed roads could be considered to address habitat connectivity for low mobility species.

Thinning and prescribed fire could be used to enhance the development of fire climax ponderosa pine forests and improve their connectivity.

Upper Nile LSR

Conn. Var.	Dry	Mesic	MGF/MH	SAF	Wet	Rip.Res.	Overall
%LS or FC	LS=L, FC=L	M	M	M	M	M	M
Open Road	L	L	L	L	L	L	L
Sec. Hab.	L	L	L	L	L	L	L
For. Int Rd.	L	L	L	L	L	L	L
%For. Int.	L	L	L	L	L	L	L

(2) Restoration Opportunities

Habitat connectivity within the Upper Nile LSR could be improved by reducing the open road density through access and travel management. For low mobility species, road closures could consider revegetation of the road surface to enhance the ability of these species to disperse across the road bed.

The use of prescribed fire could be used in the Dry Forests identified as low density to enhance the fire-climax habitats. In addition, thinning followed by prescribed fire in the Dry Forest high density would improve connectivity for fire climax associated species.

Within the Dry Forest and Moist Grand Fir/Western Hemlock many created opening could be evaluated for potential to speed their recovery and development of late-successional forests. Thinning of the single-layered stands in the Moist Grand Fir/Western Hemlock could be used to enhance the development of late-successional forest characteristics.

3. Disturbance Risk Analysis

The Upper Nile LSR and The Haystack MLSA form a contiguous land unit and, for the purposes of this discussion, will be treated as a single entity. The boundary between the two is administrative and does not represent a natural boundary separating different disturbance regimes. Although the Upper Nile LSR is primarily within wetter, more sustainable vegetation types, its location upslope of dry forests within the Haystack MLSA puts it at risk to disturbances originating in the MLSA. As a result of management activities and mortality from insect and pathogens, fuel loads within the more productive forests of the Upper Nile LSR are high, increasing the risk of habitat loss from fires originating outside the LSR boundary. A major storm track crosses both the LSR and MLSA, and lightning strikes frequently along the ridge between the Nile Creek and Rattlesnake Creek drainage's.

Sixty-one percent of the Haystack MLSA consists of dry forest, primarily dry grand fir associations; of that, more than 90 percent is at high risk to insect and pathogen outbreaks and catastrophic wildfires. Upslope from this tinderbox, the balance of this MLSA is within moist grand fir or mesic western hemlock plant associations. Seventy-eight percent of these stands are in a mature, layered condition providing ideal habitat for outbreaks of defoliating insects. Another 10 percent or more has been partially harvested, creating conditions that are ideal for the spread of root pathogens.

About 20 percent of the Upper Nile LSR is composed of successionally-advanced wet forest. Only seven percent is within the dry forest group; however, half the vegetation in this LSR is successionally-advanced and not within the wet forest group. Most successionally-advanced vegetation is within moist grand fir associations or subalpine fir series and would be considered sustainable were it not for the threat of fires originating outside the LSR. Increasing fire risk within the Upper Nile LSR is high mortality from insects and pathogens, most notably fir engraver, annosus root disease, and laminated root rot.

Both the LSR and MLSA are heavily roaded, with the exception of the western edge of the Upper Nile LSR. About 35 percent of the Upper Nile LSR has been entered for timber harvest. Most past

harvests occurred in the moist grand fir / mesic western hemlock vegetation type. Preferential removal of early-seral species was the predominant type of harvest within the LSR. Over 70% of Haystack MLSA has also been entered for timber cutting. Partial harvests began in the 1920s; many areas have had multiple entries, with ponderosa pine being heavily cut.

The following information on insect activity in the Upper Nile LSR and the Haystack MLSA is from data collected during the aerial surveys conducted by Region 6 Insect and Disease Group. Activity prior to 1980 was not available on the Forest at the time of this analysis. Light infestations or damage on less than 100 acres are not reported.

Upper Nile LSR

- Mountain pine beetle (w. white pine): 1981, 1988-91
- Mountain pine beetle (whitebark pine): 1993
- Mountain pine beetle (ponderosa pine): 1994
- Douglas-fir beetle: 1988, 1994
- Fir engraver: 1988-91, 1993
- Spruce beetle: 1988
- Western spruce budworm: 1985, 1987-92
- Larch budmoth: 1985

Haystack MLSA

- Western pine beetle: 1980, 1986
- Mountain pine beetle (w. white pine): 1982-3, 1987, 1988 (heavy), 1990
- Mountain pine beetle (ponderosa pine): 1989-90, 1992, 1994
- Douglas-fir beetle: 1988, 1994
- Fir engraver: 1980, 1988, 1989 (very heavy), 1990-1, 1993
- Western spruce budworm: 1985, 1987-1992
- Blackheaded budworm: 1985
- Larch budmoth: 1985
- Balsam woolly adelgid: 1988

Western white pine mortality associated with white pine blister rust and subsequent attack by mountain pine beetles is very high in the Haystack MLSA. Grand fir mortality from the fir engraver is high in both the LSR and MLSA. Mortality of western white pine changes species composition within stands and can reduce structural diversity, even though vegetation composition moves towards late successional stages. Fir engravers tend 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 43, Disturbance Matrix, Haystack

Veg Type	Fire	Dwarf mistletoes			Root disease			WPBR	WSB	DFB	FE	Total
		DF	WL	WH	AROS	HEAN	PHWE					
10	M	M	L	-	M	M	M	-	L	L	L	M
11	M	M	L	-	M	M	M	-	M	L	L	M
12	H	H	L	-	M	M	H	-	H	H	H	H
13	H	H	L	-	H	H	H	-	H	M	H	H
30	M	M	M	L	M	M	M	H	L	L	L	M
31	M	M	M	L	M	M	M	H	L	L	L	M

Veg Type	Fire	Dwarf mistletoes			Root disease			WPBR	WSB	DFB	FE	Total
		DF	WL	WH	AROS	HEAN	PHWE					
32	H	H	H	L	L	H	H	H	H	M	H	H
33	H	H	H	L	M	H	H	H	H	M	H	H
34	M	L	L	L	L	M	M	H	L	L	L	M
36	H	L	L	L	L	M	M	H	L	L	M	H
37	H	L	L	L	L	H	M	H	L	L	M	H
64	M	L	L	L	M	M	M	H	L	L	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 = 0; "L" = low risk, "M" = moderate risk, "H" = high risk

Eighty-two percent of the Haystack MLSA has a high composite risk to disturbances (essentially, all but the created openings and non-forested areas are at high risk). Insect and pathogen mortality is high throughout the MLSA, increasing the likelihood that fires burning within the reserve boundaries will be of high severity.

Management objectives to reduce risk of habitat loss from catastrophic wildfires and insect or disease outbreaks include reducing stand density, altering species composition, and reducing vertical and horizontal fuel continuity. Thinning and other activities to reduce stand densities are required to protect spotted owl habitat from fire. Root disease is a problem within some portions of the MLSA. Altering species composition to favor resistant species will help ensure long term sustainability. Below-ground continuity of susceptible species can be reduced by allowing group selection harvests of fir and hemlock between 0.5 to 2 acres and regenerating with ponderosa pine and western larch. Fuelbreaks along the eastern edge and along the urban/wildland interface (Hwy. 410 corridor) is required within this MLSA to protect late-successional habitat.

Silvicultural and other options to attain management objectives stated above include thinning (PCT/CT); pruning; fuelwood collection; mechanical fuel treatments; handpiling fuels; prescribed fire; and favoring the seral, fire-resistant species such as ponderosa pine, and western larch.

Table 44, Disturbance Matrix, Upper Nile

Veg Type	Fire	Dwarf mistletoes			Root disease			WPBR	WSB	DFB	FE	Total
		DF	WL	WH	AROS	HEAN	PHWE					
10	M	M	L	-	M	M	M	-	L	L	L	M
12	H	H	L	-	M	M	M	-	H	H	H	H
13	H	H	L	-	H	M	M	-	H	M	H	H
30	M	M	M	L	M	M	M	H	L	L	L	M
31	M	M	M	L	M	M	M	H	L	L	L	M
32	H	H	H	L	L	M	M	H	M	M	M	H
33	H	H	H	L	M	M	M	H	M	M	M	H

Veg Type	Fire	Dwarf mistletoes			Root disease			WPBR	WSB	DFB	FE	Total
		DF	WL	WH	AROS	HEAN	PHWE					
34	M	L	L	L	L	M	M	H	L	L	L	M
36	H	L	L	M	L	M	M	H	L	L	M	H
37	H	L	L	M	L	M	M	H	L	L	M	H
40	M	L	L	L	L	L	L	H	L	L	L	M
41	M	L	M	M	L	L	L	H	L	L	L	M
42	M	L	M	M	L	L	L	H	L	L	M	M
43	L	-	L	L	L	L	L	H	L	-	L	L
60	L	L	L	M	L	M	M	H	L	L	L	L
62	M	L	L	M	L	L	L	H	L	L	L	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 = 0; "L" = low risk, "M" = moderate risk, "H" = high risk

Thirty-eight percent of the Upper Nile LSR has a high composite risk to disturbances. Most of the risk to this LSR originates from conditions outside reserve boundaries and from high fuel loads within those portions of the LSR that are adjacent to dry forest types. Management objectives to reduce risk of habitat loss to catastrophic wildfires, insects, and pathogens include reducing stand density, altering species compositions, and reducing vertical and horizontal fuel continuity in stands adjacent to dry forest types. The primary management goal is to protect this LSR from fires originating outside the reserve boundaries. Silvicultural and other options to attain objectives within dry forest include thinning (PCT/CT); pruning; fuelwood collection; mechanical fuel treatments; handpiling fuels; prescribed fire; favoring seral, fire-resistant species such as ponderosa pine, and western larch; and developing or maintaining fuelbreaks. Silvicultural options to protect moist grand fir, mesic western hemlock, and wet forests include treating adjacent drier forest stands as described above; and developing or enhancing fuelbreaks.

4. Northern Spotted Owl

The following is the discussion and results of the within LSR Spotted Owl Module for the Upper Nile LSR/Haystack MLSA. 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 Upper Nile LSR has 6,136 acres (67%) of nesting/roosting/foraging habitat, of that 6,053 acres are in the wetter vegetation type and have a high chance of sustainability. There is a potential for the LSR to have 7,354 acres (80%) in suitable. The most contiguous (sustainable) suitable spotted owl habitat in the LSR is in the upper portions of the LSR, headwaters streams. To meet the recovery goals for the spotted owl, there is a need to increase/accelerate spotted owl habitat, especially accelerating old plantations.

The Haystack MLSA has 9,998 acres (41 %) of nesting/roosting/foraging habitat, of that 5,348 acres are in the wetter vegetation type and have a high chance of sustainability. There is a potential for the

MLSA to have 17,665 acres (72%) suitable, but most of this would be in drier vegetation types. The most contiguous (sustainable) suitable spotted owl habitat in the MLSA is in the northwest portion of the MLSA. To meet the recovery goals for the spotted owl, there is a need to increase/accelerate spotted owl habitat, especially accelerating old plantations.

b) Spotted Owl Home Ranges

The Upper Nile LSR will manage for spotted owls over risk in the wetter forests, and have a home range of 60% of 1.8 mile radius, which is 3,994 acres. In drier forests of the LSR, owl habitat will be at 40% threshold, which is 2,663 acres.

The Haystack MLSA will manage for risk over spotted owls, in that threshold acres (40% of the home range) will be managed for.

A total of ten spotted owl activity centers are known within the Haystack and Upper Nile. Eight of these are within the Haystack MLSA and two within the Upper Nile LSR. Currently six (60%) of these activity centers are below habitat thresholds, three (30%) are at threshold and one (10%) is above threshold.

One owl site is at target (wet owls) and threshold (dry owls) amounts. Those wet sites over 3,994 acres are: SO862. Those dry sites over 2,663 acres are: 0. However, 4 sites need to be monitored and field habitat verified, which are over threshold in 2,663 acres but under within the .7 mi. 500 acres, these are: SO806, SO846, SO879, SO 883.

There are 6 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 LSR. The drier forests will eventually be managed for other late-successional species.

Table 45, Suitable Spotted Owl Habitat, Upper Nile and Haystack

	SUITABLE SPOTTED OWL HABITAT[10]											
	1.8 mile Circle Around Activity Center				0.7 mile Circle Around Activity Center				.33 mile Circle Around Activity Center[11]			
Spotted owl	Dry	Mes-ic	Wet	Total	Dry	Mes-ic	Wet	Total	Dry	Mes-ic	Wet	Total
SO814	462	0	2,675	**3,137**	21	0	536	**557**	3	0	155	**158 map**
SO862	65	0	4,206	**4,270**	24	0	630	**655**	10	0	109	**119 m**
SO863	179	0	3,765	**3,944**	23	0	623	**645**	0	0	178	**178 map**
HAYSTACK												
SO806	1,435	0	1,611	**3,046**	336	0	25	**361**	107	0	1	**109 mpa**
SO814	462	0	2,675	**3,137**	21	0	536	**557**	3	0	155	**158 map**
SO846	1,292	0	1,607	**2,898**	199	0	147	**347**	61	0	27	**89 mpa**
SO866	1,360	0	1,778	**3,138**	145	0	439	**584**	40	0	112	**152 map**
SO868	1,072	0	622	**1,694**	170	0	0	**170**	66	0	0	**66 mpa**
SO879	1,516	0	1,190	**2,707**	246	0	238	**485**	77	0	40	**117 mpa**

	SUITABLE SPOTTED OWL HABITAT[10]											
	1.8 mile Circle Around Activity Center				0.7 mile Circle Around Activity Center				.33 mile Circle Around Activity Center[11]			
Spotted owl	Dry	Mes-ic	Wet	Total	Dry	Mes-ic	Wet	Total	Dry	Mes-ic	Wet	Total
SO883	1,613	0	1,244	**2,857**	286	0	139	**425**	69	0	3	**72 mpa**
SO890	1,535	0	948	**2,483**	251	0	96	**347**	54	0	53	**107 mpa**

[1] Near the LSR or MLSA but not inside the LSR or MLSA.
[2] This spotted owl is inside Haystack MLSA but is close to Upper Nile LSR.
[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 Upper Nile LSR is 523 acres (6%) and will grow up to be nesting/roosting/foraging habitat. Dispersal habitat within the Haystack MLSA is 9799 acres (40%). Habitat providing dispersal/Connectivity corridors within the LSR/MLSA is identified on the Forest Interior map and Suitable Spotted Owl Habitat Map.

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

Restoration activities could include the use of silvicultural practices to promote the development of suitable spotted owl habitat within currently non-suitable habitats. The risk of habitat loss due to disturbances could be reduced by lowering fuels in non-habitat or high risk suitable habitat. Habitat effectiveness and connectivity could be improved through road closures and revegetation of the road bed. This would be especially effective in the areas identified as forest interior.

1. Improve and accelerate N/R/F habitat, to maintain high number of spotted owl pairs. (see individual owl restoration opportunities.
    - 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.
2. Aggressive protection of remaining suitable spotted owl habitat, from outside LSR/MLSA, on Matrix lands.

3. Protect spotted owl home ranges within LSR/MLSA, between owl circles, by implementing risk reduction on first on non-suitable habitat, then on Dry and Mesic habitat:
4. Fuels reduction and hazard reduction occur outside N/R/F habitat in short term, shift emphasis in 50 years.
5. Monitor/maintain connectivity outside LSR.
6. Monitor spotted owl activity centers, 500 acre core and home ranges of owls below threshold or target acreage (see list).
7. Field verify habitat within 500 acre home ranges of spotted owl sites below threshold in that core, but above threshold in the home range.
8. Increase habitat effectiveness and connectivity by reducing open roads and revegeting road beds. Especially in forest interior habitat patches.
9. Maintain dispersal/connectivity habitat.

5. Aquatic

a) Summary of Aquatic Goals

- Protect salmonid populations and habitat in core areas Mainstem Naches FPU.
- Prevent increase in water temperature in lower Nile-Dry and Mainstem Naches FPU's.
- Reduce water temperature in Naches drainage.
- Minimize fine sediment input.
- Increase LWD recruitment potential in upper end of the Mainstem Naches FPU.
- 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 Naches and Rattlesnake basins.
- Preserve and restore all floodplain, side channel, and riparian wetland habitat, especially in C and E channel types in the Naches 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 Haystack MLSA / Upper Nile LSR. Within the Nile-Dry FPU is a core area for cutthroat trout and the Mainstem Naches is a core area for spring chinook salmon. Downstream in the mainstem Naches section below Haystack MLSA / Upper Nile LSR populations of spring chinook salmon and bull trout are found.
2. Federal candidate species and other species of concern: bull trout populations in the Naches mainstem could be impacted by LSR/MLSA management activities.
3. Anadromous salmonid populations occur within and below Haystack MLSA / Upper Nile LSR. Anadromous salmonids within the LSR/MLSA include: steelhead, early-run (spring) chinook salmon.

   Concerns include the lack of abundance of 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/MLSA. Cutthroat occur in substantial numbers, with Nile-Dry being a core area for cutthroat.

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

5. Introduced species. Eastern Brook trout are known to occur in Devil-Swamp, Nile-Dry, Mainstem Naches, Lower Rattlesnake FPU's, and may occur in the North Fork Rattlesnake FPU.

   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/MLSA. There are locally recorded sightings of aquatic amphibians within the LSR/MLSA. No sightings have been recorded for aquatic mollusks. No systematic surveys for mollusks, nor amphibians have been undertaken in this LSR/MLSA.

7. Water temperature. Within the Naches River drainage, it is important to avoid any increase in water temperature, and to lower water temperatures where possible. Maximum temperature in the Naches mainstem are recorded as reaching 69.6 degrees F. These temperatures exceed forest plan standards (max. temperature 68 F, Wenatchee National Forest 1994 monitoring report) and likely lower the fitness of the Naches's anadromous populations. Maintaining water temperature at or below the current level may be important for maintenance of the core cutthroat population in the Nile-Dry FPU.

   Maximum temperatures recorded during 1990, 1992-1994 temperature monitoring included some of the streams in the Haystack MLSA / Upper Nile LSR area. Glass creek averaged a maximum of 56.6 degrees F. over the period, Lower Nile creek 58..3 F., Upper Nile creek 55.0 F. and Orr creek 56.6 F.

   Managing for lower water temperatures in the LSR/MLSA 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 steam 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 at least common 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/MLSA. No fine sediment data is available within Haystack MLSA / Upper Nile LSR.

Sediment transport. Haystack MLSA / Upper Nile LSR lie primarily in a region of sediment input and transport; the mainstem Naches below Haystack MLSA / Upper Nile LSR has a wider floodplain at some sites and can act as a region of sediment deposition. Fine sediment data is only available for the American River and portions of the Little Naches River, which are tributaries to the Naches. Fine sediments in the three tributaries of the Little Naches were sampled and had moderate to high concentrations of fine sediment. The American River is within Wenatchee Forest Plan standards all twelve samples.

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 streambed and streambank 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.

   The Naches River receives the majority of LWD from upstream. The 1992 stream survey reported a deficiency of LWD in the Naches River for the section surveyed. Approximately half of the amount needed to meet Wenatchee Forest Plan standards was found. The above levels of LWD were influenced by in-channel removal of LWD following the flood of December 1977. During 1979 inchannel LWD was removed from the upper portion of the Naches Mainstem and burned on gravel bars. Some additional loss of inchannel LWD occurred as a result of firewood gathering. Normal channel actions of the river moving in its floodplain have improved the condition especially during 1995 and 1996.

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 Haystack MLSA / Upper Nile LSR at this time; however we can be aware of it when managing any of the above inter-related factors.

11. *Landtype. Haystack MLSA/Upper Nile LSR includes landtypes E and F (seeLandtype Association Responses Map)*

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 Haystack MLSA / Upper Nile 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. Floods have been a concern in the Naches basin, particularly where humans have build roads, residences and other improvements within the floodplain. 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.

    Peak and low flows in the Mainstem Naches FPU have been modified by the influences of the Bumping Dam, that is upstream of the LSR/MLSA area.

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 withdrawals. Because of regulation of water upstream at Bumping dam and water withdrawn from the Naches during the summer for agriculture there is a potential for lower base flows, increasing water temperatures and fine sediment levels at key times and places for anadromous spawning, other management in the basin that impacts base flow, fine sediment, and water temperature, takes on heightened significance. The Bureau of Reclamation regulates the spill of water from both Bumping and Rimrock Dams and they adjust the flow rate to meet a variety of need. Flow amount in the Naches and Tieton rivers can vary by the day.

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 2.28 miles per square mile in Haystack MLSA. The Riparian Reserves are estimated as 6,832 acres (13%) of the 76,502 acres within Haystack MLSA. Upper Nile LSR supports a total riparian road density of 2.19 miles per square mile. The Riparian Reserve is estimated as 1,108 acres (12%) of the 9,191 acres within Upper Nile 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 returns 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 lightening strike patterns), and landtype interact

    The Mainstem Naches and Wenas Watershed Assessment of 1995 assessed timber harvest in the riparian zone as having harvested 2.62 miles of stream bank in Devil-Swamp FPU, 8.03 miles in Nile-Dry and Mainstem Naches FPU's respectively.

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 Mainstem Naches is privately owned. Habitat improvement projects on National Forest land have been constructed to create offchannel habitat have been successful in the recent past. Within the LSR/MLSA some of the floodplain area has been altered, see discussion of timber harvest within the riparian zone and riparian roading above.

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

In the Naches basin a high priority may be upslope and riparian hydrologic management to prevent disturbances from impacting human resources through flooding.

The LSR/MLSA 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/MLSA network has the potential to strengthen viability of these at-risk aquatic populations.

6. Noxious Weeds

Eight noxious weed species were identified to occur within the Haystack MLSA/Upper Nile LSR. These species are discussed in priority order as identified on the noxious weed analysis module. No Class A weeds are presently documented from this area. Class B-designate species include: *Linnaria dalmatica* and *Chrysanthemum leucanthemum. Linaria dalmatica* is widespread within the Haystack MLSA, particularly within the dry vegetation group. Infestation of this species is most severe on private lands within the MLSA. Furthermore, several main travel routes and summer home areas have been invaded, as well. Following through the noxious weed analysis (Appendix 1), control/eradication efforts for this species should focus on roadways, specifically, Highway 410 and Roads 1703, 1704, and 1705. Cottonwood Campground, which occurs immediately adjacent to the MLSA, is also an area for priority treatment. Other areas with a high priority for treatment include the Gold Creek summer home group, Lost Creek Village and the area in the vicinity of Fontane Flat. *Chrysanthemum luecanthemum* is limited in it's occurrence, known primarily from along isolated open areas and roadways. Control efforts for this species should focus on activities such as hand pulling, herbicides, or a combination of these methods.

Centaurea diffusa was the only Class B weed identified, and would therefore be considered as second priority for treatment. *Centaurea diffusa* is widespread in the Haystack MLSA and occurs less frequently in the Upper Nile LSR. It occurs primarily along roadways and in waste places. Containment and prevention of further spread of this species should focus on major travelways such as Highway 410 and Roads 1601, 1611, 1500 and 1502. The dispersed campground located at the old Nile mill site should also be considered a priority area for treatment.

Five Class C weeds were identified in the Haystack MLSA/Upper Nile LSR. *Cirsium vulgare* and *C. arvense* are widespread and are documented from areas with recent ground disturbance, primarily areas previously harvested and/or heavily grazed by domestic livestock and wildlife. Containment and further spread of these species should focus on areas such as the area near Lindsay Camp, Dry Ridge and Glass Creek. *Hypericum perfoliatum, Verbascum thapsus*, and *Convolvulus arvense* are all limited in their occurrence, found as small isolated populations. Hand pulling and spot herbicide spraying, or a combination of these methods should be

7. Fire Management Plan

a) Overview

This plan is intended to provide guidance for the management of fire in the Upper Nile LSR / Haystack MLSA. It is intended to supplement the Fire Management Plan for the Late Successional Reserve System and will become a portion of 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 this plan. It is the intent of this plan to provide adequate protection of the reserve to allow management practices to be initiated which will provide for the protection of the Late Successional Associated species and associated unique habitats. These management actions are expected to include actions which will include the role of fire disturbance as an important process in the reserve.

b) Fire Prevention Actions

The following actions are site specific for the Upper Nile LSR / Haystack MLSA. They are intended to supplement the actions which will be implemented on a Forest wide basis.

1. Continue to implement campfire restrictions as warranted by increased fire danger.
2. Initiate hazard reduction around developed and dispersed recreation sites and organizational camps such as:
    - Lindsay Camp
    - McDaniel Lake
    - Cottonwood
    - Rattlesnake Springs
    - Old mill site at junction of FS Road 1600 and 1601
    - Lost Creek Village
3. Emphasize fire prevention activities along major loop roads and high use dispersed sites such as FS Road 1600 - 1706 and FS Road 1500 - 1502.
4. Continue and improve fire prevention signing program on roads and trails included or adjacent to the LSR / MLSA. Coordinate with entire district signing program.
5. Make public user education geared to fire danger an emphasis item
6. Implement road restrictions and closures as warranted during periods of extreme fire danger.
7. Emphasize contact with the following special interest groups: ORV groups, summer home groups, organization camps, local user groups, grazing permittees, and other special use permittees.
8. As a hazard reduction measure emphasize fuel wood collection around recreation use sites in the dry forest type.
9. Maintain cooperative fire prevention efforts with Yakima County Fire Prevention Association, the local Nile - Cliffdale Fire District, and DNR.

Pre-fire Protection for Fires Originating Outside the LSR / MLSA

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

1. Complete pre-attack planning process for LSR / MLSA; utilize natural fuel breaks
2. Stress prevention of fires outside LSR / MLSA boundaries
3. Strategic fuel manipulation to reduce size and intensity of fires within and adjacent to LSR / MLSA boundaries

e.g. fuel breaks - tie together existing fuel treatment areas utilizing natural openings, roads, ridgetops, etc. Priority area is along the eastern portion of the MLSA north of FS Road 1600 to the ridgeline.

4. Maintain existing pre-attack facilities (water chances) and seek opportunities for more, including helispot locations.

c) Fire Detection -

1. Staffing of Clemans L.O. and aerial detection after lightning episodes will provide the primary detection resource for this LSR / MSLA.
2. This will be supplemented by emergency staffing at Little Bald and Timberwolf during and after lightning episodes.
3. Seek opportunities for fuel-breaks around private lands within the MLSA boundary (Naches River corridor).
4. Work with the local residents, users, and cooperators on education of how to report fires.

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. 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, recognizing the fluctuation in funding levels and the ability to meet the objectives.
3. Tactical suppression activities will take into consideration specific resource values such as the protection of riparian areas and private land from fires.
4. Improvements will be a priority for protection (Dry Evaluation Plantation, recreation facilities, etc.)
5. Pre-planned dispatch cards for initial attack will be prepared for the LSR / MLSA area
6. The FSA and Escaped Fire Situation Analysis process will be used to guide initial attack, Extended Attack, and large fire-suppression. Utilize pre-attack plans and materials.
7. Protect known threatened and endangered species habitat from fire (botanical).
8. Fire suppression actions will be implemented on an inter-agency basis as appropriate.

e) Vegetation and Fuels Management

1. Returning dry forest types to sustainable conditions is a priority
2. Suggested activities include pruning, thinning, commercial and pre-commercial thinning, wood gathering, mechanical treatments, 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. Maintain a mosaic of age classes and structural conditions across the landscape outside dry forest to support species associated with late-successional forest

f) Prescribed Fires, Prescribed fire opportunities

1. Recognize the use of prescribed fire as a primary management tool in this LSR / MSLA.

2. The development and subsequent implementation of prescribed fire plans should be on a landscape level both within and adjacent to the LSR/MLSA
3. Priorities for the use of prescribed fire are dry site ecosystems including dry meadows and steppe vegetation
4. Priority outcomes are hazard reduction and vegetation manipulation throughout the LSR / MLSA
5. To return landscapes to synchrony with inherent disturbance regimes, peruse opportunities to implement prescribed fire projects in a timely and economical manner
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:

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

D. Restoration Opportunities and Potential Project Summary

Table 46, Restoration Opportunities and Potential Projects, Haystack MLSA, Upper Nile LSR

Analysis Module	Restoration Opportunity	Potential Projects	Schedule 1
Forest-Wide Sustainability	1) Reduce fuel loading and stocking levels in dense successionally advanced dry forest stands where they exist between Haystack/Upper Nile and Neighboring LSR/MLSA's. Focus on areas between Haystack/Upper Nile and Milk creek and Rattlesnake 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) Reduce fuel loadings along roads that exist between these LSR's to increase the roads effectiveness as a fuelbreak.	2) Piling of down fuels, firewood gathering, pruning to reduce vertical fuel continuity, construction of shaded fuelbreaks.	B
	3) Reduce fuel loadings in young stands.	3) Precommercial thinning	C
Forest-Wide Spotted owl	Not Applicable		
Forest-Wide Connectivity	No opportunities identified		
Unique Habitats and Species	1) Reduce road densities in riparian reserves and in talus areas.	Close or relocate roads as opportunities are identified in Access and Travel Management Planning.	A
	2) Maintain existing subalpine meadows.	2) Remove encroaching conifers from meadows.	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	A

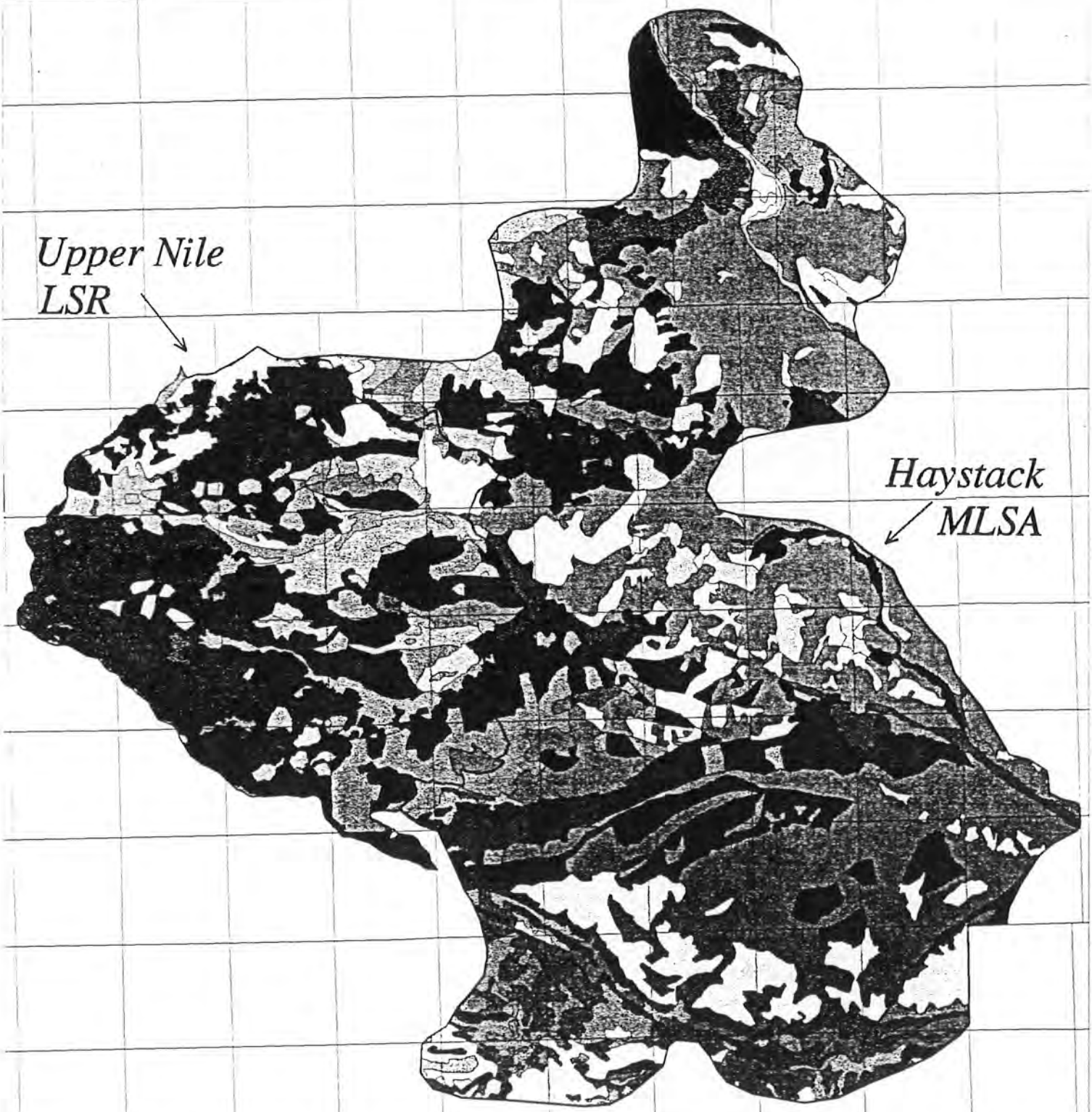
Analysis Module	Restoration Opportunity	Potential Projects	Schedule [1]
		Planning.	
	4) Retain whitebark pine acreage within the Upper Nile LSR.	4) prescribed fire.	C
Connectivity Within the LSR	1) Reduce road densities in riparian reserves to improve connectivity for low mobility species that use these areas.	1) Close roads in riparian reserves as identified in Access and Travel Management Planning, revegetate disturbed areas.	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 the following forest types. (**Dry Forest:** Vegetation Type #12 - Dense Successionally Advanced, #13 - Partial Cut; **Moist Grand Fir:** #32 - Layered/Mature, #33 - Partial Cut; **Mesic Western Hemlock:** #36 - Layered Mature, #37 - Partial Cut)[2]	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 owls for treatment of threshold acres.	A
	2) Minimize the extent of stand replacement fires within the LSR/MLSA.	2) Conduct activities that improve the effectiveness of the existing road system as fuelbreaks, focus on highway 410 corridor.	B
Spotted Owl	1) Protect 100 acre activity centers within the 11 Haystack/Upper Nile spotted owl circles.	1) Limit activities within activity centers from 3/1 to 8/31.	A
	2) Maintain 500 acres of nesting habitat within the 11 Haystack /Upper Nile spotted owl circles.	2) No Ground or vegetation disturbing activity in spotted owl nesting area, all are at or below minimums.	A
	3) Improve sustainability of dense stands (type 12) outside of 1.8 mile spotted owl circles but within the LSR/MLSA.	3) Use commercial thinning pruning and fuelwood collection.	A
	4) Improve sustainability of dense stands in spotted owl circles 806, 846, 879, and 883.	4) Use commercial thinning up to the following acreages within 1.8 mile spotted owl circles; 806-383 ac., 846-235 ac., 879-44 ac., and 883-194 ac.	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.	A
	6) Improve habitat quality in dense single story stands in spotted owl circles 814 and 866.	6) Utilize silvicultural activities that accelerate the development of multi-layered stands. Focus on single	C

Analysis Module	Restoration Opportunity	Potential Projects	Schedule [1]
		layered pole size stands in moist grand fir and wet forest groups.	
	7) Obtain information on spotted owl locations.	7) Survey areas to 1994 spotted owl protocol.	B
Aquatic	1) See goals listed in Aquatic section for Haystack/Upper Nile.	1) Coordinate projects with Mainstem Naches Watershed Assessment.	
Noxious Weed	1) Limit the extent and spread of centauria diffusa which occurs primarily along roadways in the Haystack MLSA and is less abundant in Upper Nile..	1) Consider treatments such as hand pulling and herbicides to limit extent and spread. Focus should be along highway 410, roads 1601, 1611, 1500, and 1502, and at the old Upper Nile mill site.	B
	2) Control or eradicate Linaria dalmatica where it occurs within Haystack/ Upper Nile	2) Use combination of treatments such as hand pulling, and spot herbicide application to eliminate these populations. Focus on highway 410, roads 1703, 1704, and 1705. and Cottonwood campground.	A
	3) Increase knowledge regarding noxious weed presence in Haystack and Upper Nile.	3) Survey LSR/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 1 year; (B) = within 3 years; (C) = within 5 years

[2] Refer to "LSR Vegetation Photo Mapping Key" in the Appendix for further information on vegetation types.

Vegetation in Haystack MLSA and Upper Nile LSR



04/23/96

Haystack Managed Late Successional Area and Upper Nile Late Successional Reserve

UNIQUE HABITATS

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

Map Scale: 1 inch = 0.737 miles

04/23/96

Haystack Managed Late Successional Area and Upper Nile Late Successional Reserve

SUITABLE SPOTTED OWL HABITAT

DRY Suitable Spotted Owl Habitat (N/R/F)

MESIC Suitable Spotted Owl Habitat (N/R/F)

WET Suitable Spotted Owl Habitat (N/R/F)

1.8 mile buffer around Spotted Owl Activity Centers

Spotted Owl Activity Centers

Late Successional Reserve Boundary and Managed Late Successional Area Boundary

04/23/96

Haystack Managed Late Successional Area and Upper Nile Late Successional Reserve

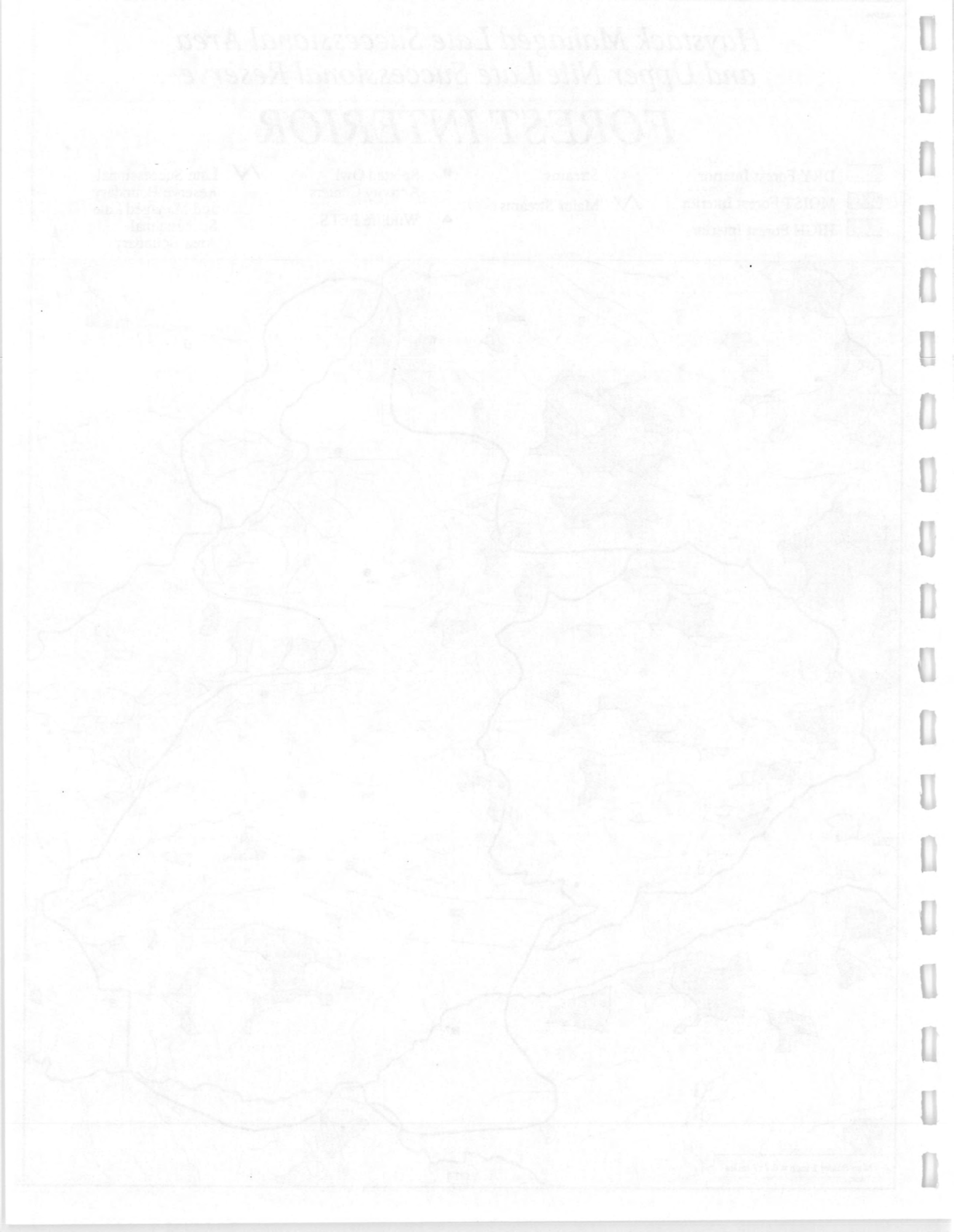
FOREST INTERIOR

DRY Forest Interior
MOIST Forest Interior
HIGH Forest Interior

Streams
Major Streams

Spotted Owl Activity Centers
Wildlife PETS

Late Successional Reserve Boundary and Managed Late Successional Area Boundary

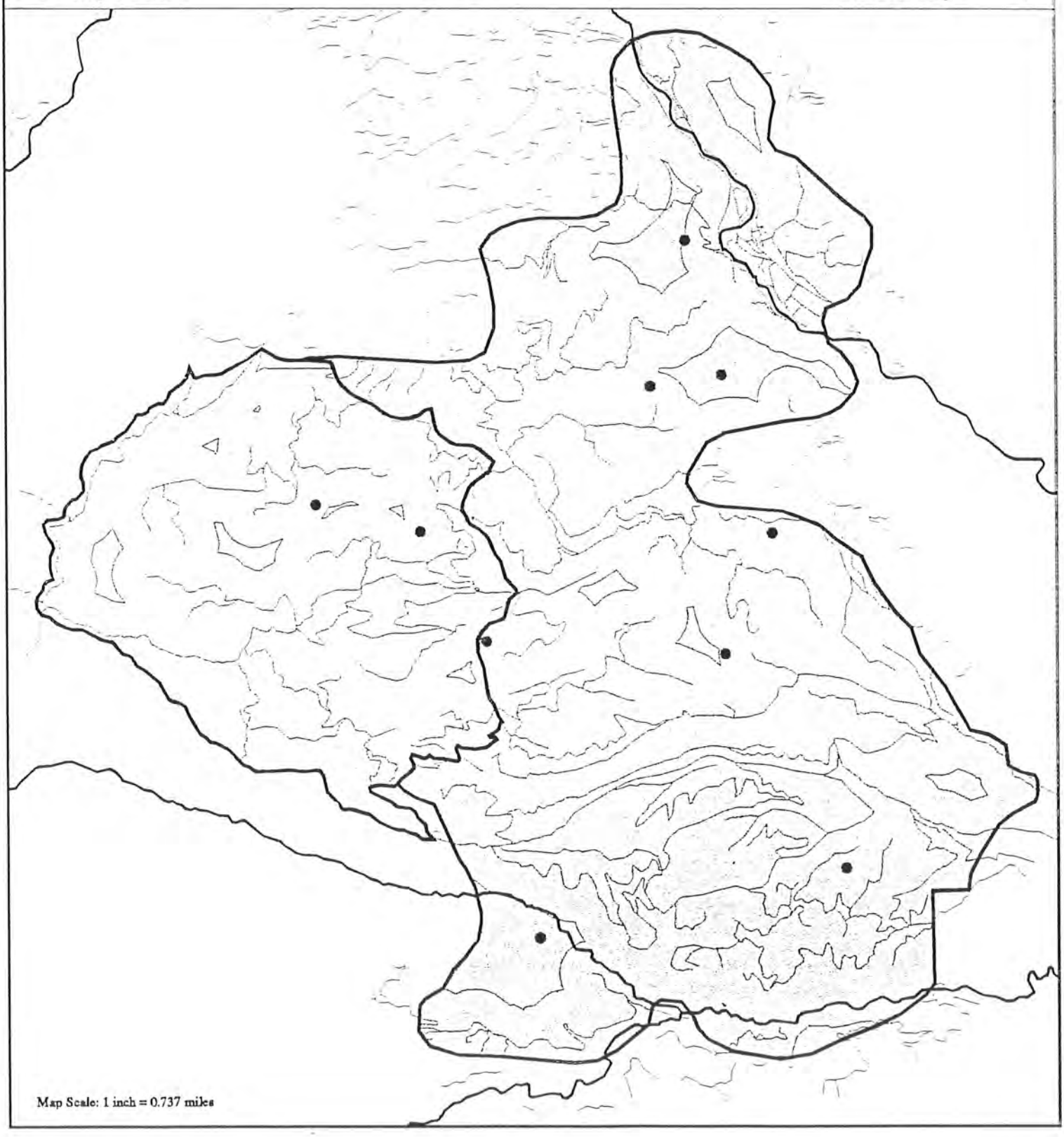


04/23/96

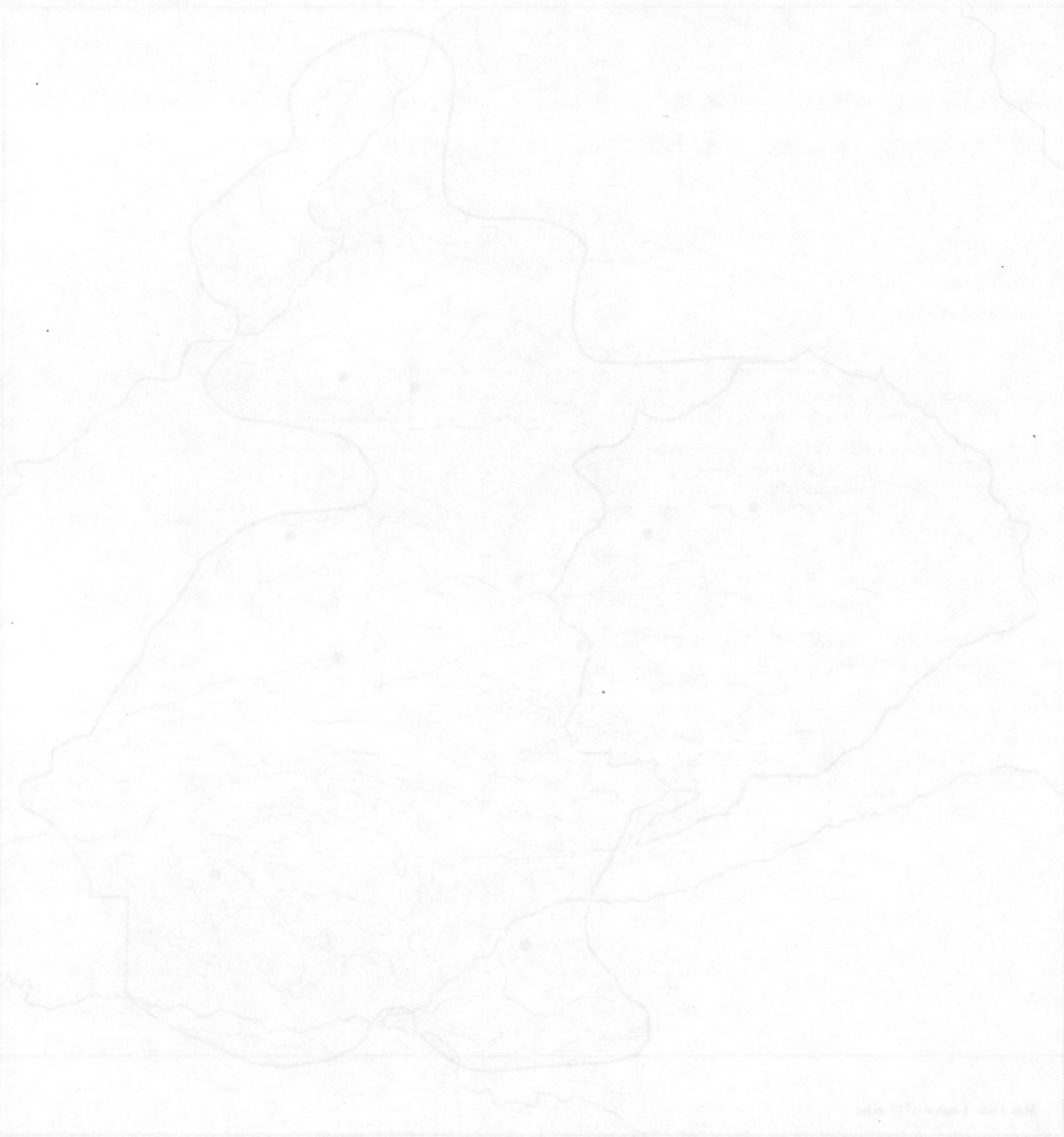
Haystack Managed Late Successional Area and Upper Nile Late Successional Reserve

SECURITY HABITAT

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



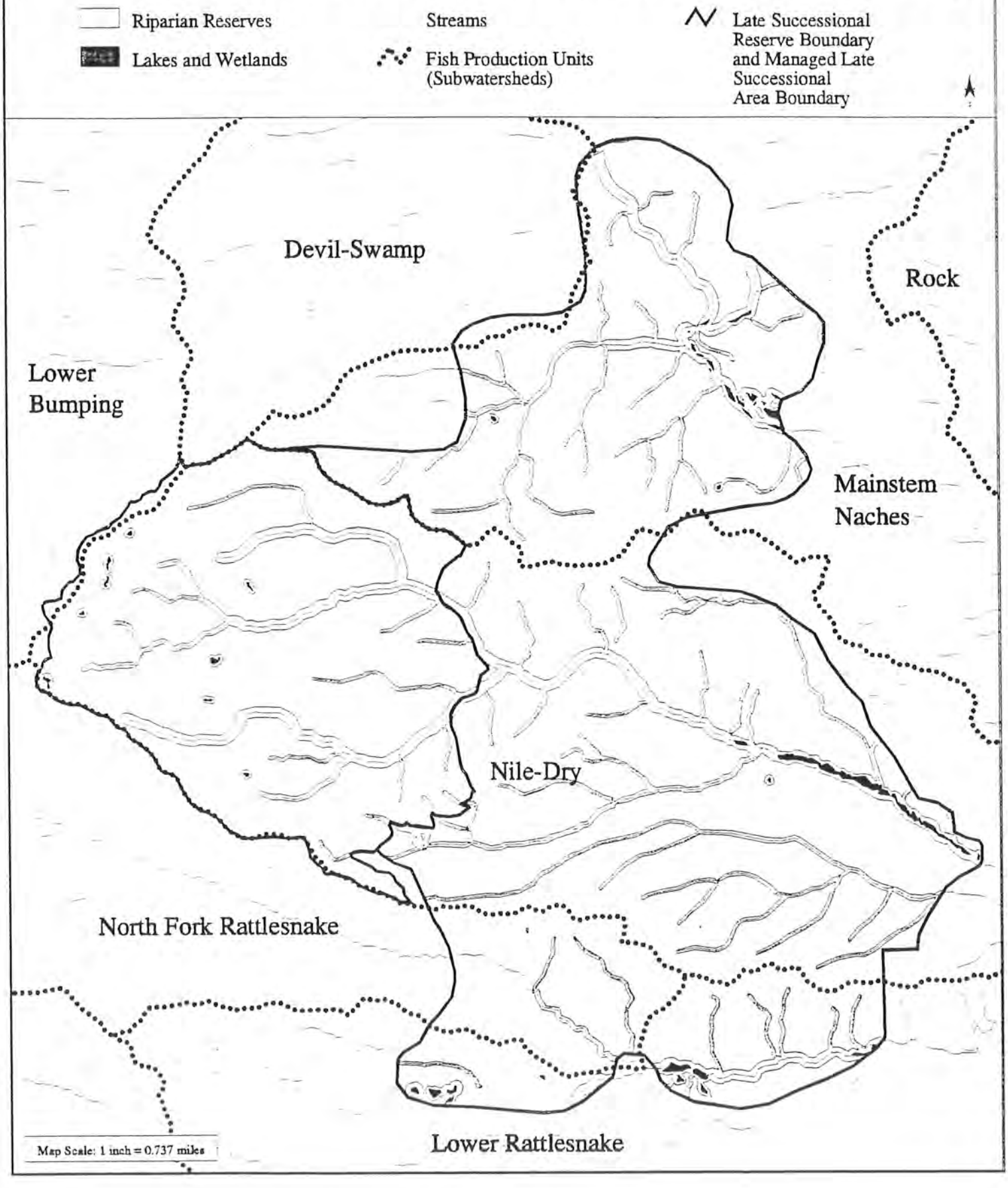
Map Scale: 1 inch = 0.737 miles

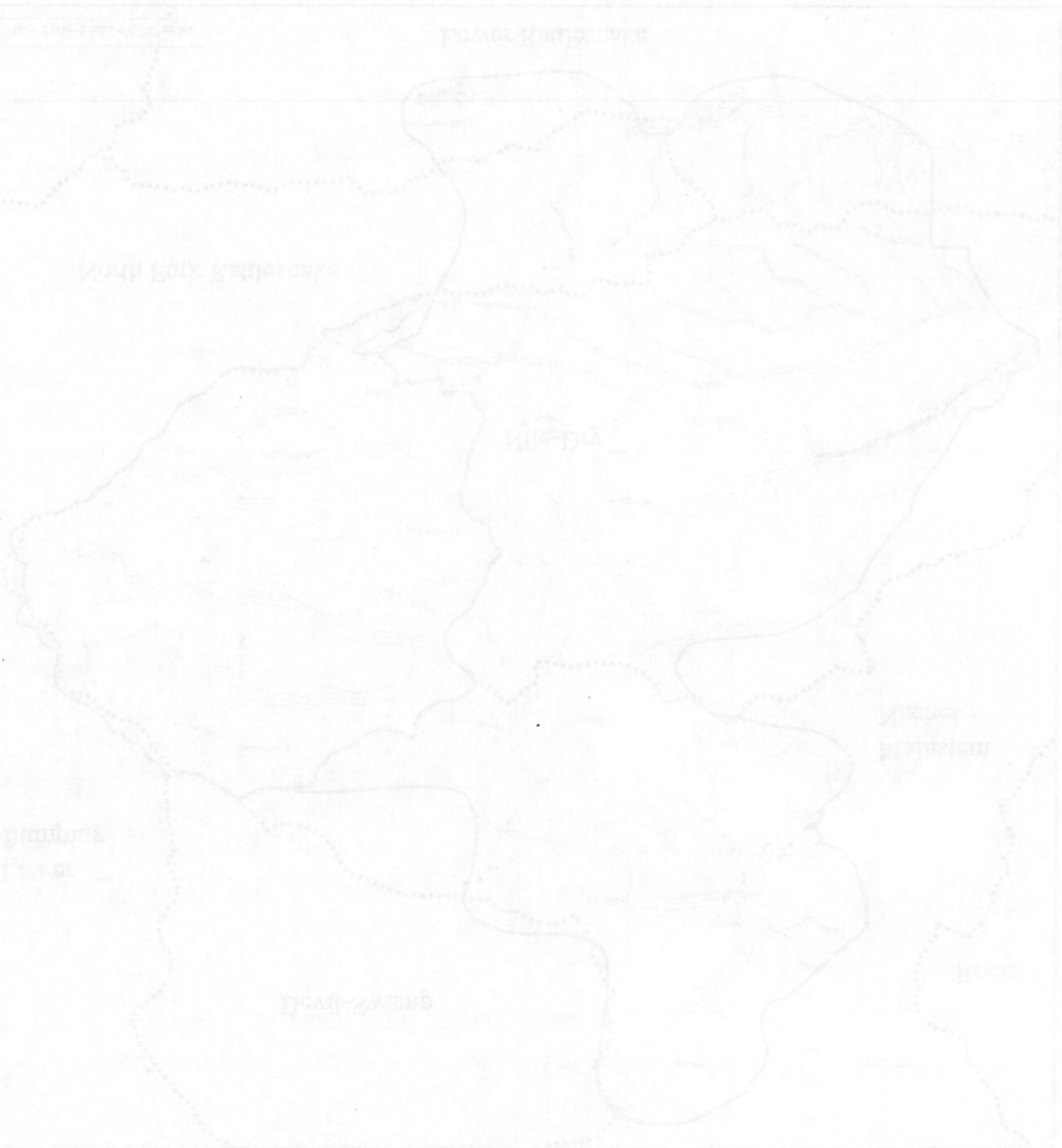


04/23/96

Haystack Managed Late Successional Area and Upper Nile Late Successional Reserve

FISH PRODUCTION UNITS (SUBWATERSHEDS)





X. Milk Creek MLSA

This individual chapter focuses on the Milk Creek MLSA. 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.

A. General Description of MLSA

1. Vegetation

This section describes the current condition of vegetation groups (see Vegetative Landscape section above) within the Milk Creek MLSA. Data was derived by aerial photo interpretation, stand exam information, and field validation (see Vegetative Landscape section above). 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 provided below regarding each vegetation group.

a) Dry Forest Group

Twenty percent (3,075 acres) of the Milk Creek MLSA consists of the dry forest group (Fig. ?). Within this group, 61 percent (1,866 acres) is mapped as high density and 36 percent (1,103 acres) as created openings (Appendix 5)

In the Milk Creek MLSA, the Douglas-fir series comprises approximately 10 percent of the dry forest group, with dry grand fir communities supported on the remaining 90 percent of the area. In a few limited sites, ponderosa pine exists as the sole overstory dominate, but more commonly is co-dominant with Douglas-fir and in some locations, grand fir. In the driest associations, shrub understory composition is dominated almost exclusively by *Purshia tridentata* (Naches Mainstem Watershed Assessment 1995, Little Naches Watershed Assessment 1994). Shrubs such as *Artemisia tridentata, Berberis aquifolium, Arctostaphylos nevadensis,* and *Phlox speciosa* may also occur as subordinate members of these communities. Grasses include *Agropyron spicatum, Calamagrostis rubescens,* and *Carex geyeri.* Forb composition is represented by *Balsamorhiza caryana, Achillea millefolium, Lupinus sulphureus,* and *Lomatium* spp. (Naches Mainstem Watershed Assessment 1995, Little Naches Watershed Assessment 1994).

b) Mesic Sites-

Mesic sites were only mapped on the northern portion of the Wenatchee National Forest. In contrast, on the southern portion of the forest, these mesic sites are replaced by moist grand fir plant associations (see Vegetative Landscape section above). In general, these sites occur on steep (>40% slope), northerly aspects and as stringer riparian areas within the dry forest group. This vegetation will be described in the following section.

c) Moist Grand Fir/Mesic Western Hemlock Vegetation Group

Approximately 69 percent (10,896 acres) of the Milk Creek MLSA supports moist grand fir or mesic western hemlock plant communities. The majority, or 87 percent (9,513 acres) of this forest group is currently mapped as layered and/or mature (mid- to late-successional). Created openings comprise approximately 11 percent (1,245 acres) of this group (Appendix 5).

Within this forest group, there is a moisture/temperature gradient which results in development of plant associations from dry, cool conditions adjacent the dry forest group to moist, cool adjacent the subalpine fir series. At the dry end of the moisture gradient, association are dominated in the understory by herbaceous species such as *Calamagrostis rubescens, Festuca occidentalis, Carex concinnoides, Carex geyeri, Arnica latifolia, Lupinus latifolius,* and *Arenaria macrophylla.* Moister associations typically include a shrub component typified by species such as *Spirea betulifolia, Rosa gymnocarpa, Vaccinium* spp., *Symphoricarpos albus, Linnaea borealis, Chimaphila umbellata, Ribes lassiococcus,* and *Pyrola* spp. Forb composition in moister plant associations is lush and includes diverse species including *Achlys triphylla, Clintonia uniflora, Adenocaulon bicolor, Smilacina stellata, Rubus parviflora* and *Trillium ovatum* (Wenatchee National Forest, Ecology Plot Database, Naches Mainstem Watershed Assessment, 1995, Little Naches Watershed Assessment 1994).

d) Subalpine Fir Series

The subalpine fir series is not supported within the Milk Creek MLSA except for 15 acres near Lily Pond Lake which is mapped as subalpine park-like. This vegetation group does occur extensively to the northeast of the Milk Creek MLSA.

e) Wet Forest Group

This vegetation group constitutes two percent (389 acres) of the Milk Creek MLSA. Eighty-nine percent (348 acres) of this group is mapped as riparian forest and is restricted, for the most part, to areas adjacent to the Bumping and Naches Rivers and along Milk Creek. Forty-one acres (11 percent) of this group is mapped as mountain hemlock and is located in the vicinity of Lily Pond Lake.

Riparian forest is represented by a diversity of species which may include in the overstory grand fir, western hemlock, Douglas-fir, western larch, western red cedar, and black cottonwood. The understory composition includes the above tree species and shrubs such as *Alnus incana, Cornus canadensis, Symphoricarpos albus.* Herb composition is often scarce but can vary to include species such as *Smilacina stellata, Achlys triphylla,* and *Equisetum hymale.*

In the mountain hemlock series, tree overstory composition is generally dominated by mountain hemlock, and subalpine fir. Lodgepole pine is commonly a subordinate associate. Undergrowth composition may vary from relatively lush and dense to scarce. Species representing the shrub component of these communities may include *Rhododendron albiflorum, Rubus lassiococcus, Vaccinium* spp., *Ribes viscosissimum, Pyrola* spp., *Lutkea pectinata and Xerophyllum tenax.* Representative herb composition includes *Luzula hitchcockii, Arnica latifolia, Achlys triphylla, Clintonia uniflora,* and *Polmonium pulcherrimum.*

f) Whitebark Pine/Subalpine Larch Group

No whitebark pine or subalpine larch series were mapped within the Milk Creek MLSA.

g) Non-Forest Vegetation Group

There are approximately 1,335 acres (9 percent) of non-forest vegetation in the Milk Creek MLSA. Included within this group are: talus (1,001 acres), wet meadow (114 acres), scree (72 acres), deciduous forest (60 acres), grassland/shrubland (33 acres), water (26 acres), dry meadow (15 acres), and bedrock (14 acres). Refer to the Forest-wide Overview discussion for descriptions of these vegetation types.

h) Species of Special Status

Within the Milk Creek MLSA, there is potentially suitable habitat for a number of species with special status. However, relatively few surveys have been conducted to determine presence or absence. Species with special status surveys should be carried out in conjunction with restoration projects, as well as, independently of other activities. It is important that species ranges are known so that accurate estimates of species viability can be assessed. In addition, little is known relative to the majority of species with special status habitat and biological requirements, and inventories provide a first and necessary step in obtaining this information.

There is one Forest Service sensitive (see Late-Successional Associated Plant Species) species within the Milk Creek MLSA (Appendix 7). *Cypripedium montanum* is documented from two locations. Based on it's occurrence on the Naches Ranger District, *C. montanum* appears to favor light disturbance such as low severity fire and light soil disturbance (Engle, personal observation).

i) Survey and Manage Species

There is one known survey and manage plant species within the Milk Creek MLSA. The lichen species, *Cyphelium inquinans* is known to be associated with western red cedar bark. Several additional species are suspected to occur, and the presence or absence of others is simply unknown (Appendix 7). The ROD provides standards and guidelines for survey and manage species, and should be referred to for management of these species within the Milk Creek MLSA.

Table 47, Sensitive and Survey and Manage Species in the Milk Creek MLSA

Group	Latin name	Common name	Federal *	State +	Forest Service ++	Presence **
VASCULAR PLANTS	*Agoseris elata*	tall agoseris		S		S
VASCULAR PLANTS	*Carex comosa*	bristly sedge		S		S
VASCULAR PLANTS	*Carex interrupta*	green-fruited sedge		M3		S
VASCULAR PLANTS	*Cryptogramma stelleri*	Steller's rockbrake		S		S
VASCULAR PLANTS	*Cypripedium montanum*	mountain ladyslipper			SM	K
VASCULAR PLANTS	*Githopsis specularioides*	common blue-cup		S		S
VASCULAR PLANTS	*Orobanche pinorum*	pine broomrape		S		K
VASCULAR PLANTS	*Spirannthes porrifolia*	western ladies-tresses		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

j) Noxious Weeds

Although systematic surveys have not been completed, portions of the Milk Creek MLSA have been surveyed for noxious weed species. Documentation of noxious weed species has resulted from roadside surveys (McRae and Harrod unpubl.) and various vegetative reconnaissance. High densities of *Centaurea diffusa,* are present along roads, particularly Highway 410 and Road 1900. *Linaria dalmatica* is present and abundant in the lowest elevations along Highway 410. *Senecio jacobae* is known from several locations in the Quartz Creek area and along Road 1900. *Cirsium vulare* and *C. arvense* are prevalent in areas with relatively recent ground disturbance. *Chrysanthemum leucanthemum, Hypericum perforatum, Verbascum thapsus, Convolvulus arvense,* and *Hypochaeris radiata* occur with relatively low frequency throughout the analysis area. Survey for species presence and extent should be completed in order to develop a noxious weed 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 Milk Creek 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, candidate, 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 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 species as shown in Appendix 7. The most extensive of these were for the Harlequin duck, northern spotted owl and barred owl. Surveys for these species have been conducted over 100% of their available habitat within the MLSA.

b) Late Successional Species By Habitat Type

(1) Dry Forests

About 3,075 acres (20%) of Milk Creek 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, 1,866 acres (61%)of the dry forest is in a successionally advanced condition. About 106 acres (3%) 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 have special status include: tailed frog, larch mountain salamander, northern goshawk, bald eagle, Van Dyke's salamander, flammulated owl, pileated woodpecker, hairy woodpecker, white-headed woodpecker, black-backed woodpecker, Williamson's sapsucker, northern flicker, 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) Mesic Sites Within the Dry Forest

The mesic sites within the Dry Forest group could only be mapped were not mapped. Mesic sites within the dry forests provide important wildlife habitat and add diversity across the landscape. It is suggested that these sites be identified during project level analysis and that the appropriate treatment criteria be applied.

Historically, fire occurred less frequently at these sites (refer to Chapter III) 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.

Wildlife species that occur in these habitats and are of special management status include: tailed frog, Van Dyke's salamander, 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, pygmy nuthatch, elk, long-legged myotis, long-eared myotis, fringed myotis, Yuma myotis, western big-eared bat, silver-haired bat, pallid bat, marten, and fisher.

These sites are capable of providing habitat structure that typically composes spotted owl nesting, roosting, foraging and dispersal habitat, while remaining within the historic range of variability.

(3) Moist Grand Fir Group/Mesic Western Hemlock

The Moist Grand Fir/Mesic Western Hemlock group covers about 10,896 acres (69%) of these areas. Historically, fire occurred less frequently than in the Dry and Mesic vegetation groups (refer to Chapter III), 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 on the WNF.

Currently, about 9,513 acres (87%) of this vegetation group that is in a late-successional condition. In the absence of any major disturbance, it is expected that in 100 years 10,758 acres (98%) of this habitat would be in a late-successional condition.

Wildlife species associated with the late-successional conditions of this vegetation group and are 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, Van Dyke's 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/Mesic Western Hemlock 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. Three (100%) of the spotted owl activity centers located within this LSR are located within this vegetation group or in the Wet Forest Group.

(4) Wet Forest Group

The Wet Forest Group covers about 389 acres (2%) of Milk Creek MLSA. 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 species that are associated with the late-successional conditions of these forests.

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, Van Dyke's 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. There are three spotted owl activity centers located within the Wet Forest and Moist Grand Fir/Mesic Western Hemlock groups. This is 100% of the total known activity centers within this MLSA.

(5) Subalpine Fir

Subalpine fir forests covered such a minor portion of this MLSA (15 acres) that is was not assessed.

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.

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 Milk Creek MLSA. 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 for spotted owls.

The bald eagle is known to occur within the Milk Creek MLSA. No surveys for bald eagles have been completed. Peregrine falcons are known to occur within the Milk Creek MLSA.

A total of three spotted owl activity centers occur within the Milk Creek MLSA and all of their habitat has been inventoried. There is 9133 acres (58%) of spotted owl habitat for nesting/roosting, and foraging habitat within the Milk MLSA. There is potential for 12,383 acres of N/R/F habitat. The estimated amount of habitat within a 1.8 mile radius of these activity centers is shown in Appendix 15. Currently, two of these activity centers are at threshold habitat levels and one is below.

The following tables display spotted owl information associated with the Milk Creek MLSA.

Table 48, Spotted Owl Information for the Milk Creek MLSA

Northern Spotted Owl	Status[3]	Ownership[4]	Dry or Wet Owl[5]	Threshold[6]	Critical Habitat Unit (CHU)	Forest Interior?[8]	Suitable Spotted Owl Habitat	Total Dispersal Habiat[9]
SO838	PY	FS	Wet	At Threshold			**3,787**	**387**
SO840	PY	FS	Wet	Below Threshold			**3,716**	**197**

Northern Spotted Owl	Status[3]	Ownership[4]	Dry or Wet Owl[5]	Threshold[6]	Critical Habitat Unit (CHU)	Forest Interior?[8]	Suitable Spotted Owl Habitat	Total Dispersal Habiat[9]
SO865	P	FS	Wet	At Threshold		Near	3,000	629

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

There are is one CHU slightly overlapping into the Milk MLSA, 35 acres from the Bumping WA15 CHU, there are no goals tied to this part of the CHU.

No class 1 grizzly bear observations have been made within the either of these areas, however, they are suspected to occur in the Milk Creek MLSA. Gray wolves are also suspected to occur but presence has not been confirmed. No surveys for either of these species have been completed.

There is no marbled murrelet habitat within the Milk MLSA.

e) Sensitive And Candidate Wildlife Species

There are 15 wildlife species that are on the R6 Sensitive Species list or are federal candidate species that could occur within the Milk Creek MLSA. 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 wolverine (*Gulo gulo*).

(1) Birds

The goshawk is known to occur in this MLSA, however, no surveys have been completed. The little willow flycatcher and olive-sided flycatcher are suspected to occur in the Milk Creek MLSA. No surveys have been completed for these species.

(2) Amphibians

Surveys for the tailed frog have been completed in about 10% of their habitat and they are known to occur in the Milk Creek MLSA. It is unknown if the spotted frog occurs, although, about 10% of their habitat has been surveyed. Cascades frogs are known to occur and surveys have been completed in 10% of their habitat.

(3) Mollusks

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

(4) Mammals

The long-legged myotis and long-eared myotis are known to occur in both of these areas. Surveys have been completed over <5% of their habitat. The fringed myotis and Yuma myotis are both unknown in these areas. Surveys have been completed over <5% of their habitat. The western big-eared bat is known to occur within the Milk Creek MLSA where 30% of their habitat has been surveyed.

No surveys for the lynx, wolverine or fisher have been completed. It is unknown if the lynx occurs in the Milk Creek MLSA. The fisher is known to occur and the wolverine is suspected to occur.

f) Management Indicator Species

There are 12 wildlife species that are listed as management indicator species that occur or could occur within the Swauk 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 (*Sphyrapicua ruber*), Williamson's sapsucker (*Sphyrapicua thyroideus*), northern flicker (*Colaptes auratus*), ruffed grouse (*Bonasa umbellus*), mule deer (*Odocoileus hemnionus*), elk (*Cervus elephus*), beaver (*Castor canadensis*), and marten (*Martes americana*).

(1) Primary Cavity Excavators

No surveys for primary cavity excavators have been completed within the Milk Creek MLSA. The pileated woodpecker, hairy woodpecker, red-breasted sapsucker, and northern flicker are known to occur in this area. The downy woodpecker, three-toed woodpecker, and Williamsons sapsucker are suspected to occur in the Milk Creek MLSA.

(2) Ruffed Grouse and Beaver

No surveys for the ruffed grouse or beaver have been completed. They are both known to occur within the Milk Creek MLSA.

(3) Mule Deer, Elk

Mule deer and elk are known to occur and no surveys have been completed.

(4) Marten

Marten are known to occur and no surveys have been completed.

g) Survey And Manage, Protection And Buffer Species

There are eight species that do or could occur within the Milk 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 (Prophysaon coeruleum), and papillose tail-dropper (Prophysaon dubium).

(1) Birds

It is unknown if the great gray owl occurs within the Milk Creek MLSA and no surveys have been completed. No surveys have been completed for the flammulated owl, however, they are known to occur. No surveys for the white-headed woodpecker, black-backed woodpecker, or pygmy nuthatch have been completed. These species are suspected to occur in the Milk Creek MLSA.

(2) Mollusks

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

(3) Amphibians

No surveys of the larch mountain salamander or the Van Dyke's salamander have been completed within the MLSA and it is unknown if they occur here.

h) Habitat Effectiveness

Habitat effectiveness was assessed using the current open road density and the amount of security habitat. The current open road density is 3.65 mi./sq.mi. in the Upper Nile LSR and is 5.04 mi./sq.mi. in the Haystack MLSA. The amount of security habitat is 2% in the Upper Nile LSR and 6% in the Haystack MLSA. Based upon these variables, the current level of habitat effectiveness for late-successional species in these areas is considered to be "low". This situation could be greatly improved through road obliterations identified during access and travel management planning.

3. Aquatic

The land within the Milk MLSA contains portions of 7 fish production units (FPU's). These FPU's are Mainstem Naches, Devil-Swamp, Milk, Lower Crow, Lower American Lower Bumping and Mainstem Little Naches. In Milk MLSA an estimated 2,482 acres (16%) of 15,711 acres are estimated to be within the Riparian Reserve. The average annual precipitation in Milk MLSA ranges between 35 and 60 inches. The "Land Type Associations" within the MLSA are described as having high deep seated failure hazard and or high moisture stress. Others have been described as having High sediment response and poor hydraulic regulation or well regulated hydraulic and high sediment response.

The Naches - Little Naches are key watersheds. The streams that drain from Milk MLSA include Devil, Swamp, Milk, Crow, West Quartz, Bumping River, American River, Little Naches River and Naches River.

4. Human Uses

a) Overview

Access to this MLSA is via Highway 410 which is open year-round. This highway is designated as the Mather Memorial Parkway which extends one half mile on either side of the highway. This designation reflects the area's importance for recreation use and travel.

b) Prehistoric and Historic Summary

There is a very high density of American Indian sites (the highest density on the Wenatchee National Forest) in this MLSA and the surrounding areas. These sites are especially prevalent along the main rivers and open ridgetops.

c) Recreation

(1) Developments

There are a number of campgrounds, picnic areas and other developed sites within this MLSA as detailed in the table below:

Table 49, Recreation Sites, Milk Creek MLSA

Site	No. of Units	Comments
Cedar Springs	15	
Crow Creek	15	Limited Development

Site	No. of Units	Comments
Indian Flat		Reservation site
Little Naches	17	
Sawmill Flat	27	
Kaner Flat	42	
Milk Pond		Picnic Area, Limited Development
Halfway Flat	12	Limited Development Site
American Forks	25	
Boulder Cave		Picnic Area and Nat. Rec. Trailhead, Popular Day Use Site

Dispersed camping (camping outside of identified campgrounds) occurs throughout the MLSA however it is more prevalent in areas adjacent to both water and roads, especially along Highway 410 and the American River.

(2) Trails

Table 50, Trails Within Milk Creek MLSA

Trail No. or Name	Miles	Type	Comments
961	2	Single Tread, Motorized	
Trail to Boulder Cave	.8	Hiker Only	Paved, Accessible, National Recreation Trail
River Trail at Boulder Cave	1	Hiker Only	Paved, Accessible
Trail 965	1	Single Tread, Motorized	

In addition to these trails an outfitter guide uses non-system trails south and west of Highway 410. There are no system four wheel drive trails within this MLSA.

(3) Other Recreation Activities

Elk and deer hunting are very popular activities. During the hunting season dispersed sites are occupied throughout the MLSA. Fishing, picnicking, driving for pleasure, and rock collecting are other popular activities.

During the winter season snowmobiling is a popular activity. There are sno-parks at Crow Creek, junction of 1708 and 410, and at Boulder Cave. Groomed routes use forest roads 1709, 1706 and 1708. Other routes may be groomed in addition to these.

Cross-country skiing is another popular winter use of this area. This occurs on the Boulder Cave Road, Old River Road (forest road 1704), and some on the snowmobile routes.

Christmas tree cutting is also a very popular activity. Much of this occurs out of the Boulder Cave Sno-Park and along the main forest roads that are still free of snow.

(4) Recreation Special Uses

The Milk Creek MLSA includes several summer home tracts along the Naches River and one tract along the Little Naches River. Camp Rogamunda is the only organization site within this MLSA. An outfitter guide has a special use permit to offer saddle rides in this area.

d) Mining

There are a few small mining claims along the Naches River and Little Naches River, these are primarily recreational, searching for gold.

e) Landownership

All of this MLSA is in federal ownership.

f) Roads

Most of this MLSA is roaded and accessible by car.

g) Social and Economic Considerations

Recreation is the primary use of this area.

B. Analysis Between LSR/MLSA's

1. Sustainability

The sustainability of LSR's/MLSA's across the forest is displayed in Table 19. The Milk Creek MLSA falls in the upper 1/3 of all LSR's/MLSA's in terms of the amount of at risk vegetation which puts it in the lower 1/3 in terms of overall sustainability. An important consideration in terms of sustainability is the relationship of the Milk Creek MLSA compared to its' neighboring LSR's/MLSA's. Three LSR's, (Manastash, Bumping and Upper Nile) and two MLSA's (Crow and Haystack) 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 Milk Creek and its five neighboring LSR's/MLSA's.

Table 51, Sustainability of Milk Creek MLSA (Acreage and Percent at Risk)

	LSR/MLSA at Risk		LS Forest at Risk		
LSR/MLSA	**Acres**	**Pct.**	**Acres**	**Pct.**	**Ignition Risk**
Milk Creek	11,432	73%	8,513	100%	Moderate
Manastash	38,858	37%	33,684	49%	Moderate
Crow	412	3%	412	4%	Moderate
Bumping	165	1%	165	2%	Moderate
Upper Nile	4,979	54%	4,589	73%	Moderate
Haystack	20,079	81%	16,154	100%	Moderate

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 Milk Creek 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 Milk Creek and Manastash, Haystack and Upper Nile, and only minor amounts between Milk Creek and Bumping and Crow.

This creates a situation where fire burning within or between Milk Creek and either the Manastash, Upper Nile or Haystack presents a risk to the others. The potential for a fire occurring with resultant effects on any combination of these four LSR/MLSA's at one time is very high, similar to what happened with the 1994 fires on the north end of the forest. The area of highest priority is that area between Milk Creek and both Nile and Haystack. These two LSR/MLSA's both lie downwind of Milk Creek and provide additional linkages of at risk vegetation to other LSR's further downwind (Rattlesnake and Russell Ridge.

a) Implications

1. Reduce stand density in dense dry successionally advanced vegetation types (types 12 and 22) where they exist between Milk Creek and either Manastash, Haystack or Upper Nile.

   Potential Projects - Commercial Thinning

2. 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.

3. Reduce fuel loadings in young stands.

   Potential Projects Precommercial thinning.

2. Northern Spotted Owl

The Milk Creek MLSA is not one of the "big 3" large population cluster/source center LSR's, for the recovery of the spotted owl. It is part of the smaller "local population" centers, which are linked to the metapopulations through dispersing individuals. The spotted owl is a Threatened species, with the recovery dependent on the implementation of the NWFP, especially in LSR/MLSA's (FSEIS Appendix G, Biological Opinion, 1994).

The objectives in the Milk Creek MLSA are similar to LSR's (to protect and enhance conditions of late successional and old growth forest ecosystems), however, MLSA's were identified for certain owl locations in drier provinces, where regular and frequent fires are a natural part of the ecosystem (NWFP A-4, C-23). The Milk Cr. MLSA is important for maintaining well distributed and well-connected spotted owl populations. 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 Bumping LSR, Manastash LSR, Crow MLSA, and the Haystack MLSA..

Habitat providing dispersal/connectivity corridors between LSR's (outside LSR/MLSA's) include: a small connection towards the William O. Douglas Wilderness to the west; Swamp Creek to Little Bald Mountain; Cliff Dale along the river; Milk Creek to Devil's Slide; South Fork Crow Creek; Willow Springs to Bumping; and Naches River. (see Forest Interior map). These connectivity corridors should be monitored for effectiveness, and should overlap into Riparian Reserves, unmapped LSR's, wilderness, etc.

3. Connectivity (Plant and Wildlife)

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 titled "Function of the LSR/MLSA Network." Connectivity specific to the Milk MLSA for vascular plants is analyzed from two perspectives here. Refer to forest overview discussions for connectivity description for lichens, bryophytes and fungi.

First, connectivity relative to the Milk MLSA can be viewed from how well habitat is connected to surrounding LSR's or MLSA's. Species and the habitats they're associated with are presented in Appendix 6. Firstly, connectivity between Milk MLSA and the Bumping LSR exists for all dispersal classes within the dry/mesic and moist grand fir vegetation groups.

Within the wet forest group, connectivity for species with moderate and high dispersal capabilities is only provided by vegetation which occurs outside of the MLSA and LSR. No connectivity exists for species with low dispersal capabilities. This situation is a consequence of the limited occurrence of the wet vegetation group and it's juxtaposition on the landscape. Subalpine fir and whitebark pine/subalpine larch are not present in both the MLSA and LSR and therefore a discussion of connectivity is not warranted.

Connectivity between the Milk and Crow MLSA's occurs for all dispersal classes in the dry/mesic, moist grand fir, and wet forest groups. No connectivity exists for any dispersal class for subalpine fir or whitebark pine/subalpine larch vegetation groups, as these groups are not present in the MLSA or LSR.

Relative to the Manastash LSR, no connectivity exists in the dry/mesic forest group for species with low dispersal capabilities. Species with moderate and high dispersal capabilities are dependent on dry/mesic vegetation between these two areas. The lack of, or dependency on, surrounding vegetation for connectivity in the dry/mesic vegetation is a function of the inherent landscape pattern associated with this vegetation type. Connectivity exists for all dispersal classes within the moist grand fir and wet forest groups. No connectivity exists within the subalpine fir series or whitebark pine/subalpine larch forest group as these groups are not present, or are extremely limited, in the Milk MLSA and Manastash LSR.

Regarding the Upper Nile LSR, connectivity for species with low and moderate dispersal capabilities within the dry/mesic forest group is dependent on vegetation which occurs outside the MLSA/LSR. Connectivity does exist for species with high dispersal capabilities. Again, the lack of connectivity in the dry/mesic vegetation type is a function of the inherent landscape pattern associated with this type. Relative to the moist grand fir forest group, species with low dispersal capabilities are dependent on vegetation occurring outside of the network. Connectivity in this forest group is provided for species with moderate and high dispersal capabilities. No connectivity exists in the wet and whitebark pine forest groups or subalpine fir series for any dispersal class as these groups are either extremely limited, or absent, from one or both of the areas.

Connectivity between the Milk and Haystack MLSA's exists for all dispersal classes in the dry/mesic and moist grand fir forest groups. The wet forest, whitebark pine/subalpine larch forest, and subalpine series are not present and therefore a discussion of connectivity is not applicable here.

In general, few opportunities to improve habitat connectivity for vascular plant species associated with a particular forest vegetation group were identified as a result of this analysis. In the dry/mesic vegetation group, the lack of connectiveness is primarily a result of inherent landscape patterns. In the moist grand fir vegetation group, maintenance of existing dispersal corridors and promotion of mature/late-successional vegetation may provide opportunities for improving connectivity.

b) Wildlife Connectivity

The following are the results of applying the forest wide connectivity module to the Milk Creek MLSA. A total of four potential linkages were assessed. These included Milk Creek to Manastash Ridge, Milk Creek to Crow, Milk Creek to Haystack, and Milk Creek to Bumping.

Table 52, Wildlife Connectivity, Milk Creek MLSA

Linkage	Distance (MI)	Low	Moderate	High	Index
MC/Manastash	0	Yes	Yes	Yes	3

R.					
MC/Crow	0.6	Yes	Yes	Yes	3
MC/Haystack	0.6	No	Yes	Yes	2
MC/Bumping	0.3	No	Yes	Yes	2
Overall Rating	2.5				

Restoration Opportunities
There may be an opportunity to enhance the linkage between Milk Creek and Bumping. The current rating has been given a 2 because of the road. However, the two areas are close enough to meet the criteria of a type 3 linkage. Further site specific analysis could be used to verify the current rating and determine if it could be managed as a 3.

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 Upper Nile LSR and the Haystack MLSA. See appendix for order, explanations and process of modules.

a) Forest-wide Overview of Unique Habitats and Species

Over all, this MLSA has a high quality of unique habitats and species for an MLSA. It has the only hibernicula of Townsend's western big-eared bat and cave sites, and has a high amount of talus and rock. It has the highest percentage of riparian reserves of any MLSA or LSR (16% or 2,482 acres). The Milk MLSA is in the transition zone for vegetation, and more disjunct forest species are found here, such as Alaska yellow cedar and Pacific yew. There are some sites used by American Indians, vision quest, cache sites, fishing and transportation. There is a fairly high number of wildlife species known to occur (42 spp) and plant species (28 species).

Snag concentrations and quality is lower. Road densities are very high especially in riparian reserves. Wilderness is not adjacent or surrounding this MLSA, so connectivity is not assured over time.

b) Unique Habitats and Species Within

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 Milk Creek MLSA these include: total open road density of 4.3 mi./sq. mi., security habitat of 2%, roads and trails in riparian reserves of 6.22 mi./sq. mi., and past harvest activities of>85% in the MLSA.

(1) Abundance and Ecological Diversity

Compared to all the other LSR/MLSA's, the Milk Cr. MLSA is moderate 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.

(2) Connectivity for Unique Habitats and Species

The Milk Cr. MLSA is moderate in 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.

(3) Process and Function of Unique Habitats and Species

The Milk Cr. MLSA is moderate in 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. American River to Little Bald Trail: forest interior, wetlands, riparian reserves, talus, caves, rock.
2. Lilly Pond Lake to Milk Creek: Riparian reserves, forest interior, talus/rock, PETS, meadows.
3. Naches River (Boulder Cave to Bumping river): natural openings, forest interior, PETS spp, wetlands, riparian reserves, talus, caves, deciduous.
4. Upper Milk Creek : wetlands, riparian reserves, forest interior,
5. Little Naches River to Kaner Flats and west: forest interior, talus/rock, riparian reserves, wetlands, deciduous..
6. Swamp Creek.

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.

(a) Unique Habitats And Species Milk Mlsa Module

Landscape Analysis:

No sites known for bioregion or RNAs.

Micro-site Analysis:

RIPARIAN RESERVES 16% of LSR	NON-FORESTED VEG 9% of LSR
Streams, Wet Meadows, Seeps, Lakes	Talus 7%, Aspen & Cottonwood, Meadows, Natural Openings.

SURVEY & MANAGE PROTECTION & BUFFER	UNIQUE FORESTS
Long-eared Myotis, Long-legged Myotis,	Forest Interior Patches 9%,
Fungi, Lichens, Plants Cymo	Dry Forests, Disjunct Cedar,
Larch Mt. Salamander?,	Snags/Logs Low Quality.
Black-backed & White-headed woodpecker, Flammulated Owl, Silver-haired Bat.	Whitebark pine,

PETS/MIS/Traditional Use Sites

PETS - Western Big-eared Bat, Peregrine Falcon, Fisher, Goshawk, Spotted Owl, Bald Eagle, Harlequin Duck, Tailed Frog, Cascade Frog.

Plants. *Orbanche pinorum*

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

Traditional Use Sites - Vision Quest in Talus

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

1. Reduce road and trail densities in riparian reserves.
2. Reduce open road densities throughout the LSR.
3. Increase amount of security habitat.
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 fire in ponderosa pine.
11. Reduce Fragmentation of Wet Forest.
12. Protect riparian from grazing.
13. Provide American Indian site access.
14. Maintain black-backed woodpecker nesting/roosting/foraging habitat.
15. Meet high end snag levels.
16. Create log den sites in low quality roaded/forest for marten, fisher, lynx.
17. Protect/maintain/enhance/monitor PETS.
18. Prescribed fire in natural openings as part of fire climax.
19. Interpret values and protection/maintenance of unique habitats and species, from high use road sites and recreation sites.
20. Aquire non-Forest System lands with high degree of unique species or habitat.
21. Habitat burns in Aspen. Fence/Recover Aspen From Grazing

d) 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. 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.

A landscape level approach was used to analyze snag, green tree recruitment, and downed wood habitat. The landscape approach reviews the quality of snag, down logs, and green tree recruitment for the LSRs. GIS and specific knowledge was used: including: forest vegetation types and acreages, amount of forest burned, percentage of past timber harvest (clearcuts and partial cuts), road densities, security habitat, Riparian Reserve acreages, pathogens, the number of spotted owl home ranges, forest interior amounts, and the percentage of late successional habitat. The qualitative analysis for the LSR/MLSA included green tree availability, short term and long term snag/log availability, burn intensity, site specific wildlife needs, land allocation goals, and the quality of refugia/security habitats.

e) Snag/Downed Log/Green Tree Recruitment

(1) Quality Rating

Each attribute for snag/downed log/green tree recruitment has a rating (see chart), a final rating incorporates all values towards one rating for the LSR/MLSA. Actual snag, downed log and green tree recruitment numbers, sizes, stages of decay and species is not practical to analysis on a landscape basis.This can also be done on a 40 acre grid, or sub-watershed basis. When data is available, incorporate actual availability data into the analysis. Snag and Downed Log levels are based on WNF Snag Levels, Fire Recover y Snag Levels, Everett et al Spotted owl and Snag studies, and wildlife needs. Qualitative ratings are based on habitat needs for snag, downed log, and recruitment tree wildlife and plant species needs. Species using these habitats include:

pileated woodpecker	spotted owl	hoary bat	marten & fisher	tailed frog
black-backed woodpecker	flammulated owl	silver-haired bat	flying squirrel	NW & PG salamander
white-headed woodpecker	great gray owl	big brown bat	lynx	lichens & fungi
olive-sided flycatcher V	Vaux's swift	voles, shrewmole	bald eagle	land snails

**** MILK MLSA SNAG ANALYSIS****

HIGH QUALITY	MEDIUM QUALITY	LOW QUALITY
Moist & Wet Veg Groups 71%	Subalpine Fir & Mesic Veg 0%	Dry & Whitebark 29%
>60% LS (non-dry) Habitat	15% - 60% LS Habitat 54%	<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 Int ND 9%
>10% Forest Interior Dry	5% - 9% Forest Interior Dry	< 5% Forest Int Dry 0%
>16% in Riparian Reserves 16%	10% to 16% in Riparian Reserves	<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 RR 6.22 mi/sq/mi
< 1 Mi/Sq Mi Open Roads	1 Mi to 2.5 Mi/Sq Mi Roads	> 2.5 Mi/Sq Mi Rds 4.3 mi/sq/mi
>70% Security Habitat	50% to 70% Security Habitat	<50% Security Hab 2%
>10% in Past Burns	--	<10% in Past Burns <10%
>50% Insect/Pathogens	25% - 50% Insect/Pathogens	< 25% Insect/Pathog (see Insect/Disease Write Up)
<10% Past CC Harvest	11% - 25% Past CC Harvest	>25% Past Ccs > 25%
<10% Past PC Harvest	11% - 50% Past PC Harvest	>50% Past PC 90%

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

Two species with special status were identified to occur within the Milk MLSA (Appendix ??). There are not immediate viability concerns associated with *Cypripedium montanum.* This is based on the relatively frequent occurrence of this species on the Naches Ranger District. Consequently, the Species with Special Status Module would recommend monitoring these species and subsequent development of a Conservation Strategy. Regarding the lichen species *Cyphelium inquinans,* very little information is available on the biology and ecology of this species. Documentation of this species from the Naches Ranger District suggests that this species is associated with various vegetation types and various substrates. Therefore, it is cautiously concluded that no immediate viability concerns exist for this species and monitoring and that development of a conservation strategy be completed for this species.

2. Connectivity (Plant and Wildlife)

a) Plant Connectivity

Connectivity can also be addressed by analyzing the connectedness of habitats or species populations *within* the MLSA/LSR. Within the Milk MLSA, most forest groups are relatively well connected. Disjunct species populations result from inherent breaks or openings in the landscape. At this time, information is not available to complete this type of analysis for survey and manage species within the Milk MLSA.

b) Wildlife Connectivity

The following are the results of applying the within MLSA Connectivity module.

Connectivity Variable	Dry	MGF/WH	Wet	Overall
%LS or Fire Climax	LS=L,FC=L	H	H	M
Open Road Density	L	L	L	L
Security Habitat	L	L	L	L
Interior Forest Roads	L	L	L	L
%Interior Forest	L	L	L	L

(1) Restoration Opportunities

The current level of open road density is 4.3 mi./sq.mi. and the amount of security habitat is 2%. The open road density within Riparian Reserves is 6.2 mi./sq.mi. The connectivity of habitats within the Milk Creek MLSA could be greatly improved through a reduction of the open road density and an increase in the level of security habitats. Priority areas for this to occur include within Riparian Reserves and interior forest patches. Road restoration could include road obliteration and revegetation to provide for suitable dispersal habitat for low mobility species.

Additional restoration opportunities includes fuels reduction and prescribed fire within the dense dry forests to improve connectivity of fire-climax associated species. Area within the Dry Forest and Moist Grand Fir/Western Hemlock vegetation groups that are currently in a created opening or single layered could be evaluated to determine if density management could occur to enhance the development of late-successional conditions.

(2) Habitat Effectiveness

Habitat effectiveness was assessed within the Milk Creek MLSA using the current open road density and the amount of security habitat. The current open road density is 4.3 mi./sq.mi. and the level of security habitat is 2%. Habitat effectiveness for late-successional associated species is currently considered to be "low". The long-term habitat effectiveness objective for LSR/MLSA is to manage towards a "high" level defined as <1mi./sq.mi. and >70% security habitat. These objectives could be integrated into access and travel management planning to improve the situation for these species.

3. Disturbance Risk Analysis

Twenty percent of the Milk Creek MLSA is in the dry forest group; of that, about half is successionally-advanced. With the exception of small amounts of wet forest and non-forested areas, the balance (69%) consists of moist grand fir or mesic western hemlock associations. The wet forest is concentrated along the riparian zones of the Bumping and Naches Rivers and Milk Creek. Three fourths of the grand fir and hemlock forests are successionally advanced, have entered multiple times for timber harvesting, and are heavily impacted by annosus root disease and, to a lesser extent, laminated root rot. It is literally possible to walk for miles within this MLSA and not leave a root disease pocket. Fuel levels are high, both in and outside the MLSA.

The Milk Creek MLSA is heavily roaded. There are ten developed campgrounds within the MLSA; recreational use is extremely heavy. A major highway across the crest of the Cascades bisects the Milk Creek MLSA. Human-caused ignitions along this highway are high, adding to the risk of fire. Fires originating within or outside the boundaries have the potential to destroy large portions of the MLSA.

The following information on insect activity in the Milk Creek MLSA is from data collected during the aerial surveys conducted by Region 6 Insect and Disease Group. Activity prior to 1980 was not available on the Forest at the time of this analysis. Light infestations or damage on less than 100 acres are not reported.

- Western pine beetle: 1986
- Mountain pine beetle (lodgepole pine): 1994
- Mountain pine beetle (w. white pine): 1981 (very heavy), 1983, 1986, 1988 (very heavy), 1993
- Mountain pine beetle (ponderosa pine): 1990
- Douglas-fir beetle: 1988
- Fir engraver: 1988-91 (very heavy)
- Spruce beetle: 1991
- Western spruce budworm: 1985
- Blackheaded budworm: 1985

Western white pine mortality associated with white pine blister rust and subsequent attack by mountain pine beetles is very high in this MLSA, as is grand fir mortality from the fir engraver. The former has the effect of changing species compositions and moving vegetation towards late successional stages by selectively eliminating a seral species. The latter 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 53, Disturbance Matrix, Milk Creek

Veg Type	Fire	Dwarf mistletoes			Root disease			WPBR	WSB	DFB	FE	Total
		DF	WL	WH	AROS	HEAN	PHWE					
10	M	M	L	-	M	M	M	-	L	L	L	M
11	M	M	L	-	M	M	M	-	M	L	L	M
12	H	H	L	-	M	M	H	-	H	H	H	H
13	H	H	L	-	H	H	H	-	H	M	H	H
30	M	M	M	L	M	M	M	H	L	L	L	M
31	M	M	M	L	M	M	M	H	L	L	L	M
32	H	H	H	L	L	H	H	H	M	M	H	H
33	H	H	H	L	M	H	H	H	M	M	H	H
34	M	L	L	L	L	M	M	H	L	L	L	M
36	H	L	L	L	L	H	H	H	L	L	M	H
37	H	L	L	L	L	H	H	H	L	L	M	H
43	L	-	L	L	L	L	L	H	L	-	L	L
62	M	L	L	L	L	L	L	H	L	L	L	M
64	M	L	L	L	M	M	M	H	L	L	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 = 0; "L" = low risk, "M" = moderate risk, "H" = high risk

Seventy-two percent of the Milk Creek MLSA has a high composite risk to disturbances. Areas at risk include the dense, dry forest types, the partially-harvested dry forests, and the layered mature and partially-harvested moist grand fir and mesic western hemlock forests. The moist grand fir and mesic hemlock types are at high risk both from adjacency to drier forests and because insect and, especially, pathogen activity has greatly increased fuel loads and vertical and horizontal fuel connectivity within these vegetation types.

Management objectives to reduce risk of habitat loss from catastrophic wildfires and insect or disease outbreaks include reducing stand density, altering species composition, and reducing vertical and horizontal fuel continuity. Fuelbreaks to protect spotted owl habitat in moist grand fir and mesic hemlock stands should be a priority within this MLSA. Thinning outside spotted owl circles within the dry forest is needed to protect spotted owl habitat from fire. Because root disease is a major problem within the MLSA, altering species composition to favor resistant species is necessary for long term sustainability. Breaking up below-ground continuity of host species root systems is required to reduce the impact of root decay organisms throughout the MLSA. Below-ground continuity of susceptible species can be reduced by allowing group selection harvests of fir and hemlock between 0.5 to 2 acres and regenerating with ponderosa pine and western larch.

Silvicultural and other options to attain management objectives stated above include thinning (PCT/CT); pruning; fuelwood collection; mechanical fuel treatments; handpiling fuels; prescribed fire; and favoring the seral, fire-resistant species such as ponderosa pine, and western larch.

4. Northern Spotted Owl

The following is the discussion and results of the within LSR Spotted Owl Module for the Milk MLSA. 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 Milk MLSA has 9133 acres (58%) of nesting/roosting/foraging habitat, of that 8800 acres are in the wetter vegetation type and have a high chance of sustainability. There is a potential for the MLSA to have 12,383 acres (79%) in suitable. The most contiguous (sustainable) suitable spotted owl habitat in the MLSA is in the headwaters of Milk Creek and Lilly Pond, and in the northwest portion of the MLSA. To meet the recovery goals for the spotted owl, there is a need to increase/accelerate spotted owl habitat, especially accelerating old plantations.

b) Spotted Owl Home Ranges

The Haystack MLSA will manage for risk over spotted owls, in that threshold acres (40% of the home range) will be managed for. A total of 3 spotted owl activity centers are known within this MLSA. Currently, 2 sites are above threshold, and one site is below in the 500 acre core.

The three owl sites are wet, and have a good chance of sustainability. See chart below for restoration needs. Owl SO840 has above threshold acreage, but the 500 acre core is below, this site should be field verified for acreage and monitored the site. 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 LSR. The drier forests will eventually be managed for other late-successional species.

Table 54, Suitable Spotted Owl Habitat, Haystack MLSA and Upper Nile LSR

	SUITABLE SPOTTED OWL HABITAT[10]											
	1.8 mile Circle Around Activity Center				0.7 mile Circle Around Activity Center				.33 mile Circle Around Activity Center[11]			
Spotted owl	Dry	Mes-ic	Wet	Total	Dry	Mes-ic	Wet	Total	Dry	Mesic	Wet	Total
SO838	46	0	3,741	**3,787**	0	0	621	**621**	0	0	162	**162 m**
SO840	212	0	3,503	**3,716**	85	0	393	**478**	15	0	123	**137 map**
SO865	194	0	2,806	**3,000**	9	0	595	**604**	3	0	147	**150 m**

[1] Near the LSR or MLSA but not inside the LSR or MLSA.
[2] This spotted owl is inside Haystack MLSA but is close to Upper Nile LSR.
[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 Milk MLSA is 1777 acres (11%). Habitat providing dispersal/Connectivity corridors within the LSR/MLSA is identified on the Forest Interior map and Suitable Spotted Owl Habitat Map.

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

Restoration activities could include the use of silvicultural practices to promote the development of suitable spotted owl habitat within currently non-suitable habitats. The risk of habitat loss due to disturbances could be reduced by lowering fuels in non-habitat or high risk suitable habitat. Habitat effectiveness and connectivity could be improved through road closures and revegetation of the road bed. This would be especially effective in the areas identified as forest interior.

1. Improve and accelerate N/R/F habitat, to maintain high number of spotted owl pairs.
    - 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.
2. Aggressive protection of remaining suitable spotted owl habitat, from outside LSR/MLSA, on Matrix lands.
3. Protect spotted owl home ranges within LSR/MLSA, between owl circles, by implementing risk reduction on first on non-suitable habitat, then on Dry and Mesic habitat:
4. Fuels reduction and hazard reduction occur outside N/R/F habitat in short term, shift emphasis in 50 years.
5. Monitor/maintain connectivity outside LSR.
6. Monitor spotted owl activity centers, 500 acre core and home ranges of owls below threshold or target acreage (see list).
7. Field verify habitat within 500 acre home ranges of spotted owl sites below threshold in that core, but above threshold in the home range.
8. Increase habitat effectiveness and connectivity by reducing open roads and revegeting road beds. Especially in forest interior habitat patches.
9. Maintain dispersal/connectivity habitat.
10. Acquire lands in Section 7.
11. Create small (1/4 to 2 acre) fuel breaks and fertilize.

5. Aquatic

a) Summary of Aquatic Goals

- Protect salmonid populations and habitat in core areas Mainstem Naches, Lower American, and Lower Bumping FPU's.

- Prevent increase in water temperature in Lower Bumping, Lower American and Mainstem Naches FPU's.
- Reduce water temperature in Naches drainage.
- Minimize fine sediment input.
- Increase LWD recruitment and riparian revegetation activities in upper end of the Mainstem Naches and lower part of Lower American FPU's.
- 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, management and recreational activities to increase base flows, and to avoid increase in peak flows in the Naches basins.
- Preserve and restore all floodplain, side channel, and riparian wetland habitat, especially in C and E channel types in the Naches 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 Milk MLSA. Within the Mainstem Naches is a core area for spring chinook salmon. In the Mainstem Naches, Lower Bumping, Lower American and Mainstem Little Naches populations of spring chinook salmon and bull trout are found.

2. Federal candidate species and other species of concern: bull trout populations in the Mainstem Naches and Mainstem Little Naches could be impacted by MLSA management activities.

3. Anadromous salmonid populations occur within and below Milk MLSA. Anadromous salmonids within the MLSA include: steelhead, early-run (spring) chinook salmon.

   Concerns include the lack of abundance of 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 MLSA. Cutthroat occur in substantial numbers.

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

5. Introduced species. Eastern Brook trout are known to occur in Devil-Swamp, **Nile-Dry**, Mainstem Little Naches, Lower Crow, Milk and Mainstem Naches FPU's.

   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 MLSA. There are locally recorded sightings of aquatic amphibians within the MLSA. No sightings have been recorded for aquatic mollusks. No systematic surveys for mollusks, nor amphibians have been undertaken in this MLSA.

7. Water temperature. Within the Naches River drainage, it is important to avoid any increase in water temperature, and to lower water temperatures where possible. Maximum temperature in the Naches mainstem are recorded as reaching 69.6 degrees F. These temperatures exceed forest plan standards (max. temperature 68 F, Wenatchee National Forest 1994 monitoring report) and likely lower the fitness of the Naches's anadromous populations. Maintaining water temperature at or below the current level may be important for maintenance of the resident salmonid populations.

   Maximum temperatures recorded during 1989-1994 temperature monitoring included some of the streams in the Milk MLSA area. Crow creek had 60-89 days/year where the temperature exceeded the Wenatchee Forest Plan temperature standard; temperatures reached between 65 and 69.9 degrees F. Other data from the maximum/minimum thermometer monitoring showed Devil creek 56, Swamp creek 57, Tributary to Milk Pond 60, upper Milk creek and lower Milk Creek at 61 degrees F. respectively.

   Managing for lower water temperatures in the MLSA 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 steam 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 at least common 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 MLSA. No fine sediment data is available within Milk MLSA.

   Sediment transport. Milk MLSA lie primarily in a region of sediment input and transport; the mainstem Naches below Milk MLSA has a wider floodplain at some sites and can act as a region of sediment deposition. Fine sediment data is only available for the American River and portions of the Little Naches River, which are tributaries to the Naches. Fine sediments in the three tributaries of the Little Naches were sampled and had moderate to high concentrations of fine sediment. The American River is within Wenatchee Forest Plan standards all twelve samples.

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.

The Naches River receives the majority of LWD from upstream. The 1992 stream survey reported a deficiency of LWD in the Naches River for the section surveyed. Approximately half of the amount needed to meet Wenatchee Forest Plan standards was found. The above levels of LWD were influenced by in-channel removal of LWD following the flood of December 1977. During 1979 inchannel LWD was removed from the upper portion of the Naches Mainstem and burned on gravel bars. Some additional loss of inchannel LWD occurred as a result of firewood gathering. Normal channel actions of the river moving in its floodplain have improved the condition especially during 1995 and 1996.

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 Milk MLSA at this time; however we can be aware of it when managing any of the above inter-related factors.

11. *Landtype. Milk MLSA includes landtypes C, F, G and J (see Landtype Association Response Map)*

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 Milk MLSA 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. Floods have been a concern in the Naches basin, particularly where humans have build roads, residences and other improvements within the floodplain. The rain on snow floods of 1995/96 caused much damage to homes and other developments. 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.

    Peak and low flows in the Mainstem Naches FPU have been modified by the influences of the Bumping Dam, that is upstream of the MLSA area.

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 withdrawals. Because of regulation of water upstream at Bumping dam and water withdrawn from the Naches during the summer for agriculture there is a potential for lower base flows, increasing water temperatures and fine sediment levels at key times and places for anadromous spawning, other management in the basin that impacts base flow, fine sediment, and water temperature, takes on heightened significance. The Bureau of Reclamation regulates the spill of water from both Bumping and Rimrock Dams and they adjust the flow rate to meet a variety of need. Flow amount in the Naches and Tieton rivers can vary by the day.

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 6.22 miles per square mile in Milk MLSA. The Riparian Reserves are estimated as 2,482 acres (16%) of the 15,711 acres within Milk MLSA.

    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 returns 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 lightening strike patterns), and landtype interact

    The Mainstem Naches and Wenas Watershed Assessment of 1995 assessed timber harvest in the riparian zone as having harvested 2.62 miles of stream bank in Devil-Swamp FPU, 8.03 miles in Mainstem Naches FPU's respectively.

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 Mainstem Naches is privately owned. Habitat improvement projects on National Forest land have been constructed to create offchannel habitat have been successful in the recent past. Within the MLSA some of the floodplain area has been altered, see discussion of timber harvest within the riparian zone and riparian roading above.

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

    In the Naches basin a high priority may be upslope and riparian hydrologic management to prevent disturbances from impacting human resources through flooding.

The MLSA 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 MLSA network has the potential to strengthen viability of these at-risk aquatic populations.

6. Noxious Weeds

Ten noxious weed species were identified to occur within the Milk MLSA. These species are discussed in priority order as identified on the noxious weed analysis module. No Class A weeds are

presently documented from this area. Class B-designate species include: *Linaria dalmatica, Senecio jacobae, Hypochaeris radicata* and *Chrysanthemum leucanthemum. Linaria dalmatica* is widespread within the Milk MLSA, particularly within the dry vegetation group. Infestation of this species is most severe on private lands within the MLSA. Furthermore, several main travel routes and summer home areas have been invaded, as well. Following through the noxious weed analysis (Appendix 1), control/eradication efforts for this species should focus on roadways, specifically, Highway 410 and Roads 1706 and 1709. The area in the vicinity of Boulder Cave and Camp Roganunda, are also areas considered for priority treatment. Cliffdell summer home group is also an area with a high priority for treatment. *Senecio jacobae* is limited in it's occurrence, found in small isolated pockets along Roads 1900, 1901 and 1903. Control measures for this species, such as hand pulling and biological control, should continue as this strategy has been relatively successful in the past. *Hypochaeris radicata* is also limited in it's occurrence, generally associated with road shoulders at mid to high elevations where moisture is not limiting. A combination of hand pulling and herbicide spraying is recommended for control/eradication of this species. *Chrysanthemum luecanthemum* is known to occur as isolated patches in open areas and along roadways. Control efforts for this species should focus on activities such as hand pulling, herbicides, or a combination of these methods.

Centaurea diffusa was the only Class B weed identified, and would therefore be considered as second priority for treatment. *Centaurea diffusa* is widespread in the Milk MLSA. It occurs primarily along roadways and in waste places. Containment and prevention of further spread of this species should focus on major travelways such as Highway 410 and Roads 1706, 1709 and 1900.

Five Class C weeds were identified in the Milk MLSA. *Cirsium vulgare* and *C. arvense* are widespread and are documented from areas with recent ground disturbance, primarily areas previously harvested and/or heavily grazed by domestic livestock and wildlife. Containment and further spread of these species should focus on areas such as Devil Creek and Milk Creek. *Hypericum perfoliatum*, *Verbascum thapsus*, and *Convolvulus arvense* are all limited in their occurrence, found as small isolated populations. Handpulling and spot herbicide spraying, or a combination of these methods should be used.

7. Fire Management Plan

a) Overview

This plan is intended to provide guidance for the management of fire in the Milk Creek MLSA. It is intended to supplement the Fire Management Plan for the Late Successional Reserve System and will become a portion of 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 this plan. It is the intent of this plan to provide adequate protection of the reserve to allow management practices to be initiated which will provide for the protection of the Late Successional Associated species and associated unique habitats. These management actions are expected to include actions which will include the role of fire disturbance as an important process in the reserve.

b) Fire Prevention Actions

The following actions are site specific for the Milk Creek MLSA. They are intended to supplement the actions which will be implemented on a Forest wide basis.

1. Continue to implement campfire restrictions as warranted by increased fire danger.
2. Utilize educational opportunities at Boulder Cave and the East Portal Site
3. Initiate hazard reduction around developed and dispersed recreation sites and organizational camps such as:

Kaner Flat	Crow Creek	American Forks
Cedar Springs	Indian Flat	Halfway Flat

Sawmill Flat	Little Naches	Milk Pond
Boulder Cave	Pine Springs	Camp Roganunda

1. Emphasize fire prevention activities along major loop roads and high use dispersed sites such as Highway 410, FS Road 1900, FS Road 1707 - 1708, and FS Road 1709 - 1706.
2. Continue and improve fire prevention signing program on roads and trails included or adjacent to the MLSA. Coordinate with entire district signing program.
3. Make public user education geared to fire danger an emphasis item
4. Implement road restrictions and closures as warranted during periods of extreme fire danger.
5. Emphasize contact with the following special interest groups: ORV groups, summer home groups, organization camps, local user groups, grazing permittees, and other special use permittees.
6. As a hazard reduction measure emphasize fuel wood collection around recreation use sites in the dry forest type.
7. Maintain cooperative fire prevention efforts with Yakima County Fire Prevention Association, the local Nile - Cliffdale Fire District, and DNR.

c) Pre-fire Protection for Fires Originating Outside the MLSA

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

1. Complete pre-attack planning process for MLSA; utilize natural fuel breaks
2. Stress prevention of fires outside MLSA boundaries
3. Strategic fuel manipulation to reduce size and intensity of fires within and adjacent to MLSA boundaries

   e.g. fuel breaks - tie together existing fuel treatment areas utilizing natural openings, roads, ridgetops, etc. Priority areas are the ridge between Milk Creek and Quartz Creek; and the ridge between Devil Creek and the Bumping River.
4. Maintain existing pre-attack facilities (water chances) and seek opportunities for more, including helispot locations.

d) Fire Detection

1. Staffing of Clemans L.O. and aerial detection after lightning episodes will provide the primary detection resource for this MLSA.
2. This will be supplemented by emergency staffing at Little Bald and Kaner Overview during and after lightning episodes.
3. Seek opportunities for fuelbreaks and fuel management areas around summer homes within the MLSA boundary (Naches River corridor).
4. Work with the local residents, users, campground concessionaires, cooperators, and the state DOT on education of how to report fires.

e) 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. 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, recognizing the fluctuation in funding levels and the ability to meet the objectives.
3. Tactical suppression activities will take into consideration specific resource values such as the protection of riparian areas and private land from fires.
4. Improvements will be a priority for protection (summer homes, recreation facilities, Sawmill RAWS, etc.)
5. Pre-planned dispatch cards for initial attack will be prepared for the MLSA area
6. The FSA and Escaped Fire Situation Analysis process will be used to guide initial attack, Extended Attack, and large fire-suppression. Utilize pre-attack plans and materials.
7. Protect known threatened and endangered species habitat from fire (botanical).
8. Fire suppression actions will be implemented on an inter-agency basis as appropriate.

f) Vegetation and Fuels Management

1. Returning dry forest types to sustainable conditions is a priority
2. Suggested activities include pruning, thinning, commercial and pre-commercial thinning, wood gathering, mechanical treatments, 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. Maintain a mosaic of age classes and structural conditions across the landscape outside dry forest to support species associated with late-successional forest

g) Prescribed Fires Opportunities

1. Recognize the use of prescribed fire as a primary management tool in this MSLA.
2. The development and subsequent implementation of prescribed fire plans should be on a landscape level both within and adjacent to the MLSA
3. Priorities for the use of prescribed fire are dry site ecosystems including dry meadows and steppe vegetation
4. Priority outcomes are hazard reduction and vegetation manipulation throughout the MLSA
5. To return landscapes to synchrony with inherent disturbance regimes, peruse opportunities to implement prescribed fire projects in a timely and economical manner
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)

h) Summary:

Fire prevention, 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 55, Restoration Opportunities and Potential Projects, Milk Creek MLSA

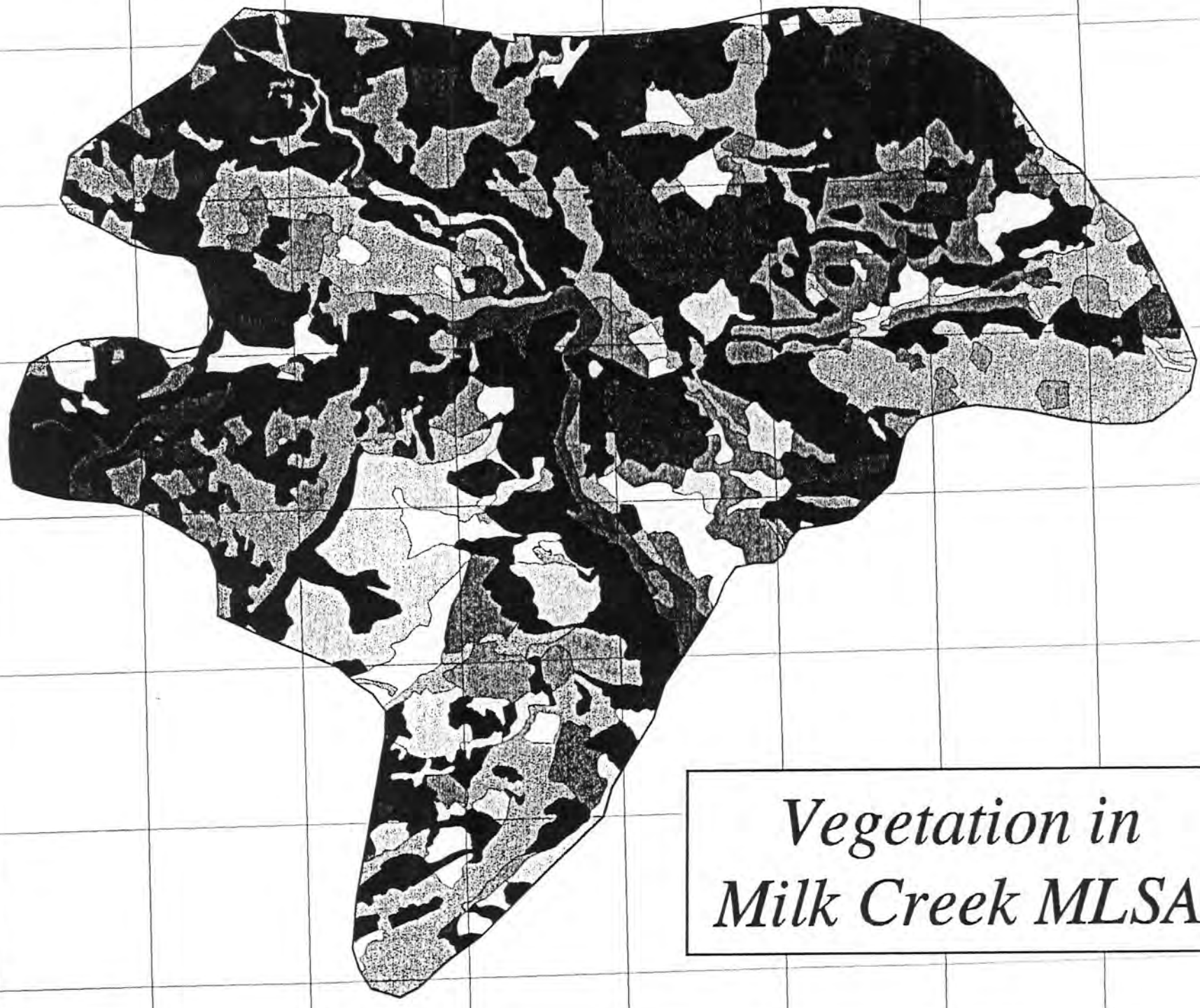
Analysis Module	Restoration Opportunity	Potential Projects	Sched-ule[1]
Forest-Wide Sustain-ability	1) Reduce fuel loading and stocking levels in dense successionally advanced dry forest stands where they exist between Milk Creek and either Haystack/Upper Nile or Manastash.	1) Use commercial thinning, 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) Reduce fuel loadings along roads that exist between these LSR's to increase the roads effectiveness as a fuelbreak.	2) Piling of down fuels, firewood gathering, pruning to reduce vertical fuel continuity, construction of shaded fuelbreaks.	B
	3) Reduce fuel loadings in young stands.	3) Precommercial thinning	C
Forest-Wide Spotted owl	Not Applicable		
Forest-Wide Connec-tivity	1) Verify linkage between Milk Creek and bumping for low mobility species.	2) Do site specific analysis to determine if Bumping road is affecting species movement and if anything can be done.	C
Unique Habitats and Species	1) Reduce road densities in riparian reserves and in talus areas.	Close or relocate roads as opportunities are identified in Access and Travel Management Planning.	A
	2) Maintain existing subalpine meadows.	2) Remove encroaching conifers from meadows.	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.	A
	4) Accelerate the development of late successional forest.	4) Use commercial thinning to accelerate the development of layered stands as described in disturbance module treatment key.	C
	5) Verify the viability of Cypripedium montanum within the MLSA	5) Monitor known sites and develop conservation strategy for this species.	B
Connec-tivity Within the LSR	1) Reduce road densities in riparian reserves to improve connectivity for low mobility species that use these areas.	1) Close roads in riparian reserves as identified in Access and Travel Management Planning, revegetate disturbed areas.	A

Analysis Module	Restoration Opportunity	Potential Projects	Sched-ule[1]
Distur-bance	1) Reduce the risk of habitat loss to wildfire by reducing stand density, altering species composition and reducing vertical and horizontal fuel continuity in the following forest types. (**Dry Forest:** Vegetation Type #12 - Dense Successionally Advanced, #13 - Partial Cut; **Moist Grand Fir:** #32 - Layered/Mature, #33 - Partial Cut; **Mesic Western Hemlock:** #36 - Layered Mature, #37 - Partial Cut)[2]	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 4 under spotted owls for treatment of threshold acres.	A
	2) Minimize the extent of stand replacement fires within the MLSA.	2) Conduct activities that improve the effectiveness of the existing road system as fuelbreaks, focus on highway 410 corridor.	B
Spotted Owl	1) Protect 100 acre activity centers within the three Milk Creek spotted owl circles.	1) Limit activities within activity center from 3/1 to 8/31.	A
	2) Maintain 500 acres of nesting habitat within the three Milk Creek spotted owl core areas.	2) No Ground or vegetation disturbing activity in spotted owl 504 core area.	A
	3) Improve sustainability of dense dry forest (type 12) outside of 1.8 mile spotted owl circles, but within the MLSA.	3) Use commercial thinning, pruning and fuelwood collection..	C
	4) 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)	4) Utilize commercial thinning, pruning and fuelwood collection.	A
	5) Improve habitat quality in dense single story stands in spotted owl circles 838, 840, and 865	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.	A
	6) Obtain information on spotted owl locations.	6) Survey areas to 1994 spotted owl protocol.	B
Aquatic	1) See goals listed in Aquatic section for Milk Creek.	1) Coordinate projects with Little Naches and Mainstem Naches Watershed Assessments.	
Noxious Weed	1) Limit the extent and spread of centauria diffusa which occurs primarily along roadways in the	1) Consider treatments such as hand pulling and herbicides to limit extent and spread. Focus should be along	B

Analysis Module	Restoration Opportunity	Potential Projects	Sched-ule[1]
	Milk Creek MLSA.	highway 410, roads 1706, 1709, and 1900.	
	2) Control or eradicate Linaria dalmatica where it occurs within the Milk creek MLSA.	2) Use combination of treatments such as hand pulling, and spot herbicide application to eliminate these populations. Focus on highway 410, roads 1706, and 1709. and the vicinity of Boulder Cave and camp Roganunda.	A
	3) Increase knowledge regarding noxious weed presence in Milk Creek MLSA.	3) 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 1 year; (B) = within 3 years; (C) = within 5 years

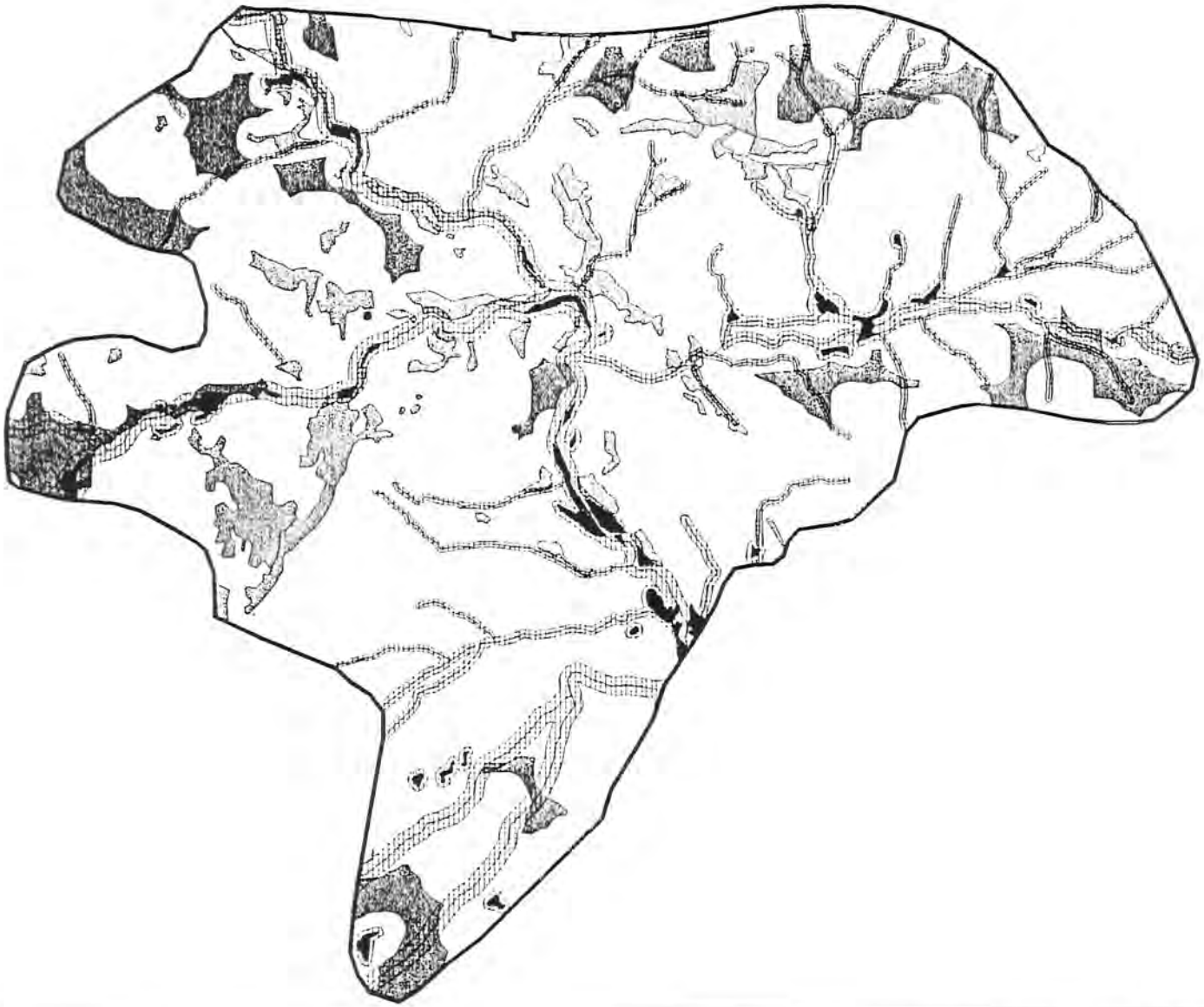
2 Refer to "LSR Vegetation Photo Mapping Key" in the Appendix for information on Vegetation types.



Vegetation in Milk Creek MLSA

Milk Creek Managed Late Successional Area

UNIQUE HABITATS



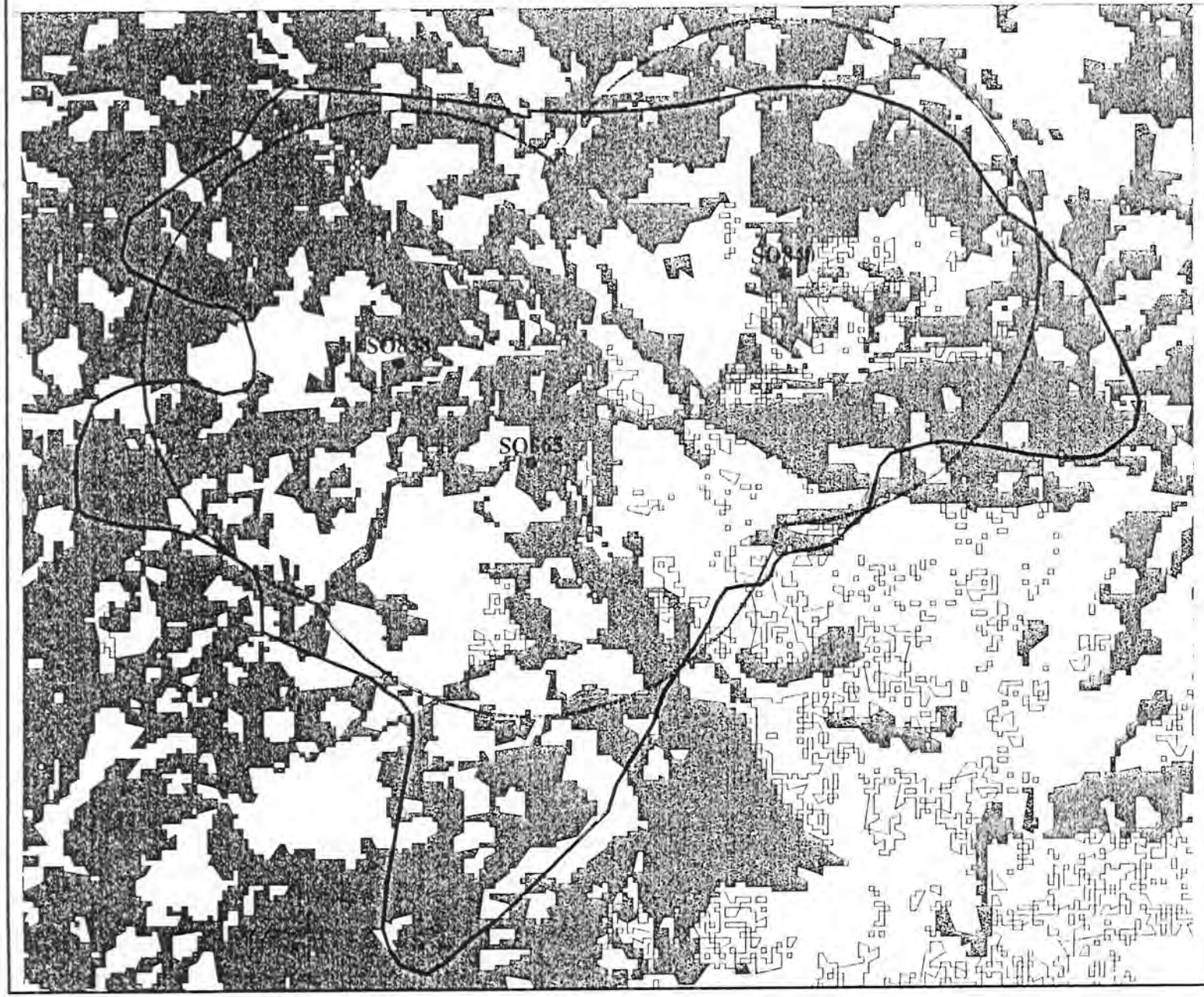
- Large Forest Interior Patches
- Whitebark Pine
- Talus, Scree, Bedrock, Cliff
- Meadows
- Natural Opening
- Shrub
- Deciduous Forest
- Wenatchee Forest Plan Allocations RN1, SI1, SI2
- Riparian Reserves
- Lakes and Wetlands
- Streams
- Spotted Owl Activity Centers
- Wildlife PETS
- Managed Late Successional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

Map Scale: 1 inch = 0.946 miles

04/24/96

Milk Creek Managed Late Successional Area

SUITABLE SPOTTED OWL HABITAT



DRY Suitable Spotted Owl Habitat (N/R/F)

MESIC Suitable Spotted Owl Habitat (N/R/F)

WET Suitable Spotted Owl Habitat (N/R/F)

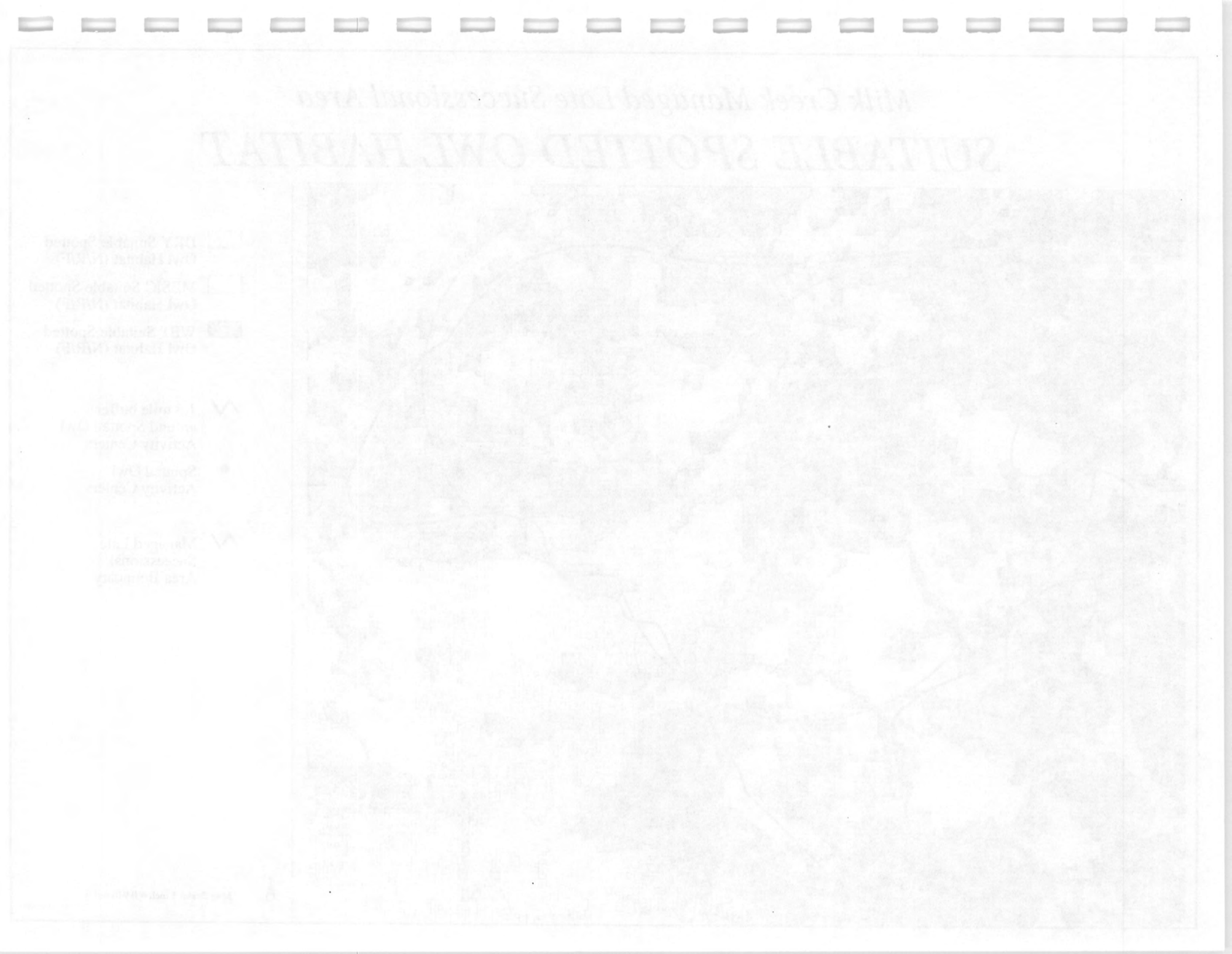
1.8 mile buffer around Spotted Owl Activity Centers

Spotted Owl Activity Centers

Managed Late Successional Area Boundary

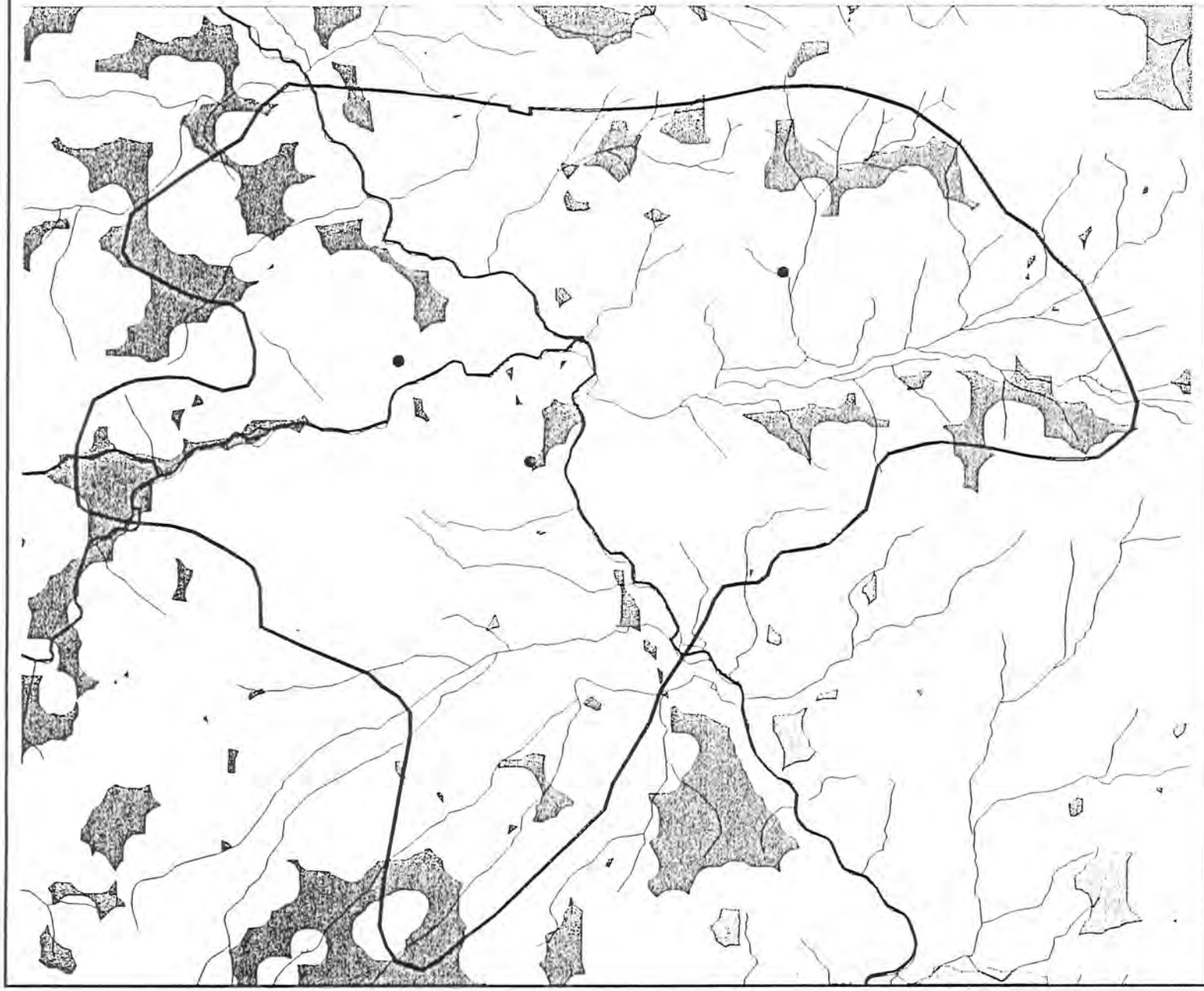
Map Scale: 1 inch = 0.946 miles

04/24/96



Milk Creek Managed Late Successional Area

FOREST INTERIOR



DRY Forest Interior

MOIST Forest Interior

HIGH Forest Interior

Streams

Major Streams

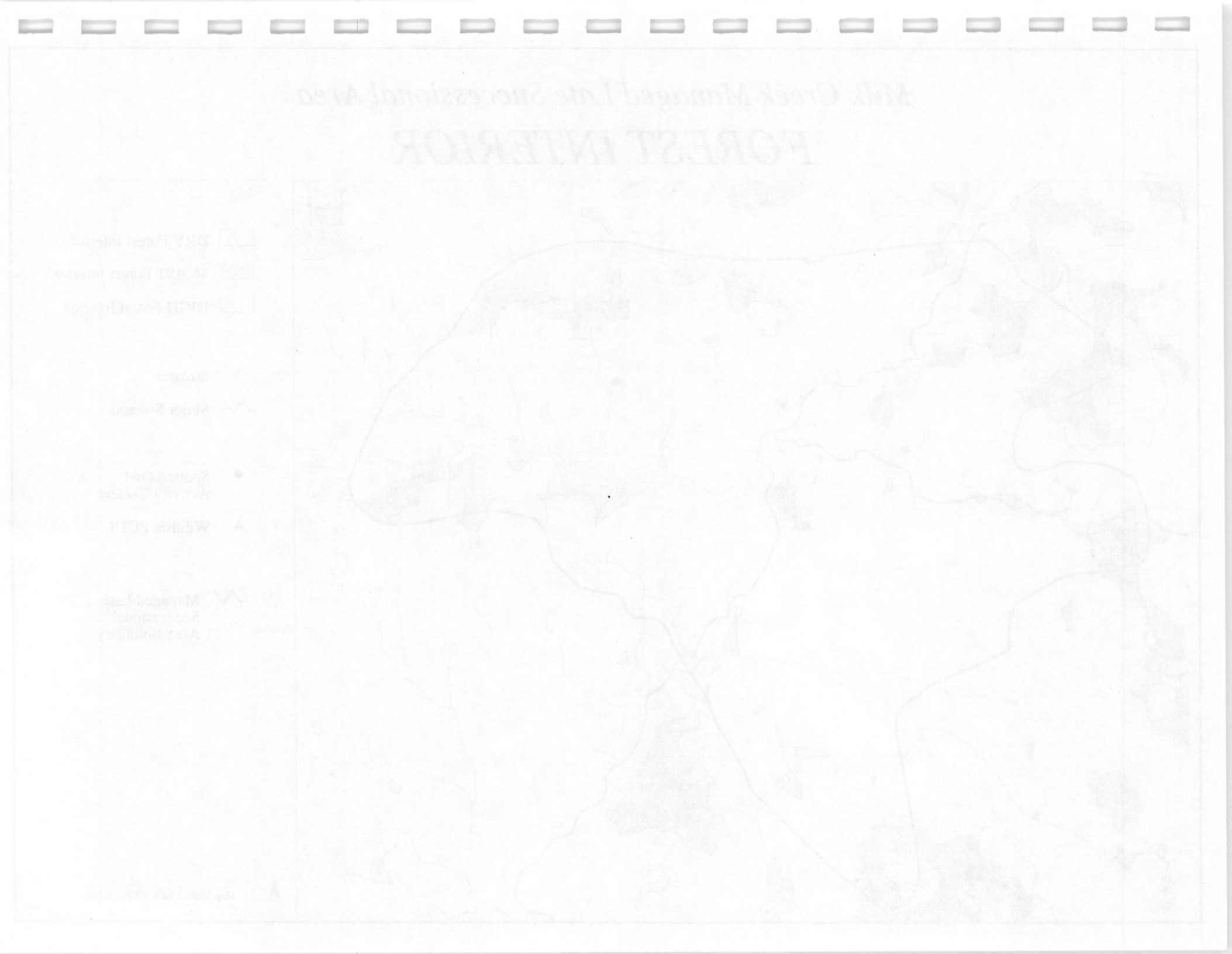
Spotted Owl Activity Centers

Wildlife PETS

Managed Late Successional Area Boundary

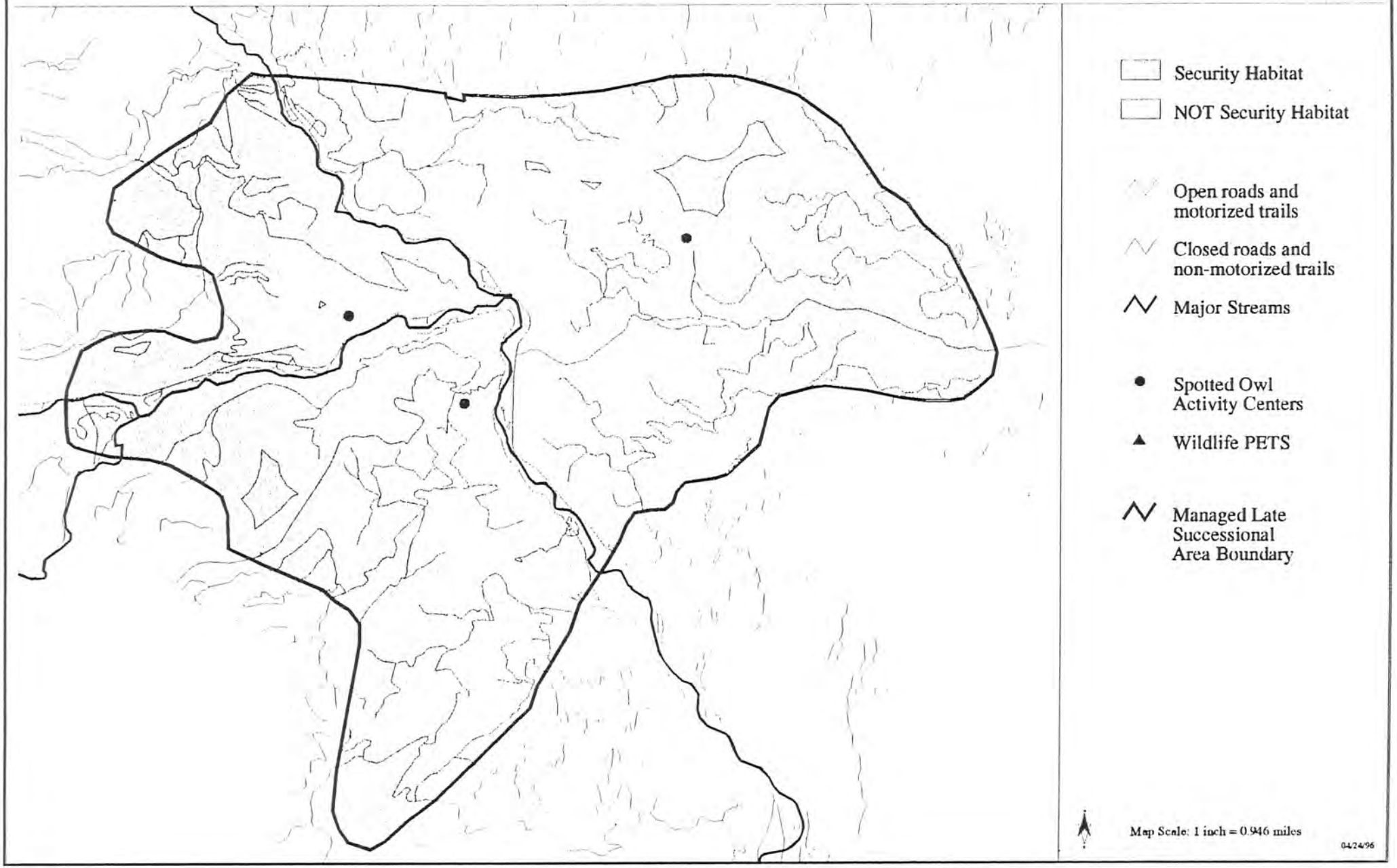
Map Scale: 1 inch = 0.946 miles

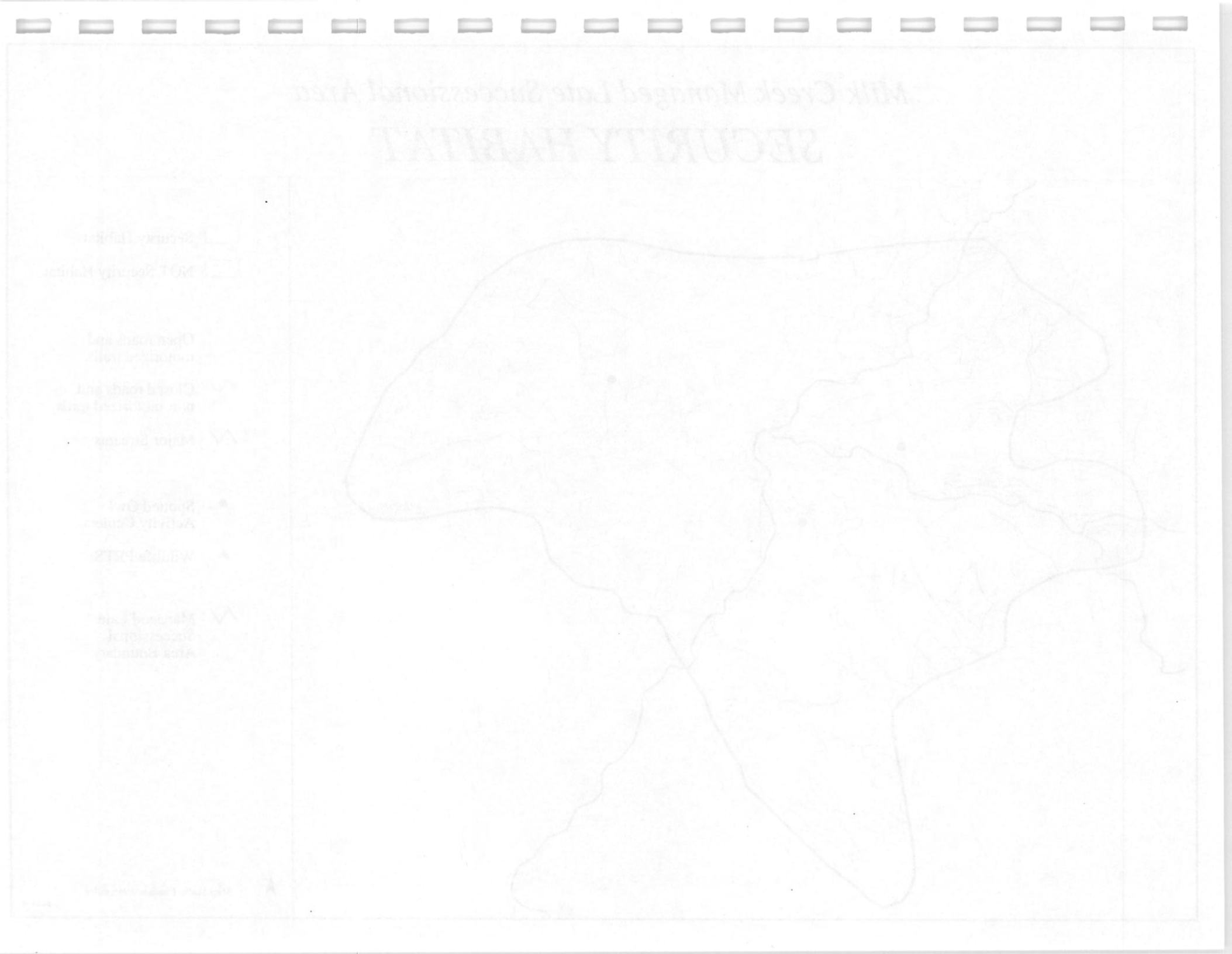
04/24/96



Milk Creek Managed Late Successional Area

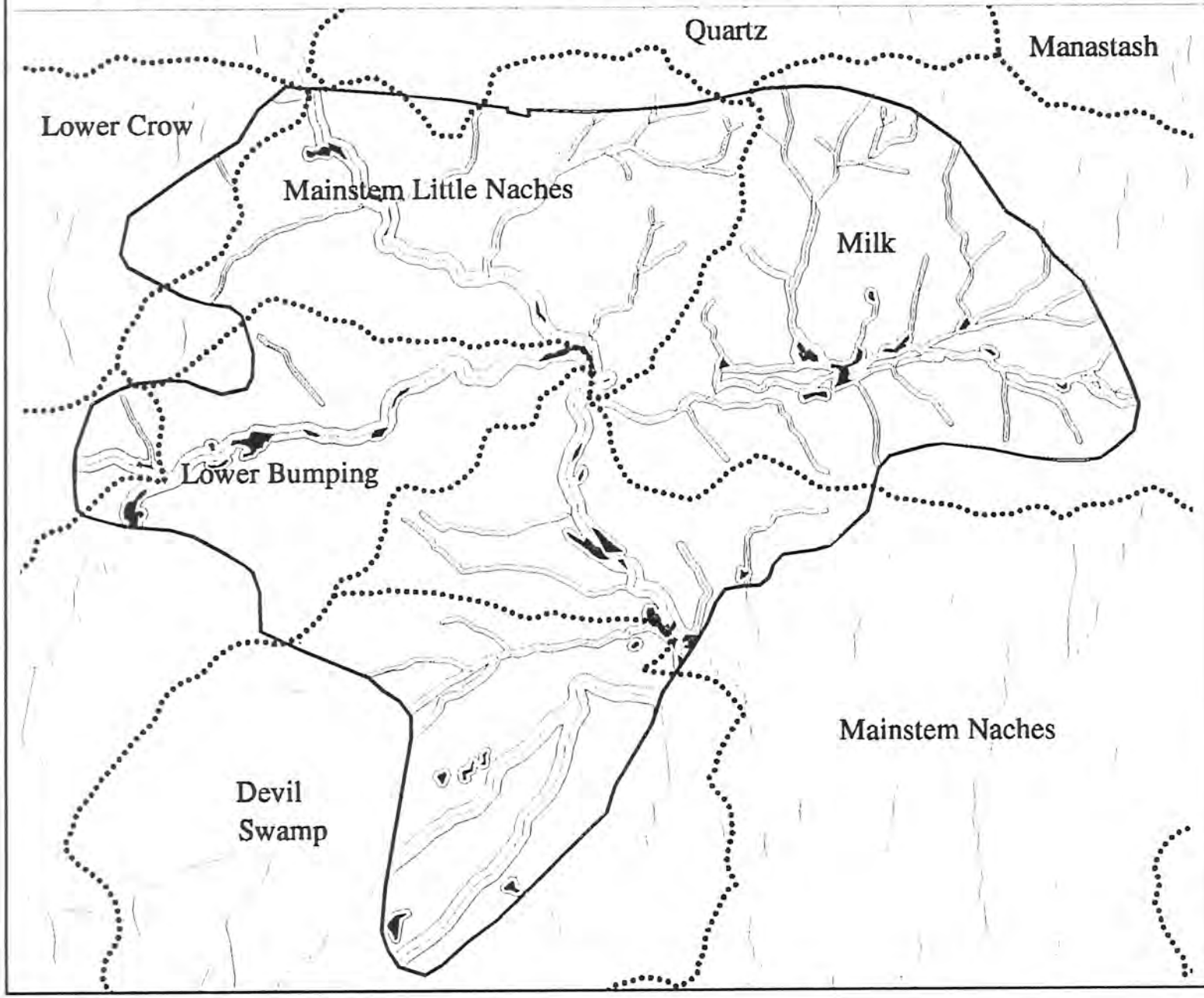
SECURITY HABITAT





Milk Creek 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 = 0.946 miles

04/24/96

XI. Shady Pass LSR

This individual chapter focuses on the Shady Pass 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.

A. General Description of LSR

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

1. Vegetation

This section describes the current condition of vegetation groups within the Shady Pass LSR. Data was derived from a combination of aerial photo interpretation (only in the eastern-most lobe) and modeling. 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) Vegetation Group Information Unique to this LSR

(1) Dry Forest Group and Grassland/Shrubland

Twenty-three percent (17,579 acres) of the Shady Pass LSR consists of the dry forest group (Fig. ?). Within this group, 73 percent (12,860 acres) is mapped as high density and 27 percent is mapped as created openings (Appendix 5). The actual amount of created openings in this group is significantly less because of the inability of the modeling effort to distinguish between created (fire or human-caused) openings in forest environments and inherent openings (scattered forest, grassland/shrubland). For example, the area on the shore of Lake Chelan is grassland/shrubland and/or grassland/shrubland with scattered trees and no created openings. Therefore, the amount of grassland/shrubland mapped (315 acres) is grossly underestimated. The southwestern lobe of the LSR in the vicinity of Halfway Springs and the lower portion of Silver Creek has sustained some recent logging activity, so created openings indicated in this area are correct (locations are not exact).

Within this forest group, the ponderosa pine series is limited within the LSR. In some locations, ponderosa pine exists as the sole overstory dominate, but more often is co-dominant with Douglas-fir.

Shrub composition in the understory is dominated almost exclusively by *Purshia tridentata* (Chelan Basin Watershed Assessment, on file at the Chelan RD). Grasses include *Agropyron spicatum, Calamagrostis rubescens, Carex geyeri,* and *Poa wheeleri*, and forbs present include *Achillea millefolium, Lupinus serecius, Balsamorhiza sagitata,* and *Lomatium* spp. (Chelan Basin Watershed Assessment, on file at the Chelan RD).

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

Mesic sites were not mapped within the Shady Pass LSR due to the limitations of the modeling process. In general, mesic sites would occur on steep (>40 percent slopes), northerly aspects, riparian areas, or moist benches within the dry forest group (see Vegetative Landscape section above). 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. 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 ablus, Arctostaphylos uva-ursi, Spiraea betulifolia, Pachistima myrsinites, Sheperdia canadensis, Carex concinnoides, Festuca occidentalis, Carex geyeri,* and *Calamagrostis rubescens* (Chelan Basin Watershed Assessment, on file at the Chelan RD).

(3) Moist Grand Fir Group

A small portion (seven percent, 5,164 acres) of the Shady Pass LSR consists of the moist grand fir group. The majority (88 percent) of this forest group is currently layered and/or mature (mid- to late-successional) (Appendix 4). The nearly 400 acres of created openings (Appendix 4) within this group are concentrated near the mouth of the North Fork of the Entiat River. Only four percent of this forest group is single layered (Appendix 4) and the mid-seral patches are small and widely scattered.

As a community dominant, grand fir becomes less important north of the Entiat River (see Vegetative Landscape section). Where grand fir does form the climax communities, it is restricted to relatively narrow bands between the dry forest group and the subalpine fir or wet forest group. One large contiguous patch of moist grand fir occurs in the southern portion of the Shady Pass LSR, otherwise it is scattered in the northern portion.

Understory composition is graminoid and forb dominated with such species as *Calamagrostis rubescens, Spiraea betulifolia, Rosa gymnocarpium, Linnaea borealis,* and *Chimaphila umbellata* (Wenatchee National Forest, Ecology Plot Database, and Chelan Basin Watershed Assessment, on file at the Chelan RD).

(4) Wet Forest Group

Twelve percent (9,279 acres) of the Shady Pass 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). The large majority (8,100 acres, 87 percent) of this group is currently mapped as layered or mature. Wet forest communities are most prevalent in the western portion of the LSR and as scattered patches between the dry forest group and the subalpine fir series on the Lake Chelan side of the LSR.

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 (Wenatchee National Forest, Ecology Plot Database). Understory composition is largely dominated by shrub species such as *Vaccinium myrtillus, V.*

membranaceum, Pachistima myrsinites, and *Rhododendron albiflorum* (Wenatchee National Forest, Ecology Plot Database).

(5) Subalpine Fir Series

The subalpine fir series is the most abundant forest vegetation type in the Shady Pass LSR, with 26,521 acres (35 percent of LSR) (Appendix 4). This series is well distributed throughout the LSR, but is most contiguous in the southeastern lobe, in the vicinity of the north fork of Twenty-five Mile Creek. The vast majority (87 percent, 23,000 acres) of this series is mapped as layered or mature, while only eight percent (2,067 acres) is mapped as created openings and five percent (1,456 acres) as single-layered stands.

Subalpine fir is the most widespread species within the overstory (Wenatchee National Forest, Ecology Plot Database). 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, Vaccinium membranaceum, Rhododendron albiflorum,* and *Sorbus sitchensis* (Wenatchee National Forest, Ecology Plot Database).

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

The remainder of the forest vegetation within the Shady Pass LSR consists of high elevation whitebark pine and subalpine larch, with the majority being subalpine larch. Approximately 11 percent (8,365 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. It should be noted that the amount and location of this forest group is underestimated. The vegetation modeling used (see Vegetative Landscape section) was not able to provide a highly accurate distinction between open forest types and rock or upland meadows. Therefore, it is likely that less rock and more of this forest group are present within the LSR. Site-specific analyses tied to restoration projects will be needed in order to rectify this discrepancy.

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, which are either present or would be managed for in the Shady Pass LSR. A total of 80 species have been identified as being associated with these kinds of forest conditions and are present, or could occur within the LSR. This species list can be found in Appendix 27.

In addition to consideration for the groups of species associated with various kinds of late-successional forests, individual species assessments were also conducted. These assessments were completed for all threatened, endangered, sensitive, candidate, management indicator, protection and buffer, and survey and manage species. Collectively, this group of species is referred to as species of special management concern. The information that is available about the status of these species within the Shady Pass LSR is summarized in this chapter. It should be noted, however, that relatively little is known about many of them.

Inventories or surveys have been conducted for only a few of the wildlife species as shown in Appendix 27. The most extensive of these were for the wood duck, northern spotted owl, mule deer and gray wolf. Inventories for the wood duck have been conducted over about 50 percent of the available habitat within the LSR. Since 1991, northern spotted owl inventories have been conducted on approximately 30 percent of the suitable habitat within the LSR.

b) Late Successional Species By Habitat Type

(1) Dry Forests

The dry forest vegetation group comprises about 17,579 acres (23 percent) of the Shady Pass LSR. Fire climax ponderosa pine forests historically dominated these areas and 49 wildlife species are associated with these forests.

Currently, 12,860 acres (73 percent) of the dry forest are in a successionally advanced condition. Only about 617 acres are in a low density condition and could be fire climax.

Some species that are associated with the late successional or fire-climax condition of forests and that have special management status, include: tailed frog, larch mountain salamander, Harlequin duck, northern goshawk, bald eagle, Van Dyke's salamander, 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). One spotted owl activity center occurs in the Dry Forests. This comprises 25 percent of the total known spotted owl activity centers within the Shady Pass LSR.

(2) Mesic Forest Sites (Embedded Within the Dry Forest Group)

The mesic forest group could not be mapped for the Shady Pass LSR because of limitations posed by having to model the vegetation. Mesic sites within the dry forests provide important wildlife habitat and add diversity across the landscape. It is suggested that these sites be identified during project level analyses and that the appropriate treatment criteria be applied.

Historically, fire occurred less frequently at these sites (refer to Chapter III), allowing for succession that resulted in a more complex forest structure such as 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.

Wildlife species that occur in these habitats and are of special management status include: tailed frog, Cascade frog, larch mountain salamander, Harlequin duck, 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, mule deer, long-legged myotis, long-eared myotis, fringed myotis, Yuma myotis, western big-eared bat, silverhaired bat, pallid bat, marten, and fisher.

This forested group is capable of providing habitat structure that typically composes spotted owl nesting, roosting and foraging and dispersal habitat, while remaining within the historic range of variability.

(3) Moist Grand Fir Group

The Moist Grand Fir group covers about 5,164 acres (seven percent) of the LSR. Historically, fire occurred less frequently than in the dry and mesic vegetation groups (refer to Chapter III), 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 Shady Pass LSR.

Currently, about 4,566 acres (88 percent) of the moist grand fir group that is within this LSR is in a late-successional condition. In the absence of any major disturbance, it is expected that in 50 years 4,767 acres, and in 100 years 5164 acres of this habitat would be in a late-successional condition.

Wildlife species that are associated with the late successional conditions of this vegetation group and are of special status include the common loon, Harlequin duck, 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, Cascade 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, mule deer, lynx, gray wolf, fisher, and marten.

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. Two (50 percent) of the spotted owl activity centers located within this LSR are located within this vegetation group.

(4) Wet Forest Group

The Wet Forest Group covers about 9,279 acres (12 percent) of the Shady Pass LSR. 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 species that are associated with the late-successional conditions of these forests.

Currently about 8,100 acres of the Wet Forest Group are in a late-successional condition. In the absence of any major disturbance event, it is expected that in 50 years about 8,349 acres, and in 100 years 9,279 acres of late-successional habitat would be available.

Wildlife species that are associated with the late successional conditions of this vegetation group and are of special status include common loon, Harlequin duck, northern goshawk, bald eagle, northern spotted owl, great gray owl, peregrine falcon, 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, Cascade 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, mule deer, 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. No known spotted owl activity centers are located within this vegetation group in the Shady Pass LSR.

(5) Subalpine Fir/ Whitebark Pine/Subalpine Larch

Subalpine fir covers about 26,521 acres (35 percent) of the Shady Pass LSR and whitebark pine/subalpine larch covers about 8,365 acres (11 percent). Historically, fire frequency was relatively low but when fires did occur they were of high intensity. The longer fire-return interval (refer to Chapter III) allowed for successional advancement that resulted in complex habitat structure, such as high canopy closure, and 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 22,999 acres (87 percent) 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 24,455 acres, and in 100 years 26,522 acres would be in a late-seral condition. Currently, all of the whitebark pine/subalpine larch is in a condition other than created opening. No further detail concerning the condition of this vegetation group could be determined from available vegetation data.

Wildlife species that are associated with this series and have special status include the tailed frog, Cascades frog, larch mountain salamander, Harlequin duck, 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. One of the four spotted owl activity centers in the Shady Pass LSR was located in the subalpine fir forest group. It is unknown if this is actually subalpine fir or only a result of inaccurately modeled vegetation. It is possible that this spotted owl site is actually located within the wet forest group or the moist grand fir and was simply mapped incorrectly. Specific site inventories are need to validate this discrepancy.

c) Species-Specific Information

The information presented in this section provides an overview of what is known about the species identified in Appendix ? 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 and one Critical Habitat Unit, that are federally listed as Threatened or Endangered and could occur within the Shady Pass 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 Shady Pass LSR. About five percent of the available habitat for bald eagles has been surveyed. A portion of Bald Eagle Territory Number 3 (Safety Harbor Creek) lies within the Shady Pass LSR (Rees 1989). It is unknown if peregrine falcons occur within the LSR and only 10 percent of their habitat has been surveyed.

(a) Spotted Owls

Four spotted owl activity centers occur within the Shady Pass LSR. Since only 30 percent of the available habitat has been inventoried, additional sites may be present. The estimated amount of habitat within a 1.8 mile radius of these activity centers is shown in Table 56. The availability of suitable spotted owl habitat is currently at or above threshold levels at this time.

The tables below display the information for owls associated with the Shady Pass LSR.

Table 56, Spotted Owl Information in the Shady Pass LSR

Northern Spotted Owl	Status[3]	Ownership[4]	Dry or Wet Owl[5]	Threshold[6]	Critical Habitat Unit (CHU)	Forest Interior?[8]	Suitable Spotted Owl Habitat	Total Dispersal Habitat[9]
SO 205	PY	FS	Wet	At Threshold	WA-4	Inside	**3,245**	**196**
SO502	PY	FS	Wet	Optimum	WA-5		**5,444**	**275**
SO503	P	FS	Wet	Optimum	WA-5	Inside	**5,359**	**244**
SO504	PY	FS	Dry	Optimum	WA-5	Inside	**4,486**	**302**

[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.

The Shady Pass CHU's WA-4 and WA-5 overlaps 9% of the Shady Pass LSR, there are 24,405 acres of critical habitat within Shady Pass LSR. The two CHU's that make up Shady Pass were developed to support a cluster of 5 spotted owl pairs, providing essential nesting, roosting, foraging and dispersal habitat. Habitat in this unit is naturally patchy, and occurs primarily in stringers along the Entiat River and it's tributaries, North Fork 25 Mile Creek, and tributaries to Lake Chelan. These CHU's provide essential breeding habitat connectivity between CHU's on the Wenatchee and CHU's on Okanogan National Forest. They are important range-wide for distribution of spotted owl habitat within the eastern edge of the range.

No class 1 grizzly bear observations have been made within the Shady Pass LSR, however, class 1 observations have been reported nearby (Almack et al. 1993). Grizzly bears are suspected to occur within the LSR and about 10 percent of their available habitat has been surveyed. Gray wolves are known to occur within the LSR and about 20 percent of their habitat has been surveyed. In addition, confirmed wolf locations have been made to the south and north of this area (Gaines et al. 1995).

There is no marbled murrelet habitat within the Shady Pass LSR.

(2) Sensitive And Candidate Wildlife Species

There are 17 wildlife species on the Region VI Sensitive Species list or are federal candidate species that could occur within the Shady Pass LSR. These include the Harlequin *duck (Histrionicus histrionicus)*, goshawk (*Accipiter gentilis*), willow flycatcher (*Empidonax trailii*), olive-sided flycatcher (*Contopus borealis*), tailed frog (*Ascaphus trueii*), 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*), bighorn sheep (*Ovis canadensis*), fisher (*Martes pennanti*), and wolverine (*Gulo gulo*).

(a) Birds

The Harlequin duck in known to occur within the Shady Pass LSR and formal surveys have not been conducted. The goshawk is known to occur and surveys have been completed over about 10 percent of the available habitat. The little willow flycatcher and olive-sided flycatcher are suspected to occur and no surveys have been completed.

(b) Amphibians

No formal surveys for amphibians have been completed within the Shady Pass LSR. The tailed frog is known to occur and the presence of the spotted frog and Cascade's frog is unknown.

(c) Mollusks

No surveys for the Columbia pebblesnail have been conducted and its presence is unknown.

(d) Mammals

Surveys for the western big-eared bat have been completed over about 5 percent of the available habitat within the LSR. Surveys for other bat species have not been completed. It is unknown if the long-legged myotis, long-eared myotis, fringed myotis, Yuma myotis or the western big-eared bat occur in the Shady Pass LSR.

Surveys for lynx and fisher have been conducted over about 10 percent of the available habitat, and surveys for wolverine have been completed on about five percent of the available habitat. Lynx and wolverine are known to occur and fisher are suspected.

d) Management Indicator Species (MIS)

There are 13 wildlife species that are listed as management indicator species that occur or could occur within the Shady Pass 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 (*Sphyrapicua ruber*), Williamson's sapsucker (*Sphyrapicua thyroideus*), northern flicker (*Colaptes auratus*), ruffed grouse (*Bonasa umbellus*), mule deer (*Odocoileus hemnionus*), elk (*Cervus elephus*), mountain goat (*Oreamnos americanus*), beaver (*Castor canadensis*), and marten (*Martes americana*).

(a) Primary Cavity Excavators

No formal surveys for primary cavity excavators have been completed. The pileated woodpecker, hairy woodpecker and northern flicker are known to occur within the LSR and the remaining MIS primary cavity excavators are suspected to occur.

(b) Ruffed Grouse and Beaver

No surveys for the ruffed grouse have been conducted and only five percent of the available habitat has been surveyed for beavers. Ruffed grouse are suspected to occur and beaver are known to occur.

(c) Mule Deer, Elk, Mountain Goat

Surveys for mule deer and mountain goats have covered about 10 percent of the available habitat. No surveys for elk have been completed. All three species are known to occur within the LSR.

(d) Marten

Marten are known to occur in the LSR and about 10 percent of their available habitat has been surveyed.

e) Survey And Manage, Protection And Buffer Species

There are eight species that are known or suspected to occur within the Shady Pass 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 (Prophysaon coeruleum), and papillose tail-dropper (Prophysaon dubium).

(1) Birds

The great gray owl is suspected to occur within the Shady Pass LSR although no surveys have been completed. No surveys have been completed for the flammulated owl, white-headed woodpecker, black-backed woodpecker, or pygmy nuthatch. The pygmy nuthatch and flammulated owl are suspected to occur and the white-headed woodpecker and black-backed woodpecker are known to occur in the Shady Pass LSR.

(2) 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.

(3) Amphibians

No surveys of the larch mountain salamander or the Van Dyke's salamander have been conducted within the LSR and it is unknown if they occur here.

f) Habitat Effectiveness

A variety of human activities have and do occur within the Shady Pass LSR. These include timber harvest, roading, fire exclusion, recreational uses, activities on private lands, and fires. These activities have the potential to affect late-successional associated species, especially those that are known to be sensitive to human disturbance.

The open road density within the LSR is 0.9 miles/square mile and the area within security habitat is 69 percent. The overall habitat effectiveness based upon the open road density is currently high and the level of security habitat is considered to be at a moderate level. The distribution of roads and security habitat across vegetation types shows that the dry, mesic and wet vegetation groups currently have low habitat effectiveness and low levels of security habitat. The subalpine fir has moderate to high habitat effectiveness and moderate security habitat. The whitebark pine and subalpine larch have high habitat effectiveness and high security habitat.

g) Connectivity

Connectivity between late-successional habitat 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 Shady Pass and adjacent LSR/MLSA's the dispersion index was used (as described in appendix ?). A total of four potential linkages was evaluated; Shady Pass to Sawtooth, Shady Pass to Lucerne, Shady Pass to Slide Ridge, and Shady Pass to Chiwawa. The overall dispersion index for this LSR was 2.2. Two linkages (Chiwawa to Shady Pass and Lucerne to Shady Pass) were indexed as 3, allowing for dispersal of low, moderate and high mobility species on two of the four linkages (Shady Pass to Slide) as indexed as 2, allowing for dispersal of high and moderate mobility species. One linkage (Shady Pass to Sawtooth) was indexed as 1, allowing for dispersal of high mobility species only.

Table 57, Dispersion Indices for Shady Pass.

Linkage	Distance (km)	High	Mod	Low	Index	Barrier
SP-Sawtooth	2.5	yes	no	no	1	Lake
SP-Lucerne	1.3	yes	yes	yes	3	
SP-Slide Ridge	2.2	yes	yes	no	2	Fire
SP-Chiwawa	1.6	yes	yes	yes	3	Ridge
Overall					**2.2**	

3. Aquatic

The aquatic resource analysis for Shady Pass LSR considered the LSR's conditions using 20 categories to evaluate the aquatic situation. Generally, the aquatic condition in Shady Pass LSR is similar to the forest wide aquatic condition. Specific conditions and sites could be improved through future management activities.

Shady Pass LSR contains portions of 10 Fish Production Units (FPU's). These FPU's are Bear, SW Shore Chelan, Corral-Big, S. Shore Chelan, Twenty-five Mile, Lake-Silver-Pope, National Forest Entiat, Lower Entiat, Upper-Mid Entiat, Three-Tommy. The average annual precipitation on the lands within Shady Pass LSR vary between 30 and 70 inches. Of the 76,502 acres within the LSR, an estimated 6,832 acres are within Riparian Reserves, or approximately 9% of the area. The Entiat river is a Key Watershed.

4. Human Uses

a) Overview

The Shady Pass LSR is located on the Entiat and Chelan Ranger Districts. The portion adjacent to Lake Chelan is very inaccessible, access is limited to the few recreation developments along the shore where the terrain is flat enough to allow campsites and a boat dock.

b) Prehistoric and Historic Summary

A large part of this LSR has not been surveyed for prehistoric sites. Based upon surveys of nearby areas there is little evidence of prehistoric use in this LSR. Some use may have occurred upon the shores of Lake Chelan but many of these sites would now be underwater since the lake level was raised earlier in this century for power production and irrigation purposes.

Around the 1900's the higher, open ridgetops were heavily grazed by sheep bands. This use continued on into the 1930's.

The Shady Pass Road was one of the earliest roads constructed in the 1930's by the Civilian Conservation Corps.

Some logging begin prior to the 1950's in the Tyee and Mud Creek areas that was easy to access. Larger scale logging did not begin until after the 1950's associated with construction of forest roads.

c) Recreation

(1) Facilities

(a) Campgrounds

There are six campgrounds on the Chelan District portion of the LSR and eight campgrounds on the Entiat District portion. The table below displays information about these.

Table 58, Campground Facilities and Use, Shady Pass

Campground	No. of Units	District	Accessed by:	Use Season	Use Levels[6]
Big Creek	4	Chelan	Boat	Memorial Day to Labor Day	High
Corral Creek	4	Chelan	Boat	Memorial Day to Labor Day	High
Cottonwood	25	Entiat	Road	May 15th to Oct. 31st	Moderate
Graham Harbor	5	Chelan	Boat	Memorial Day to Labor Day	High
Halfway Spring	?	Entiat	Road	May 15th to Oct. 31st	Moderate
Handy Spring	1	Chelan	Road	June to Nov. 1st	Low

[6] Use levels have not been accurately or consistently recorded. The level of use indicated here reflects: Heavy = facility typically filled to capacity on weekends, weekday use may run at 30% or higher; Moderate = filled to capacity on weekends, weekday use less than 30%; Low = Not filled to capacity on weekends, weekday use less than 10%.

Campground	No. of Units	District	Accessed by:	Use Season	Use Levels[6]
Junior Point	5	Chelan	Road	June to Nov. 1st	Low
North Fork	8	Entiat	Road	May 15th to Oct. 31st	Moderate
Silver Falls	31	Entiat	Road	May 15th to Oct. 31st	Moderate
Spruce Grove	2	Entiat	Road	May 15th to Oct. 31st	Moderate
Three Creeks	3	Entiat	Road	May 15th to Oct. 31st	Moderate

Ramona Park campground is located just outside this LSR. This is a moderately- to heavily-used campground serving as an overflow from the state park use.

(b) Trails

Trails are an important recreation facility for both Districts. Most of the trail mileage outside of wilderness is open to motorized users. The motorized trail system in the LSR is part of a larger motorized trail system that extends across the Lake Wenatchee, Entiat and Chelan Ranger Districts. This motorized trail system is popular with motorcyclists throughout Washington state.

The trail system also includes a National Recreation Trail and interpretive trail associated with the trail development at Silver Falls.

(c) Overview of Other Recreation Uses

(i) Recreation Residences

There are two recreation residences at Twin Harbor and two tracts on the Entiat, which combine for a total of 17 residences. These are privately-owned recreational cabins that are located on National Forest lands by special use permit.

(ii) Snowmobiling

Sno-parks are located just beyond the private land on the Entiat River Road and at 25 Mile Creek. A groomed trail is maintained from this snow park over Shady Pass and to 25 Mile Creek. Periodically, the road to Big Hill will be groomed to a scenic saddle which is located approximately halfway to Big Hill. The snowmobiling season runs from December through March. This snowmobile route is fairly popular. Some snowmobiling occurs up the Entiat River Road, however this use is fairly low.

d) Social and Economic Considerations

This LSR has several important social values. The scenic value as viewed from Lake Chelan is particularly high, enhancing the experience for lake users. The motorized trail system provides an important recreation experience for residents throughout Washington. The Entiat drainage and, to some extent other areas within the LSR, has also produced many wood products over recent decades contributing employment and economic benefits to the community.

B. Analysis Between LSR/MLSA's

1. Sustainability

a) Sustainability Analysis

The sustainability of LSR's/MLSA's across the Forest is displayed in Table 19. The Shady Pass LSR falls in the middle one-third of all LSR's/MLSA's in terms of the amount of at-risk vegetation and the

degree to which its current vegetative conditions are sustainable into the future. An important consideration in terms of sustainability is the relationship of the Shady Pass LSR to neighboring LSR's. Four LSR's (Sawtooth, Lucerne, Slide Peak and Chiwawa) are, for the purposes of this analysis, considered to be neighbors. In terms of overall sustainability, Shady Pass ranks lower than Sawtooth, Slide Peak (which burned in its entirety in 1994) and Chiwawa, (22 percent of which burned in 1994), and higher than Lucerne. The following table shows the acres at risk and the ignition risk determined in the Forest-wide sustainability analysis for Shady Pass and its four neighboring LSR's.

Table 59, Acres at Risk and Ignition Risk, Shady Pass LSR.

LSR/MLSA	% of LSR/MLSA at Risk		% of LS Forest at Risk		Ignition Risk
	Acres	Pct.	Acres	Pct.	
Shady Pass	31.142ac	41%	31,044ac	69%	Moderate
Sawtooth	2,334ac	15%	2,331ac	97%	Moderate
Lucerne	4,985ac	58%	4,955ac	95%	High
Chiwawa	29,042ac	27%	21,345ac	38%	Moderate
Slide Peak	341ac	21%	341ac	100%	High

When looking at sustainability issues between LSR's/MLSA's, the factor driving this analysis is the amount and location of at-risk vegetation between the Shady Pass LSR and its four 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 not exist between the Shady Pass and Sawtooth LSR's, due to the presence of Lake Chelan, which lies directly between the two.

On the other hand, Lucerne LSR lies only one mile northwest of Shady Pass, and the area between the two is comprised mostly of at-risk vegetation. This makes the spread of fire from one to the other very likely; moreover, due to Shady Pass LSR's position directly downwind from Lucerne, the spread of fire from Lucerne to Shady Pass is more likely than the reverse. There is also considerable at-risk vegetation between Shady Pass and Slide Peak. However, because Slide Peak burned in 1994, the threat of burning one LSR because of fire in another is a moot point in the short term. The 1994 Tyee Fire also burned most of the at-risk vegetation linking Shady Pass and Chiwawa LSR's, thereby greatly reducing the threat of fire spreading from one to the other in the near future.

(1) Implications

Although the analysis presented would indicate that the area lying between Lucerne and Shady Pass would be a high priority for fuel reduction efforts, this area lies within the Glacier Peak Wilderness. The wilderness designation limits fuel management options to only those consistent with wilderness management objectives, such as the use of prescribed natural fire. The need to do anything between Shady Pass and either Chiwawa or Slide Peak has been greatly lessened by the 1994 Tyee Fire, which burned ten's of thousands of acres between and within these LSR's. In other words, the opportunity to do something to improve the sustainability of the late-successional vegetation that existed two years ago within the Chiwawa and Slide Peak LSR's has been lost.

2. Northern Spotted Owl

The Shady Pass LSR is not one of the "big three" LSR's on the forest designated as a large population cluster/source center LSRs, for the recovery of the spotted owl. Shady Pass LSR is part of the smaller "local population" centers, which are linked to the metapopulations through dispersing individicuals.

The spotted owl is a Threatened species, with the recovery dependant on the implementation of the NWFP, especially in LSR/MLSAs (FSEIS Appendix G, Biological Opinion, 1994).

For final recovery of the northern spotted owl, smaller LSRs/MLSAs contributet to the goal of occupied home ranges (See table below). The Shady Pass LSR has a goal of 5 pairs of spotted owls.

Table 60, Spotted Owl Pair Goals for LSRs and MLSAs with CHUs

Individual LSR/MLSA	S.Owl Pairs -1994, FSEIS Appendix G, Table G-3	S.Owl Pairs - 1996	Number of Owl Pairs Should Support, as per CHU discussion.
Shady Pass RW136	4 Pairs	4 Pairs	5 Pairs
Lil' Wenatchee RW134	3 Pr	9 Pr	7+ Pr
Deadhorse RW133	4 Pr	7 Pr + 2 RS	4+ Pr
Tumwater DM3	-	1 Pr	1 Pr
Natapoc DM2	-	-	1 RS
Icicle RW132	1 Pr	1 Pr	1 Pr
Boundary Butte RW131	3 Pr	2 Pr	3 Pr
Sand Cr DM7	-	2 Pr + 1 RS	3 Pr
Teanaway RW130	2 Pr	5 Pr	5 Pr
Bumping RW126	2 Pr	7 Pr	4+ Pr
Rattlesnake RW128	3 Pr	3 Pr	2+ Pr
Tieton RW153	8 Pr	13 Pr	6+ Pr
Lost DM12	-	1 Pr	1 Pr
Milk DM9	NA for 35 ac of CHU	NA	NA

Objectives in the Shady Pass 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). Shady Pass LSR is important for maintaining well distributed and well-connected spotted owl populations. 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 Chiwawa LSR, and Lucerne LSR. There may be some difficulty crossing Lake Chelan, for dispersing owls into the Sawtooth LSR and the Okanogan portion of the North Cascades Province. Slide Peak LSR could have dispersal, however, the LSR is small with the least amount of suitable spotted owl habitat on the.

Habitat providing dispersal/connectivity corridors between LSR's (outside LSR/MLSA's) include: Glacier Peak Wilderness for the northwestern portion of the Shady Pass LSR; Cougar Creek, Tommy Creek, 3 Creeks, Pomas Creek, Lake Creek; and 25 Mile Creek to Slide Peak. (see Forest Interior map). These connectivity corridors should be monitored for effectiveness, and should overlap into Riparian Reserves, unmapped LSR's, wilderness, etc.

3. Connectivity (Plant & Wildlife)

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 entitled "Species with Special Status." Vascular plant connectivity, specific to the Shady Pass LSR, is analyzed from two perspectives in this discussion. Refer to forest overview discussions for connectivity descriptions of lichens, bryophytes and fungi.

First, connectivity relative to the Shady Pass LSR can be viewed from how well-connected the habitat is to surrounding LSR's or MLSA's. Primarily, connectivity by vegetation group within the Sawtooth

LSR only exists for species with high dispersal capabilities; the cause of this being Lake Chelan. Relative to the Lucerne LSR, connectivity exists for dispersal classes of the dry forest group. However, no connectivity exists for any dispersal class of the moist grand fir and whitebark pine/subalpine larch vegetation groups. This is a consequence of the absence or limited occurrence of these vegetation groups in the Lucerne LSR. In the wet forest group and subalpine fir series, connectivity for the moderate and high dispersal classes is dependent on habitat between the Shady Pass and Lucerne LSR's.

Due to the lack of connectedness in the wet vegetation group and subalpine fir series, there is no connectivity for low dispersal species between these two LSR's. Relative to the Slide Peak LSR, connectivity in the dry/mesic vegetation group only exists for species with high dispersal capability. In the low and moderate dispersal classes for the dry/mesic vegetation group and all dispersal classes for the subalpine vegetation group, connectivity is dependent on the occurrence of habitat outside or between LSR's. No connectivity exists for the moist grand fir, wet, and whitebark pine/subalpine larch vegetation groups, as these groups are not present in the Slide Peak LSR.

Table 61, Shady Pass -- Vascular Plant Connectivity

	Vegetation Group														
LSR/MLSA	**Dry/Mesic**			**Moist GF**			**Subalpine**			**Wet**			**Whitebark**		
Dispersal Class	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
Sawtooth	N	D	Y	A	A	A	N	D	Y	N	N	Y	N	N	Y
Lucerne	Y	Y	Y	A	A	A	N	D	D	N	D	D	A	A	A
Slide Peak	D	D	Y	A	A	A	D	D	D	A	A	A	A	A	A
Chiwawa	Y	Y	Y	N	N	Y	D	Y	Y	D	Y	Y	N	N	N

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 habitat patches is important to provide movement between patches, minimize local extinctions, and reduce genetic isolation (Harris 1984, Noss and Harris 1986). In order to assess connectivity between the Shady Pass and adjacent LSR/MLSA's the dispersion index was used (as described in appendix ?). A total of four potential linkages were evaluated: Shady Pass to Sawtooth, Shady Pass to Lucerne, Shady Pass to Slide Ridge, and Shady Pass to Chiwawa. The overall dispersion index for this LSR was 2.0. One linkage (Lucerne to Shady Pass) was indexed as a 3 allowing for dispersal of low, moderate and high mobility species. Two of the four linkages (Shady Pass to Slide Ridge and Shady Pass to Chiwawa) were indexed as 2 allowing for dispersal of high and moderate mobility species. One linkage (Shady Pass to Sawtooth) was indexed as 1 allowing for dispersal of high mobility species only.

C. Analysis Within the LSR

1. Unique Habitats And Species

a) Landscape Analysis

The western portion of the Shady Pass LSR is within a bioregion center of species rarity and endemism for plants. It is adjacent to Lake Cr. Potential Botanical Area.

b) Micro-site Analysis

(See Table 26 Forest-Wide Unique Habitats and Species)

c) Riparian Reserves

The Shady Pass LSR has at least 9% in Riparian Reserves. There are wetlands and open water inclusive in this LSR. Wet lands are composed of wet meadows, seeps, lake edges and streamsides.

d) Non-Forested Vegetation

Shady Pass LSR has the highest amount of cliffs, talus, rock, scree of any LSR or MLSA on the Forest. There are 5,345 acres, which is 7% of this LSR. Other non-forested vegetation includes: shrub fields (2%), which is one of the highest amounts of LSR/MLSA; subalpine meadows (3%) which is a high amount; and natural openings. Very little deciduous forests exist in this LSR.

e) Survey & Manage And Protection & Buffer

There are 3 of these species known to exist within this LSR, including lynx, black-backed woodpecker, and white-headed woodpecker. Other survey & manage or protection and buffer species are suspected to occur here, such as great gray owl, flammulated owl, the bats, Larch Mt. Salamander, lichens, and fungi.

f) Unique Forests

The Shady Pass LSR has the highest amount (11% 8, 363 acres) of whitebark pine on the Forest. Shady Pass also has the highest amount of Forest Interior habitat on the Forest (25% in Moist and High Elevation 18,936 acres). Other unique forests include dry old growth ponderosa pine, disjunct western red cedar, past Champion Subalpine Larch (Big Hill), Pacific yew patches. The snag quality for Shady Pass is rated as Moderate (see Snag Analysis Below).

g) Other Unique Species And Sites

(1) Proposed, Endangered, Threatened, Sensitive (PETS) Species

The Shady Pass LSR has 8 PETS wildlife, 1 PETS fish, and 2 Sensitive plants. The wildlife include wolverine, gray wolf, goshawk, bald eagle, harlequin duck, tailed frog, lynx and spotted owl. PETS fish include bull trout. Sensitive plants include *Illiamna longesepela* and *Carex bauxbaumii.* To determine if there is immediate viability concerns for these species, see "Species with Special Status Module".

(2) Management Indicator Species

The Shady Pass LSR has 9 management indicator species, they are mountain goat, mule deer, elk, pileated woodpecker, marten, ruffed grouse, beaver, bald eagle and spotted owl. See Wenatchee National Forest Land and Resource Management Plan for further information on management direction for these species.

(3) Traditional Use Sites

American Indian usage of this LSR is known for rock paintings, possible vision quest sites, and food storage sites in the talus and ridge tops. Food gathering of huckleberries, root crops, and mule deer has also occurred. These sites need to be protected and continued traditional access provided.

Areas providing high quality biodiversity abundance, connectivity and functioning for unique habitats and species are the following:

- Chelan/Entiat Divide
- Duncan Hill/Fern Lake

- Entiat River Valley
- North Fork Entiat to South Fork Pyramid Creek
- Silver Falls-to Cotton wood
- North Fork 25 mile Cr. to Junior Point

h) Shady Pass Treatment Potential:

- Reduce noxious weed spread in meadows and natural openings;
- Reduce roads in forest interior patches;
- Reduce encroaching trees in subalpine meadows;
- Conduct prescribed fire in low density dry forest, (vegetation type 11);
- Conduct prescribed habitat burns in Whitebark pine;
- Protect riparian from grazing;
- Remove roads/trails from talus and Riparian Reserves;
- Balance lynx prey/travel/denning habitat;
- Protect large trees and screen near talus, cliffs, caves, meadows;
- Maintain black-backed woodpecker nesting/roosting/foraging habitat;
- Create log den sites in low quality roaded/forest for marten, fisher, and lynx;
- Meet high end snag levels;
- Protect/maintain/enhance/monitor PETS;
- Thin to accelerate old growth
- Retain access for American Indian traditional use sites

Table 62, Snag/Log/Green Tree Recruitment Analysis for Shady Pass LSR

HIGH QUALITY	MEDIUM QUALITY	LOW QUALITY
Moist & Wet Veg Groups	Subalpine Fir & Mesic Veg	Dry & Whitebark Veg
7% Moist, 12% Wet	** 35% SAF	23% Dry
>60% LS (non-dry) Habitat	15% - 60% LS Habitat	<15% LS Habitat,** 49% LS
80% - 100% LS (all) Habitat	40% - 80% LS/M Habitat	<40% LS/M Habitat,** 66% all LS
> 30% Forest Interior (non-dry)	15% -29% Forest Interior Non-dry	<15% Forest Interior ND, ** 25% F.I. wetter
>10% Forest Interior Dry	5% - 9% Forest Interior Dry	< 5% Forest Interior Dry, ** 5% F.I. dry
>16% in Riparian Reserves	10% to 16% in Riparian Reserves	<10% in Rip Res, ** 9% Rip Reserves
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, ** 2.28 Mi/Sq Mi in Rip
< 1 Mi/Sq Mi Open Roads	1 Mi to 2.5 Mi/Sq Mi Roads	> 2.5 Mi/Sq Mi Roads, ** 0.87 Mi/Sq Mi
>70% Security Habitat, ** 68% Security Hab	50% to 70% Security Habitat	<50% Security Habitat
>10% in Past Burns, **> 10% burned	--	<10% in Past Burns
>50% Insect/Pathogens, ** (see Insect/Disease Write Up)	25% - 50% Insect/Pathogens	< 25% Insect/Pathogens
<10% Past CC Harvest, ** <10% in Clear Cuts	11% - 25% Past CC Harvest	>25% Past CC Harvest
<10% Past PC Harvest, ** < 10% in Partial Cut	11% - 50% Past PC Harvest	>50% Past PC Harvest

i) Potential Treatments:

- Reduce roads in riparian reserves;
- Reduce Roads in Forest Interior Patches;
- Retain Snags at High End of Range;
- Improve contiguous forest conditions.

j) Species with Special Status (Plant)

There is one species with special status suspected to occur within the Shady Pass LSR, *Carex buxbaumii*. This species appears on the Regional Forester's Sensitive Species List and is listed as sensitive by the Washington State Department of Natural Resources. *Carex buxbaumii* is known from a nearby location in Lake Creek Basin. There is potential habitat for a number of other 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.

Few, if any, studies have addressed biological and ecological aspects of *C. buxbaumii*. *Carex buxbaumii* is found in sunny bogs, marshes, and lake margins in calcareous regions (Mckenzie 1935, Hitchcock et al. 1969, Smith-Kuebel and Lillybridge 1993). Hitchcock et al. (1993) note that this species apparently requires ample moisture, but even where these conditions are met its occurrence is irregular. The species reaches its western limit in Washington, likely contributing to its rarity in this area (Mckenzie 1935).

k) Survey and Manage Species (Plant)

There are no known survey and manage plant species within the Shady Pass 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.

Refer to Appendix @@@ for a complete listing of Sensitive and Survey and Manage Species Forest-wide.

Table 63, Sensitive and Survey and Manage Species in Shady Pass LSR

Latin name	Common name	Federal *	State +	Forest Service ++	Presence **
Agoseris elata	Tall Agoseris		S		S
Allotropa virgata	Sugarstick			SM	S
Anemone nuttalliana	Pasqueflower		S		S
Astragalus arrectus	Palouse Milk-Vetch		S		S
Botrychium minganense	Victorin's Grape-Fern		S	SM	S
Botrychium montanum	Mountain Moonwort		S	SM	S
Botrychium simplex	Little Grape-Fern		S		S
Carex buxbaumii	Buxbaum's Sedge		S		K
Chaenactis thompsonii	Thompson's Chaenactis		S		S
Cryptogramma stelleri	Steller's Rockbrake		S		S
Cypripedium fasciculatum	Clustered Ladyslipper	SP	T	SM	S
Cypripedium montanum	Mountain Ladyslipper			SM	S
Epipactis gigantea	Giant Hellebore		S		S
Githopsis specularioides	Common Blue-Cup		S		S

Latin name	Common name	Federal *	State +	Forest Service ++	Presence **
Iliamna longisepala	Longsepal Globemallow		S		K
Orobanche pinorum	Pine Broomrape		S		S
Pellaea brachyptera	Sierra Cliff-Brake		S		S
Spirannthes porrifolia	Western Ladies-Tresses		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

2. Connectivity (Plant and Wildlife)

a) Plant Connectivity

Connectivity can also be addressed by analyzing the connectedness of habitats within the LSR. Within the Shady Pass LSR, 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 Shady Pass LSR.

b) Wildlife Connectivity

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

Table 64, Connectivity rankings for Shady Pass LSR.

Connectivity Variable	Dry	Wet	SAF	RR	Overall
% Late-success or Fire Climax	L	H	H	H	H
Open Road Density	L	L	H	M	H
Security Habitat	L	L	H	M	M
Forest Interior Roads	L	L	L	L	L
% Forest Interior*	L	L	M	M	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 improve the connectivity in this forest group. The overall open road density and level of security habitat provides for a high level of connectivity. However, the existing roads are concentrated in certain vegetation types. The current level of forest interior connectivity is considered to be low, as a result of habitat patches being fragmented by roads. 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) Wet Forest Group, Riparian Reserves and Subalpine Fir Forests

There is an opportunity to improve the connectivity within the wet forest group, riparian reserves and the subalpine fir forests by reducing the level of roads in the forest interior patches.

3. Disturbance Risk Analysis

Shady Pass LSR contains nearly 10,000 acres of successionally-advanced dry forest. Most of this is concentrated on the southern shore of Lake Chelan and along the lower, eastern portion of the Entiat river drainage. Upslope from dry forests are extensive areas of successionally-advanced subalpine fir forest and some successionally-advanced moist grand fir forest.

Several factors combine to increase the risk of catastrophic fire in the two southern lobes of the Shady Pass LSR: the successionally-advanced vegetative condition of the dry forest within the LSR that promotes crowning fires; extensive infestations of Douglas-fir mistletoe that also contribute to crown fires; a higher-than-average probability for a lightning ignition within the Entiat Valley; a steep temperature gradient within the valley that produces strong and shifting wind patterns; and, steep slopes rising from Lake Chelan and the Entiat Valley that can cause fires to spread rapidly. Crown fires originating within the dry forest are likely to spread into adjacent, upslope successionally-advanced subalpine fir and moist grand fir forests.

The large amounts of connected, successionally-advanced dry forest, subalpine fir forests, and moist grand fir forests are susceptible to outbreaks of western spruce budworm and Douglas-fir tussock moth. Outbreaks are most likely to originate in dry forests and could spread to moist grand fir forests. Cooler temperatures in subalpine fir forests would tend to suppress outbreaks. White pine blister rust infections in mesic forests containing western white pine are a risk to sustaining upper-elevation whitebark pine which is highly susceptible to this disease. In riparian areas within the subalpine fir series, there is a potential for extensive damage by the spruce beetle (J. Hadfield, pers. comm.). Understory trees in successionally-advanced subalpine fir forests are likely to be infected with Indian paint fungus. This disease will remain latent until suppressed trees are released by the death of overstory trees. Heart-rot from the disease will increase the number of soft snags, benefiting cavity excavators and secondary cavity users. Laminated root rot and armillaria root disease centers are probable in stands containing a large proportion of Douglas-fir. Annosum root disease is likely to kill individual, weakened subalpine fir trees in overstocked stands. Each of these diseases will provide snags and logs; disease centers close to adjacent dry forests contribute to the risk of fires spreading into subalpine fir and moist grand fir stands.

Logging records exist since 1910 to the present. Only the lower portion of the southwest arm has been entered. Most entries have been partial harvesting within dry forest types, including several miles along the Upper Entiat riparian corridor. Partial cutting lets more light into a stand, promoting growth of dwarf mistletoes, and increasing infestation severity in residual trees. There has been some clearcutting within adjacent moist grand fir forests. Forests within and adjacent to stands that have been partially harvested are at higher risk to large centers of annosum root diseases and Indian paint fungus than unentered forests.

Aerial surveys conducted by the Insect and Disease Group of Region 6 since the late 1940s indicate the following insect outbreaks occurring within the Shady Pass LSR:

- Western pine beetle: 1951-53, 1958-59, 1963, 1965, 1968-70, 1986, 1993-94
- Mt. pine beetle (lodgepole pine): 1952, 1956, 1970-71, 1978, 1982, 1985, 1988, 1989, 1991-93
- Mt. pine beetle (w. white pine): 1953, 1960, 1962-63, 1965, 1969, 1974-77, 1979-80 1982-83, 1986-1994

- Mt. pine beetle (ponderosa pine): 1978, 1988, 1992-93
- Douglas-fir beetle: 1953-56; 1962, 1969-70, 1973-76, 1978, 1980, 1988, 1990, 1992
- Spruce beetle: 1956, 1963, 1965, 1986, 1989-92
- Fir engraver: 1961-63, 1965, 1969, 1973-76, 1978-79, 1980, 1982, 1986, 1987-88. 1990
- Western spruce budworm: 1973-77, 1979, 1980, 1985, 1987
- Balsam Woolly Adelgid: 1985, 1988, 1990

Susceptibility of the Shady Pass LSR to fires, insects, and pathogens is shown in Table 65. 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 (for example, western spruce budworm and Douglas-fir beetle or fir engraver). Moreover, 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 or surrounded by dry forests.

Table 65, Disturbance Matrix, Shady Pass LSR

Veg Type	Fire	Dwarf mistletoes			Root decay		WPBR	WSB	DFB	MPB	WPB	Total Risk
		PP	DF	WL	AROS	HEAN						
10	L	M	M	L	L	M	-	L	L	L	L	M
11	M	M	M	L	M	M	-	M	L	L	M	M
12	H	H	H	L	M	M	-	H	H	L	H	H
13	H	H	H	L	M	M	-	H	M	L	M	H
30	L	L	M	M	L	M	H	L	L	L	L	M
31	M	L	M	M	L	M	H	L	L	L	L	M
32	M	L	H	H	L	M	H	M	M	L	L	H
33	H	L	H	H	M	H	H	M	M	L	L	H
40	L	-	L	L	L	L	H	L	L	L	L	L
41	M	-	L	L	L	L	H	L	L	H	L	M
42	H	-	L	L	L	L	H	L	M	H	L	M
60	L	-	L	L	L	L	H	L	L	L	L	L
61	L	-	L	L	L	L	H	L	L	M	L	M
62	M	-	L	L	L	M	H	L	M	M	L	M
71	M	-	-	-	L	L	H	L	L	M	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; 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 = 0; "L" = low risk, "M" = moderate risk, "H" = high risk

Fifty-three percent of the Shady Pass LSR has a high composite risk to disturbances. Areas at risk include the dense, dry forest types, the partially-harvested dry forests, layered mature moist grand fir, and the layered subalpine fir forests. The latter two types are at high risk both from adjacency to drier forests and because insect and pathogen activity has increased fuel loads and vertical and horizontal fuel connectivity within these vegetation types.

Management strategies to reduce risk of habitat loss to catastrophic wildfires, insects, and pathogens include reducing stand density, altering species compositions, and reducing vertical and horizontal fuel continuity in dry forest types and protecting layered true fir forests from fires originating outside these vegetation types (primarily from lower elevation, dry forest types). Silvicultural and other options to attain objectives within dry forest include thinning (PCT/CT); pruning; fuelwood collection; mechanical fuel treatments; handpiling fuels; prescribed fire; favoring seral, fire-resistant species such as ponderosa pine, and western larch; and developing or maintaining fuelbreaks. Silvicultural options to protect moist grand fir and subalpine fir forests include treating adjacent dry forest stands as described above; and developing or enhancing fuelbreaks.

4. Northern Spotted Owl

The following is the discussion and results of the within LSR Spotted Owl Module for the Shady Pass 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 Shady Pass LSR has 42,224 acres (55%) of nesting/roosting/foraging habitat, of that 35,897 acres are in the wetter vegetation type and have a high chance of sustainability. There is a potential for the LSR to have 73,792 acres (68%) in suitable habitat, but much of this added acreage would be drier forest and difficult to sustain. The most contiguous (sustainable) suitable spotted owl habitat in the LSR is along the Entiat River valley and along the North Fork Entiat. To meet the recovery goals for the spotted owl, there is a need to increase/accelerate spotted owl habitat, especially accelerating old plantations.

b) Spotted Owl Home Ranges

The Shady Pass LSR will manage for spotted owls over risk in the wetter forests, and have a home range of 60% of 1.8 mile radius, which is 3,994 acres. In drier forests of the LSR, owl habitat will be at 40% threshold, which is 2,663 acres.

A total of four spotted owl activity centers are known within the Shady Pass LSR. Of these, 1 is in dry habitat the other 3 are in wetter. Currently none of these activity centers are below habitat thresholds, these figures will need to be ground truthed and field verified. Three owl sites are at target (wet owls) and one is at threshold (for dry, 2663 to 3994 acres).

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 LSR. The drier forests will eventually be managed for other late-successional species.

Table 66, Suitable Spotted Owl Habitat, Shady Pass LSR

	SUITABLE SPOTTED OWL HABITAT[10]											
	1.8 mile Circle Around Activity Center				0.7 mile Circle Around Activity Center				.33 mile Circle Around Activity Center[11]			
Spotted owl	Dry	Mesic	Wet	Total	Dry	Mesic	Wet	Total	Dry	Mesic	Wet	Total
SO205	927	0	2,319	**3,245**	33	0	607	**640**	1	0	154	**155 mpa**
SO502	8	0	5,436	**5,444**	0	0	724	**724**	0	0	178	**178 m**

	SUITABLE SPOTTED OWL HABITAT[10]											
	1.8 mile Circle Around Activity Center				0.7 mile Circle Around Activity Center				.33 mile Circle Around Activity Center[11]			
Spotted owl	Dry	Mesic	Wet	Total	Dry	Mesic	Wet	Total	Dry	Mesic	Wet	Total
SO503	257	0	5,102	**5,359**	78	0	619	**697**	17	0	155	**171 m**
SO504	1,021	0	3,465	**4,486**	285	0	245	**529**	127	0	11	**138 m**

[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 9037 acres (12%) and will grow up to be nesting/roosting/foraging habitat. Habitat providing dispersal/Connectivity corridors within the Shady Pass LSR include: Entiat River valley, North Fork Entiat, the high elevation areas, and the dry dispersal areas. 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 Shady Pass LSR has 49% in late-successional wetter forest habitat, this could increase. There is good amount of forest interior habitat, it's location is disrupted as a result of natural barriers along the Chelan/Entiat divide. 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.

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 AMA's, and in wilderness areas (NWFP 1994, . 3-4 pg. 240-241).

d) Restoration Opportunities And Potential Projects

1. Meet goals of LSR for 5 pairs of spotted owls.
2. Improve and accelerate N/R/F habitat, to maintain high number of spotted owl pairs.
3. Clear cuts in wet/moist vegetation groups predicted to be habitat in 100 years.
4. Pole sized stands in wet/moist will be habitat in 50 years.

5. Clear cuts in mesic/dry vegetation groups will be habitat in 120 years.
6. Pole sized stands in mesic/dry will be habitat in 70 years.
7. Aggressive protection of remaining suitable spotted owl habitat, from outside LSR.
8. 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:
9. 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 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.
10. Monitor/maintain connectivity outside LSR..
11. Monitor spotted owl activity centers, Acres below Threshold highest priority.
12. Monitor spotted owl activity centers, 500 acre core and home ranges of owls below threshold (see list).
13. Field verify habitat within 500 acre home ranges of spotted owl sites below threshold in that core, but above threshold in the home range:.
14. Increase habitat effectiveness and connectivity by reducing open roads and revegeting road beds. Especially in forest interior habitat patches.
15. Reduce road densities.
16. Maintain dispersal/connectivity habitat.

5. Aquatic

a) Summary of Aquatic Goals

- Protect salmonid populations and habitat in core areas in the North Fork Entiat and upper-mid Entiat FPU's.
- Prevent increase in water temperature, especially in the Entiat drainage.
- Reduce water temperature in Entiat drainage.
- Minimize fine sediment input especially in the Entiat drainage.
- Increase LWD recruitment potential in North Fork Entiat.
- Reduce groundwater to surface water conversion by roads, especially in landtypes A and B.
- Evaluate road surfacing, maintenance, and culverts especially in landtypes C and C1.
- Reduce or avoid increase in riparian roads in Lake-Silver-Pope and upper-mid Entiat FPU's.
- Manage upslope vegetation, roads and activities to increase base flows, and to avoid increase in peak flows, especially in the Entiat basin.
- Preserve and restore all floodplain, side channel, and riparian wetland habitat, especially in C and E channel types in the Entiat drainage.
- Protect and inventory upslope wetlands and ponds.
- Restore natural disturbance regimes within LSR, like 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 Shady Pass LSR. Within Entiat, North Fork Entiat is a core area for cutthroat trout; and upper-mid Entiat is a core area for bull trout. Downstream: the mainstem Entiat below Shady Pass LSR contains core areas for bull trout, lamprey, sockeye, spring chinook, and summer/fall chinook.

2. Federal candidate species and other species of concern: bull trout and pacific lamprey populations in the Entiat mainstem could be impacted by LSR management.

3. Anadromous salmonid populations occur within and below Shady Pass LSR. Anadromous salmonids within the LSR include: steelhead, early-run (spring) chinook, and late-run (summer/fall) chinook.

   Concerns include low populations that have been severely reduced from historic population levels. Also of concern are within-population genetic and life-history diversity, condition of physical habitat and water quality for incubation, rearing, over-wintering, migration, and spawning; direct human interaction or harvest potentially reducing fitness of individual spawners. All life stages of anadromous salmonids are probably vulnerable to management activities that cause deterioration of riparian habitat.

   Anadromous salmonids downstream of Shady Pass LSR: the small sockeye population is presumed to have developed recently, following the damming of the Columbia. The bulk of steelhead and chinook habitat in the Entiat basin is downstream of Shady Pass LSR.

4. Resident salmonids. Redband trout occur throughout the LSR. Cutthroat trout occur in substantial portions of both the Chelan and Entiat drainages of the LSR; North Fork Entiat is a core area for cutthroat trout.

   Concerns include maintaining existing populations, protecting against habitat degradation, over-harvest, and competition with non-native species.

5. Introduced species. Eastern Brook trout are known to occur in the Twenty-five Mile, Three-Tommy, and Lake-Silver-Pope FPU's, and may occur elsewhere.

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

   The introduced mollusk Corbicula occurs in the Columbia downstream of Shady Pass LSR.

6. Non-salmonid aquatic biota: We have little data for other aquatic biota in the area.

7. Water temperature. Within the Entiat drainage of Shady Pass LSR, it is important to avoid any increase in water temperature, and to lower water temperatures where possible. Maximum temperature in the Entiat mainstem (above N. Fork) are higher than temperatures in near-by streams, and are within a degree of violating forest plan standards (WNF 1994 monitoring report). Maximum temperature in North Fork Entiat is higher than that in Pope, Potato, and Stormy Creeks (based on elevation, the reverse relationship would have been predicted); maintaining water temperature at or below the current level may be important for maintenance of the core cutthroat population in the North Fork. Downstream of Shady Pass LSR in the mainstem Entiat, temperatures exceed forest plan standards (max. temperature 68 F, WNF 1994 monitoring report) and likely lower the fitness of the Entiat's anadromous populations.

   Temperature monitoring between August 14 and October 2 in Twenty-five Mile creek showed the maximum temperatures remained within the range specified in the Wenatchee Forest Plan. Maximum temperature recorded reached 57.2 degrees F.

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

8. Sediment transport. Shady Pass LSR lies primarily in a region of sediment input and transport; the mainstem Entiat below Shady Pass LSR is a region of sediment deposition (Carl Davis ref.). Overabundance of fine sediment in the Entiat mainstem (1994 monitoring report) is a major concern given the unique aquatic habitat and key populations here. See discussions of flow, fine sediment, roads, disturbance regimes, and channel type for management actions that may mitigate downstream fine sediment levels.

   Fine sediment. No fine sediment data are available within Shady Pass LSR. Sediment samples taken in 1995, in the Entiat mainstem below the LSR in Lake-Silver-Pope show that the bed has 15% fines. Further downstream in the deposition reach on private land, fines were found to be at 21%. This reach is flatter than the upstream areas, has active floodplains and contains spawning gravel. Per cent fine sediment within this reach is a concern as it exceeding forest plan standards and potentially reducing the fitness of anadromous and sensitive populations.

   Sediment input in an upper reach will eventually works downstream and may deposit in the spawning reach. Thus, although the sediment levels on Forest lands are within Forest Plan standard in the upper reaches, effects of sediment deposition in the key spawning reach needs to be considered during project planning.

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, flow energy dissipation, fines/gravel retention, sinuosity, pool formation, side channel creation, in channel shade, 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 by FPU is available forest-wide, and LWD and pool abundance data are available for selected (R6 protocol - surveyed) streams.

   The Chelan drainage of Shady Pass LSR has better channel structure conditions. The ratio of riparian road miles to stream channel miles is very low (<.01) in all FPU's except Twenty-five Mile, where the ratio is moderate (< .25). LWD and pool data are available for four reaches in the Twenty-five Mile drainage: LWD abundance is excellent, pool numbers are moderate, and abundance of deep pools (max. depth >= 3 ft) is good (see figure xxx).

   In the Entiat drainage of Shady Pass LSR there are no known severe concerns for channel structure; however pool and deep pool abundance are below forest plan standards throughout, and LWD abundance is below forest plan standards in North Fork Entiat FPU.

Riparian roads are low (ratio <.1) in North Fork, upper Entiat, and Tommy-Three FPU's and moderate (ratio <.25) in Lake-Silver-Pope and upper-mid Entiat. In the North Fork FPU, pool and deep pool abundance are low but not dissimilar to the adjacent wilderness, and LWD abundance is generally below forest plan standards. In lower Three Creek, pool and deep pool abundance are similar to those in North Fork FPU; however LWD abundance is good. In upper Entiat FPU, pool and deep pool abundance are moderate to low while LWD abundance is good to fair. Downstream of Shady Pass LSR in the mainstem Entiat, pool, deep pool, and LWD abundance are good.

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 Shady Pass LSR at this time; however we can be aware of it when managing any of the above inter-related factors.

11. Landtype. Shady Pass LSR includes A, B, C, and C1 landtypes (see Landtype Associations Response Map, Appendix 21). Bear Creek (Chelan), the Entiat above North Fork, and N. Fork. Entiat are predominantly Landtypes A and B; the rest of the LSR is predominantly landtype C; landtype C1 occurs between Graham Harbor and Twin Harbor on the south shore of Lake Chelan. In Landtypes A and B the major valleys have a well regulated hydrologic response with high subsurface water storage and therefore less of a drop at summer low flow; they also have relatively high debris slide hazard and corresponding high coarse sediment delivery. Ridgetops, valley walls and cirques in landtypes A and B have high surface runoff, high first order stream density and high bedrock exposure. Roads in landtypes A and B may intercept groundwater, converting it to surface water (with implications for flow regime, sediment input, and water temperature). Roading or harvesting in these landtypes may increase debris slide frequency. Road management will be important in these landtypes in Shady Pass LSR given temperature, fine sediment, LWD, and aquatic biota concerns.

    Landtypes C and C1 have moderate to high surface runoff, high sediment delivery, high surface erosion and high hazard of shallow rapid failures. Landtype C1 inputs mainly fine sediments to stream channels, while landtype C inputs a range of sediment sizes from fine to coarse. Roading these landtypes could exacerbate their natural tendency toward high fine sediment production. Road management will be important in these landtypes in Shady Pass LSR given fine sediment concerns, especially in the Entiat drainage.

12. Channel type. In the absence of human influence, valley shape and geology determine the basic character of the stream channel flowing within. 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 channel type analysis of Shady Pass 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.

Within Shady Pass LSR the "A" channels are responding as described, the "C" and "E" channels are reacting to upstream management impacts.

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. While floods have been a concern in the Entiat basin, particularly in conjunction with fire disturbance, there is little information about natural pre-Euro-American regimes. 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 withdrawals. An estimated 10% to 12% of the water in the Entiat River is being withdrawn before it reaches the Columbia River. (Mullen, et. al, 1992)

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 2.28 miles per square mile. The Riparian Reserves are estimated as 6,832 acres of the 76,502 acres within Shady Pass 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 returns 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.

In Shady Pass LSR, FPU-wide road densities are highest in Twenty-five Mile Creek, upper-mid Entiat, and Lake-Silver-Pope. Road densities are lowest (<.1 mile per sq. mi.) in Bear (Chelan) and south shore Lake Chelan.

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 lightening strike patterns), and landtype interact

18. Floodplain connectivity. Much of the channel within the Shady Pass LSR is "A" type. The "A" type typically has narrow channel width and minimal floodplain. The stream sources are handing valleys, they are relatively inaccessible for management activities. The lower portions of the drainage, those below the LSR have channel types that have more room for floodplain activity. Historic photos might reveal changes in off-channel habitat, floodplain area and riparian wetland habitat over time.

19. Upslope wetlands and ponds may serve as "islands" and/or refugia for aquatic biota, especially those amphibians 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 (see wildlife write-up) but little understanding of alterations in their ecosystem functions over the recent century.

    As a broad generalization wetlands, especially in late-successional forests and/or hanging valleys (such as those in the Lake-Silver-Pope FPU), 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. Generating a disturbance regime that "safely" approximates "natural" disturbance results is currently one of our greatest challenges.

    In the Entiat basin a high priority may be upslope and riparian hydrologic management to prevent disturbances from impacting human resources through flooding.

The LSR/MLSA 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/MLSA network has the potential to strengthen viability of these at-risk aquatic populations.

Some recommendations to avoid increasing aquatic risks for Shady Pass LSR are listed here by drainage.

Entiat drainage:

1. Avoid management activities that could cause increases in fine sediment input, water temperature and compaction (ground water to surface water conversion).
2. Avoid reduction in riparian canopy cover.
3. Avoid increases in road density, especially Upper-mid Entiat and Lake, Silver, Pope drainages.
4. Be aware of debris slide hazard in land types A and B.
5. Be aware of hazard of activities in land types C and C1 that have erosion and shallow rapid failure hazards. (Lake, Silver, Pope and Upper Entiat drainages)

Chelan drainage

1. Avoid increases in road density, especially Twenty-five Mile drainage.
2. Be aware of debris slide hazard in land types A and B.
3. Be aware of hazard of activities in land types C and C1 that have erosion and shallow rapid failure hazards.

6. Noxious Weeds

A portion of the Shady Pass 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 in the area of Twenty-five Mile Creek. *Linaria dalmatica* is a species which is widespread outside the LSR and would be a priority for containment and prevention of further spread (refer to Noxious Weed Analysis Module in Appendix 1). Current information is lacking regarding the presence of other noxious weed species within the Shady Pass LSR. Survey for species presence and extent should be completed in order to develop a noxious management plan for this LSR (refer to Harrod 1994).

7. Fire Management Plan

a) Overview

This plan is intended to provide guidance for the management of fire in the Shady Pass LSR. It is intended to supplement the Fire Management Plan for the Late Successional Reserve System and will become a portion of 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 this plan. It is the intent of this plan to provide adequate protection of the Reserve to allow management practices to be initiated which will provide for the protection of the Late Successional Associated species and associated unique habitats. These management actions are expected to include actions which will include the role of fire disturbance as an important process in the reserve.

b) Fire Prevention Actions

The following actions are site specific for the Shady Pass LSR. They are intended to supplement the actions which will be implemented on a Forest wide basis.

1. Continue to implement campfire restrictions below 3,000' in the Lake Chelan Drainage. Add additional restrictions as warranted by increased fire danger.
2. Emphasize campfire restrictions as warranted during Mule Deer and other hunting seasons.
3. Initiate hazard reduction around developed and dispersed recreation sites such as:

- Grouse Mt.
- Big Creek
- Cottonwood
- Graham Harbor
- Twin Harbor

4. Emphasize fire prevention activities in the 25 Mile Creek 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 the High Hunt, an emphasis item
7. Implement road restrictions and closures as warranted during periods of extreme fire danger.
8. Emphasize contact with the following special interest groups. Lake Chelan Boat Company, Backcountry Horseman, ORV groups.
9. As a hazard reduction measure emphasize fuel wood collection around recreation use sites in the dry forest type.

c) Pre-fire Protection for Fires Originating Outside 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 LSR utilize natural fuel breaks
3. Stress prevention of fires outside LSR boundaries
4. Strategic fuel manipulation within and adjacent to LSR boundaries (live and dead)

d) Fire Detection -

1. Staffing of Tyee L.O. and aerial detection after lightning episodes will provide the primary detection resource for this LSR.
2. This will be supplemented by emergency staffing at Junior Point during and after lightning episodes
3. Supplementation by L.C. Boat Company and L.C. Airways - fire reports

e) 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. Rapid initial attack will occur on all ignitions in Critical Habitat Units, with minimum disturbance as a goal
4. Until vegetation conditions have been modified, initial attack should occur on all fires below 5,000 ft; normal policy (FSA, Escaped Fire Situation Analysis)
5. Ignitions above 5000' will be considered candidate fires and may be managed as prescribed fires after prescribed plans are completed

6. Protection of riparian areas from fires and from suppression activities is a priority
7. Improvements will be a priority for protection (Lone Peak Seed Orchard, recreation facilities, etc.)
8. Adjust pre-planned dispatch runcards in LSR area
    - Use of retardant is appropriate on initial attack
    - Use of air-delivered firefighters is appropriate
    - Use of dozers need 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 efforts. Utilize pre-attack plans and materials. These may be prepared in advanced and updated annually prior to the fire season.

f) Vegetation Management

1. Returning dry forest types to historic conditions is a priority. Suggested activities include pruning, thinning, commercial and pre-commercial thinning, wood gathering, and prescribed fire
2. High density, multi-story refugia in mesic sites will be maintained.
3. Fuels management in lodgepole pine is not a high priority (stand-replacing fires are within inherent disturbance regime)
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

g) Prescribed Fires Opportunities

1. The development and subsequent implementation of prescribed fire plans should be a priority for this LSR
2. Priorities for the use of prescribed fire are dry site ecosystems and whitebark pine ecosystems
3. Priority outcomes are hazard reduction near improved sites.
4. Projects should be of scale/location to enhance landscape-level diversity tied to inherent disturbance regime
5. 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)

D. Restoration Opportunities and Potential Project Summary

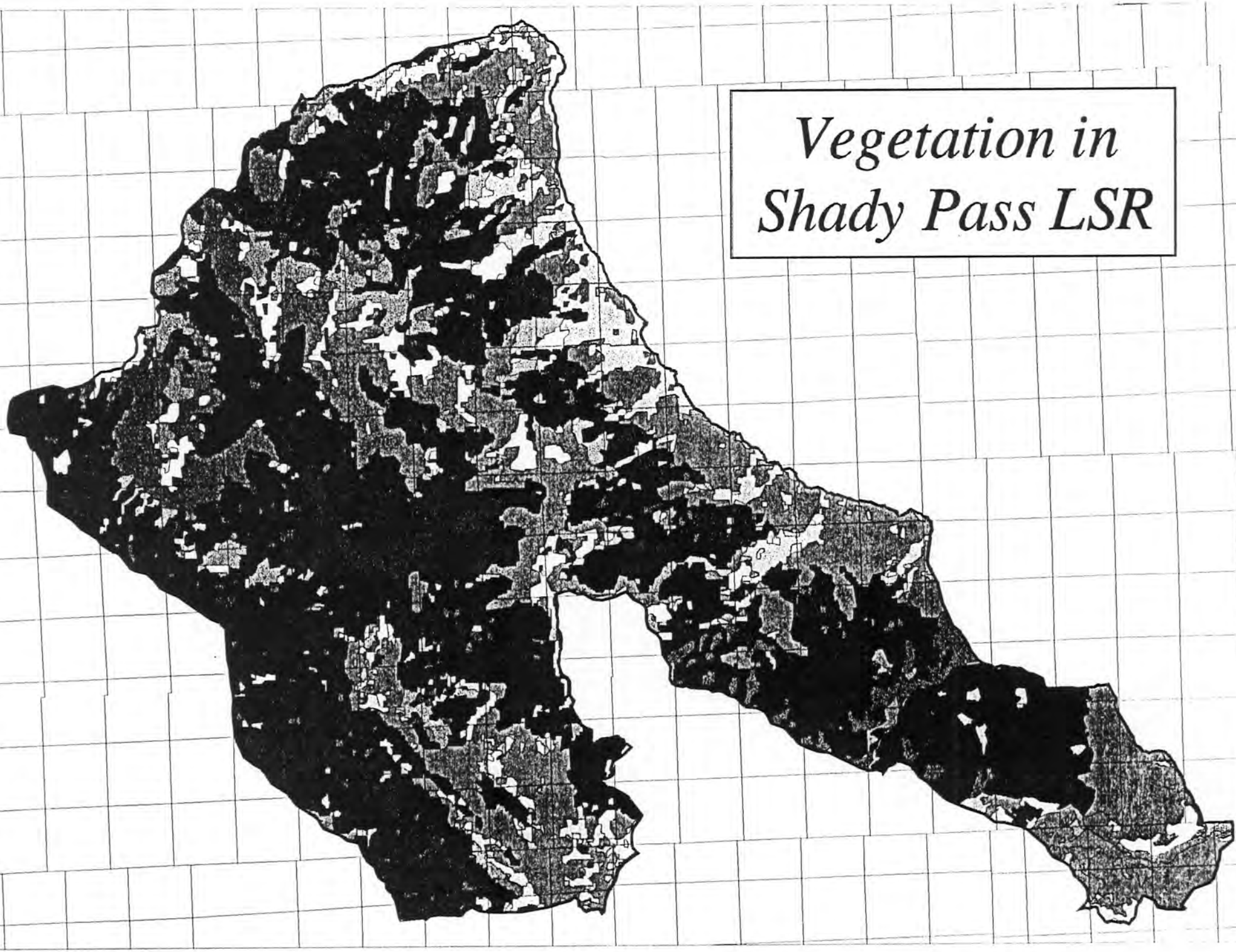
Table 67, Restoration Opportunities and Potential Projects, Shady Pass LSR

Analysis Module	Restoration Opportunity	Potential Projects	Sched-ule[1]
Forest-Wide Sustain-	1) Reduce fuel loading and stocking levels in dense successionally advanced dry	1) Potential projects are limited due to the wilderness land allocation for this area. Prescribed Natural Fire is	

Analysis Module	Restoration Opportunity	Potential Projects	Schedule[1]
ability	forest stands where they exist between the Shady Pass and Lucerne LSR's..	the only potential option for reducing fuels. This is likely to be unrealistic due to the nature of the fuels.	
Forest-Wide Spotted owl	Not Applicable. (This LSR is not one of the 3 LSR's on the forest designated as a source population area.)	Not Applicable.	
Forest-Wide Connectivity	1) Promote the development of fire climax stands within the dry forest vegetation group.	1) Thin from below favoring ponderosa pine.	A
Unique Habitats & Species	1) Reduce road densities in riparian reserves and in talus areas.	Close or relocate roads as opportunities are identified in Access and Travel Management Planning.	A
	2) Maintain existing subalpine meadows.	2) Remove encroaching conifers from meadows.	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.	A
	4) Retain whitebark pine acreage within the LSR.	4) Prescribed fire.	C
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.	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.	A
	2) Protect layered true fir forests from fire originating outside these types, primarily lower elevation dry forest types.	2) Use treatments described in#1 above in the adjacent dry forest types.	B
	3) Minimize the extent of stand replacement fires within the LSR and minimize the spread of fire from Shady Pass to other LSR's.	3) Maintain existing fuelbreak and develop additional fuelbreak at key ridgetop locations.	C
Spotted Owl	1) Protect 100 acre core areas within the four Shady Pass spotted owl activity centers.	1) Limit activities within 0.25 mile of activity centers from 3/1 to 8/31.	A
	2) Maintain 500 acres of nesting habitat within the four Shady	2) No Ground or vegetation disturbing activity in spotted owl 504	A

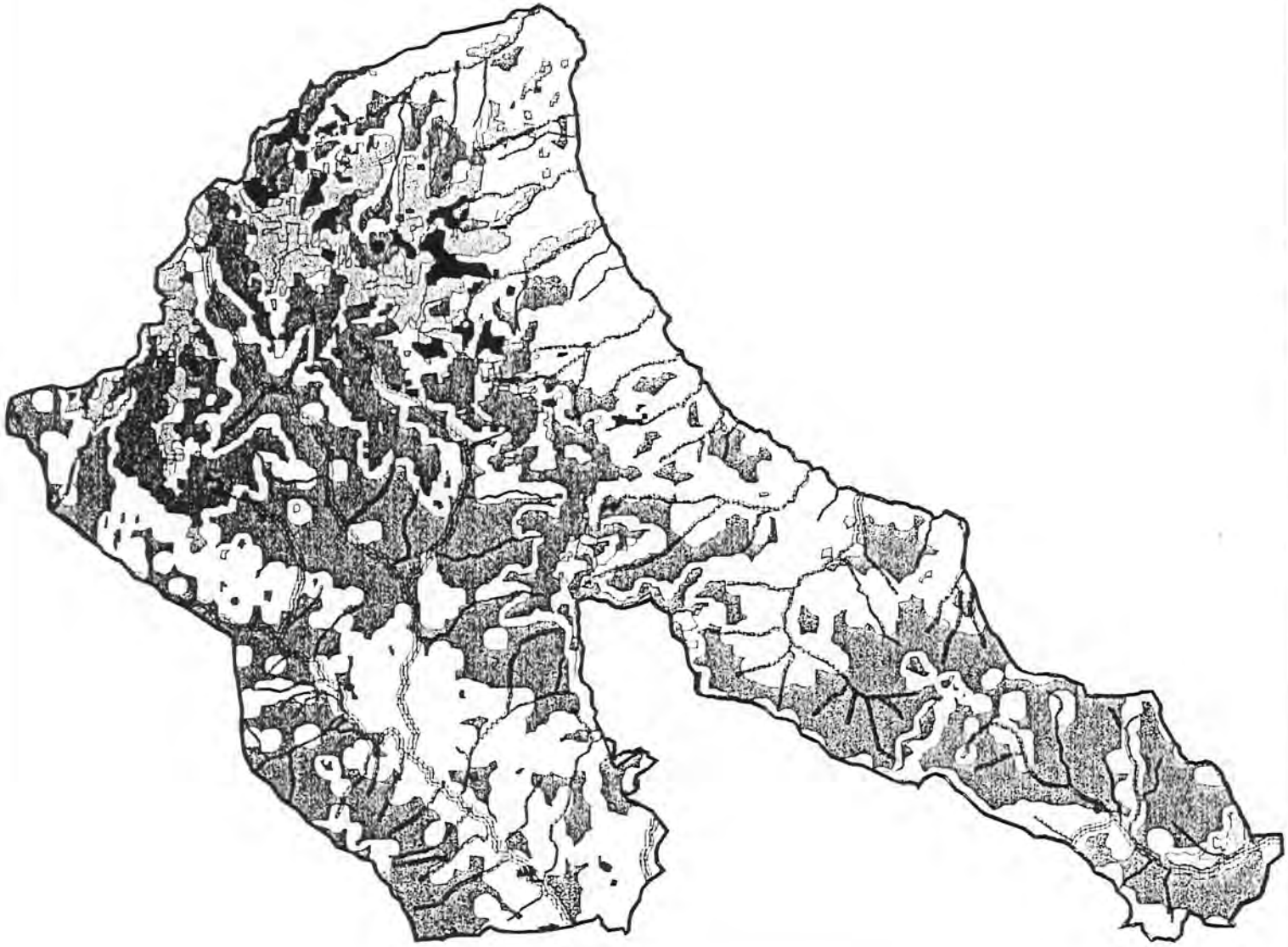
Analysis Module	Restoration Opportunity	Potential Projects	Schedule[1]
	pass spotted owl activity centers.	nesting area.	
	3) Rehabilitate or accelerate habitat recovery around activity centers 504 and 205.	3) Plant PP and DF in activity center 504 and DF in activity center 205. Fertilize young trees to accelerate growth.	C
	4) Improve sustainability of dense stands in 503 activity center.	4)Thin up to 257 acres within the 1.8 mile activity center.	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.	A
	6) Improve habitat quality in dense single story stands in activity centers 502 and 503	6) Thin to create layered canopy development.	A
	7) Obtain information on spotted owl locations.	7) Survey areas to 1994 spotted owl protocol.	B
	8) Accelerate the development of suitable spotted owl habitat.	8) 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.	C
Aquatic	1) See goals listed in Aquatic section for Shady Pass	1) Coordinate projects with Entiat and Chelan Watershed Assessments.	
Noxious Weed	1) Limit the extent and spread of centauria diffusa in twenty five mile creek area.	1) Consider treatments such as hand pulling and herbicides to limit extent and spread.	A
	2) Prevent invasion of *Linaria dalmatica* from nearby areas.	2) Use combination of treatments that prevent spread of this weed into Shady Pass.	B
	3) Increase knowledge regarding noxious weed presence in Shady Pass 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


Vegetation in
Shady Pass LSR

Shady Pass Late Successional Reserve

UNIQUE HABITATS



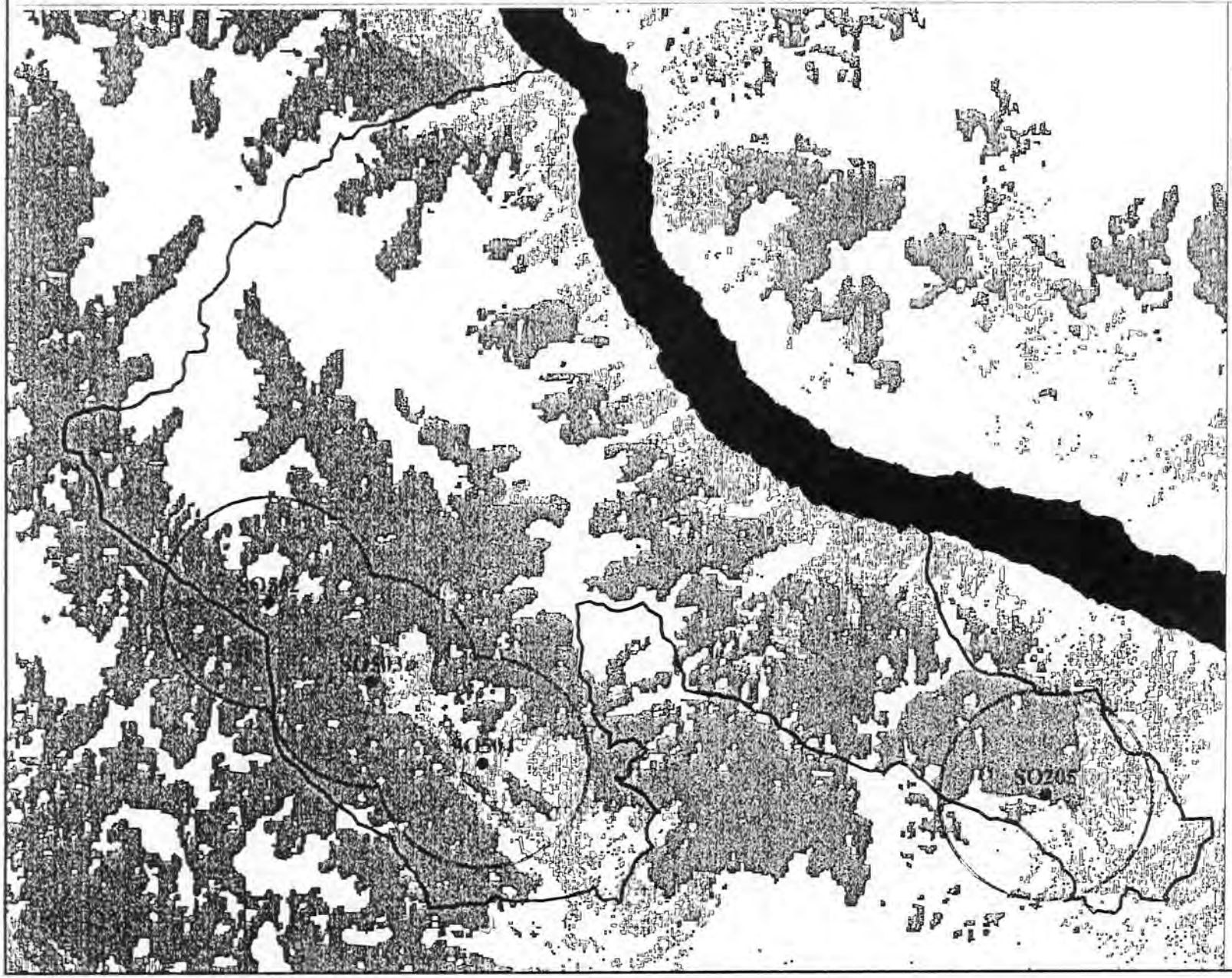
- Large Forest Interior Patches
- Whitebark Pine
- Talus, Scree, Bedrock, Cliff
- Meadows
- Natural Opening
- Shrub
- Deciduous Forest
- Wenatchee Forest Plan Allocations RN1, SI1, SI2
- Riparian Reserves
- Lakes and Wetlands
- Streams
- Spotted Owl Activity Centers
- Wildlife PETS
- Late Successional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

Map Scale: 1 inch = 0.399 miles

04/23/96

Shady Pass Late Successional Reserve

SUITABLE SPOTTED OWL HABITAT



DRY Suitable Spotted Owl Habitat (N/R/F)

MESIC Suitable Spotted Owl Habitat (N/R/F)

WET 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 = 0.399 miles

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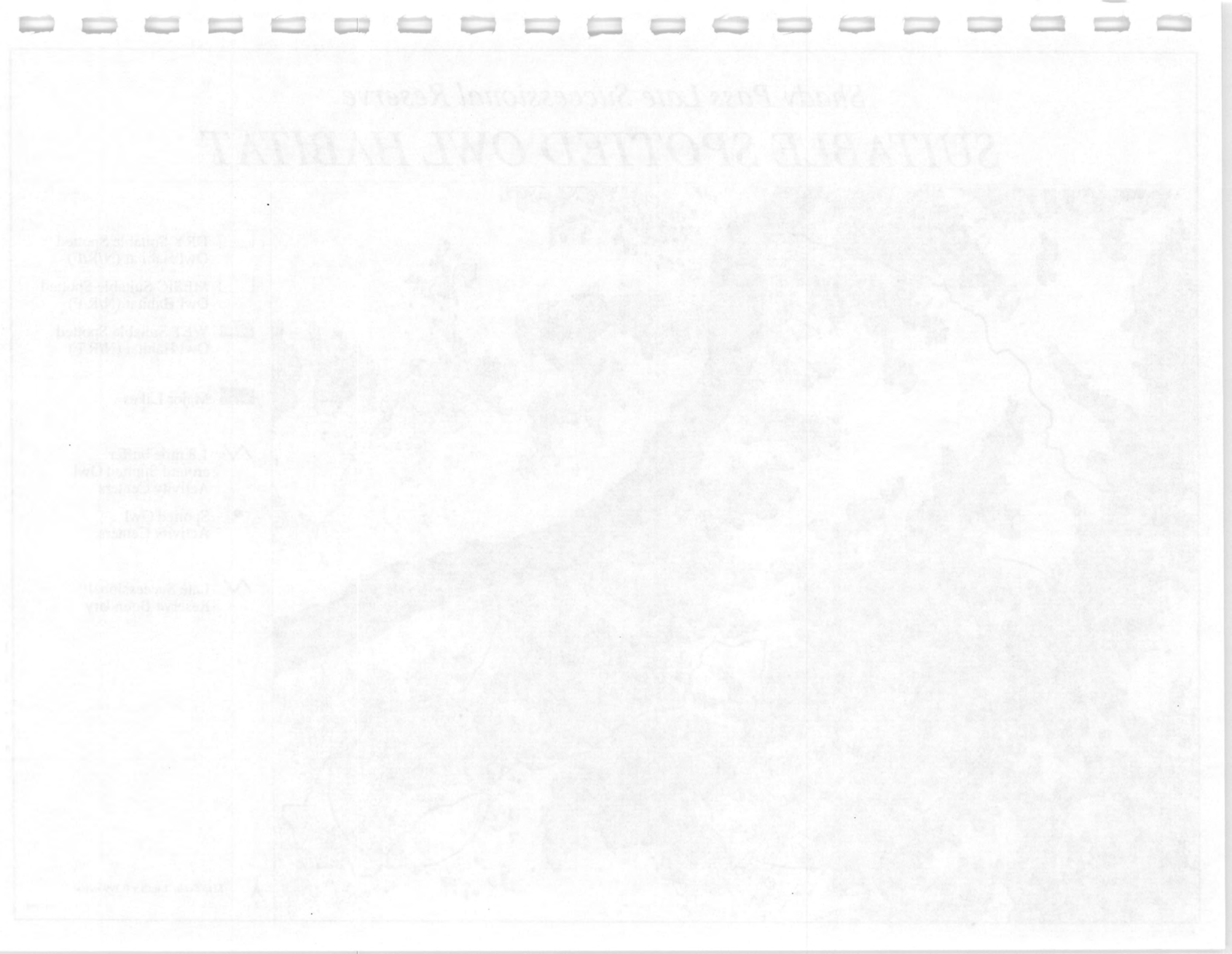
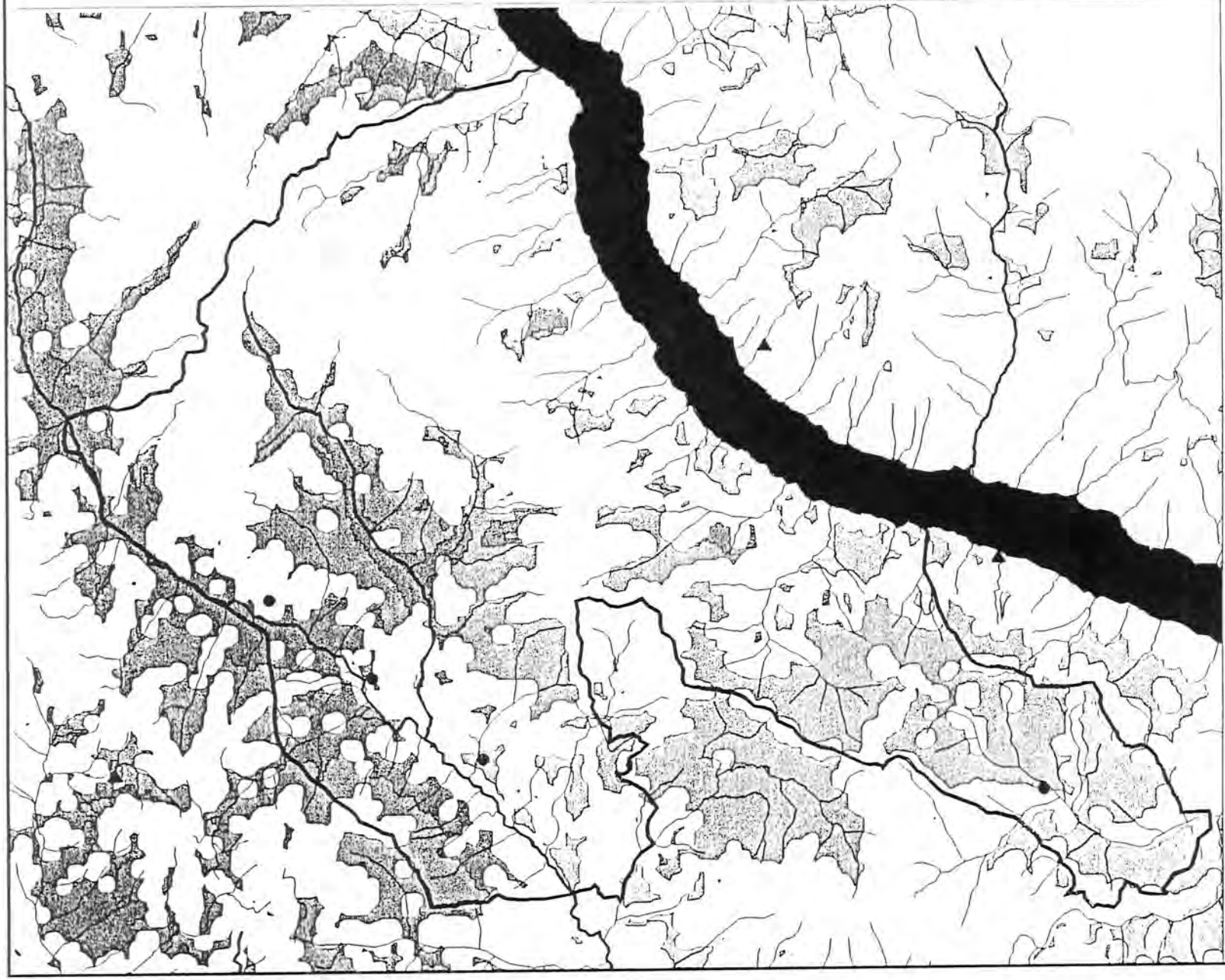


Shady Pass Late Successional Reserve

FOREST INTERIOR



DRY Forest Interior

MOIST Forest Interior

HIGH Forest Interior

Major Lakes

Streams

Major Streams

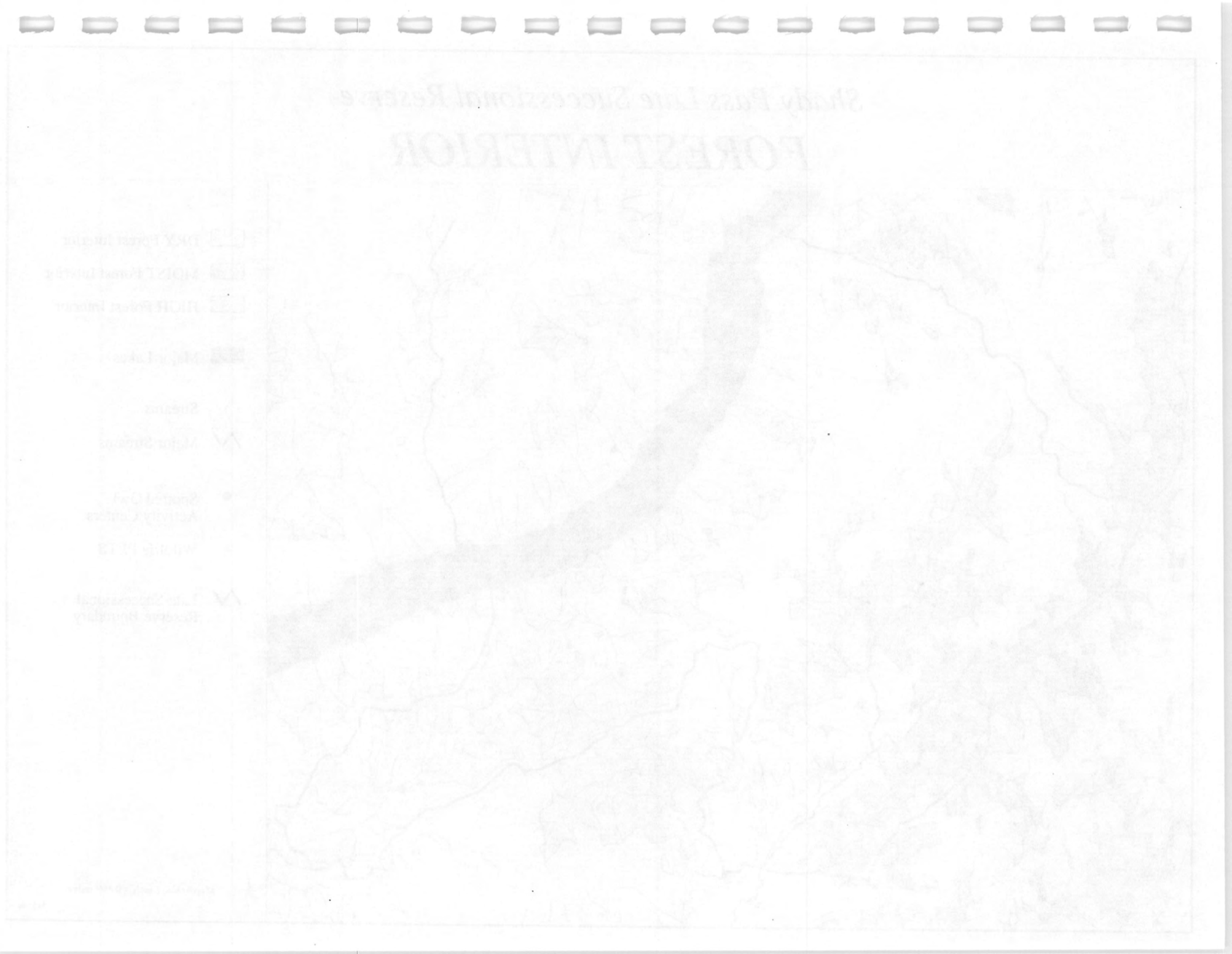
Spotted Owl Activity Centers

Wildlife PETS

Late Successional Reserve Boundary

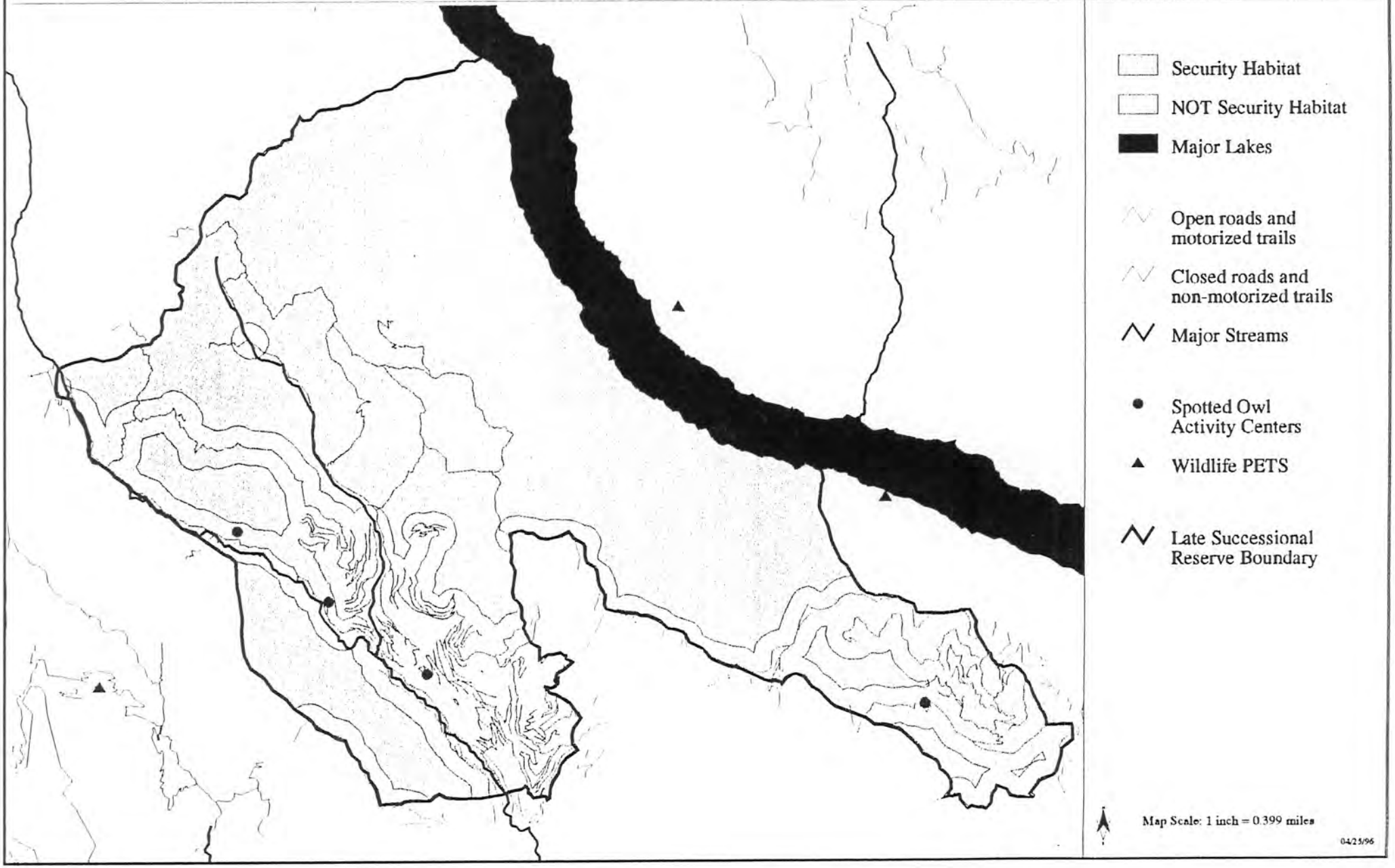
Map Scale: 1 inch = 0.399 miles

04/25/96



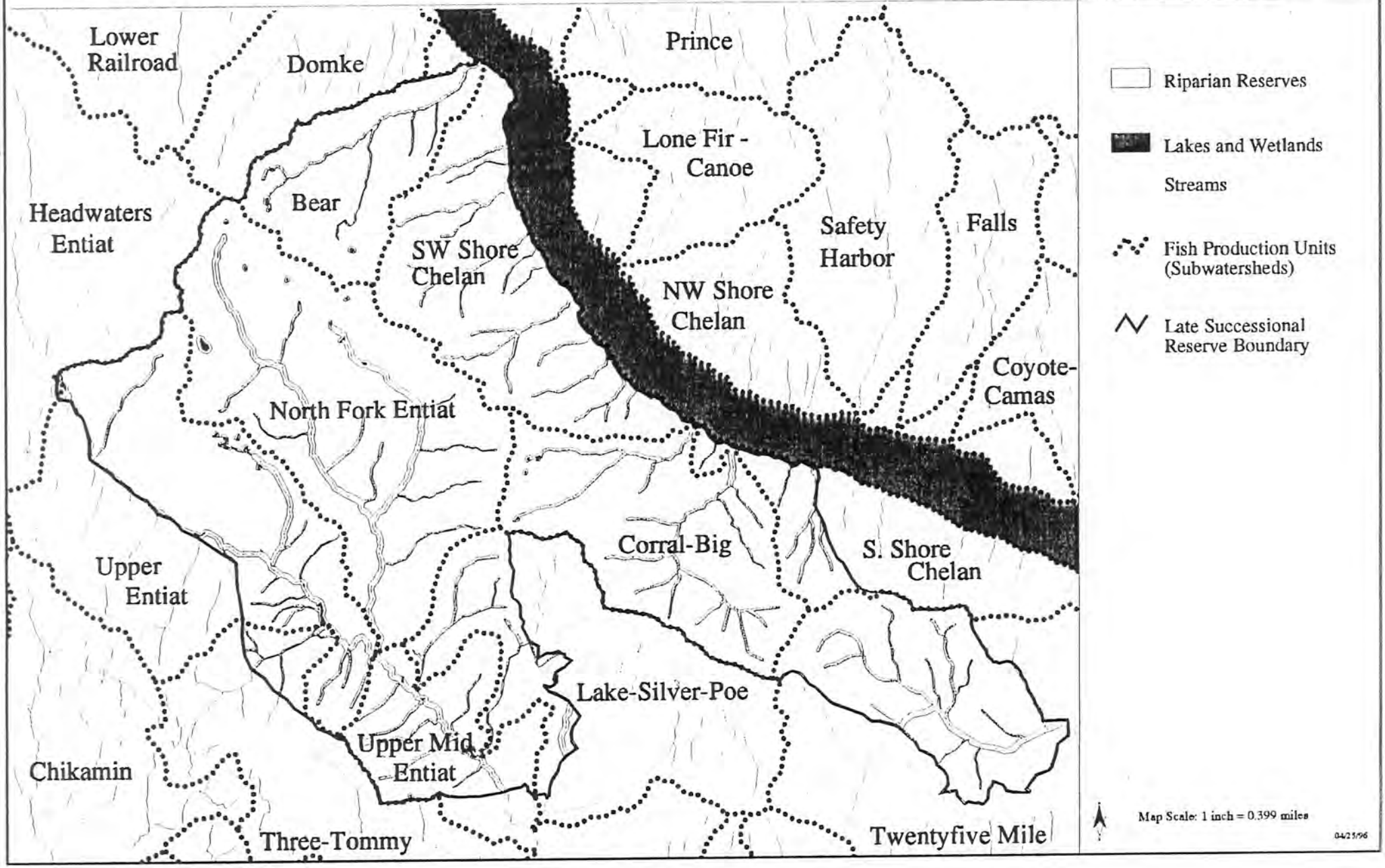
Shady Pass Late Successional Reserve

SECURITY HABITAT



Shady Pass Late Successional Reserve

FISH PRODUCTION UNITS (SUBWATERSHEDS)



XII. Swauk LSR

Intro to individual chapters

This individual chapter focuses on the Swauk 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.

A. General Description of LSR

1. Vegetation

This section describes the current condition of vegetation groups (see Vegetative Landscape section above) within the Swauk LSR. Data was derived by a combination of aerial photo interpretation (only in the northern portion, north of the Cle Elum and Leavenworth Ranger District Boundary) and modeling (see Vegetative Landscape section above). 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) Description by Vegetative Group

Information is provided below regarding each vegetation group, refer to the "LSR Vegetation Photo Mapping Key" in the Appendix for definitions of structural classes.

(1) Dry Forest Group and Grassland/Shrubland

Fifty-four percent (58,065 acres) of the Swauk LSR consists of the dry forest group (Appendix 4). Within this group, 56% (32,845 acres) is mapped as high density and only 9% mapped created openings. The actual amount of created openings in this group is probably even less because of the inability of the modeling effort (in the southern portion) to distinguish between created (fire or human caused) openings in forest environments and inherent openings (scattered forest, grassland/shrubland).

Fairly detailed vegetation data can be found in the Mission Creek Watershed Assessment which covers most of the northern portion of the LSR. Little information is currently available for the southern portion, but some generalizations can be made. Within this forest group, the ponderosa pine

series is limited within the LSR. In some locations, ponderosa pine exists as the sole overstory dominate, but more often is co-dominant with Douglas-fir and in some locations, grand fir. In the driest associations, shrub understory composition is dominated almost exclusively by *Purshia tridentata* (Mission Creek Watershed Assessment, on file at the Leavenworth RD). Shrubs such as *Artemisia tridentata, Berberis aquafolium, Arctostaphylous uva- ursi,* and *Phlox speciosa* may also occur as subordinate members of these communities. Grasses include *Agropyron spicatum, Calamagrostis rubescens, and Carex geyeri.* Forbs composition is represented by *Balsamorhiza sagittata, Achillea millefolium, Lupinus serecius, L. latifolius* and *Lomatium* spp. (Mission Creek Watershed Assessment, on file at the Leavenworth RD).

(2) Mesic Sites-

Mesic sites were only mapped within the northern portion of the Swauk LSR because of the limitations of the modeling process used in the southern 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 northern portion of the LSR, 1,495 acres of mesic sites have been identified. It will be important that these sites in the southern portion 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. 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 *Arctostaphylous uva-ursi, Berberis nervosa* and *Pachistima myrsinites* as low shrubs. Herb composition includes *Festuca occidentalis, Carex geyeri, Calamagrostis rubescens, Smilacina stellata,* and *Claytonia lanceolata* (Mission Creek Watershed Assessment, on file at the Leavenworth RD).

(3) Moist Grand Fir Group

About one-fifth (16%, 17,421 acres) of the Swauk LSR consists of the moist grand fir group. The majority (71%) of this forest group is currently layered and/or mature (mid- to late-successional) (Appendix 4). The layered/mature forest are located in two disjunct locations within the Swauk LSR; in the vicinity of Table Mountain and near upper Teanaway. Created openings and single-layered stands are dispersed throughout this forest group within the LSR.

Within this forest group, there is a moisture/temperature gradient which results in development of plant associations from dry, cool conditions adjacent the dry forest group to moist, cool adjacent the subalpine fir series. At the dry end of the moisture gradient, association are dominated in the understory by herbaceous species such as *Calamagrostis rubescens, Carex concinnoides, Carex geyeri, Arnica latifolia, Lupinus latifolius,* and *Arenaria macrophylla.* Moister associations typically include a shrub component typified by species such as *Spirea betulifolia, Rosa gymnocarpium, Vaccinium* spp., *Symphoricarpos albus, Linnaea borealis, Chimaphila umbellata,* and *Pyrola* spp. Forb composition in the most moist plant associations is lush and includes diverse species such as *Achlys triphylla, Adenocaulon bicolor, Smilacina stellata, Rubus parviflora* and *Trillium ovatum* (Wenatchee National Forest, Ecology Plot Database, and Mission Creek Watershed Assessment, on file at the Leavenworth RD).

(4) Subalpine Fir Series

The subalpine fir series constitutes about one-quarter of the Swauk LSR with 24,286 acres (22% of LSR) (Appendix 4). This series is concentrated in the middle portion of the LSR along Mission and Wenatchee Ridges (Fig. ?). The majority (63%, 15,418 acres) of this series is mapped as layered or

mature, while only 7% (1,846 acres) is mapped as created openings and 29% (6,943 acres) as single layered stands (Appendix 4).

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. Understory composition may be shrub dominated with common species represented by *Vaccinium myrtillus, Vaccinium membranaceum, Vaccinium scoparium, Chimaphila umbellata, Pachistima myrsinites, Sorbus sitchensis,* and *Pyrola* spp. Herb composition may also be lush with species such as *Valeriana sitchensis, Lupinus* spp., *Carex* spp., *Calamagrostis rubescens*, and *Arnica latifolia* dominating. Subordinate community associates may include *Polemonium pulcherrimum, Pedicularis racemosa*, and *Elymus glaucus*. (Wenatchee National Forest, Ecology Plot Database).

(5) Wet Forest Group

A minimal amount of wet forest vegetation was mapped within the Swauk LSR. Approximately forty-one acres of this type was identified, with 40 acres being layered/mature and one acre of created opening.

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

A minimal amount of this forest vegetation was mapped within the Swauk LSR. The population mapped on Table Mountain is in error and needs to be corrected before project implementation. No further discussion of this group will follow.

(7) Non-Forest Vegetation

There are approximately 6,646 acres (6% of LSR) of non-forest vegetation within the Swauk LSR. Included in this group are: grassland/shrubland (21,047 acres), bedrock (1,677 acres), talus (1,173 acres), wet meadows (769 acres), upland meadow (452 acres), brushfield (147 acres), cliff (139 acres), scree (127 acres), water (11 acres), and dry meadow (5 acres). Since half of the Swauk LSR was modeled, grassland/shrubland acres are over-estimated, and wet, dry, upland meadows, brushfields and cliffs are under-estimated.

b) Species with Special Status

Within the Swauk LSR, there is potential habitat for a number of special 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 six Forest Service sensitive (see Late-Successional Associated Plant Species) species within the Swauk LSR (Appendix 6); *Cypripedium fasciculatum, Delphinium viridescens, Anemone nuttalliana, Agroseris elata, Chaenactis thompsonii,* and *Orobanche pinorum.* Two species, *Cypripedium fasciculatum* and *Delphinium viridescens*, are federal species of concern.

Cypripedium fasciculatum has been the focus of a number of research and monitoring projects over the past four years on the Leavenworth Ranger District. Project include pollination ecology, seed dispersal, habitat characteristics, seed germination, electrophoresis, and fire ecology

Delphinium viridescens is endemic to the area between Leavenworth and Liberty. It requires adequate soil moisture during the spring and dry soil conditions in late summer. Suitable habitats are often found on old land slumps (Carl Davis, Soil Scientist, Wenatchee National Forest, personal communication). In the Swauk LSR, this species is often found along relatively open riparian areas as well. Most populations occur where shading is 60% or less (Richard Everett, Forestry Science Lab, personal communication.

A recent study by Harrod et al. (in press) found that *Delphinium viridescens* apparently responds favorably to fire. Plants in burned plots were found to be more robust and produced nearly 2.5 times more flowers and fruits as compared to unburned plots. It is unclear, however, if fire is actually required for maintenance of this species. Fire may change habitat conditions, be required for seed germination, or may stimulate sprouting of rhizomes.

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).

Orobanche pinorum is an achlorophyllus plant and obligate root parasite of *Holodiscus discolor*. Aerial stems are annual developing from a haustorial turbercle. From each stem, 50-150 flowers are produced in late June or early July. The species is facultatively autogamous and it apparently only reproduces by seed (Ellis et al. 1994).

Orobanche pinorum is often found in *Pseudotsuga menziesii* dry forest associations with incomplete upper canopies between 460 and 1220 meters in elevation (Harrod et al. in press). These sites have scattered herb and low shrub understories, and a tall shrub layer dominated by its host, *H. discolor*.

c) Survey and Manage Species

There are two known survey and manage plant species within the Swauk LSR; *Cypripedium fasciculatum* and *C. montanum* (Appendix 7). A few species are suspected, even more are simply unknown. The ROD provides standards and guidelines for survey and manage species, and these should be addressed within the Swauk LSR.

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

Table 68, Sensitive and Survey and Manage Species in Swauk LSR

Group	Latin name	Common name	Federal *	State +	Forest Service ++	Presence **
FUNGI	*Albatrellus ellisii*				SM	S
FUNGI	*Albatrellus flettii*				SM	S
FUNGI	*Arcangeliella crassa*				SM	S
FUNGI	*Boletus pulcherrimus*				SM	S
FUNGI	*Bondarzewia montana (=B.mesenterica)*				SM	S
FUNGI	*Cantharellus cibarius*				SM	S
FUNGI	*Cantharellus subalbidus*				SM	S
FUNGI	*Clavariadelphus ligula*				SM	S
FUNGI	*Clavariadelphus pistillaris*				SM	S
FUNGI	*Clavariadelphus*				SM	S

Group	Latin name	Common name	Federal *	State +	Forest Service ++	Presence **
	truncatus					
FUNGI	*Clavulina cinerea*				SM	S
FUNGI	*Clavulina cristata*				SM	S
FUNGI	*Gastroboletus turbinatus*				SM	S
FUNGI	*Gomphus clavatus*				SM	S
FUNGI	*Gomphus floccosus*				SM	S
FUNGI	*Gomphus kauffmanii*				SM	S
FUNGI	*Gyromitra esculenta (Helvella)*				SM	S
FUNGI	*Gyromitra infula (Helvella)*				SM	S
FUNGI	*Gyromitra melaleucoides (Helvella)*				SM	S
FUNGI	*Gyromitra montana (=G.gigas)*				SM	S
FUNGI	*Helvella elastica*				SM	S
FUNGI	*Hydnum repandum (Dentinum)*				SM	S
FUNGI	*Hydnum umbilicatum (Dentinum)*				SM	S
FUNGI	*Mycena lilacifolia*				SM	S
FUNGI	*Mycena monticola*				SM	S
FUNGI	*Otidea leporina*				SM	S
FUNGI	*Otidea smithii*				SM	S
FUNGI	*Phlogiotis helvelloides*				SM	S
FUNGI	*Phytoconis ericetorum (Omphalina)*				SM	S
FUNGI	*Plectania latahensis (Sarcosoma)*				SM	S
FUNGI	*Polyozellus multiplex*				SM	S
FUNGI	*Ramaria abietina*				SM	S
FUNGI	*Rhizopogon abietis*				SM	S
FUNGI	*Rhizopogon atroviolaceus*				SM	S
FUNGI	*Rhizopogon truncatus*				SM	S
FUNGI	*Sarcodon imbricatum (Hydnum)*				SM	S
FUNGI	*Sarcosphaera eximia (=S.crassa)*				SM	S
FUNGI	*Sparassis crispa*				SM	S
FUNGI	*Spathularia flavida*				SM	S
FUNGI	*Thaxterogaster pingue*				SM	S
VASCULAR PLANTS	*Agoseris elata*	tall agoseris		S		K
VASCULAR PLANTS	*Anemone nuttalliana*	pasqueflower		S		K

Group	Latin name	Common name	Federal *	State +	Forest Service ++	Presence **
VASCULAR PLANTS	*Astragalus arrectus*	Palouse milk-vetch		S		S
VASCULAR PLANTS	*Chaenactis thompsonii*	Thompson's chaenactis		S		K
VASCULAR PLANTS	*Cypripedium fasciculatum*	clustered ladyslipper	SP	T	SM	K
VASCULAR PLANTS	*Cypripedium montanum*	mountain ladyslipper			SM	K
VASCULAR PLANTS	*Delphinium viridescens*	Wenatchee larkspur	SP	E		K
VASCULAR PLANTS	*Hackelia hispida var. disjuncta*	sagebrush stickseed		S		S
VASCULAR PLANTS	*Hackelia venusta*	showy stickseed	SP	E		S
VASCULAR PLANTS	*Iliamna longisepala*	longsepal globemallow		S		S
VASCULAR PLANTS	*Orobanche pinorum*	pine broomrape		S		K
VASCULAR PLANTS	*Pellaea brachyptera*	Sierra cliff-brake		S		S
VASCULAR PLANTS	*Sidalcea oregana var. calva*	Oregon checker-mallow	SP	T		S
VASCULAR PLANTS	*Silene seelyi*	Seely's silene	SP	T		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

d) Noxious Weeds

A portion of the Swauk LSR was surveyed in 1992 for noxious weed species that occur along roadsides (McRae and Harrod unpubl. report). High densities of *Centaurea diffusa, C. maculosa* and *Linaria dalmatica* are present along roads particularly Highway 97, Mission Creek, and the Teanaway. Other species include *C. repens, Chrysanthemum leucanthemum, Hypericum perforatum,* 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

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 Swauk 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, candidate, 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 Swauk 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 the northern spotted owl, elk and barred owl. Northern spotted owl inventories have been conducted over 100% of the suitable habitat within the LSR and includes a radio telemetry and demography study conducted by the PNW Research Station.

b) Late Successional Species By Habitat Type

(1) Dry Forests

About 58,065 acres (54%) of the Swauk 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, 32,845 acres (57%)of the dry forest is in a successionally advanced condition. About 19,944 acres (34%) 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). Eighteen spotted owl activity centers occur in the Dry Forests. This comprises 75% of the total known spotted owl activity centers within the Swauk LSR.

(2) Mesic Sites Within the Dry Forest

The mesic forest group could only be mapped for the Leavenworth district portion of the Swauk LSR. They were not mapped on the remainder of the LSR because of limitations posed by having to model the vegetation. Mesic sites within the dry forests provide important wildlife habitat and add diversity across the landscape. It is suggested that these sites be identified during project level analysis and that the appropriate treatment criteria be applied.

Historically, fire occurred less frequently at these sites (refer to Chapter III) 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, 1,495 acres have been mapped as Mesic Sites on the Leavenworth portion of the LSR. About 1,151 acres (77%) are in a late-successional condition.

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.

(3) Moist Grand Fir Group

The Moist Grand Fir group covers about 17,421 acres (16%) of the LSR. Historically, fire occurred less frequently than in the Dry and Mesic vegetation groups (refer to Chapter III), 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 Swauk LSR.

Currently, about 12,318 acres (71%) 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 16,440 acres (95%), and in 100 years 17,335 acres (99%) 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, Cascade 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. Six (25%) of the spotted owl activity centers located within this LSR are located within this vegetation group.

(4) Wet Forest Group

The Wet Forest Group covers only about 41 acres (12%) of the Swauk LSR. 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 species that are associated with the late-successional conditions of these forests.

Currently all of the 41 acres are in a late-successional condition.

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. No known spotted owl activity centers are located within this vegetation group in the Swauk LSR.

(5) Subalpine Fir/Subalpine Larch

Subalpine Fir covers about 23,915 acres (22%) of the Swauk 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 15,047 acres (63%) 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 21,990 acres (92%), and in 100 years 23,836 acres (99%) would be in a late-successional condition.

Wildlife species that are associated with the late-successional forest in this vegetation group and have special status include the tailed frog, Cascade 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 ? 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 and one Critical Habitat that are federally listed as Threatened or Endangered and could occur within the Swauk 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 Swauk LSR, however, because no large bodies of water occur in the LSR it is only an occasional visitor to the area. It is unknown if peregrine falcons occur within the LSR and none of their habitat has been surveyed.

(a) Spotted Owls

The Swauk 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/MLSA's. 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 LSR's 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 LSR's. For these areas to function as source centers, at least 20 pairs of spotted owls should be managed for.

A total of 24 spotted owl activity centers occur within the Swauk LSR and about all of the habitat has been surveyed. There are 45,675 acres (42%) of suitable nesting/roosting/foraging habitat within the LSR. The Swauk is capable of having up to 73,792 acres or 68%, in suitable spotted owl habitat. However, 32,845 acres of potential habitat are in the dry forest group, which would not be sustainable. The estimated amount of habitat within a 1.8 mile radius of these activity centers is shown in Table 69. Spotted owls within the Swauk LSR have been included in a radio telemetry

study and demography study conducted by PNW USFS Research. This research has shown that spotted owls within the Swauk may be declining (Forsman et al. In press) and that they are experiencing a high level of adult and juvenile mortality (S.Sovern, pers. comm.). Because the Swauk is one of the "Big Three" LSR's on the Wenatchee National Forest and is designed to function as a "source" of spotted owls for the other LSR's/MLSA's (USFWS 1992), it is important to emphasize spotted owls and their habitat. Currently 22 (92%) of the spotted owls activity centers are below habitat thresholds and 2 (8%) are at threshold levels.

Table 69, Spotted Owl Status and Habitat Information for the Swauk 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]
SO301	PY	FS	Dry	Below Threshold	WA-12		**2,292**	**1,550**
SO304	PY	FS	Wet	Below Threshold	WA-12		**2866**	**2267**
SO309	PY	FS	Dry	Below Threshold	WA-12		**1711**	**1915**
SO310	PY	FS	Dry	Below Threshold	WA-12		**2759**	**1818**
SO312	PY	FS	Dry	Below Threshold	WA-12		**1496**	**3539**
SO317	PY	FS	Dry	Below Threshold	WA-12	INSIDE	**2241**	**1889**
SO318	PY	FS	Dry	Below Threshold	WA-12		**1894**	**2812**
SO323	PY	FS	Wet	Below Threshold	WA-12	1	**2918**	**1644**
SO324	P	FS	Dry	Below Threshold	WA-12		**2077**	**2163**
SO335	PY	FS	Dry	At Threshold	WA-12	INSIDE	**2762**	**2036**
SO336	PY	FS	Dry	Below Threshold	WA-12	INSIDE	**1720**	**2923**
SO337	PY	FS	Dry	Below Threshold	WA-12		**2094**	**2317**
SO345	PY	FS	Wet	Below Threshold	WA-12		**1258**	**988**
SO350	PY	FS	Dry	Below Threshold	WA-12	NEAR	**1547**	**3141**
SO352	P	FS	Wet	At Threshold	WA-12		**3399**	**1355**
SO370	P	FS	Dry	Below Threshold	WA-12	INSIDE	**2489**	**954**
SO387	PY	FS	Wet	Below Threshold		NEAR	**1865**	**1015**
SO701	PY	FS	Dry	Beowl Threshold	WA-12	NEAR	**2348**	**1593**
SO712	PY	FS	Wet	Below Threshold	WA-12		**2830**	**1642**

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]
SO713	PY	FS	Dry	Below Threshold	WA-12	NEAR	**2403**	**1944**
SO756	PY	FS	Dry	Below Threshold	WA-12		**2702**	**1567**
SO757	RS	FS	Dry	Below Threshold	WA-12	NEAR	**2865**	**1688**
SO761	PY	FS	Dry	Below Threshold	WA-12[7]		**2295**	**1960**
SO764	RS	FS	Dry	Below Threshold	WA-12[7]		**2100**	**1768**

[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

The Swauk CHU WA-12 overlaps into 80% of the Swauk LSR (86,098 acres), 8% of the Teanaway LSR (2,573 acres), and 50% of the Sand Creek MLSA (4,596 acres). This CHU includes parts of two LSR's and one MLSA, it would support 46 spotted owl pairs. It includes portions of the I-90 corridor, an area of concern. The Swauk CHU provides essential east-west and north-south breeding habitat connectivity. This CHU also is necessary to insure protection for the essential elements, since some of the area is checkerboard ownership. This CHU provides essential breeding habitat connectivity adjacent to the Alpine Lakes Wilderness and other CHU's important for the range wide distribution of spotted owl.

No class 1 grizzly bear observations have been made within the Swauk LSR, however, class 1 observations have been reported nearby (Almack et al. 1993). Grizzly bears are suspected to occur within the LSR and about 20% of their available habitat has been surveyed. Gray wolves are suspected to occur within the LSR and about 30% of their habitat has been surveyed. In addition, confirmed wolf locations have been made to the north of this area (Gaines et al. 1995).

There is no marbled murrelet habitat within the Swauk LSR.

(2) Sensitive And Candidate Wildlife Species

There are 15 wildlife species that are on the R6 Sensitive Species list or are federal candidate species that could occur within the Swauk LSR. These include the goshawk (*Accipiter gentilis*), willow flycatcher (*Empidonax trailii*), olive-sided flycatcher (*Contopus borealis*), tailed *frog (Ascaphus trueii*), 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 occurs in the Swauk and the olive-sided flycatcher is known to occur. Surveys have been completed over about 10% of their available habitat.

(b) Amphibians

Surveys for amphibians have been completed over about 5% of the habitat within the Swauk LSR. The tailed frog, spotted frog and Cascade's frog are all known to occur 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 the western big-eared bat have been completed over about 10% of the available habitat within the LSR. Surveys for other 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 Swauk LSR.

Surveys for wolverine and fisher have been conducted over about 20% of the available habitat, and surveys for lynx have not been completed. Lynx and fisher are known to occur and it is unknown if wolverines are present.

(3) Management Indicator Species

There are 12 wildlife species that are listed as management indicator species that occur or could occur within the Swauk 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 (Sphyrapicua ruber), Williamson's sapsucker (Sphyrapicua thyroideus), northern flicker (Colaptes auratus), ruffed grouse (Bonasa umbellus), mule deer (Odocoileus hemnionus), 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, downy woodpecker, three-toed woodpecker, Williamson's sapsucker, hairy woodpecker and northern flicker are known to occur within the LSR 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 or beavers have been completed. Ruffed grouse and beaver are known to occur in this LSR.

(b) Mule Deer, Elk

Surveys for mule deer and elk have covered most of the available habitat. Both species are known to occur within the LSR.

(c) Marten

Marten are known to occur in the LSR 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 Swauk 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 (Prophysaon coeruleum), and papillose tail-dropper (Prophysaon dubium).

(a) Birds

It is unknown if the great gray owl occurs within the Swauk LSR and no surveys have been completed. No surveys have been completed for the flammulated owl, white-headed woodpecker, or black-backed woodpecker. About 10% of the habitat for the pygmy nuthatch has been surveyed. The pygmy nuthatch, flammulated owl, white-headed woodpecker, three toed woodpecker, and black-backed woodpecker are known to occur in the Swauk 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) Amphibians

No surveys of the larch mountain salamander or the Van Dyke's salamander have been conducted within the LSR and it is unknown if they occur here.

3. Aquatic

The land area in the Swauk LSR has been broken down into the following fish production units (FPU's) : Upper Naneum, Lower Naneum Tributaries, Headwaters Swauk, Upper Swauk, Lower Swauk, Williams, Stafford, Lower N.F. Teanaway, Lower Teanaway within in the Cle Elum Ranger District and Headwaters Peshastin, Devil's Gulch and East Fork Mission on the Leavenworth Ranger District. Parts of the Teanaway, Swauk, Peshastin and Mission drainages are contained in this LSR. Swauk LSR has as estimated 12,678 acres of riparian reserve and is about 12% of the acres of the LSR. Mission Creek is designated a Key Watershed.

Swauk LSR is located in the precipitation zones that receive between 20 inches and 50 inches of average annual rainfall. Soils in some portions of the LSR are dry and described as having low stream density and intermittent flow patterns. Other soils are described as having potential for high surface erosion and/or shallow rapid soil failure hazards, high sediment delivery, and fine sediment response. Reactions of these two types of soil should be considered in making management decisions about activities planned for the LSR.

Level of dispersed recreation and livestock grazing within the riparian zone are causes for concern throughout the LSR.

Swauk drainage: Suffers from roads located in the floodplains, developments in the floodplains, past and present mining activities in channels and floodplains, and harvest removing riparian vegetation. Approximately. 980% of the watershed ahs been managed in one form or another. This has resulted in impacts to stream channel stability and aquatic habitat.

Teanaway drainage: Stafford Creek in Stafford FPU has riparian zones is in good condition overall and this state needs to be maintained.

Peshastin drainage: Flood damage from the 1995/96 floods showed problems of floodplain entrapment and the unstable soils along the stream.

Mission drainage: The East Fork Mission FPU contains riparian zones in good overall condition and this state need to be maintained. Devil's Gulch drainage is mainly untouched by management activities, it is in relatively natural condition.

4. Human Uses

a) Overview

The Swauk LSR is located on the Leavenworth and Cle Elum Ranger Districts. U.S. Highway 97, a major automobile route passes through a portion of the LSR. Much of the southern border of the LSR lies adjacent to privately owned lands.

b) Prehistoric and Historic Summary

American Indian use of this area, from information gleaned from known sites and other cultural sources appears to have been mostly in the summer and focused on hunting, fishing and root digging. Most of the historical resources in this area are associated with early-day mining activity beginning in the 1860's that focused on exploration for gold. The town of Liberty was founded in 1892. This site has been designated a historic district. Another mining community, Blewett, was established due to mining activities. In 1919 the first road over Blewett Pass was constructed. This highway was later relocated over Swauk Pass in 1956. Some railroad logging occurred in the 1930's and 1940's. The area was heavily grazed in the late 1800's and early 1900's by sheep to take advantage of the forage in the open areas.

c) Recreation

(1) Campgrounds

There are five campgrounds located within this LSR, all on the Cle Elum District. The Swauk Campground has 23 campsites and 22 day use sites. The Mineral Springs Campground consists of 12 campsites. Both campgrounds are fairly well used as they are easily accessed from Highway 97. The Haney Meadows Horse Camp with 35 units was completed in the last few years. This camp was constructed to better accommodate the high equestrian use of this area. Lion Rock (three units) which for a high elevation, remote campground is quite popular as a destination for equestrian rides, site for amateur astronomers, hunters, Ellensburg area stockmen during roundup of the range cattle and a winter snowmobiler destination.

(2) Dispersed Camping

Since there are no lakes or major rivers within the LSR there are few places that are popular for dispersed camping (camping at undeveloped location, no toilets, fire rings, etc.). However certain locations such as near Haney Meadows has long been a popular dispersed camp area for equestrians. This LSR receives considerable hunting use, considerable dispersed camping occurs during the hunting season.

(3) Trails

There are many miles of trails within this LSR. A portion of these are motorized trails. The Devil's Gulch trail system is composed entirely of trails open to motorized use in the Mission Creek drainage. The most predominant user of this trail system are mountain bikers, the second most frequent user are the motorcycle riders followed by hikers. Since 1990 the Devil's Gulch trail system has undergone considerable reconstruction and new construction to improve the quality of the trail system and better meet the needs of recreationists. There are also some motorized trails located on the Cle Elum District. A number of miles of non-motorized trail is located near Haney Meadow on the Cle Elum Ranger District. These trails are popular with equestrians using the Haney Meadows Horse Camp.

The Swauk Forest Discovery Trail, located near Blewett Pass, is a three mile non-motorized trail that focuses on eastside forests. This trail is moderately popular with families and formal classes from nearby schools and colleges.

A number of roads, trails and trailheads on the west side of this LSR provide access to the Alpine Lakes Wilderness.

(4) Winter Use

This LSR is popular in the winter for snowmobiling and cross country skiing. A sno-park located at Blewett Pass provides access for many of the users. Because of the steep terrain there is little access off Highway 97 north of Blewett Pass. The Swauk Sno-park is shared by snowmobilers and cross country skiers. There are some restrictions on snowmobile use, however there are over 100 miles of groomed sno-mobile trails in the area. The groomed snowmobiling routes receive fairly heavy use, however snowmobiling use does occur on many of the forest roads which are not closed to snowmobile use. There are a number of winter access points for snowmobilers and cross country skiers on the Cle Elum Ranger District. This includes the Swauk Campground and Pipe Creek Sno-parks which are for non-snowmobile use only.

(5) Other Recreation Uses

The Red Top Agate Beds is an area known for it's non-gem stone quality specimens. The beds receive use from rockhounds, college geology classes, and sightseers. The site is accessed by trail from Red Top Campground. Quite a few holes have been dug along the ridge top in efforts to find the stones.

Some recreational dredging and panning continues to occur in the streams.

(6) Mining

A number of claims continue to be improved upon in the LSR as prospectors pursue their search for gold. At this time no large scale mining efforts are underway.

(7) Social and Economic Considerations

This LSR provides a number of benefits, including:

- Winter recreation for cross country skiers and snowmobilers.
- Scenery and history for Highway 97 travelers
- Deer and elk hunting
- Trail users - motorized and non-motorized
- Forest products.

B. Analysis Between LSR/MLSA's

1. Sustainability

a) Sustainability Analysis

The sustainability of LSR's/MLSA's across the forest is displayed in Table 19. The Swauk LSR falls in the upper 1/3 of all LSR's/MLSA's in terms of the amount of vegetation at risk of loss to catastrophic fire. An important consideration in terms of sustainability is the relationship of the Swauk compared to its neighboring LSR's/MLSA's. Two LSR's, (Teanaway and Manastash) and one MLSA (Sand Creek) are, for the purposes of this analysis, considered to be neighbors. The two neighboring LSR's fall in the upper 1/3 of LSR's/MLSA's forest-wide in terms of sustainability and Sand Creek is in the lower 1/3 and actually has a higher percentage of at risk vegetation than the Swauk, making it one of the least sustainable LSR's/MLSA's on the forest. The following table shows the acres at risk and the ignition risk determined in the forest-wide sustainability analysis for the Swauk and its three neighboring LSR's/MLSA's.

Table 70, Acres at Risk and Ignition Risk, Swauk LSR

LSR/MLSA	% of LSR/MLSA at Risk		% of LS Forest at Risk		Ignition Risk
	Acres	Pct.	Acres	Pct.	

LSR/MLSA	% of LSR/MLSA at Risk		% of LS Forest at Risk		Ignition Risk
	Acres	Pct.	Acres	Pct.	
Swauk	59,948	55%	55,996	91%	High
Manastash	38,858	37%	33,648	49%	Moderate
Teanaway	6,840	20%	6,340	35%	Moderate
Sand Cr.	5,998	66%	5,973	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 Swauk and its three 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 is no such linkage between the Swauk and the Manastash, because any linkage in forested vegetation that may have existed historically has been broken by residential and agricultural development on private land lying between the two.

This situation is however quite different when comparing the Swauk to both Teanaway and Sand Creek. Here there is continuous at risk vegetation between the Swauk and these two LSR's/MLSA's and the potential for fires to spread from one to the other is present. The actual amount of this vegetation is mapped but not quantified at this time. Estimates from the maps show that approximately 1/3 of the vegetation between the Swauk and the Teanaway is at risk, and for the area between the Swauk and Sand creek approximately 2/3 of the existing vegetation is in an at risk condition.

(1) Implications

1. Reduce stand density in dense dry successionally advanced vegetation types (types 12 and 22) where they exist between the Teanaway and Swauk and between Sand Creek and Swauk.

2. Reduce fuel loadings along roads that exist between these LSR's to increase the roads effectiveness as fuelbreaks.

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

3. Reduce fuel loadings in young stands.

   Potential Projects - Precommercial thinning.

2. Northern Spotted Owl

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

The Swauk LSR is one of the "big three" LSR's, which is important as sources for spotted owl distribution throughout the North Cascades province. The south and western portions of this LSR lay in the I-90 corridor area of concern, the LSR network needs to provide essential east-west breeding habitat connectivity across the Cascade Crest to LSR's on the Mt. Baker Snoqualmie National Forest. However, the I-90 corridor has high potential for inter- and intra- provincial isolation resulting from extremely poor habitat conditions. The Swauk is in a location to provide important linkage for north-south connectivity, radio telemetry research in the Swauk shows dispersal distances of 25 to 30 miles, and up to 70 miles. The Swauk is in the northeastern edge of the range of the northern spotted owl. There is very little habitat beyond the Swauk to the east.

This LSR provides essential breeding habitat connectivity with the Sand Creek MLSA directly to the north and the Teanaway MLSA directly to the west. Connectivity further north to Boundary Butte LSR, has been disrupted from the Rat Creek fires in 1994. Connectivity to the Manastash LSR to the south is essential for the recovery of the species, providing genetic interchange from north to south.

The linkage between the Swauk and Manastash Ridge is dependent upon maintaining habitat in the AMA, outcome of land exchanges, and linkage at Snoqualmie Pass

There is 45,675 acres (42%) of nesting, roosting and foraging habitat for spotted owls in this LSR, this is a high amount of habitat acreage, but a low percentage of area within habitat for a large LSR, such as this. It also has one of the highest amounts of potential N/R/F habitat (73,792 acres - 68%), yet one of the lowest predicted sustainable habitat over time (27,521 acres - 25% 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 71 "Spotted Owl Pair Goals for 'Big e' LSR's" below). Currently there are 24 spotted owl activity centers within the Swauk LSR. Early historical reports of spotted owls show they have been part of these ecosystems at least since 1930 in Cle Elum and 1939 in Blewett (Condor 1946). The current 24 activity centers include 22 spotted owl pairs, of which all but 2 are below threshold acreage (2,663 acres within 1.8 mile radius).

Table 71, Spotted Owl Pair Goals for "Big 3" LSR's with CHU's

Source Center LSR	S.Owl Pairs -1994, FSEIS Appendix G, Table G-3	S.Owl Pairs - 1996	Number of Owl Pairs LSR Should Support, as per CHU discussion.
Chiwawa RW 135	11 Pairs + 1 Res Single	16 Pairs + 3 Res Singles	21+ Pairs
Swauk RW 129	15 Pr + 1 RS	22 Pr + 2 RS	20+ Pr
Manastash RW 125	13 Pr	31 Pr + 2 RS	20+ Pr

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. The spotted owl radio telemetry research in the Swauk, shows spotted owls in the Swauk have a very high reproductive rate, go long distances for dispersal (mostly to the north and west), and have a very high juvenile and adult mortality rate. Spotted owls in this Eastern Cascades area, are showing a high winter loss of juvenile birds, higher than the other study areas within the range of the spotted owl. Winter diet includes higher amounts of flying squirrel and bushy-tailed woodrat. Summer diet is composed of flying squirrel, small mammals, snowshoe hare, bushy-tailed woodrat, insects, red-backed vole, deer mouse, pocket gopher and birds. The reasons for this spotted owl mortality are predation, starvation, trauma and unknown causes. Understanding the role of prey base and winter habitat, helps in management and design of future spotted owl habitat.

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 Swauk LSR does not adjoin a wilderness, though it is close to the Alpine Lakes Wilderness in the northwestern portion. Though the Alpine Lakes Wilderness 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 north and west.

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 Sand Creek MLSA and the Teanaway

LSR. There may be difficulty along the I-90 Corridor connecting to the Manastash LSR and along the Highway 97 Corridor to Boundary Butte LSR, which recently burned in the Rat Creek fire.

Habitat providing dispersal/Connectivity corridors between LSR's (outside LSR/MLSA's) include: Crow Canyon to Bear Gulch; Scotty Creek to Peshastin Creek; Standup Creek; Yellow Hill to Davis Creek to Domerie Creek; Cabin Creek to Coles Creek to North Ridge; Peoh Point area (see Forest Interior map and Suitable owl habitat map).

a) Restoration Opportunities And Potential Projects

1. Meet goals of LSR for 20 pairs of spotted owls.
2. Improve and accelerate N/R/F habitat, to maintain high number of spotted owl pairs.
3. Aggressive protection of remaining suitable spotted owl habitat, from outside LSR on Matrix lands, etc.
4. Monitor/maintain connectivity outside LSR.
5. Monitor spotted owl activity centers, 500 acre core and home ranges of owls below threshold and below LSR target acres..

3. Connectivity (Plant and Wildlife)

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 Swauk LSR for vascular plants is analyzed from two perspectives here. Refer to the forest overview discussions for connectivity description for lichens, bryophytes and fungi.

First, connectivity relative to the Swauk LSR can be viewed from how well habitat is connected to surrounding LSR's or MLSA's. Species associated with the dry forest and moist grand fir vegetation groups are connected for all dispersal classes between the Swauk and the Teanaway LSR and the Sand Creek MLSA. There is no connectivity for the subalpine fir series between the Swauk and the Teanaway LSR, but this series absent from the Sand Creek MLSA. There is no connectivity for any dispersal class for those species associated with the dry forest group and the subalpine fir series between the Swauk and Manastash Ridge LSR's. In the moist grand fir group, there is no connectivity between the Swauk and Manastash Ridge LSR's for the low dispersability species, but the moderate and high dispersal species are dependent on habitat in between these LSR's. Finally, the wet forest and whitebark pine/subalpine larch vegetation groups are absent from Swauk, so discussion of connectivity is not applicable.

(1) Restoration Opportunities

No opportunities were identified as a result of this analysis.

b) Wildlife Connectivity

The following are the results of applying the forest wide connectivity module to the Swauk LSR (Refer to the Dispersion Index in Appendix A). A total of four potential linkages were evaluated. These included Swauk to Sand Creek, Swauk to Boundary Butte, Swauk to Teanaway, and Swauk to Manastash Ridge.

Table 72, Dispersal Indices for the Swauk LSR Forest Wide Connectivity Module.

Linkage	Distance (Mi.)	Low	Moderate	High	Index
Swauk/Sand Creek	0	Yes	Yes	Yes	3

Linkage	Distance (Mi.)	Low	Moderate	High	Index
Swauk/Boundary Butte	5.3	No	No	Yes	1
Swauk/Teanaway	1.3	No	Yes	Yes	2
Swauk/Manastash Ridge	9.0	No	No	Yes	1
Overall Rating					**1.75**

Two (50%) of the linkages were indexed as a 1 providing for dispersal of highly mobile species only. The linkage between the Swauk and Manastash Ridge is dependent upon maintaining habitat in the AMA, outcome of land exchanges, and linkage at Snoqualmie Pass. One linkage was indexed as a 2 providing for dispersal of moderate and high mobile species. The linkage between the Swauk and Sand Creek was indexed as a 3 providing for low, moderate and high mobility species. This linkage is important as few areas on the forest provide connectivity for low mobility species.

(1) Restoration Opportunities

There is an opportunity to improve the linkage between the Swauk and Teanaway from a 2 to a 3. This could be accomplished by identifying, on a site specific basis, the best potential linkage and managing it to provide for low mobility species.

A careful, site specific evaluation of the linkage at Snoqualmie Pass is needed in order to fully assess what species are provided for and how to improve this linkage. It may be necessary to coordinate with the Department of Transportation to provide for dispersal of wildlife.

C. Analysis Within LSR

1. Unique Habitat and Species

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

a) Forest-wide Overview of Unique Habitats and Species

The Swauk LSR, over all, is high in unique habitats and species. It is located in the Wenatchee Mountains, an area for plant rarity and endemism noted by Columbia Basin Ecosystem Management Project, 1995. The Wenatchee NF plan noted the Drop Creek RNA for Engleman spruce/subalpine fir forests. There are two other areas of Special Interest, one in the Upper Naneum Meadows and one in Miller/Bear Creeks. With the Alpine Lakes Wilderness close to the north, many species found in the wilderness may also inhabit the Swauk LSR.

The Swauk LSR has comparatively high amounts of natural openings, wet meadows, riparian reserves (see Table 26 "Unique Habitats and Species" for all LSR/MLSA's). It also has a high amount of known special wildlife species, 57 species, and of known special plant species, 28 species, (see same table 26 noted above, and Appendix 6 Plant Species Lists and Appendix 27 Wildlife Species List).

From a Forest perspective, the Swauk LSR has relatively high amounts of forest interior, in all vegetative groups (dry, high elevation and moist/wet). There is a higher percentage (54%)of dry forest in this LSR, compared to the other large LSR's. Higher percentages of dry forest are found only in Lucerne LSR, Deadhorse LSR, Slide Peak LSR and Boundary Butte LSR. Overall, the Swauk LSR has moderate quality snags.

American Indian food gathering and other material collections would be moderate to high. The gathering of bitterroot, camas, as well as deer and elk are past traditions of this area. With the amount

of talus in the Swauk there are probably several lithic and vision quest sites. This area provided early season root digging, as well as travel and trade routes and camp sites later through the year.

b) Unique Habitats and Species Within

Each LSR/MLSA was 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 were found to effect the function of unique habitats and species. For the Swauk LSR these include: total open road density of 3.13 miles per square mile: security habitat of 50%; roads and trails in riparian reserves of 5.49 miles per square mile; and past harvest activities of 75% 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 Swauk is in the high quality group that provides 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.

(2) Connectivity for Unique Habitats and Species

The Swauk is also in the high group for 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.

(3) Process and Function of Unique Habitats and Species

The Swauk is again in the high group 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 Swauk LSR are:

1. Table Mountain Area: meadows, talus/rock, forest interior, wetlands, riparian reserves, PETS spp.
2. Devils Gulch/Tronson Ridge/Mission Ridge: springs, wetlands, natural openings, meadows, forest interior, rock/talus, riparian reserves.
3. Miller/Bear Creek: Special Interest Area, meadows, shrubs, talus/rock, forest interior.
4. Upper Naneum Meadow/Mount Lillian: Special Interest Area, forest interior, meadows, riparian reserves, talus/rock.
5. Drop Creek: RNA for engleman spruce, talus/rock, forest interior, riparian reserves.
6. Peavine/Mission: Natural openings, rock/talus, riparian reserves, PETS spp.
7. Baker/Mill Creek: forest interior, PETS spp, natural openings, riparian reserves.
8. Headwaters Swauk Meadows: wetlands, riparian reserves, forest interior, talus/rock/ PETS spp.
9. Headwaters Jack Cr.: wetlands , riparian reserves, forest interior.
10. Lower First Creek: forest interior, wetlands, riparian reserves, PETS spp.

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

1. Reduce road and trail densities in riparian reserves
2. Reduce open road densities throughout the LSR..
3. Increase amount of security habitat

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 forested screening near talus, cliffs, caves, meadows.
9. Reduce encroaching trees in subalpine meadows.
10. Prescribed fire in ponderosa pine.
11. Reduce Fragmentation of Wet Forest.
12. Protect riparian from grazing.
13. Provide American Indian site access.
14. Maintain black-backed woodpecker nesting/roosting/foraging habitat.
15. Meet high end snag levels.
16. Create log den sites in low quality roaded/forest for marten, fisher, lynx.
17. Protect/maintain/enhance/monitor PETS.
18. Prescribed fire in natural openings as part of fire climax.
19. Interpret values and protection/maintenance of unique habitats and species.
20. Acquire non-Forest System lands with high degree of unique species or habitat.

d) 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 Swauk LSR. 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.

A landscape level approach was used to analyze snag, green tree recruitment, and downed wood habitat in the Swauk LSR.. The landscape approach reviews the quality of snag, down logs, and green tree recruitment for the LSR's. GIS and specific knowledge was used: including: forest vegetation types and acreages, amount of forest burned, percentage of past timber harvest (clearcuts and partial cuts), road densities, security habitat, Riparian Reserve acreages, pathogens, the number of spotted owl home ranges, forest interior amounts, and the percentage of late successional habitat. The qualitative analysis for the LSR included green tree availability, short term and long term snag/log availability, burn intensity, site specific wildlife needs, land allocation goals, and the quality of refugia/security habitats.

(1) Quality Rating

Each attribute for snag/downed log/green tree recruitment has a rating (see chart), a final rating incorporates all values towards one rating for the LSR. Actual snag, downed log and green tree recruitment numbers, sizes, stages of decay and species is not practical to analysis on a landscape basis. This can also be done on a 40 acre grid, or sub-watershed basis. When data is available, incorporate actual availability data into the analysis. Snag and Downed Log levels are based on Wenatchee National Forest Snag Levels, Fire Recover y Snag Levels, Everett et al Spotted owl and Snag studies, and wildlife needs. Qualitative ratings are based on habitat needs for snag, downed log, and recruitment tree wildlife and plant species needs. Species using these habitats include:

pileated woodpecker	spotted owl	hoary bat	marten & fisher	tailed frog
black-backed woodpecker	flammulated owl	silver-haired bat	flying squirrel	NW & PG salamander

white-headed woodpecker	great gray owl	big brown bat	lynx	lichens & fungi
olive-sided flycatcher V	Vaux's swift	voles, shrewmole	bald eagle	land snails

***** SWAUK ****

HIGH QUALITY	MEDIUM QUALITY	LOW QUALITY
Moist & Wet Veg Groups 16%	Subalpine Fir & Mesic Veg 23%	Dry & Whitebark Veg 54%
>60% LS (non-dry) Habitat	15% - 60% LS Habitat 31%	<15% LS Habitat
80% - 100% LS (all) Habitat 82%	40% - 80% LS/M Habitat	<40% LS/M Habitat
> 30% Forest Interior (non-dry)	15% -29% Forest Int Non-dry	<15% Forest Interior ND 9%
>10% Forest Interior Dry	5% - 9% Forest Interior Dry	< 5% Forest Interior Dry 2%
>16% in Riparian Reserves	10% to 16% in Riparian Res 12%	<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 5.49 mi/sq/mi
< 1 Mi/Sq Mi Open Roads	1 Mi to 2.5 Mi/Sq Mi Roads	> 2.5 Mi/Sq Mi Roads 2.68 mi/sq/mi
>70% Security Habitat	50% to 70% Security Habitat	<50% Security Habitat 19%
>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 20% ?	>25% Past CC Harvest
<10% Past PC Harvest	11% - 50% Past PC Harvest	>50% Past PC Harvest 40%

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

Reduce roads in riparian reserves;
Retain Snags at High End of Range;
Complete snag analysis on 40 acre grid

Reduce Roads in Forest Interior Patches
Incorporate Healthy Insect/Disease Levels,

e) Plant Species with Special Status

There are six sensitive and two survey and manage species (one of which is a sensitive species) known to occur within the Swauk 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 *Anemone nuttaliana* has a disjunct distribution throughout its range and is known only in Chelan and Kittitas Counties in Washington from only a few locations. Furthermore, little or no information exists regarding the biology or ecology of this species. It will be important to develop monitoring projects that collect biological information so that population viability can be assessed.

In addition, *Chaenactis thompsonii* is a local endemic known only from a few locations in the Wenatchee Mountains. Again, little or no information exist describing the biology and ecology of this species. It will be important to develop monitoring projects that collect biological information so that population viability can be assessed.

2. Connectivity (Plant and Wildlife)

a) Plant Connectivity

Connectivity can also be addressed by qualitatively describing the connectedness of habitats within the LSR. Within the Swauk LSR, the subalpine fir series is particularly well connected within the southeastern portion of the LSR. However, the dry forest habitat in Mission Creek is disconnected, particularly for low dispersal species, from that in lower Swauk Creek. The same is true for the moist grand fir habitat type when comparing the eastern and western portions of the LSR. Species with low and moderate dispersal abilities associated with the dry forest and the moist grand fir vegetation groups are apparently disconnected within the LSR. This is due, in large part, to inherent breaks in the vegetative landscape.

Disconnectivity identified in this analysis results from inherent breaks in the vegetative landscape. For example, the lack of connectivity for the subalpine fir series between the Swauk, Teanaway, and Manastash Ridge LSR's, as well as within the Swauk LSR, is because of landform. The results of this analysis does not necessarily lead to any proposed projects.

b) Wildlife Connectivity

The results of applying the within LSR connectivity module are presented in this section for the Swauk LSR.

Table 73, Swauk LSR Connectivity Rankings

Connectivity Variable	DF/MS	MGF	SAF	RR	OVERALL
%LS or Fire Climax	FC=L, LS=M	H	M	M	M
Open Road Density	L	L	L	L	L
Security Habitat	L	L	L	L	L
Forest Interior Roads	L	L	L	L	L
%Forest Interior	L	L	L	L	L

Currently, the availability of habitat in a late-successional or fire climax condition is moderate in all vegetation groups except the moist grand fir. Restoration projects that promote the development of fire-climax conditions, given the need to maintain spotted owl habitat, would improve the connectivity of this vegetation group. The overall open road density is 2.68 mi./sq.mi. resulting and a low rating for habitat connectivity relative to open roads and security habitat. This is particularly a concern for species with low levels of mobility as roads present barriers to movement. The percent of each vegetation type in forest interior will improve over time unless large scale disturbances occur. 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 to be managed for 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 less mobile species. This could not be adequately addressed at the course/moderate filter approach used in this assessment.

(1) Restoration Opportunities

(a) Dry Forest Group

It is important to locate and map the mesic sites within the Dry Forest Group in order to apply appropriate DEC's. Mesic sites have been identified on the Leavenworth portion of the LSR but could not be identified on the remainder to the LSR from available vegetation data.

There is an opportunity to restore habitat for fire-climax ponderosa pine associated species. These restoration activities should occur outside of areas currently identified as providing suitable spotted owl habitat unless habitat is in imminent danger from fire. There is opportunity to manage towards the DEC in areas outside or suitable spotted owl habitat using tools such as thinning and prescribed fires. This should include nonforested areas that could benefit from the use of prescribed fires.

Perhaps the most immediate opportunity to improve the connectivity of the Swauk LSR is through the active management of roads. To improve connectivity for low mobility species, these restoration actions should include recontouring and/or revegetation of roads.

(b) Moist Grand Fir, Wet Forest

There is opportunity to improve the habitat connectivity for LS associated species by promoting the development of LS habitat in areas that do not currently provide it. The tools that could be used include thinning to improve tree growth.

Again, there is a opportunity to improve connectivity through active management of roads. For low mobility species, recontouring and revegetating roads could be considered.

(c) Riparian Reserves

The current open road density within Riparian Reserves is 4.8 mi./sq.mi. There is an opportunity to greatly improve habitat connectivity by restoring vegetation and cover where roads currently exist.

(d) 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 2.7 mi./sq.mi. and the amount of area in security habitat is 19%. This information shows that habitat effectiveness is considered to be "low" (>2mi./sq.mi.) relative to roads and "low" relative to security habitat (<50%). The long term management objective for LSR/MLSA's is to manage towards a "high" level of habitat effectiveness defined as >1mi./sq.mi. open road density and >70% security habitat.

3. Disturbance Risk Analysis

The Swauk LSR contains nearly 34,000 acres of successionally-advanced dry forest. Most of this is concentrated and connected along both sides of the highway 97 corridor. Road densities and recreational use in the Swauk LSR are high, elevating the risk of human-caused fires. A second block of successionally-advanced dry forest lies within the Mission Creek drainage, in the eastern portion of the LSR. Although much of this area is unroaded, it receives considerable use from hunters in the fall, and its distance from the crest of the Cascades makes it one of the driest areas within the Wenatchee NF LSR network. There are also about 15,000 acres of mature/layered forest and nearly 7,000 acres of single-layered forest in the subalpine fir series, primarily on Table Mountain, in the eastern portion of the LSR. Many single-layered stands within the subalpine fir series are dominated by mature lodgepole pine. As part of a study conducted within the Swauk LSR, Camp (1995) cored and aged trees throughout the reserve. Of the 161 lodgepole pine sampled on 63 plots, more than half (57 percent) were 75 years or older and 32 percent were at least 100 years. Only 12 lodgepole pines in the sample were younger than 50 years. Lodgepole pine becomes increasingly susceptible to mountain pine beetle attacks as it matures; on the Wenatchee National Forest, trees 100 years or older are very susceptible (P. Flanagan, pers. comm.).

A recently-completed study found that immediately prior to Euro-American incursion and settlement, between 7 to 12 percent of the Swauk LSR contained late-successional forest, and, based on topography and physiography, about 60 percent of this LSR has less than a 2 percent probability of sustaining late-successional composition and structure under inherent disturbance regimes (Camp

1995, Camp and others 1996 in press). Of all the LSR's on the Wenatchee National Forest, the Swauk is one of the least likely to provide quality late-successional habitat over time, yet it is one of the three LSR's most heavily utilized by the northern spotted owl.

The above-mentioned study provides information about trees. snags, logs, and cut stumps within the Swauk LSR. In 9 subdrainages (487 plots) over 3,000 live trees were cored and aged. In 5 of the subdrainages (345 plots), snags, logs, and stumps were also sampled. Table 76 lists snags greater than 6' in height by species and size class. Of 343 snags for which diameter measurements were obtained, 49 percent were less than 10" in diameter and 74 percent were less than 15". Only 14 percent were 20" or more. Most snags were grand fir or Douglas-fir, the preferred host species for many insects and pathogens currently exhibiting high activity levels in the Swauk LSR. Eleven percent of the snags were ponderosa pine or western larch, possibly killed by either western bark beetle (pine) or larch dwarf mistletoe infestation. An interesting comparison can be made between the sizes of snags, logs, and cut stumps within the LSR (Tables xx and xx). Most cut stumps were ponderosa pine (136) or Douglas-fir (125). Ponderosa pine stumps ranged in size from 5 to 75.9 inches in diameter; 79 were 20" or greater in diameter. Douglas-fir stumps ranged from 5.6 to 59.5"; 59 of these were 20" or greater in diameter. Logs tallied in the study and measured at the butt end showed that a preponderance were less than 10" in diameter. The disturbance risk from large numbers of logs and snags in small size classes is that these lose moisture exponentially faster and become more rapidly flammable than snags and logs in larger size classes. Flammability decreases as moisture content in snags and logs increases since more of a fire's heat is required to vaporize the water.

High levels of recent snags (those still retaining fine branch and twig structure) are to a large extent the result of western spruce budworm defoliation in the 1980s. Many trees not killed by defoliation later succumbed to Douglas-fir beetle and fir engraver beetles. Over 50 percent of snags sampled in Baker, Mill, and Medicine Creeks are from recently killed trees. This heavy pulse of dead structure probably benefits wildlife, but also contributes to the likelihood of fires moving into the canopy using these dead ladder fuels. The fine twig and branch structure of recently-killed trees provides an abundance of fast-drying fuels, and these fuels are vertically connected from the forest floor into the canopy, increasing the likelihood of fires crowning.

Over 14 percent of all live trees sampled within the LSR showed evidence of damage from insects and/or pathogens. The pathogen and insect activity is a result of past overstory harvests and excluding fires within the LSR. Nineteen percent of more than 1,000 Douglas-fir sampled had mistletoe in at least two-thirds of the live crown. Some western larch and ponderosa pine in the sample also had heavy mistletoe infestations. Six percent of the sampled trees exhibited evidence of stem decay. Most decayed trees were grand fir and Douglas-fir, although some individuals of every species in the sample were infected. Ten percent of the sampled trees had mechanical damage to the bole or top, including dead tops, forked tops, wounds, and scars. Damaged areas can provide infection courts for several decay fungi. In addition, 208 ponderosa pine, western larch, and Douglas-fir in the sample were scarred by past fires. Most fire-scarred trees were in stands that currently have live and dead structure from the ground into the crowns. These stands are highly susceptible to stand-replacing fires that would kill most trees in the stand, including those that survived past fires.

Aerial surveys conducted by the Insect and Disease Group of Region 6 since the late 1940s indicate the following insect outbreaks occurring within the Swauk LSR:

- Western pine beetle: 1954, 1963, 1965, 1981, 1984-94
- Mountain pine beetle (lodgepole pine): 1950, 1952, 1956-7, 1963, 1982, 1985, 1987-8
- Mountain pine beetle (w. white pine): 1953, 1960-62, 1969, 1976-79, 1981, 1983-93
- Mountain pine beetle (ponderosa pine): 1963, 1968-9, 1974, 1977-81, 1983, 1986-94
- Mountain pine beetle (whitebark pine): 1980-1, 1989, 1994
- Douglas-fir beetle: 1952-6, 1960, 1962-3, 1965, 1970, 1973, 1976, 1978-9, 1988, 1990-1

- Fir engraver: 1953-6, 1959-60, 1968-71, 1973, 1977-79, 1985-8, 1990-93
- Spruce beetle: 1954, 1959, 1976, 1988, 1990, 1992
- Western spruce budworm: 1972-80, 1986-87
- Larch budmoth: 1986

For nearly all insects surveyed, damage during the past decade has been more frequent and of longer duration than in the previous 50 years. In particular, mortality associated with western bark beetle, Douglas-fir beetle, and the fir engraver has increased dramatically during the past two decades, partially as a result of an extended drought. The susceptibility of stands in the Swauk LSR to fires and several biotic disturbance agents are shown in Table 74. Mortality 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 (for example, western spruce budworm and Douglas-fir beetle or fir engraver). Moreover, risk to the biotic disturbance agents generally elevates the risk of catastrophic fires by potentially increasing fuel levels.

The Swauk LSR has and continues to support small-scale mining activity. Disturbances are localized, but frequently concentrated in riparian areas. Soils are frequently severely damaged by mining-related activities, lowering future site productivity. Numerous residences along the major highway that bisects the Swauk LSR are within some of the driest portions of the LSR. Escaped trash fires constitute a real threat to sustaining this LSR as do fires ignited by hunters and recreationists in dispersed campsites within the Swauk.

Table 74, Disturbance Matrix, Swauk LSR

Veg Type	Fire	Dwarf mistletoes			Root disease		WPBR	FE	WSB	DFB	MPB	WPB	TOTAL
		PP	DF	WL	AR OS	HE AN							
10	M	M	M	L	L	M	-	L	L	L	L	L	M
11	M	M	M	L	M	M	-	M	M	L	L	M	M
12	H	H	H	L	M	M	-	H	H	H	L	H	H
13	H	H	H	L	M	M	-	H	H	M	L	M	H
20	M	L	M	M	M	M	-	L	L	L	L	L	M
21	M	M	M	M	M	M	-	L	L	M	L	L	M
22	H	M	H	H	M	M	-	L	M	H	L	L	H
23	H	M	M	M	L	L	-	L	M	M	L	L	H
30	M	L	M	M	L	M	H	L	L	L	L	L	M
31	M	L	M	M	L	M	H	L	L	L	L	L	M
32	H	L	H	H	L	M	H	H	M	M	L	L	H
33	H	L	H	H	M	H	H	H	M	M	L	L	H
40	L	-	L	L	L	L	H	L	L	L	L	L	L
41	H	-	L	L	L	L	H	L	L	L	H	L	H
42	H	-	L	L	L	L	H	M	L	M	H	L	H
43	M	-	L	L	L	L	H	L	L	L	M	L	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 = 0; "L" = low risk, "M" = moderate risk, "H" = high risk

Table 75, Live and Dead Structure in Swauk LSR

	Live Trees	Snags - All	Snags - < 6 feet	Snags - Old	Snags - Recent	Logs	Cut Stumps
Total	2107	467 22.2%*	110 23.6%**	162 35.0%**	195 41.8%**	105	361 17.1%***
Boulder	1055	239 22.7%	59 24.7%	98 41.0%	82 34.3%	33	143 13.6%
Medicine	721	198 27.5%	41 20.7%	57 28.8%	100 50.5%	69	162 22.5%
Baker	71	17 23.9%	3 17.7%	5 29.4%	9 52.9%	0	2 2.8%
Mill	134	6 4.5%	3 50.0%	0	3 50.5%	2	10 7.5%
Lion	126	7 5.6%	4 57.1%	2 28.6%	1 14.3%	1	44 34.9%
ABGR	649	160 24.7%	20 12.5%	38 23.8%	102 63.8%	27	62
ABLA	111	14 12.6%	0	6 42.9%	8 57.1%	5	0
PICO	59	21 35.6%	3 14.3%	4 19.1%	14 66.7%	10	4
PIPO	391	37 9.5%	16 43.2%	12 32.4%	9 24.3%	12	136
PSME	865	172 19.9%	54 31.4%	86 50%	32 18.6%	33	125
LAOC	62	26 41.9%	4 15.4%	6 23.1%	16 61.5%	10	10

* Proportion to live trees, ** Proportion of total snags, *** Proportion to live trees

Data taken from a sample in five randomly chosen subdrainages - 1993 (see Camp 1995)

Table 76, Snags in the Swauk LSR

	< 10"	10 - 14"	15 - 19"	> 20"
Grand fir	77	40	15	7
Douglas-fir	39	23	21	29
Western larch	10	6	1	3
Lodgepole pine	10	5	1	1
Subalpine fir	8	5	1	0
Ponderosa pine	7	5	1	6

	< 10"	10 - 14"	15 - 19"	> 20"
W. white pine	4	1	1	0
Other species	12	2	1	1
Total	167	87	42	47

Table 77, Log Data, Swauk LSR

	<10"	10"-14"	15"-19"	³ 20"
Grand fir	10	6	4	1
Subalpine fir	3	1	2	1
Douglas-fir	15	4	4	6
Western larch	6	2	0	2
W. white pine	2	1	0	0
Lodgepole pine	6	3	2	0
Ponderosa pine	3	3	2	4
Undetermined	3	0	0	0
TOTAL	**48**	**20**	**14**	**14**

Sixty-four percent of the Swauk 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 single-layered and layered subalpine fir forests. The moist grand fir and subalpine fir types are at high risk both from adjacency to drier forests and because insect and pathogen activity has greatly increased 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. Management within this LSR will 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 (e.g. fuelbreaks on south-facing aspects) or outside spotted owl circles. Management objectives to reduce risk of habitat loss to catastrophic wildfires, insects, and pathogens include reducing stand density in non-spotted owl habitat and outside spotted owl circles; altering species compositions to favor fire-tolerant and insect/disease resistant species; and reducing vertical and horizontal fuel continuity outside spotted owl circles and outside LSR boundaries. Silvicultural and other options to attain objectives within dry and mesic forest types include thinning (PCT/CT); pruning; fuelwood collection; mechanical fuel treatments; handpiling fuels; prescribed fire; favoring seral, fire-resistant species such as ponderosa pine, and western larch; and developing or maintaining fuelbreaks. Silvicultural options to protect moist grand fir and subalpine fir forests include treating adjacent dry forest stands as described above; favoring fire tolerant and insect/disease resistant species; reducing negative impacts of insects and pathogens by reducing the vertical and horizontal continuity of host species; and developing or enhancing fuelbreaks.

4. Northern Spotted Owl

A total of 24 spotted owl activity centers are currently known within the Swauk LSR. Of these, 22 (92%) are below the habitat threshold levels and two (8%) at currently at the threshold levels. Research has shown that the numbers of owls in the Swauk may be declining (Forsman et al. In

press). Because this area is one of the "big three" it is important to emphasize the development of suitable spotted owl habitat conditions.

Currently, the connectivity of habitat within the LSR is considered to be low as a result of high open road densities and habitat fragmentation.

Restoration activities that could be used include the use of silvicultural practices to promote suitable habitat development in areas not currently providing suitable habitat. This is especially desirable in the mesic and moist forests. The risk of habitat loss from fires could be accomplished by reducing fuels in area that are not currently spotted owl habitat such as south slopes or open pine stands with high brush fuels. Habitat effectiveness and connectivity could be enhanced by reducing the open road density and revegetating the road beds. This would be especially effective in the areas identified as forest interior.

The following is the discussion and results of the within LSR Spotted Owl Module for the Swauk 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 Swauk LSR has 45,675 acres (42%) of nesting/roosting/foraging habitat, of that 27,521 acres are in the wetter vegetation type and have a good chance of sustainability. There is a potential for the LSR to have 73,792 acres (68%), but much of that is in the dry and not sustainable. The most contiguous (sustainable) suitable spotted owl habitat in the LSR is between Teanaway Ridge /Baker/Deer Gulch and the Table Mountain area. Secondarily are Devils' Gulch and Bear Creek. There are extensive past clear cuts and shelterwood harvests, that currently fragment habitat. To meet the recovery goals for the spotted owl, there is a need to increase/accelerate spotted owl habitat, especially accelerating old plantations..

b) Spotted Owl Home Ranges

The Swauk 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 Swauk LSR. There are a total of 24 spotted owl activity centers. This includes 22 pairs of owls. This LSR has 22 of the 24 sites below threshold, the other 2 sites are at or above threshold. No owl sites are at target amounts over 3,994.

There are 18 dry owl sites, making this a 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.

Table 78, Status Individual Spotted Owl Home Ranges and Restoration Opportunities

	1.8 mile Circle Around Activity Center				0.7 mile Circle Around Activity Center				.33 mile Circle Around Activity Center[11]				Restoration
Spotted owl	Dry	Mesic	Wet	Total	Dry	Mesic	Wet	Total	Dry	Mesic	Wet	Total	
SO301	1029	0	1263	**2292**	282	0	111	**394**	81	0	1	**82**	mpa

	1.8 mile Circle Around Activity Center				0.7 mile Circle Around Activity Center				.33 mile Circle Around Activity Center[11]				Restoration
Spotted owl	Dry	Mesic	Wet	Total	Dry	Mesic	Wet	Total	Dry	Mesic	Wet	Total	
SO304	435	0	2431	**2866**	58	0	415	**473**	14	0	77	**91**	mpa
SO309	1260	0	451	**1711**	282	0	137	**419**	61	0	59	**120**	mpa
SO310	1097	0	1662	**2759**	249	0	243	**492**	71	0	47	**118**	mpa
SO312	1369	0	128	**1496**	255	0	0	**255**	79	0	0	**79**	mpa
SO317	2138	0	104	**2241**	427	0	0	**427**	98	0	0	**98**	mpa
SO318	1239	0	655	**1894**	151	0	37	**188**	38	0	13	**51**	mpa
SO323	813	0	2105	**2918**	126	0	271	**398**	48	0	13	**61**	mpa
SO324	1916	0	161	**2077**	323	0	0	**323**	66	0	0	**66**	mpa
SO335	1015	0	1748	**2762**	332	0	204	**536**	103	0	8	**111**	mpa
SO336	1068	0	651	**1720**	234	0	0	**234**	72	0	0	**72**	mpa
SO337	1868	0	226	**2094**	284	0	2	**286**	47	0	0	**47**	mpa
SO345	633	0	625	**1258**	53	0	76	**129**	22	0	23	**45**	mpa
SO350	1355	0	292	**1647**	221	0	0	**221**	59	0	0	**59**	mpa
SO352	839	0	2560	**3399**	187	0	419	**607**	45	0	91	**135**	mpa
SO370	2141	0	348	**2489**	449	0	1	**450**	102	0	0	**102**	mpa
SO387	559	0	1306	**1865**	137	0	231	**369**	62	0	19	**81**	mpa
SO701	1653	565	130	**2348**	291	73	0	**364**	83	29	0	**112**	mpa
SO712	985	186	1659	**2830**	209	0	210	**419**	44	0	4	**48**	mpa
SO713	1491	556	357	**2403**	328	119	0	**447**	72	23	0	**95**	mpa
SO756	1336	332	1034	**2702**	278	67	89	**434**	69	18	14	**101**	mpa
SO757	1048	184	1633	**2865**	259	7	126	**392**	83	0	24	**107**	mpa
SO761	1817	468	10	**2295**	205	115	0	**320**	22	54	0	**75**	mpa
SO764	1284	371	445	**2100**	229	107	3	**339**	43	59	0	**102**	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 Swauk LSR is noted on 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 Swauk has 31% in late-successional wetter forest habitat, this needs to increase. 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.

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 AMA's, and in wilderness areas (NWFP 1994, Ch 3-4 pg. 240-241).

d) Restoration Opportunities And Potential Projects

1. Meet goals of LSR for 20 pairs of spotted owls.
2. Improve and accelerate N/R/F habitat, to maintain high number of spotted owl pairs.
    - 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.
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:
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.
7. Monitor spotted owl activity centers, 500 acre core and home ranges of owls Acres below Threshold highest priority.
8. Monitor spotted owl activity centers, 500 acre core and home ranges of owls at threshold (see list).
9. Field verify habitat within 500 acre home ranges of spotted owl sites below threshold in that core, but above threshold in the home range.
10. Increase habitat effectiveness and connectivity by reducing open roads and revegetating road beds. Especially in forest interior habitat patches.
11. Reduce road densities
12. Maintain dispersal/connectivity habitat

5. Aquatic

a) Summary of Aquatic Goals for Swauk LSR

- Protect salmon and resident non-salmonid fish populations and habitat in core areas.
- Prevent increases in water temperature

- Reduce water temperature
- Minimize fine sediment input
- Increase large woody debris recruitment potential
- Reduce ground to surface water conversion by roads, especially in land types A and B.
- Evaluate road surfacing maintenance, especially in land types C.
- Reduce and avoid increase in riparian roads.
- Manage upslope vegetation, roads, and activities to increase base flows and to avoid increase in peak flows.
- Preserve and restore all floodplains, side channel and riparian wetland habitat, especially in C and E channel types.
- 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 salmonid and non-salmonid aquatic biota.
- Upgrade culverts and other stream crossings to pass 100 year flood events and provide fish passage.

(Table Mountain Watershed Analysis, Projects were identified in the watershed analysis.)

b) Key Issues

1. Core fish areas have been identified within and downstream of Swauk LSR. Cutthroat trout, in the Upper Stafford FPU. Cutthroat trout are found throughout the majority of the LSR . Steelhead population strongholds occur in the Teanaway drainage, the Lower Teanaway and Lower N.F. FPU. The Swauk drainage contains critical steelhead habitat that needs to be protected. Sockeye/Kokanee salmon are known absent throughout the FPU's. Mountain whitefish are unknown. Lamprey are unknown. Summer Chinook are known absent. .

   Redband/native rainbow trout are known to occur in the Headwaters Peshastin, Devils Gulch and East Fork Mission FPU's, they have an unknown status in the Upper Naneum, Williams, Swauk, Upper Swauk and Lower Swauk FPU's and a stronghold exists in the Headwaters Peshastin FPU.

   Spring Chinook are known present in the Lower Swauk FPU's, in Devil's Gulch FPU's they are known absent, in the Headwaters Peshastin, East Fork Mission, Upper Naneum, Headwaters Swauk, Upper Swauk, Williams, Lower Naneum Tributaries. Lower Teanaway, Lower North fork Teanaway and Stafford FPU's the presence is unknown.

2. Federal candidate species and other species of concern:

   Bull trout populations are not abundant in the Swauk. Swauk creek has a few entries from the Yakima River, but it is speculated that the irrigation diversions associated with the creek cause dewatering and high water temperatures that discourage bull trout from remaining as residents of the lower reach. Bull trout are found in the Teanaway system in portions of the FPU west of the LSR boundary. .

   Aquatic mollusks found in Swauk LSR are Menetus operculus and Pisidium sp. The recorded individuals are incidental. Little is known about populations of mollusks as there have been no formal studies of populations or habitats within the Wenatchee National Forest.

3. Anadromous salmonid populations within the LSR are spring chinook salmon and steelhead trout.

   Concerns include the severely reduced number of returning spawning adults from historic levels (pre 1880's) , loss of anadromous species historically using the watershed for spawning, loss of genetic diversity of the returning population, condition of the physical habitat and water quality for incubation, rearing, over-wintering of

young, migration, and spawning. All life stages are vulnerable to management and recreation activities causing changes in habitat.

4. Resident salmonids: Salmonids have access to all part of the LSR at high flows and have been confirmed to utilize the streams throughout the LSR during their development. Spring chinook salmon and steelhead trout are found in the Peshastin and Mission drainages. Steelhead are also found in the Swauk drainage.

   Concerns include maintaining existing populations, protecting against habitat degradation through management activities and dispersed recreation.

5. Introduction species: Eastern brook trout have access to the Teanaway and Swauk systems. They are recorded in Iron Creek and in the Peshastin and Missions systems.

   Concerns include changes as result management activities or recreation that would favor brook trout over native species.

6. Non-salmonid aquatic biota : There is little information about other aquatic biota in this area.

7. Water temperature: Maximum temperatures recorded in 1993-1994 Max-min thermometer monitoring for Swauk exceeded Washington State water quality standards. The temperatures were 68 degrees Fahrenheit in Swauk creek, 70 degrees in Iron creek and 76 degrees in Hurley Creek. Lower reaches of creeks within the LSR passing through private/state lands have been tapped for irrigation diversion. These low flow, unshaded, riparian zones cause higher water temperatures in Swauk Creek and others. Swauk Creek has had much mining development and dispersed recreational activity within the riparian zone and Highway 97 parallel to the creek often passing within the floodplain. Much of the overstory has been altered and much of the LWD has been removed form the creek. In the Headwaters Swauk FPU, Iron Creek has been disturbed by timber harvest removing stream bank vegetation at several sites. Dispersed recreation, camping and recreational mining are retarding the recovery of the riparian vegetation.

   In Lower Naneum FPU High Creek and Wilson Creek have one reach each that has poor canopy closure to protect the stream from solar heating. In the Upper Naneum FPU, west fork Naneum creek has shown temperature problems. Naneum Creek, Nealey Creek, Howard Creek and the West Fork Naneum have poor canopy closure.

   Based on available data, the most severe temperature problems in the LSR occur in Mission Creek and Peshastin Creek. Private land ownership, railroad and highway right-of-way probably play an important role in the temperature problems with some contribution from Forest Service activities upstream. The concern is focused by these streams importance for their steelhead spawning runs.

8. Fine sediment: Sediment sampling information pointed to Peshastin and Mission as the two rivers with the highest sediment levels of the water ways sampled by the Wenatchee National Forest surveys. Of note is that all samples collected data below heavily managed areas. In the Upper Naneum FPU, the West fork Naneum and Howard Creek have sedimentation problems. In Lower Naneum Tributaries FPU Wilson Creek and High Creek have sedimentation problems. In all three Swauk FPU have streams with sedimentation problems, but they are not as severe as the problem in Swauk Creek. Iron creek in the Headwaters Swauk FPU, was surveyed in 1992 showing sedimentation problems. In Williams FPU, Williams Creek, Boulder Creek, Lion Gulch, Cougar Gulch, Harknes Gulch and Deer Gulch have not been surveyed, but based on development and current mining activities there are likely sedimentation and temperature problems. Much of the Williams FPU is privately owned.

9. Channel complexity: Channel complexity and lack of LWD is a concern in the Peshastin, Mission, Swauk and Teanaway mainstems. Tributaries are overall deficient in LWD, with some having little potential for future LWD recruitment.

Channel complexity has implications for fish habitat and for hydraulic regime. 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, side channels, floodplain connectivity.

Riparian road density is often inversely related to channel complexity and quality of riparian habitat.

10. Aquatic nutrient cycling depends in part on the riparian understory vegetation, groundwater/surface water partitioning, in-channel LWD, hydraulic retentively, pool depth and character, micro invertebrate community structure, and returning anadromous biomass. We have inadequate data to evaluate aquatic nutrient cycling at this time. There is also a relationship between soil productivity of the upland soils, the overall health of the land and aquatic nutrient cycling. Management activities on uplands need to be evaluated for their impacts on the aquatic community downstream.

11. Hydraulic Regime: The upland areas have been subject to a considerable amount of timber harvest activities. In many areas this has caused a large percent of the harvest area to have compacted soils. Compacted soils are found to increase overland flow and sediment pick up, they usually cause the timing of peak flows to be earlier than historic. (Percent of riparian that has harvest activities within the buffer. Percent of Swauk that has been harvested, especially with ground based harvest systems.

12. Landtype: Landtypes in Swauk LSR are categorized as C, E, F, G. See the map in Appendix??? Land type association C is Glaciated Mountain slope of crystalline bedrock. Type E is a mountain slope also of crystalline bedrock; type F has structurally controlled mountain slope land of volcanic or sedimentary formation. Land type G is a plateau land form.

13. Channel type: Source, transport, and deposition are the major functions that result from channel type. Channels are influenced by gradient, confinement and size of the substrate that makes up the stream bed and banks (Rosgen). Concern occurs when management activities interfere with or change the natural channel functioning. The large proportion of roads within the riparian zone and floodplains in Swauk LSR act to confine the stream channels and functioning. The crossings can interrupt the input of LWD and change natural stream flow pattern.

14. Peak flows: Generally snow melt during spring and early summer supplies the water for the aquatic system. Rain on snow events, warm "chinook" winds cause unseasonable snow melts that may result in flooding. Management activities that alter the riparian zone or the adjacent upland vegetation influence the rate of snow melt, percolation of water into or over the soil. Protection of meadows, side channels and other floodplain areas will help lower the impact of peak flows. Careful upslope management, road placement, grazing and recreation practices will also help mitigate peak flow impacts.

15. Low flow periods occur seasonally, extremely low flows can strand organisms, reduce aquatic habitat, create passage barriers, increase water temperatures, and reduce the streams ability to move sediment and bed load. The management factors that help mitigate peak flows will also help mitigate against low flows.

16. Water withdrawals are mostly located on non Wenatchee National Forest lands and in the lower portions of drainages. First Creek has a diversion into Green Canyon. The dewatering of some creeks lower reaches at low flow contributes to the isolation of fish populations. Swauk Creek, Peshastin creek and Mission creek have had dry portions in the past drought years. Peshastin has a water diversion and Mission has a series of pump locations. Additional water diversions occur in Williams Creek, Wildcat Gulch, and the head of Lion Gulch.

17. Road Density: Average road density for the 168.7 square mile of Swauk LSR is 5.49 miles per square mile within the riparian zones. There are as estimated 108 miles of roads within the

riparian reserve area. Lower N.F. Teanaway, Lower Swauk, Williams, Upper Swauk, Headwaters Swauk and Headwaters Peshastin have riparian road density problems.

18. Upslope vegetation:

    Lower N.F. Teanaway FPU, Jack Creek has had a lot of harvest activity, the dominant seral stage in the riparian zone is sapling pole size. The Headwaters Peshastin FPU has both roads and timber harvest units within the riparian zone. There have been shifts in vegetation from coniferous to deciduous (alder) in some areas.

    Lower Teanaway FPU is largely state or private (Boise Cascade) land. Drainages that are privately owned lands include Indian Creek, Dickey Creek, and Lick Creek. The owners have and are harvesting their lands.

    In Stafford and Devil's Gulch FPU's, the dominate Successional stage is large trees, there have been minimal harvest activities and the riparian zone is generally healthy.

19. Floodplain connectivity: The large proportion of roading in the riparian zones has confined many of the floodplains. The major drainage mainstems are very altered, without much opportunity to do recovery projects. They contain portions of state highway and large portions of the lower reaches are privately owned.

20. Upslope wetlands:

    Upslope wetlands are known to occur with the LSR, they are not currently mapped, but need to be protected as Riparian Reserves/Unique Habitats.

21. Disturbance Regimes: We have come to recognize that suppression or alteration of natural disturbance regimes can lead to fundamental long term recourse changes. Concern for minimum viable populations or habitats may not be able to withstand moderate disturbance. Aquatic systems are now seen to be dependent on disturbance by fire, flood, insect and disease use of forest vegetation, landslides, volcanic actions. Humans have a different agenda than natural systems, and have used other activities to build and maintain the habitats more to their needs. Historic and current grazing, mining, travel, vegetative management, fire exclusion and other activities have altered the habitats from their 'natural' balances (pre 1700 conditions).

6. Noxious Weeds

Centaurea diffusa, C. maculosa and *Linaria dalmatica* are present along roads particularly Highway 97, Mission Creek, and the Teanaway. Other species include *C. repens, Chrysanthemum leucanthemum, Hypericum perforatum, Senecio jacobaea* and *Cirsium canadensis.* Following through the noxious weed module, there are no Class A noxious weeds within the Swauk LSR. The Class B-designates and Class C noxious weeds that are known to occur within the LSR are more or less widespread. One exception is Senecio jacobaea at Jack Road 9738-112. This population is high priority for control efforts. Control efforts should focus on the Devil's Gulch, Haney Meadow, Teanaway Ridge, Bear Creek, and Lion Rock Trailheads, and Campgrounds throughout Swauk corridor. The extent of *Cirsium canadensis* is likely limited and local populations should be controlled or eradicated. Harrod (1994) provides a brief synopsis of control methods available and provides recommendation for noxious weed management

7. Fire Plan

a) Overview

This plan is intended to provide guidance for the management of the Swauk LSR. It is intended to supplement the Fire Management Plan for the Late Successional Reserve System and will become a portion of 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 this plan. The intent of this plan is to provide adequate protection of the reserve to allow management practices to be initiated which will provide additional protection of the late successional associated species and associated unique habitats. These management actions are expected to include actions which will include the role of fire as an important disturbance process in the reserve.

b) Fire Prevention Actions

The following actions are specific for the Swauk LSR. They are intended to supplement the actions which will be implemented on a Forest wide basis.

- Emphasize fire prevention actions at all dispersed sites.
- Utilize educational opportunities at the Swauk Discovery Trail, Swauk Campground, and Haney Meadows Horse Camp.
- Develop a comprehensive fire prevention sign plan for the entire reserve.
- Implement campfire restrictions as warranted from July - September in the Swauk and Mission Cr. drainages.
- Develop a fire prevention plan specific to preventing fires started by miners and their operations.
- Develop an interagency fire prevention plan to contact local residents. (Lion Gulch & Liberty)
- Initiate hazard reduction actions adjacent to developed and dispersed recreation sites. (Swauk, Mineral Springs, Lion Rock, Haney Meadows, Red Top Lookout, Liberty Work Center, and Swauk Discovery Trail)
- Make hunter education an emphasis item in fire prevention plans.
- As a hazard reduction measure emphasize fuelwood collection around recreation use sites in the dry forest type and along the Highway 97 corridor, also near residences. (Liberty)
- Emphasize contact with the following special interest groups; homeowners' associations' miner's association, O.R.V. groups, Backcountry Horseman, Town of Liberty, all groups that use the Swauk Discovery Trail, organized rockhounding groups, and grazing permittees.
- Implement road restrictions and closures as warranted during periods of extreme fire danger.

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

- Develop pre-attack facilities (fuel breaks) near Lauderdale Junction in the Swauk drainage.
- Develop pre-attack facilities in First Creek, Green Canyon, and Reecer Creek.
- Develop pre-attack plans and fuel breaks for Mission Creek and the following areas of specific concern. Beehive Reservoir, Valley High, Camas, Sand Creek, Mission Ridge, Lake Clara.
- Develop fuelbreaks on the west side of Teanaway Ridge to separate private land slash.
- Develop fuelbreaks around the town of Liberty.
- Stress the prevention of fires on lands immediately adjacent to the LSR (Timber Sales)

c) Fire Detection

- Staff Red Top Lookout during the months of July through September.
- Consider supplemental staffing of Tip Top, Boundary Butte, and or Beehive during periods of high fire danger or after lightning occurrence.
- Work with the residents of the Town of Liberty, Mineral Springs Restaurant, Liberty Cafe, and Ingalls Creek Lodge on how to report fires.

- Implement aerial detection after all lightning storms which occur over the reserve.

d) Fire Suppression

- 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.
- Because of the flammability of this LSR and desire to maintain late successional attributes, aggressive initial attack will take place on all areas in this LSR.
- Fire suppression actions will be implemented on an interagency basis as appropriate.
- Protection of riparian areas from fires and fire suppression damage is a priority.
- Improvements will be a priority for protection (Liberty Guard Station, Red Top Lookout,
- Swauk Discovery Trail, Swauk RAWS, Tip Top microwave, all recreation facilities and all special use permits)
- Pre-planned dispatch cards will be prepared for the entire reserve.
- The use of aerially delivered firefighters and retardant is appropriate in the LSR.
- The use of dozers requires the approval of the appropriate District Ranger.
- Burning out is an appropriate strategy when required.
- The 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.
- Protect known Threatened and Endangered Species Habitats from Wildfire. (Botanical)

e) Vegetation Management

- Where recommended by biologists, return dry forest types to conditions encountered under historic disturbance regimes.
- Suggested activities to reduce fire hazard include pruning, commercial and pre-commercial thinning, wood gathering and the use of prescribed fire.
- High density , multi-storied refugia will be maintained as described by an interdisciplinary team.
- Prescribed fire projects in meadows and steppe are encouraged for the enhancement of native species.
- Maintain a mosaic of age classes and structural conditions across the landscape outside dry forest to support late successional species. (Table Mountain)

f) Prescribed Fires

Prescribed fire opportunities are outlined below;

- There may be an opportunity to utilize natural and management ignited prescribed fires in the upper Iron Creek drainage and Miller Peak area . Additional prescribed fire planning will be necessary to pursue this action.
- The dry site ecosystems should be the priority areas for the use of prescribed fire.
- Hazard reduction near improvements should be priority projects.
- The use of prescribed fire to prevent the spread of noxious weeds is encouraged as appropriate.

- The scale and location of prescribed fire projects to enhance landscape-level diversity as it is tied to the Inherent Disturbance Regimes.
- Prescribed fire should be utilized to enhance the habitat of threatened and endangered botanical species as indicated by the botanists.
- Prescribed fire projects should attempt to minimize the risk of future catastrophic wildfires.

g) Summary

Initial and extended attack are appropriate on all wildfires through out this reserve. The use of prescribed fire is also appropriate, but will be limited due to the density of the spotted owl population and the desire to maintain this habitat. It is realized that this does not promote the desired ecological condition for this reserve and that with this approach there will be a high degree of risk for catastrophic fires to occur.

D. Restoration Opportunities and Potential Project Summary

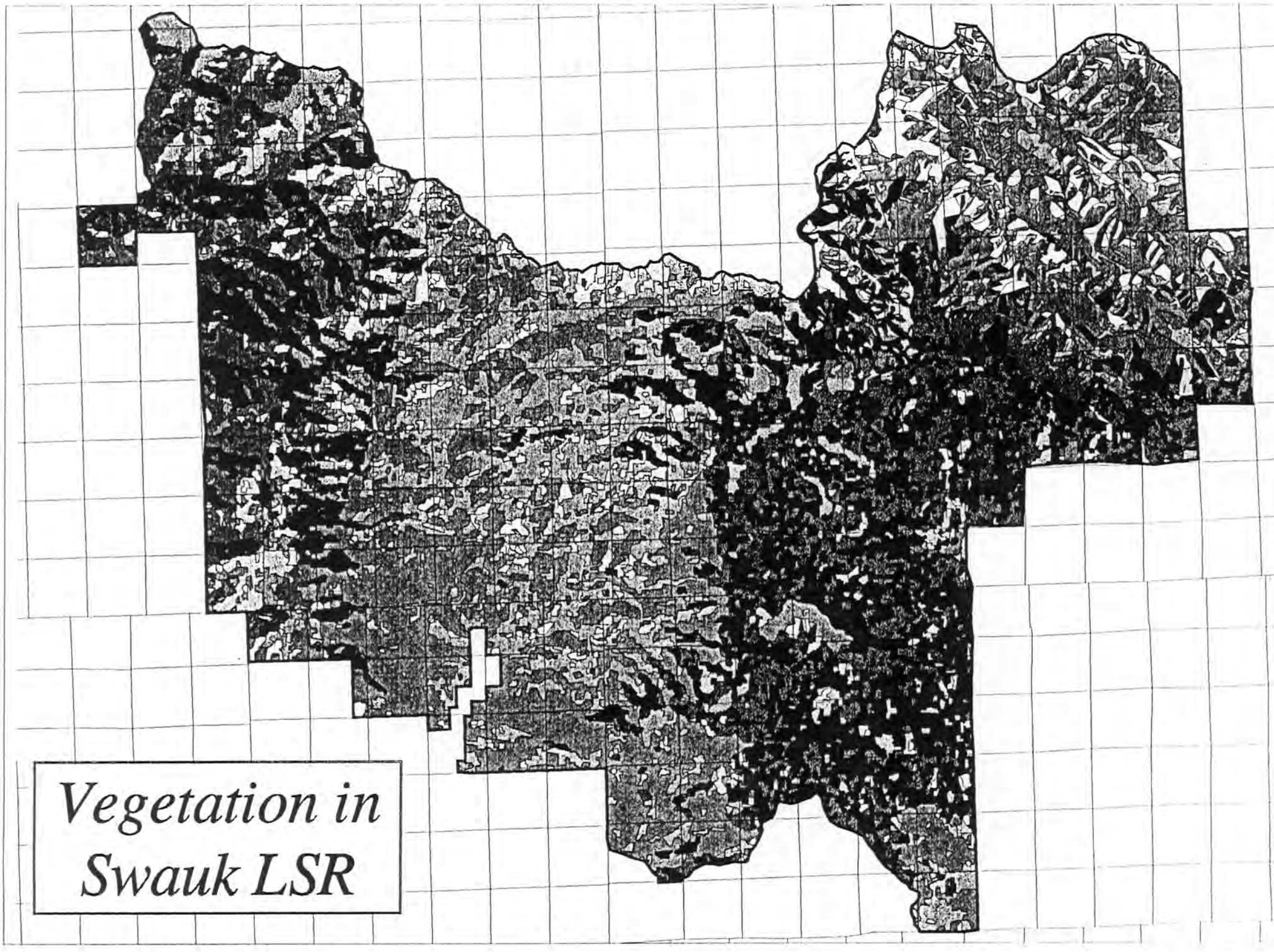
Table 79, Restoration Opportunities and Potential Projects, Swauk LSR

Analysis Module	Restoration Opportunity	Potential Projects	Schedule[1]
Forest-Wide Sustainability	1) Reduce fuel loading and stocking levels in dense successionally advanced dry forest stands where they exist between Swauk and the Teanaway LSR and between Swauk and Sand Creek MLSA.	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) Reduce fuel loadings along roads that exist between these LSR's to increase the roads effectiveness as a fuelbreak.	2) Piling of down fuels, firewood gathering, pruning to reduce vertical fuel continuity, construction of shaded fuelbreaks.	B
	3) Reduce fuel loadings in young stands.	3) Precommercial thinning	C
Forest-Wide Spotted owl	1) Reduce fuel loading and stocking levels in dense successionally advanced dry forest stands where they exist between Swauk and the Teanaway LSR and between Swauk and Sand Creek MLSA	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
Forest-Wide Connectivity	1) Improve the linkage for low mobility wildlife species between the Swauk and Teanaway LSR's	2) Do site specific analysis to identify the best area between the two LSR's to manage low mobility species linkage.	C

Analysis Module	Restoration Opportunity	Potential Projects	Schedule[1]
Unique Habitats and Species	1) Reduce road densities in riparian reserves and in talus areas.	Close or relocate roads as opportunities are identified in Access and Travel Management Planning.	A
	2) Maintain existing subalpine meadows.	2) Remove encroaching conifers from meadows.	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.	A
	4) Accelerate the development of late successional forest.	4) Use commercial thinning to accelerate the development of layered stands as described in disturbance module treatment key.	C
	5) Verify the viability of *Anemone muttaliana* and *Chaenactus thompsonii* within the LSR	5) Monitor known sites and develop conservation strategy for these species.	B
Connectivity Within the LSR	1) Reduce road densities in riparian reserves to improve connectivity for low mobility species that use these areas.	1) Close roads in riparian reserves as identified in Access and Travel Management Planning, revegetate disturbed areas.	A
	2) Promote the development of fire climax stands within the dry forest vegetation group.	2) Thin from below favoring ponderosa pine. Use prescribed fire where current fuel loadings permit the attainment of objectives.	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 successionally 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 4 under spotted owl for treatment of threshold acres.	A
2)	2) Minimize the extent of stand replacement fires within the LSR.	2) Conduct activities that improve the effectiveness of the existing road system as fuelbreaks, focus on highway 97 corridor.	B
	3) Protect layered true fir forests from fire originating outside of these type, primarily lower	3) Use treatments described in #1 above in the adjacent dry forest types.	B

Analysis Module	Restoration Opportunity	Potential Projects	Schedule[1]
	elevation dry forest types.		
Spotted Owl	1) Protect 100 acre core areas within the 24 Swauk spotted owl activity centers.	1) Limit activities within the activity center from 3/1 to 8/31.	A
	2) Maintain 500 acres of nesting habitat within the 24 Swauk core areas.	2) No Ground or vegetation disturbing activity in spotted owl core area, all 24 are at or below the minimum.	A
	3) Improve sustainability of dense stands (type 12) outside of 1.8 mile spotted owl circles, within the LSR.	3) Use commercial thinning, pruning and fuelwood collection.	A
	4) 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)	4) Utilize commercial thinning, pruning and fuelwood collection.	A
	5) Improve habitat quality in dense single story stands in spotted owl circles 304, 323, 345, 352, 387 and 712.	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.	A
	6) Obtain information on spotted owl locations.	6) Survey areas to 1994 spotted owl protocol.	B
Aquatic	1) See goals listed in Aquatic section for Swauk	1) Coordinate projects with Table Mountain, Mission and Peshastin Creek Watershed Assessments.	
Noxious Weed	1) Limit the extent and spread of centauria diffusa, C. maculosa and Linaria dalmatica which occur primarily along roadways in the Swauk LSR	1) Consider treatments such as handpulling and herbicides to limit extent and spread. Focus should be at Devils Gulch, Haney Meadow, Teanaway Ridge, Bear Creek, and Lion Rock trailheads.	B
	2) Control or eradicate Cirsium canadensis where it occurs within the Swauk LSR.	2) Use combination of treatments such as handpulling, and spot herbicide application to eliminate these populations.	A
	3) Increase knowledge regarding noxious weed presence in the Swauk 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	

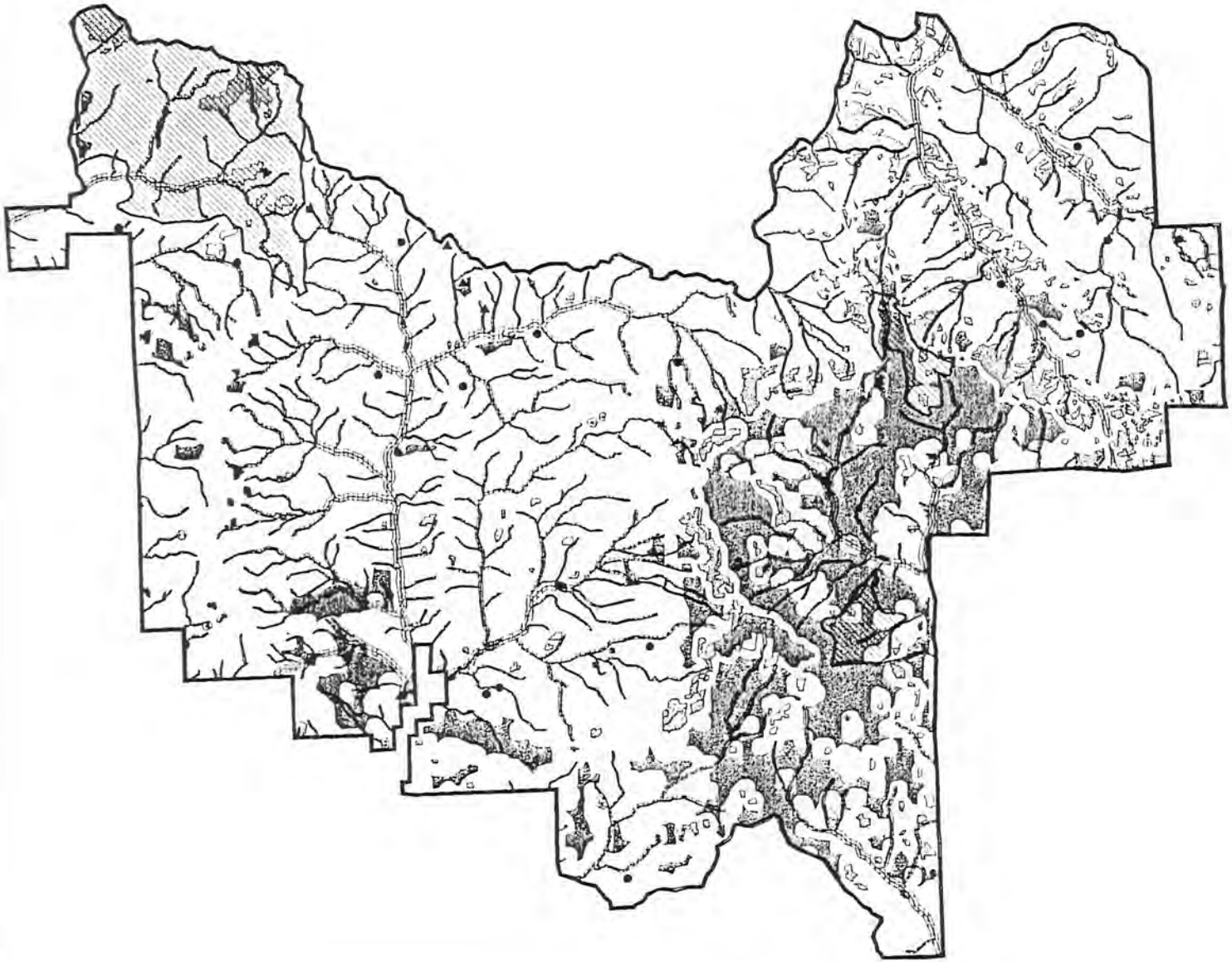
[1] Implementation Schedule; (A) = within 1 year; (B) = within 3 years; (C) = within 5 years


Vegetation in
Swauk LSR

Archivez vos documents en toute sécurité

Swauk Late Successional Reserve

UNIQUE HABITATS



- Large Forest Interior Patches
- Whitebark Pine
- Talus, Scree, Bedrock, Cliff
- Meadows
- Natural Opening
- Shrub
- Deciduous Forest
- 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 = 0.380 miles

04/24/96

Swauk Late Successional Reserve

SUITABLE SPOTTED OWL HABITAT

DRY Suitable Spotted Owl Habitat (N/R/F)

MESIC Suitable Spotted Owl Habitat (N/R/F)

WET Suitable Spotted Owl Habitat (N/R/F)

1.8 mile buffer around Spotted Owl Activity Centers

Spotted Owl Activity Centers

Late Successional Reserve Boundary

Map Scale: 1 inch = 0.380 miles

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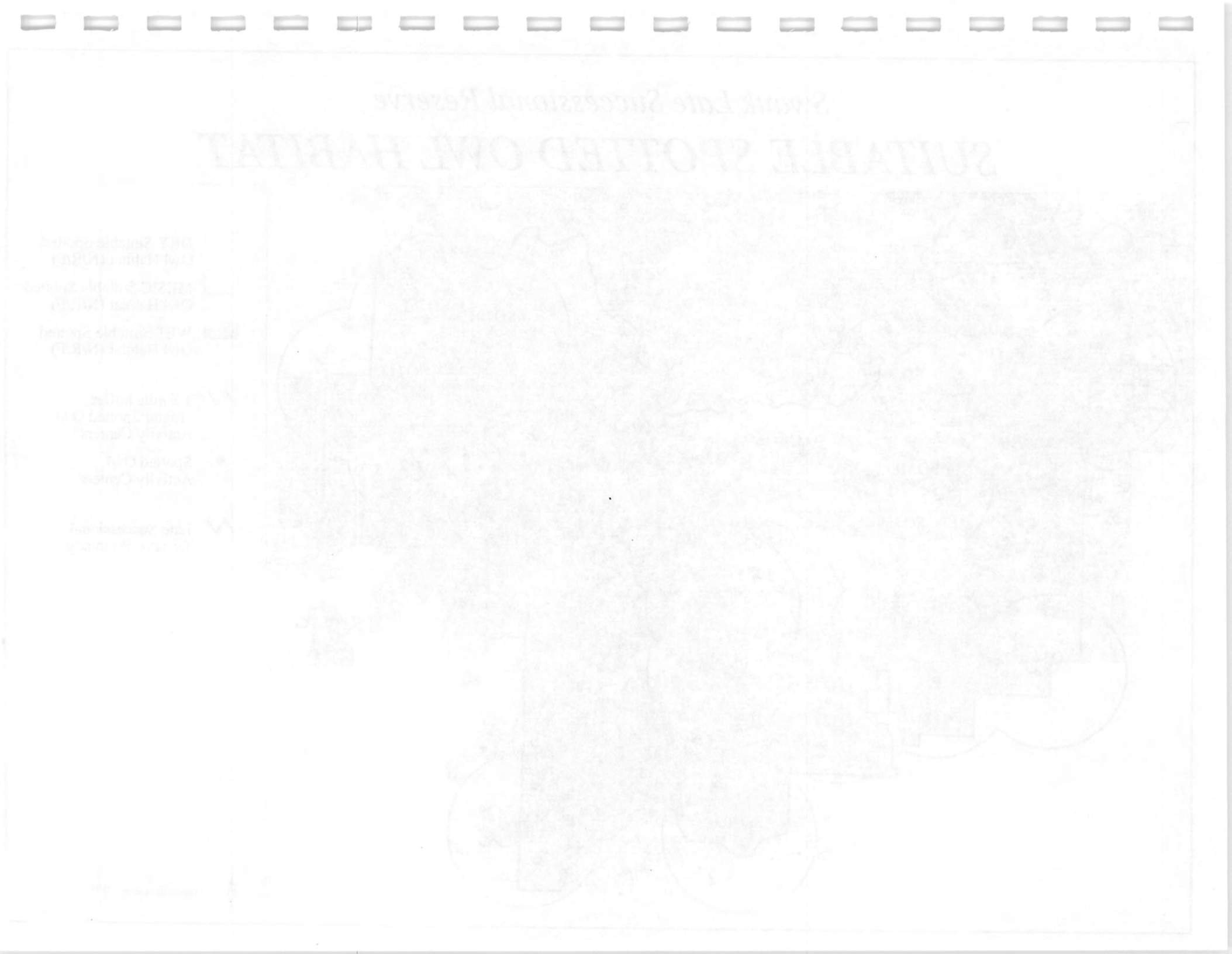
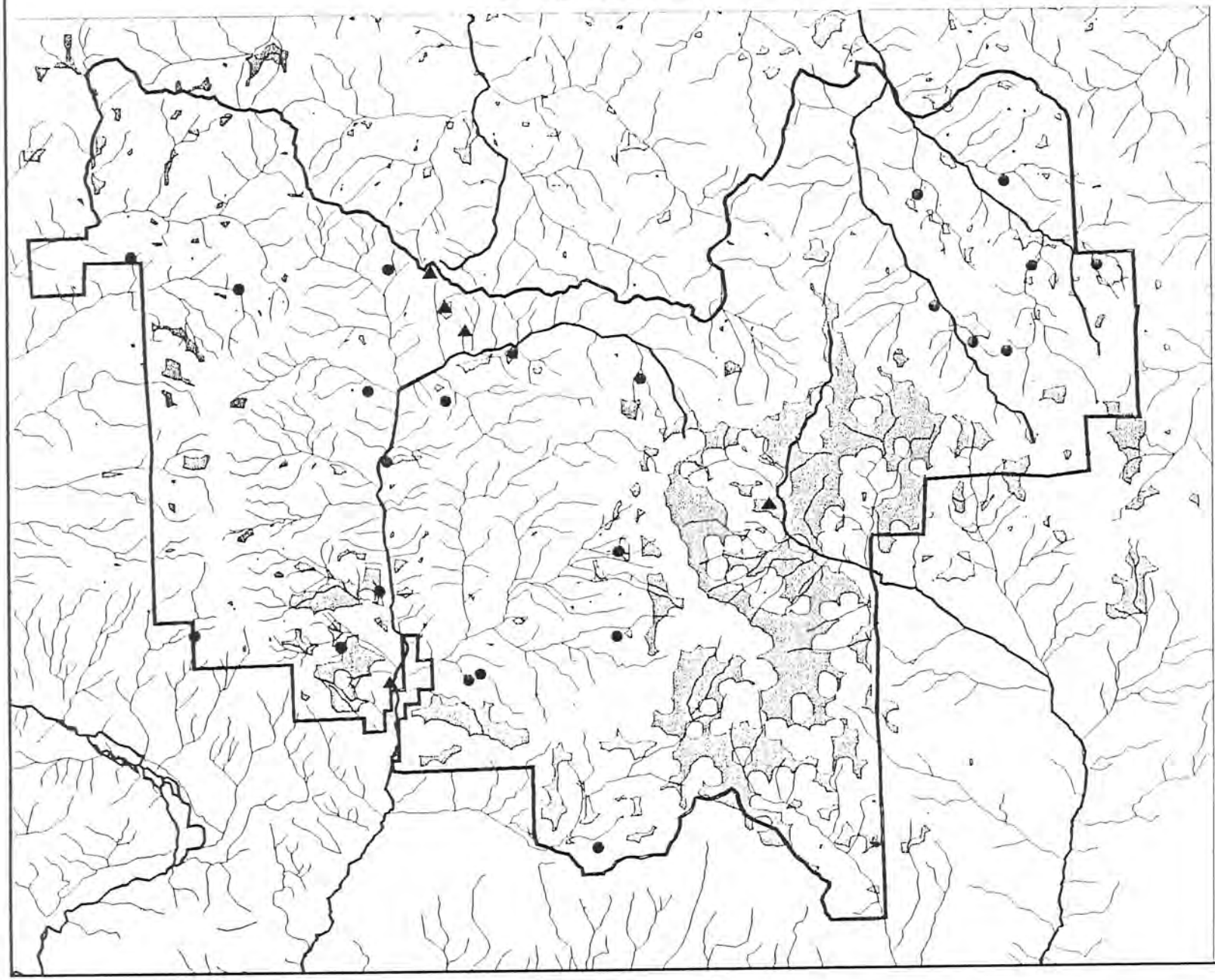


Swauk Late Successional Reserve

FOREST INTERIOR



DRY Forest Interior

MOIST Forest Interior

HIGH Forest Interior

Streams

Major Streams

Spotted Owl Activity Centers

Wildlife PETS

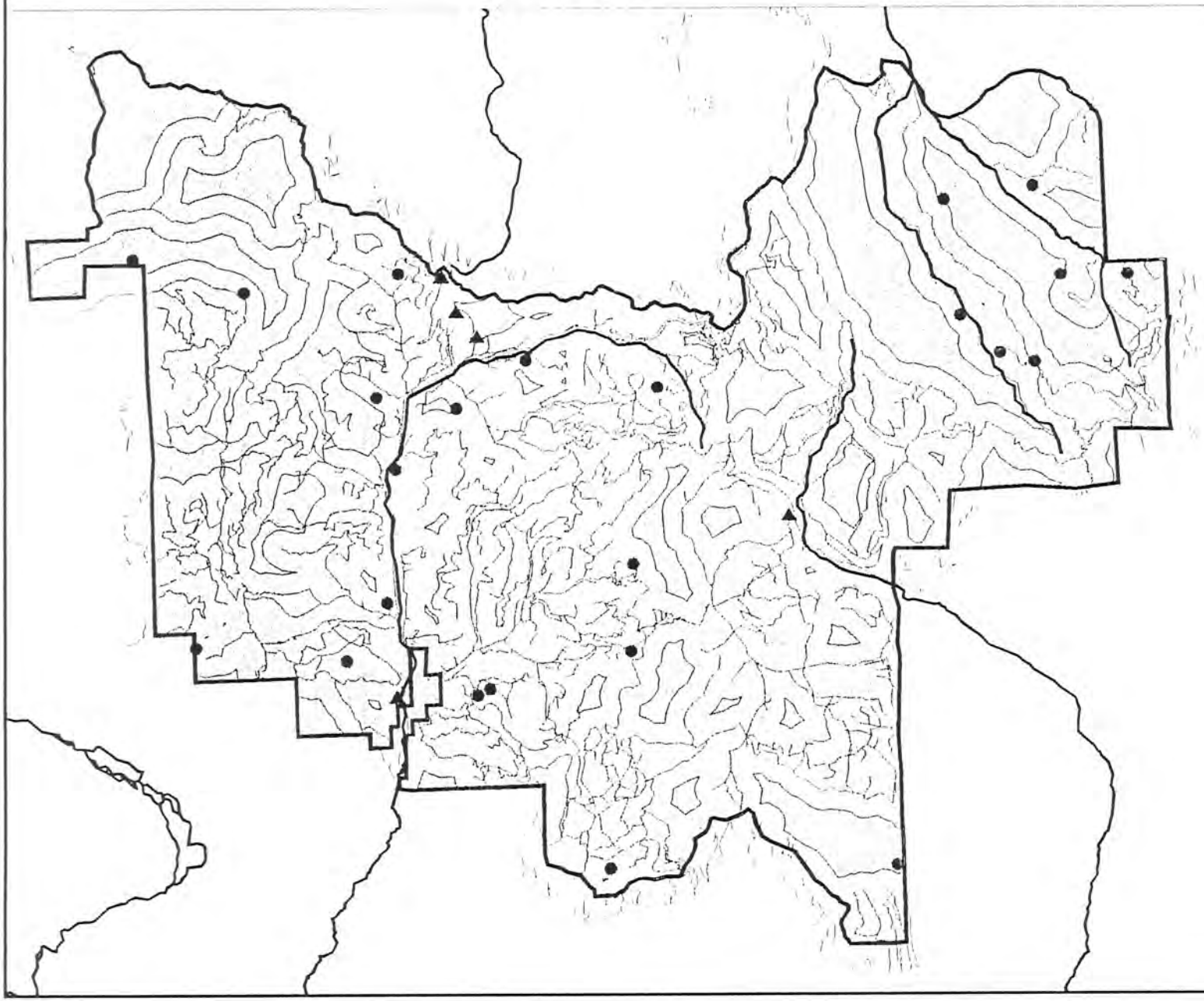
Late Successional Reserve Boundary

Map Scale: 1 inch = 0.380 miles

04/24/96

Swauk Late Successional Reserve

SECURITY HABITAT



Security Habitat

NOT Security Habitat

Open roads and motorized trails

Closed roads and non-motorized trails

Major Streams

Spotted Owl Activity Centers

Wildlife PETS

Late Successional Reserve Boundary

Map Scale: 1 inch = 0.380 miles

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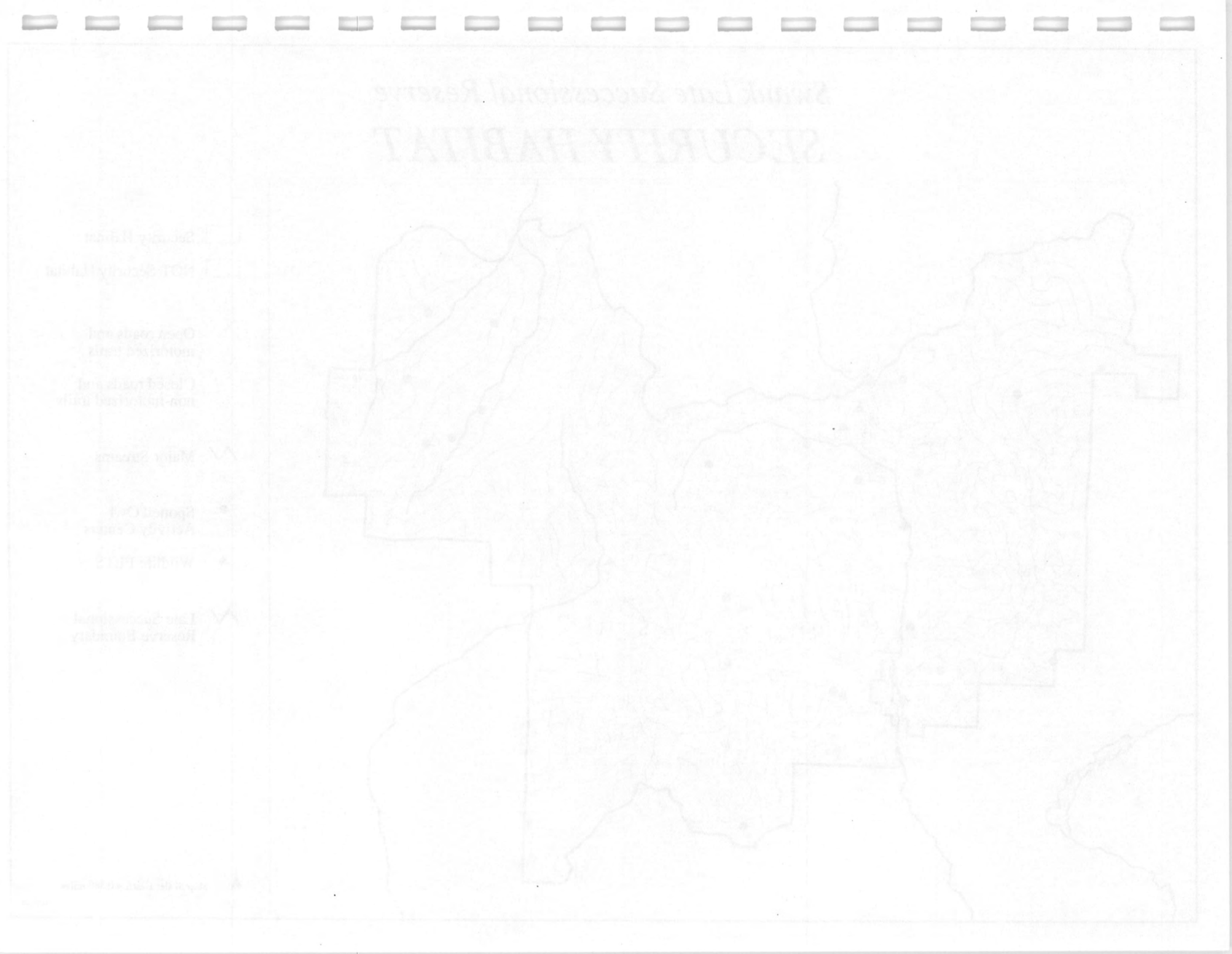
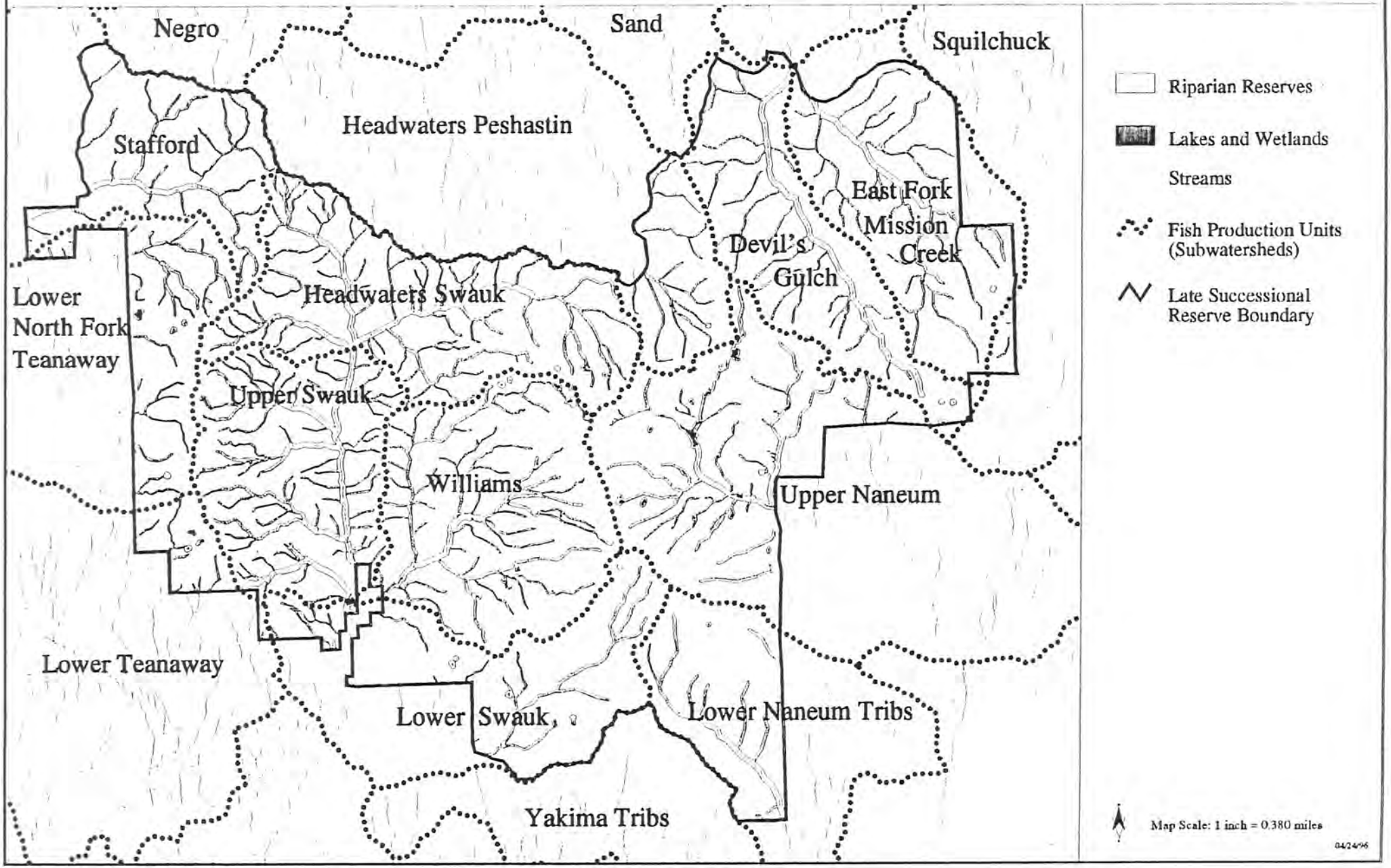
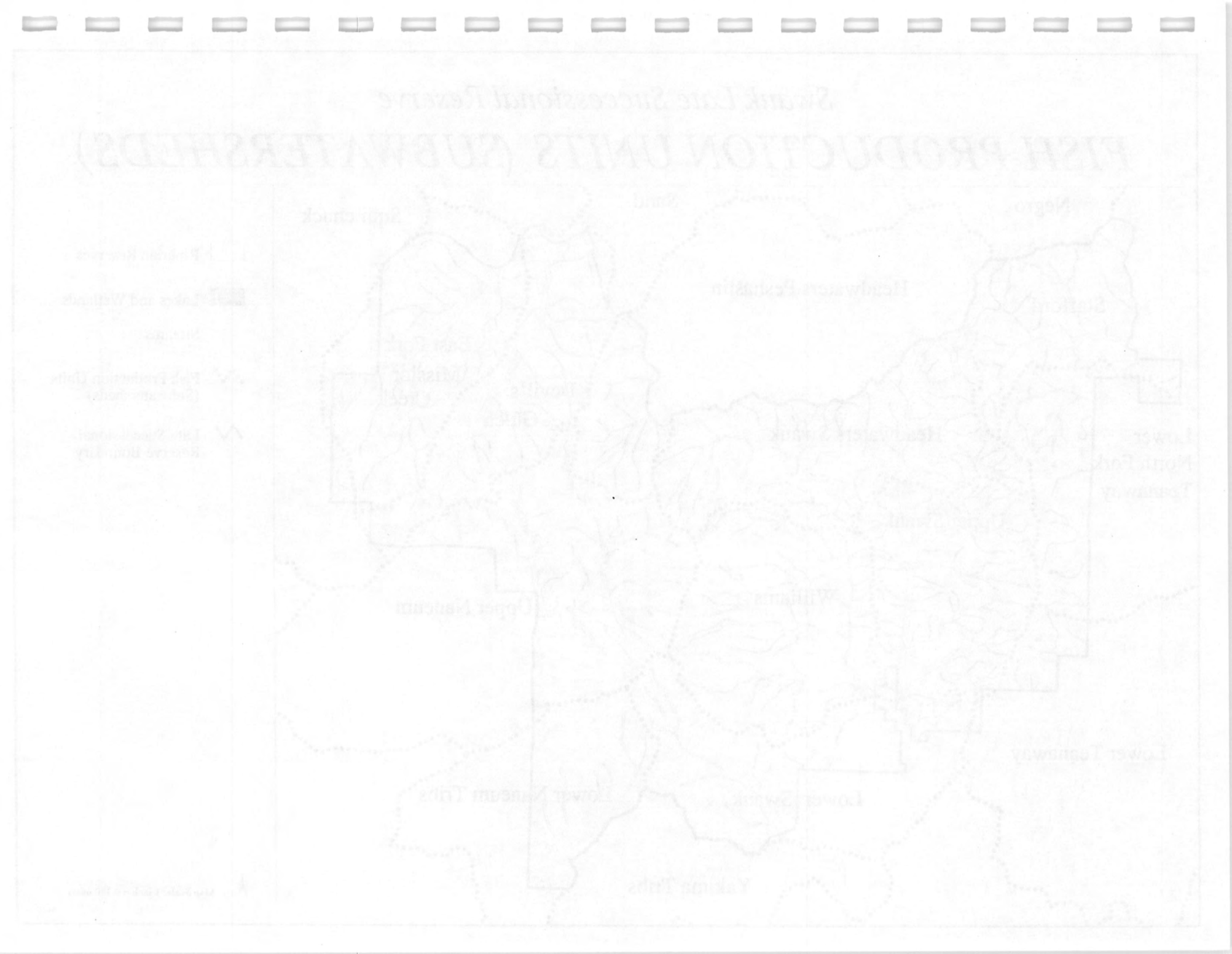


Swauk Late Successional Reserve

FISH PRODUCTION UNITS (SUBWATERSHEDS)





XIII.Monitoring

The implementation of the Standard and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl should be monitored to ensure that management actions are meeting the objectives of the prescribed standards and guidelines, and that they comply with federal mandated laws and management policy. Monitoring should provide information to determine if the standards and guidelines are being followed (implementation monitoring), verify if they are achieving the desired results (effectiveness monitoring), and determine if underlying assumptions are sound (validation monitoring).

A. Implementation Monitoring

Implementation monitoring determines if the standards and guidelines were followed in project implementation. The following are key items to monitor.

1. Late-Successional Reserve:

1. **High Priority** - Timber harvests consistent with standards and guidelines and with Regional Ecosystems Office review requirements..
2. **High Priority** - Other management activities in the LSR consistent with the standards and guidelines.
3. **High Priority** - Management activities are consistent with this LSR assessment.

2. Riparian Reserve:

1. **Moderate Priority** - Width and integrity of the Riparian Reserves.
2. **High Priority** - Completion of watershed analysis prior to management activities.
3. **High Priority** - Management activities within the Riparian Reserves consistent with standards and guidelines.

3. Key Watershed:

1. Watershed analysis prior to management activities.
2. Presence and timing of activities, including restoration projects.
3. Miles of new or reopened roads.
4. Miles of roads closed to motorized vehicles or obliterated.

B. Effectiveness Monitoring

Effectiveness monitoring determines if application of the standards and guidelines helps achieve the desired future condition. For example: Does management of this resource maintain or restore the habitat for late-successional associated species? The following are key items to monitor:

1. Aquatic Ecosystems:

1. Pool frequency and quality (width, depth, and cover).
2. Percent fine sediment.
3. Coarse woody debris (size and quality).
4. Water temperature.
5. Width-to-depth ratio.
6. Bank stability and lower bank angle.

2. Biological Diversity, Late-Successional and Old-Growth

Forest Ecosystems:

1. Size, location, spatial distribution, species composition, and development of late successional and old growth forests.
2. Retention of snags and coarse woody debris.
3. Abundance and diversity of species associated with late-successional forest communities.
4. Species presence (to calculate species richness).
5. Percent of the area effected by exotic species.
6. Structure and composition.
7. Ecological processes.
8. Ecosystem functions.
9. Air quality.

C. Validation Monitoring

Validation monitoring determines if a cause and effect relationship exists between management activities and the indicators or resources being managed. Validation monitoring determines whether the underlying assumptions are correct.

1. Key items to monitor include:

1. Number of northern spotted owls.
2. Populations of fish species and stocks that are listed under the Endangered Species Act or are considered sensitive or at risk by land management agencies.
3. Rare species.
4. The relationship between the levels of management intervention and the health and maintenance of late-successional and old-growth ecosystems.

2. Special Monitoring Issues

1. Fuel loading levels and expected fire behavior.
2. Did silvicultural treatments benefit the creation and maintenance of late-successional conditions?

D. Social Monitoring

Social monitoring provides a means to measure the effects of managing actions from a human perspective. Key items to monitor include:

1. Natural Resource Use Levels

1. Timber harvest levels
2. Special forest products (e.g., mushrooms, boughs, and ferns)
3. Livestock grazing
4. Mineral extraction
5. Recreation
6. Scenic quality
7. Air quality

2. Rural Economies and Communities

1. Demographics
2. Employment (timber, recreation, forest products, fishing, mining, and grazing)
3. Government revenues (Forest Service and BLM receipts)
4. Facilities and infrastructure
5. Social service burden (welfare, poverty, aid to dependent children, and food stamps)
6. Federal assistance programs (loans and grants to state, counties, and communities)

7. Business trends (cycles, interest rates, and business openings and closings)
8. Taxes (property, sales, and business)

3. Native Americans and Their Culture

1. The conditions and trends of trust resources identified in treaties with Native Americans.
2. Protection or loss of sites of religious and cultural heritage.
3. Native American accessibility to and use of forest species, resources, and places.

E. Interagency Monitoring

The late-successional species found in the eastern Cascades are found in many different ownership's. To implement a coordinated, interagency approach to managing late successional species an interagency monitoring network would be developed as directed in the FSEIS (1994).

1. This includes the following four-step process:

1. Identify information needs and develop them into quantitative monitoring objectives.
2. Survey and evaluate existing monitoring activities relevant to monitoring objectives, focusing on both indicators and design components.
3. Develop a comprehensive monitoring strategy including statistical designs, indicators, quality assurance plan, and sampling protocols.
4. Coordinate between the various agencies and groups.

XIV.Glossary

Activity. - The work processes or management practices that are conducted to produce, enhance, or maintain outputs or achieve administrative and environmental quality objectives. An activity can generate multiple outputs.

Age Class. - One of the intervals into which the age range of trees is divided for classification or use.

Airshed. - A geographical area that, because of topography, meteorology, and climate, shares the same air.

Alevin. - The larval form of a salmonid fish from the time of hatching until the resorption of the yolk sack.

Allocation. - The assignment of management prescriptions to specific land to achieve goals and objectives.

Anadromous Fish. - Species of fish which mature in the ocean and migrate into streams to spawn; use herein refers to salmon and steelhead.

Animal Community. - Any assemblage of animals which interact and occur in a common area.

Appropriate Suppression Response. - The kind, amount, and timing of suppression action on a wildfire which most efficiently meets fire management direction under current and expected burning conditions.

Association. - (Plant Ecology) A kind of plant community with a definite species composition and structure, and relatively uniform environment.

Basal Area.- The cross-sectional area, in square feet, of a tree measured at breast height-(4.5 feet).

Big Game.- Those species of large mammals normally managed for sport hunting. Herein, generally refers to Roosevelt elk, black-tail deer, or black bear.

Biodiversity.- Short for biological diversity, this term has a broad, encompassing meaning. Biodiversity is the variety, distribution, and structure of plant and animal communities, including all vegetative stages, arranged in space over time that support self-sustaining populations of all natural and desirable naturalized plants and wild animals. Biodiversity also includes the processes (which are difficult to identify and quantify) that link the components of these plant and animal communities.

Biological Diversity. - The distribution and abundance of different plant and animal communities and species over time and space.

Biological Growth Potential. - The average net growth attainable in a fully stocked natural forest stand.

Biotic Community. - Any interacting assemblage of animal and plant communities living in a prescribed area or physical habitat.

Climax.- A climax community is an abstract conception that describes an end-point to succession. In the absence of disturbance, a plant community exists which has stable composition. These plant communities are termed plant associations and represent the "climax" plant community. Such communities may never develop because of disturbance that is present in the ecosystem. The Forest Service's Forested Plant Associations guide is based on the concept of climax.

Community.- Communities are made up of all the populations of living organisms in a given area that interact with one another, forming an ecological unit with individually unique composition, structure, environmental relations, development, and function (See Harrod et al. (in press), Barbour et al. 1987).

Composition.- Composition is used in ecology to refer to the "make-up" of communities. In other words, communities are composed of different plant and animal species.

Ecosystem. - A community interacting with the abiotic (physical) environment to form a functional system of complementary relations with characteristics rates of transfer and circulation of energy and matter.

Edge Effect. - The increased richness of flora and fauna resulting from the mixing of two communities where they join, as at the edge of a meadow.

Endangered Species. - Any plant or animal species which is in danger of extinction throughout all or a significant portion of its range. (Endangered Species Act of 1973).

Endemic Species. - A species whose natural occurrence is confined to a certain region and whose distribution is relatively limited.

Environment.- The aggregate -of physical, biological, economic, and social factors affecting organisms in an area

Erosion. - detachment or movement of soil or rock fragments by water, wind, ice, or gravity. Accelerated erosion is much more rapid than normal, natural, or geologic erosion, primarily as a result of the influence of activities of man, animals, or natural catastrophes.

Escaped Fire Situation Analysis. A study of the factors influencing the suppression of a fire not controlled during initial attack, conducted for the purpose of deciding which suppression strategy will be used.

Expected Burned Acreage. - The expected annual number of acres burned by fire size class and intensity level for a given program option or budget level, and which must equal or be less than the resource protection objective to be a valid option.

Fire Climax. - A term coined by Komarek (1968) to refer to lightning fires which keep many vegetation and animal associations or communities in a seral stage or more properly a "fire-climax". Historically, ponderosa pine forests of the East Cascades, and elsewhere, where maintained in early or mid-seral stages of succession by frequent, low intensity fires.

Fire Intensity Level (FIL). - A relative measure of fire severity based on flame height, higher flames indicating a more intense fire.

Fire Management Analysis Zone (FMAZ). - The geographically delineated areas into which the planning unit is divided for the purpose of analysis based upon common fire-behavior characteristics.

Fish Production Unit (FPU) - A method used to divide the landscape. The creek drainage areas (subdrainages) within a river basin are used to define a land area that is between 10,000 and 15,000 acres.

Floodplain. - The lowland and relatively flat areas adjoining inland and coastal waters, including, at a minimum, that area subject to a one percent or greater chance of flooding in any given year.

Forage. - Vegetation used for food by wildlife, particularly ungulate wildlife and domestic livestock.

Forb. - Any herbaceous plant species other than those in the Gramineae (grasses), Cyperaceae (sedges), and Juncaceae (rushes) families; fleshy-leaved plants.

Forage Areas. - Vegetated areas with less than 60 percent combined canopy closure of tree and tall shrub (greater than seven feet in height). This includes the grass-forb, shrub and open sapling-pole stand conditions and may include some older stands that have been thinned. In a managed forest the primary forage areas are those that have had all or most of the forest canopy removed, i.e. clearcut or shelterwood units.

Forest Fragmentation. - The creation of habitat islands through land development or through natural causes, such as fire.

Forest Land.- Land at least 10 percent occupied by forest trees or formerly having had such tree cover and not currently developed for nonforest use. Lands developed for nonforest use include areas for crops, improved pasture, residential, or administrative areas, improved roads of any width, and adjoining road clearing and powerline clearing of any width.

FPU - See Fish Production Unit

Fry. - The life stage of salmonid fish species that refers to the juvenile fish which have either not emerged from the gravel or have recently emerged.

Fuel Treatment. - The process of removing and/or modifying natural or human created fuels to reduce fire hazard and achieve other resource objectives.

Function. - Activities, roles, or processes performed by structures defines ecosystem function. Production, nutrient cycling, water cycling, storage and output of resources, and provision of habitat for organisms are examples.

Game Species. - Any species of wildlife or fish for which hunting seasons and bag limits have been established, and which are normally harvested by hunters and fishermen.

Goal. - A concise statement that describes a desired condition to be achieved sometime in the future. Normally expressed in broad, general terms, ft is timeless in that ft has no specific date by which ft is to be completed. Goal statements form the basis from which objectives are developed.

Geographic Information System (GIS). - An information processing technology to input, store, manipulate, analyze, and display spatial resource data to support the decision making processes of an organization. Generally, an electronic medium for processing map information, typically used with manual processes, to effect specific decisions about the land base and its resources.

Habitat. - The natural environment of a plant or animal.

Habitat Diversity. - Distribution and abundance of plant and wildlife habitats.

Habitat Island. - The occurrence of a habitat, such as an old-growth forest, that is physically separated from the next closest habitat of the same type by vegetation that is markedly different in composition and structure.

Hard Snag. - A snag composed primarily of sound wood, particularly sound sapwood; generally merchantable.

Hardwood. - A conventional term for the wood of broadleaf trees. Hardwood areas reference herein are usually the result of past forest fires, and once supported conifer trees in the past. See Tentatively Suitable Forest Land.

Hazard Reduction. - Any treatment of forest fuels that reduces the threat, ignition, or spread of wildfire.

Hiding Cover. - Vegetation capable of hiding 90 percent of a standing adult deer or elk at 200 feet or less. Includes some shrub stands and all forested stand conditions with adequate tree stem density or shrub layer to hide animals. In some cases, topographic features also can provide hiding cover.

Indicator Species. - Species of fish, wildlife, or plants which reflect ecological changes caused by land management activities. See Management Indicator Species.

Individual Tree Selection. - The selection of trees for harvest based on individual tree characteristics.

Instream Flow. - Streamflow required to support instream uses, the flow required varying widely by type of channel, water quality, and time of distribution.

Interior Habitat. - Habitat located within a patch of vegetation which does not include the environment influenced by edge effect (depending on species - 120 to 240 meters in from the edge).

Land Allocation. - The assignment of a management emphasis to particular land areas with the purpose of achieving the goals and objectives of the alternative.

Land Class. - The topographic relief of a *unit* of land. Land classes are separated by slope.

Landscape Ecology. - The science of describing and understanding how plant and animal species and communities interact across watershed- and regional-scale areas.

Land Stratification. - Inventory of land according to a set of specific land characteristics, such as the ability to support owls or the ability to resist erosion.

Large Woody Material. - Standing and down trees which provide wildlife and fish habitat, and site productivity. This term is interchangeable with Coarse Woody Debris (CWD), a term in the Northwest Forest Plan.

Late Seral Structural Stage. - A vegetation condition of large trees (>320 and <484) as detected by satellite data.

Late-Successional Reserve. - A land allocation established by the Northwest Forest Plan whose goals are to maintain the vi of species associated with older forests.

Local Road. - A road constructed to provide access to specific resource areas. As such, these roads connect terminal facilities with Forest collector or arterial roads or public highways.

Maintenance Levels - Maintenance levels define the level of service provided by, and maintenance required for, a specific road. (Forest Service Handbook, Washington Office Amendment 7709.58-95-1, 7/28/95)

1. *Level 1.* Assigned to intermittent service roads during the time they are closed to vehicular traffic. The closure period must exceed 1 year. Basic custodial maintenance is performed to keep damage to adjacent resources to an acceptable level and to perpetuate the road to facilitate future management activities. Emphasis is normally given to maintaining drainage facilities and runoff patterns. Planned road deterioration may occur at this level.
2. *Level 2.* Assigned to roads open for use by high clearance vehicles. Passenger car traffic is not a consideration. Traffic is normally minor, usually consisting of one or a combination of administrative, permitted, dispersed recreation, or other specialized uses. Log haul may occur at this level.
3. *Level 3.* Assigned to roads open and maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities. Roads in this maintenance level are typically low speed, single lane with turnouts and spot surfacing. Some roads may be fully surfaced with either native or processed material.
4. *Level 4.* Assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most roads are double lane and aggregate surfaced. However, some roads may be single lane. Some roads may be paved and/or dust abated.
5. *Level 5.* Assigned to roads that provide a high degree of user comfort and convenience. These roads are normally double lane, paved facilities. Some may be aggregate surfaced and dust abated.

Management Area. - An area composed of aggregate pieces of land (generally several to many analysis areas) to which a given management objective and prescriptions are applied.

Management Direction. - A statement of multiple use and other goals and objectives, along with the associated management prescriptions and ,,,standards and guidelines to direct resource management.

Management Indicator Species. - Management indicator species are animals or plants selected for special attention in the Forest Plan for one or more- of three reasons. They may be-:

1. *Emphasis species* - species to be managed as key resources on the basis of identified issues, e.g., threatened, endangered, rare, sensitive, harvest, or special interest species;
2. *Indicate special habitat conditions* - species that require special habitat such as snags, riparian, old-growth forest stands, etc.; and/or
3. *Indicate cumulative forest ecosystem change* - generally species- having [me home ranges and requiring a diversity of habitats.

Management Practice. - A specific action, measure, course of action, or treatment.

Mass Failure (also Wasting). - All geologic processes in which earth materials move downslope, either slowly or quickly, by gravitational forces.

Metapopulation. -

Midseral Structural Stage. - A vegetation condition of large trees (>221 and <32) as detected by satellite data.

Monitoring and Evaluation. - The evaluation, on a sample basis, of Forest Plan management practices to determine how well objectives are being met, as well as the effects of those management practices on the land and environment.

Native species. - A plant or animal species that occurs indigenously in an area.

Natural Opening. - A break in the forest canopy. A naturally-occurring area of bare soil, grasses, forbs, or shrubs located in a large area dominated by trees.

Natural Variability. - This term refers to the composition, structure, and dynamics of ecosystems before the influence of Euro-American settlers. This term has been used synonymously with "historic", "pristine", "prehistoric" and others. Managing an ecosystem within its range of natural variability is thought to be the best means of maintaining biologically diverse, resilient, productive systems. In management, natural variability is to be used as a baseline in ecosystem analysis. Further information on this topic may be found in Morgan et al. 1994 and Swanson et al. 1994 (see references).

Naturalized Species. - A non-native species established as if it were a native species.

NEPA Process. - An interdisciplinary process, mandated by the NEPA, which concentrates decision making around issues concerns, alternatives and the effects of alternatives on the environment.

Nonforest Land. - Lands that never have had or that are incapable of having I 0 percent or more of the area occupied by forest trees; or lands previously having such cover and currently developed for nonforest use.

Nonvegetative. - Rock and rock outcrops.

Northwest Forest Plan. - The Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl (April,1994).

Objective. - Specific statement of measurable planned results to be achieved within a stated time period. Reflects attempt mixes of all outputs or achievement which can be attained at a given budget level.

Older Forests. - Any stand of trees generally containing the following characteristics: (1) stands contain mature overmature trees in the overstory and are well into the mature growth stage; (2) stands will usually contain a multi-layered canopy with trees of several age classes; (3) standing dead trees and d material are present; and (4) evidence of human activities may be present, but do not significantly alter the other characteristics and are a subordinate factor in the stand description.

Overstory. - The portion of trees in a forest which forms the uppermost layer of foliage.

Peak Flow. - The highest value of stream stage or flow attained during a flood.

Perennial Streams. - Streams which normally flow throughout the year.

Peridotite. - Plutonic rocks containing olivine, amphibole, pyroxenes, and micas. See Ultramafic

Pioneer Structural Seral Stage.- A vegetation condition of trees (<12") as detected by satellite data.

Pioneer Species. - A plant capable of invading bare sites (newly exposed soil surface) and persisting there, i.e., "colonizing" them, until supplanted.

Plant Series. - Any assemblage of plants which occur in the same area and that form a distinct ecological unit.

Pool/Riffle Ratio. - The ratio of pools to riffles, expressed as a percentage, used to describe fish habitat rearing quality.

Population. - All interbreeding individuals of a given species living in a particular area.

Population Viability. - The degree to which a population can maintain itself over time; population viability analysis is the process by which this is estimated. See also Viable Population.

Precommercial-Thinning. - The selective felling or removal of trees in a young stand, conducted to accelerate diameter growth on remaining trees, maintain a specific stocking density, and improve vigor and quality of remaining trees; conducted al an age before the trees are commercially merchantable.

Prescribed Fire. - Intentional application of fire, of either planned or unplanned ignitions, to accomplish certain planned objectives.

Prescription.- Management practices selected and scheduled for application on a specific area to attain goals and objectives.

Presuppression. - Activities conducted in advance of fire occurrence to insure effective suppression.

Processes. *** - Processes change conditions within an ecosystem or community and provide landscape flows ***. Some examples are fire, erosion, migration and wind.

Ranger District (R.D.). - Administrative subdivision of the Forest, supervised by a District Ranger who reports to the Forest Supervisor.

Rare. - Plant or animal species which are uncommon in a specific area. All endangered, threatened, and sensitive species can be considered rare, but the converse is not true.

Rearing Habitat. - The river or stream areas where juvenile salmonids must find food and shelter to survive for a period of time.

Recreation River. - See Wild, Scenic and Recreation Rivers.

Redd. - Nest in gravel of stream bottom where fish deposit eggs; herein, refers to salmon spawning redds.

Reforestation. - The natural or artificial restocking of an area with forest trees; includes measures to obtain natural regeneration, as well as tree planting and seeding. The work is done on National Forests to produce timber and other forest products, protect watershed functioning, prevent erosion, and improve other social and economic values of the forests, such as wildlife, recreation, and natural beauty.

Regeneration. - The renewal of a tree crop, whether by natural or artificial means. Also the young tree crop (seedlings and saplings) itself.

Release. - All work done to free desirable trees from competition with other less desirable vegetation.

Research Natural Area (RNA). - An area representing the major natural timber types or other plant communities in unmodified condition (FSM 4060). A natural plant community established for research and study of ecosystem and their changes.

Resource Area. - Administrative subdivision of the BLM, supervised by an Area Manager who reports to the District Manager.

Riparian Areas. - Terrestrial areas where the vegetation and microclimate are influenced by perennial and/or intermittent water, associated high water tables and soils which exhibit some wetness characteristics; this habitat is transitional between true bottom land wetlands and upland terrestrial habitats and, while associated with water courses, may extend inland for considerable distance.

Riparian Ecosystems. - See Riparian Areas.

Riparian Habitat. - See Riparian Areas.

Riparian Reserves. - Riparian areas, as defined by the Northwest Forest Plan.

Risk. - Different possible outcomes, where a probability can be assigned to each outcome with a degree of accuracy.

River Corridor. - A strip of land, ridge top-to-ridge top, which is seen or potentially seen from a river.

Road Corridor. - A strip of land between two points used by a road, or some future road whose exact location remains to be determined; usually with an indefinite width.

Salmonid. - Member of the fish family *salmonidae;* includes salmon and trout.

Salvage. - Removal of recently-dead or dying trees to minimize the loss of wood products.

Scenic River. - See Wild, Scenic and Recreation Rivers.

Sensitive Species. - Those plant and animal species identified by the Regional Forester for which population viability is a concern as evidenced by significant current or predicted downward trends in (a) population numbers or density, or (b) habitat capability that would reduce a species' existing distribution.

Seral Community. - A community which exists prior to the climax community is referred to as seral or successional. A given site on the landscape may have a number of seral communities present over time following a disturbance. Differing communities will result from the same disturbance on different sites or different disturbances on the same site.

Seral Stage. - A transitory or developmental stage of a biotic community in an ecological succession (does not include structural seral stage).

Sere. - The entire progression of seral stages, from the first to occupy a disturbed site (pioneer community) to the climax community is referred to as a sere. A sere is essentially the successional pathway for a given community.

Series. - All plant associations (see climax) capable of supporting a given climax tree species form a series. The name of the series is given to the dominant tree species which is the most shade tolerant and environmentally demanding species capable of reproducing itself.

Site. - Commonly used to indicate a particular area with relatively unique capability and/or soil and environmental conditions; often used in lieu of habitat or habitat type.

Silviculture. - The art and science of growing and tending forest vegetation, i.e., controlling the establishment, composition, and growth of forests, for specific management goals.

Smolt. - Juvenile salmon or steelhead which are ready to leave freshwater for the ocean. -They mature in the ocean before returning as adults to rivers and streams to spawn.

Snag. - A standing dead tree.

Spatial. - Referring to the distance, interval, or area between or within things.

Species. - Organisms that successfully reproduce among themselves and cannot reproduce successfully with other Organisms.

Species Diversity. - The distribution and abundance of different plant and animal communities and species.

Stand. - A community of trees or other vegetation sufficiently uniform in composition, constitution, age, spatial arrangement, or condition to be distinguishable from adjacent communities and so form a silvicultural or management entity.

Steelhead. - A large-sized, silvery anadromous rainbow trout.

Stocking. - The degree to which trees occupy the land, measured by basal area and/or number of trees by size and spacing, compared with a stocking standard; that is, the basal area and/or number of trees required to fully utilize the land's growth potential.

Stream Class. - The classification of streams according to their beneficial uses. Whole streams or parts of streams can be classified. One stream may be divided into several classes.

- *Class* I. Perennial or intermittent streams have one or more of the following characteristics: (I) is the direct source of water for domestic use (cities, recreation sites, etc.); (2) Are used by large numbers of fish for spawning, rearing, or migration; (3) Flow enough water to have a major influence on water quality of a Class I stream.
- *Class* II. Perennial or intermittent streams have one or both of the following characteristics: (1) Are used by moderate though significant numbers of fish for spawning, rearing, or migration; (2) Flow enough water to have a moderate influence on downstream quality of a Class I or 11 stream.
- *Class* III. All other perennial streams not meeting Class I or Class 11 definitions.
- *Class* IV. All other intermittent streams not meeting Class 1, 11, or III definitions.

Structure. - Structures are the physical, tangible elements of ecosystems. Structures may be vertical or horizontal. For example, branching, leaf characteristics, and size of plants determine vertical structure, while the spatial distribution of logs, branches, and even plants and animals determines horizontal structure.

Structural Successional Stage. - The size of trees in a stand, as depicted by satellite data.

Succession. - Plant succession is a directional, cumulative change in the species that occupy a given area, through time. Obviously, disturbance is an important mechanism of succession. Succession culminates in the absence of disturbance with a mature or climax community, or with a dynamic equilibrium, which takes into account cyclical disturbance, such as fire.

Successional Stage. - A stage or recognizable condition of a plant community which occurs during its development from bare ground to climax.

Suppression Strategy. - The broad application of plans and tactics to a specific fire situation; basic strategies include confine, contain, and control.

Sustainability. - Sustainability of ecological systems is defined by the range of natural variability of ecosystem patterns and processes at different spatial and temporal scales. Ecosystems become no longer sustainable when "they attempt" (or are managed as such) to operate outside of the range of natural variability.

Talus. - The loose accumulation of fragmented rock material on slopes, especially at the base of a cliff.

Temporal. - Referring to time.

Terrestrial. - Living on land: distinguished from aquatic (living in water).

Threatened Species.- Any species of plant or animal which is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

Timber Stand improvement (TSI). - Measures such as thinning, pruning, release cutting, prescribed fire, girdling, weeding, etc., of unwanted trees with the objective of improving growing conditions of the remaining trees.

Tolerance. - The forestry term for expressing the relative capacity of a tree to compete under low light and high root competition:

- *Tolerant Trees* - Trees which reproduce and form understories beneath canopies of less tolerant trees or even beneath shade of their own species.
- *Intolerant Trees* - Trees which reproduce successfully only in the open or where the canopy is greatly broken.

Travel Corridor. - A road, trail, or waterway used by people; or a strip of land used by wildlife.

Turbidity. - The optical property of water as affected by suspension of material such as sediment, i.e., the muddy or cloudy state of water.

Understory. - Vegetation (trees or shrubs) growing under the canopy formed by taller trees.

Vegetation Group. - This is a term which is used in this document to refer to "groups" of plant associations that have similar disturbance regimes and, therefore, would have had a similar composition and structure in a historic landscape. This term will be used in watershed assessment, in particular the vegetation module. Specific definitions are provided below.

- *Dry Vegetation Group* - This group includes all association within the Pinus ponderosa (ponderosa pine) and Pseudotsuga menziesii (Douglas-fir) Series. It also includes what we consider to be the dry half of the Abies grandis (grand fir) series. What was considered Mesic Douglas-fir in previous watershed assessments will now be included in this group, but will remain as a distinct "type" within this group. In other words, sites within this group which are more moderate (moist, northerly aspects) will be distinguished.
- *Moist Grand Fir Group* - This group includes the other, more moist half of
- *Wet Forest Group* - This group includes all associations within the Tsuga heterophylla (western hemlock), A. amabilis (silver fir) and T. mertensiana (mountain hemlock) Series.
- *Nonforest Group* - This group includes all nonforested communities. Distinction will be made, however, between high elevation meadows, shrublands and grasslands so that written discussion can be tailored to the appropriate ecosystem.

Viability. - Capable of living, growing, and developing.

Viable Population. - A population of plants or animals large enough and distributed in such a way as to ensure their continued existence over a specified period of time, usually on the order of decades to centuries.

Watershed. - The land area drained by a river system.

Wetlands. - Areas that are inundated by surface or ground water with a frequency sufficient to support, and that, under normal circumstances, do or would support, a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, wet meadows, river overflows, mud @ and natural ponds.

Wild, Scenic, and Recreation Rivers. - Rivers or river segments which have been designated as part of the National Wild and Scenic Rivers System (Public Law 90-542, 1968). Criteria for classification are as follows:

- *Wild Rivers* - Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.
- *Scenic Rivers* - Those rivers or sections of rivers that are tree of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.
- *Recreation Rivers* - Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

Wilderness. - All lands included in the National Wilderness Preservation System by public law; generally defined as undeveloped Federal land retaining its primeval character and influence without permanent improvements or human habitation.

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