Introduction

The Record of Decision on Management of Habitat for Late-Successional and Old-growth Forest Related Species Within the Range of the Northern Spotted Owl (ROD) established a network of Late Successional Reserves (LSR), to include 100-acre core areas, and Managed Late Successional Areas. Accompanying this was a set of management standards and guidelines. The network of reserves are intended to provide old-growth forest habitat, provide for populations of species that are associated with late-successional forests, and to help ensure that late-successional species diversity will be conserved. This direction was incorporated into the Shasta-Trinity National Forest's Land and Resource Management Plan (LRMP). Standards and guidelines for management of LSRs are detailed in the LRMP and can be found in several sections of the document, including Forest-wide standards and guidelines and Management Area 7 direction.

Late-successional forests are those forest successional stages that include mature and old-growth age classes (USDA, USDI 1994b). The structure and composition of these forests vary by forest type, site quality, and fire regime. Typically, such stands include live old-growth trees, standing dead trees (snags), and fallen trees or logs. In Douglas-fir forest, other features include multiple canopy layers with smaller understory trees. In pine dominated forest, stands under normal conditions are more open with relatively fewer snags and logs. In wet climates, on productive sites, these old-growth characteristics can begin to develop as early as 150 years. On dry sites, stands may be well over 180 years before these characteristics develop.

The management objective within LSRs is to protect and enhance conditions of late-successional forest ecosystems, which serve as habitat for late-successional and old-growth related species including the northern spotted owl (USDA, USDI 1994b). Protection includes reducing the risk of large-scale disturbance, including stand-replacing fire, insect and disease epidemic, and major human caused impacts. The California Klamath Province and California Cascade Province have been identified as being included in an area of elevated risk to large-scale disturbance due to changes in the characteristics and distribution of the mixed-conifer forests resulting from past fire suppression. Risk reduction and efforts are encouraged where they are consistent with the overall recommendations in management guidelines. The Klamath and California Cascade Provinces are physiographic provinces that differentiate between areas of common biological and physical processes. These provinces differ from the planning provinces which extend outside the range of the northern spotted owl, and are based more on major river basins.

The purpose of this Forest-wide assessment is to develop management strategies for the LSRs, determine their sustainability, and provide information to decision makers for managing LSRs to meets Forest Plan goals and objectives. In brief, the assessment covers: inventory of vegetative conditions, a list of late successional forest-associated species, a history and description of current land uses, fire management plan(s), criteria for developing appropriate treatments, identification of general treatment conditions, a proposed implementation schedule, and proposed monitoring and evaluation components. The LSRA is also referenced to ecological units identified in the draft document Ecological Subregions of California (USDA Forest Service 1997).

Ecosystem management requires maintaining biological diversity including species viability (ROD, Ecological Principles for Management of Late-Successional Forests, pages B-1 to B-6). The Forest goals and objectives are consistent with the ROD requirements and are reflected in the Shasta-Trinity National Forests Land and Resource Management Plan (LRMP).

Since species directly depend on habitat, a variety of habitats over time and space provide for a range of species including rare and sensitive species and those associated with late successional stages. Successional and disturbance processes have provided a varied successional stage mix and a functional landscape pattern. However, the effects of fire, the most influential process, have been altered and will continued to be so well into the foreseeable future.

The assessment, and it's outcome, will focus on the amount and distribution of late-successional habitat and be based on the ecological capabilities of the landscape. It will include the sustainability of individual LSRs and the Forest network in general. Sustainability for this assessment is defined as the amount and distribution of late-successional habitat by LSR and throughout the network that can be maintained over time. It is considered relative to the requisites of the species utilizing it.

Area of Assessment

This document is the assessment of 24 LSR/MLSAs within the boundary of the Shasta-Trinity National Forest's (STNF) including portions of LSRs that cross National Forest boundaries on to the Klamath National Forest, Six Rivers National Forest, and BLM Redding Resource Area. Located in northern California, the land is varies from rugged, isolated river subbasins, flat eastside areas with few riparian areas, to high elevation subalpine. The STNF occurs primarily within 2 physiographic provinces: the Klamath Province and California Cascades Province. (USDA, 1994b).

The Klamath Province is characterized as being dominated by Douglas fir, Douglas fir/mixed hardwood, mixed conifer, mixed conifer/hardwoods, and ponderosa/Jeffrey pine forests. Forests tend to be almost continuous occupied by forest vegetation at a level at or over the carrying capacity of the land. Spotted owls and spotted owl habitat generally are well distributed throughout the western and most of the central portion of the province. Owls and owl habitat occur along the borders with the other provinces except where areas of natural habitat fragmentation occur along the southwest and northeast boundaries. The eastern part of the province is drier and owl densities are lower than in the western and central part of the province. The southeastern portion of the province and both owl habitat and late-successional/old growth (LS/OG) terminates at foothills of the Sacramento Valley.

The California Cascades Province is the area located in the north central portion of the state, between the Oregon Cascades provinces, the Klamath Province, and the range of the California spotted owl at the north end of the Sierra Nevada Mountains. The California Cascades province is generally isolated from the adjacent provinces. It is characterized as being dominated by mixed conifer and/or ponderosa pine associations on relatively dry sites. Forests are generally continuous with vegetation occupying greater than the sustainable carrying capacity. Present forest conditions are a result of past management activities, including fire suppression. Mixed

conifer communities have increased, gradually replacing stands that were dominated by large ponderosa pines with little understory. Suitable owl habitat is separated by Mt. Shasta, and other high elevation areas of unsuitable soils, and areas of marginal, low elevation habitats from habitat in other provinces (USDI 1993 - Recovery Plan). Spotted owl populations are relatively low in this province (USDI 1993-Recovery Plan). The STNFs portion of this province has been repeatedly recognized as being crucial in providing sufficient habitat in both quality and quantity for connectivity to and from the Sierra Nevada Province.

Description - Context of the Assessment

Range-wide Setting: The Shasta-Trinity's LSRs are part of a rangewide network designed in association with other land allocation to provide functional mature and late seral habitat, including long-term dispersal and migratory pathways.

The Klamath Mountains and Southern Cascades provides north-south, east-west and mid to high elevation routes. Each has its own unique or shared complement of species associated with the inland continental climates. The Forest network joins two parallel pathways by provide east-west access connecting the California and Oregon Coast Ranges to the Cascades and Sierra Nevada Ranges. The Forests are extremely important and has long been recognize as the "link" between the Northern and California subspecies of spotted owls

Ecological Setting: The USDA Forest Service, and other agencies and departments, have adopted an ecological approach to forest management that applies to federal lands and research programs. Using the document "Ecological Subregions of California - Section and Subsections Descriptions" were used to group LSRs/MLSAs with like conditions.

Table I-1. LSR by Ecological Section

Section	Subsection(s)	LSR/MLSA
Klamath Mountain	M261Ba, M261As	RC330, RC328
	M261Au	RC330, RC332
	M261Ar, M261Ac	RC331, RC332, RC333
	M261Ai	RC335, DD83
	M261Ak, M261Aj	RC337, RC338, RC339, RC340, RC341, RC342, RC343, DD67
Southern Cascades	M261Dj, M261Dg	RC357, DD79, RC360, DD76,
	M261Df	RC361, RC362, DD72, DD78,
	M261Di	RC359, 358,

Note: For the purpose of this analysis, Subsections such as M261As of the Klamath Mountains were grouped to reflect similarities in topographic and climatic conditions.

Under the ecological classification, California has 19 ecological sections. The Shasta-Trinity National Forests lies partially within two of these major sections: Klamath Mountains and Southern Cascades. A Section is defined as an ecological unit in the subregions planning and analysis scale of the National Hierarchical Framework corresponding to subdivisions of a Province having broad areas of similar geomorphic process, stratigraphy, geologic origin, drainage networks, topography, and regional climate. Such areas are often inferred by relating

geologic maps to potential natural vegetation groupings as mapped by Kuchler. A Subsection is an ecological unit in the subregion planning and analysis scale of the National Hierarchical Framework corresponding to subdivisions of a Section and are characterized by more specific descriptions to include; lithology and stratigraphy, geomorphology, soils, potential natural vegetation, climate, and surface wear. Disturbance regimes were added for each of the 8 ecological units. This ecological stratification was utilized to group LSRs/MSLA/CORE based on like factors such as geomorphology, soils, potential natural vegetation, and disturbance regimes. It was assumed that LSRs having like factors or characteristics would display similar reactions to disturbance over time.

There are approximately 389,982 acres of LSR/MLSAs in Federal ownership that are considered by this analysis. These areas are primarily located on the Shasta-Trinity National Forests but also including small portions of the Six Rivers and Klamath National Forests and Bureau of Land Management, Redding Resource Area lands. For this assessment, 18 Late-Successional Reserves (LSR), 6 Managed Late-Successional Areas (MSLA) land allocations are considered and discussed in this document.

Three other LSRs located on the Shasta-Trinity National Forest will be considered in this document as part of the overall network functioning but, will not be assessed in detail. The assessments have been recently competed on these three LSRs including Chalk Mountain RC-336 (completed by the Lassen NF), LSR RC-305 (completed by the Six Rivers NF) and, Clear Creek RC-334 (complete by the Shasta-Trinity NF).

Table I-2: Late-successional reserves to be addressed in the Forest-wide Late-Successional Reserve Assessment.

Table I-2. LSRs/MSLAs (Federal Acres)	
LSR/MLSA	**Acres**
Yolla Bolla RC328	1,644
South Fork RC330	80,451
Chanchellula RC331	22,526
Corral RC332	78,634
Canyon Creek RC333	8,479+blm
Iron Canyon RC335	89,141
Buckeye RC337	7,044
Eagle RC338	3,832
Graves RC339	2,588
Scott Mountain RC340	25,638
Eddy RC341	2,723
Deer RC342	5,932
Algoma RC357	25,498
Porcupine RC358	1,070
Harris Mountain RC359	2,224
Elk Flat RC359	3,056
Mt. Shasta RC361	14,504
Wagon RC362	4,922

Table I-2. LSRs/MSLAs (Federal Acres)	
LSR/MLSA	**Acres**
Castle Lake DD67	1,910
Fons DD72	1,243
McCloud DD76	2,596
Sheepheaven DD78	1,138
Bartle DD79	1,393
Madrone DD83	1,796

Document Organization

This document is organized into 4 chapters. This first chapter, "Historic Reference Land Uses and Conditions" reviews some of the important resource management and natural events which have affected the condition of the LSR/MLSAs. The second chapter will assess the current condition of the Forest-wide LSR/MLSA network and each individual LSR/MLSA, relative to how LSR/MLSA sustainability will be assessed. Chapter 3 will describe the desired conditions for terrestrial habitats and late-successional sustainability analysis within the LSR/MLSAs. Lastly, the Management Recommendations Chapter 4, will outline criteria to be used for identifying potential treatments in LSRs and it will identify specific treatments, if appropriate, to be proposed now and in the future.

Chapter 1
Historic Reference Land Uses and Conditions

Introduction

The Shasta-Trinity National Forest has been inhabited by humans for over 5000 years after one of the ice ages of this Holocene epoch. Native Americans hunted deer, fished, and gathered acorns on the Forest. The forest canopy was more open than today. Native Americans burned vegetation to maintain and improve their food supply. This effected the oak habitat and forest seral stages. In winter, they clustered along the McCloud and Trinity River systems as fishing sustained them during the snow season. The Hudson Bay Company fur trappers explored and trapped the area during the 1830s and 1840s.

Discovery of gold enticed many miners to stake claims in Shasta and Trinity counties starting in 1848. Placer mining occurred in most streams from 1850-1870. By the 1870's the Forest and its terrain was networked with trails, stage routes, and wagon roads. Farmers burned vegetation to increase grazing vegetation, especially in the McCloud region. Lumbering, mining, and recreation increased with the advent of railway access from Redding to Shasta Springs via the Sacramento River canyon in 1887. Copper smelters peaked near Shasta Lake during 1895 to 1920. Local vegetation communities changed from trees to shrubs as a result of emissions from the smelters.

In 1905 to 1907, the Shasta and Trinity National Forest were established. These Forests are part of two physiographic provinces: Cascade Mts., and the Klamath Mts. Foothills are covered by oak and grassland savannas, Douglas fir stands dominate the western mountains, and ponderosa pines abound in the elevated flats of the eastern hills. The area is influenced by a Mediterranean type of climate with hot, dry summers and winter/spring rains making the Forest vulnerable to fire. Fire disturbance was wide-spread, relatively frequent, low-intensity surface fires, with occasional crown fires creating small gaps. Both Native Americans and lightning were sources of fire. Since 1906, over one-half million acres, or 1/4 of the National Forest has burned including some large stand replacing fires of the late 1800's.

Fire played a major role in shaping the composition and successional stages of vegetative communities, especially forests. The forest has become more closed and multi-storied today from fire suppression (which became more aggressive in 1930's and then very effective after World War II fire-fighting technology) and climate change. Tree species composition has succeeded towards more shade tolerant, fire sensitive species such as white fir and away from more shade intolerant, fire resistant species such as ponderosa pine. Due to these changes in tree species composition, forests are more sensitive to fire now than in the past. The fire regime has changed from a short interval, low intensity regime to a moderate to high intensity with infrequent intervals. White fir occurred less in mixed stands and was usually confined to upper elevations. In some eastern parts of the Forest, fire tolerant black oak trees were more abundant. Pure oak stands along with the oak component of mixed conifer forests have been encroached by conifers, become more decadent, lost vigor, and produce fewer acorns.

The 1906 San Francisco earthquake and reconstruction increased lumbering on the Shasta-Trinity National Forest. The lumber market decreased during the 1927 depression era and increased with the post WWII construction boom. With these industry ups-and-downs, only about 335,000 acres (about 16% of the Shasta-Trinity NFs) have been harvested in some manner for wood products since 1910.

Table 1-1. Forest-wide History

Decade	Annual Timber Harvest
1920 - 1940	1000 ac/yr
1940's	1500 ac/yr
1950's	5000 ac/yr
1960's	10,000 ac/yr
1975 - 1990	200 mmbf/yr
1990 - 1992	90 mmbf/yr
1993	71 mmbf/yr

Selection was the primary harvest system through the 1960s. Even-aged regeneration systems were implemented from about 1975 through the early 1990s. Regeneration harvest and tree planting has occurred on about 130,000 acres (6%) of the Shasta-Trinity NFs.

The major north-south freeway route, Interstate Five, was completed in 1962.

Table 1-2a. Forest-wide Successional Stages

Successional Stage	Estimate
late successional	38%
mid successional	48%
early successional	14%

Table 1-2b. Forest-wide Successional Stages
(STNF LRMP FEIS III-20)

Seral Stages	Early	Mid	Late	Total	%
Mixed Conifer	90,829	778,930	591,233	1,460,991	69
Douglas-fir	6,274	2,391	18,132	26,797	1
Red Fir/White Fir	3,487	26,799	68,840	99,127	5
Ponderosa Pine/ Jeffrey Pine	4,384	19,327	12,353	36,065	2
Subtotal - Major Conifer Types	104,973	827,448	690,559	1,622,980	77
Other Conifer Types	0	32,512	8,767	41,282	2
Hardwoods	18,829	113,374	56,687	188,892	9
Chaparral	148,742	0	0	0	7
Grass	10,560	0	0	0	0
Total Vegetated Land	283,105	973,338	756,013	2,012,456	95
Total Non Vegetated Land				109,091	5
Total Forest Acres				2,121,547	100

Table 1-3. Forest-wide Roads	
Road Type	**Amount**
arterial [1]	685 miles
collector [2]	1515 miles
local [3]	4619 miles
uninventoried [4]	500 miles
roads gated [5]	15% of system
roads closed by snow [6]	30%

1 Arterial: main through roads
2 Collector: connect local roads to arterial roads
3 Local: dead end roads, often single purpose or temporary
4 Uninventoried: Nonsystem roads
5 Roads Gated: Closed roads, permanent and seasonal
6 Roads Closed by Snow: Roads not maintained during winter months

Table 1-4. Forest-wide Water	
Waterway	**Amount**
lake/reservoir	53,000 acres
perennial streams	2000 miles
intermittent streams	3,500 miles

The Shasta-Trinity National Forests include 212,000 acres of the Whiskeytown-Shasta-Trinity National recreation Area (NRA). Recreation use on the Shasta-Trinity National Forests ranks among the top 10 in the Nation. This use is the result of the unique and abundant recreation opportunities which are easily accessible from Interstate 5, the primary north/south transportation corridor for the West Coast.

Currently 370 species of wildlife are known to inhabit the Shasta-Trinity National Forests: 240 birds, 85 mammals, and 45 amphibians and reptiles species. Prior to the effective suppression of wildfires during the 20th Century, the forest was more open. Organized fire suppression has been extremely effective in limiting the area burned by wildfires (Husari and McKelvey 1996; McKelvey and Busse 1996). The resulting virtual exclusion of low- and moderate-severity fire has profoundly affected the structure and composition of most California Cascade forests, especially in low- to middle-elevation forests. Conifer stands have become denser, mainly in small and medium size classes of shade-tolerant and fire-sensitive tree species. Stands have also become more complex when viewed vertically, but less complex and more homogeneous in terms of areal arrangement (Weatherspoon et al. 1992). Prior to effective fire control during the 19th and early part of the 20th century species such as northern spotted owl, goshawk, Pacific fisher, and American marten were probably limited to the denser, layered forests in riparian areas and north-facing slopes. In some localized areas forest-interior wildlife often were exposed to increased predation, weather, and disturbance. In some areas hardwoods and mast dependant species were more abundant: bear, western grey squirrel, band-tailed pigeon, elk, and quail. Meadow areas were larger prior to conifer encroachment due to fire suppression. Besides fur trapping, beaver have been subject to removal attempts as recently as 1966. There were less bald eagle and lake associated species prior to the advent of Shasta Lake and Trinity reservoirs.

Table 1-5. Current Forest-wide Grazing	
2545 cattle	year
2120 sheep	year
45 horses	year
8730 animal months	[AM]
33 active allotments	5 vacant allotments

* includes those administered by the Klamath National Forest

Domestic animal grazing peaked from the late 1880's to early 1900's. Grazing was unregulated prior to National Forest establishment. For example, 7000 head of cattle were grazed at Squaw Creek, Pit River, and McCloud River in 1905. As lands and forage, especially in riparian areas, deteriorated due to grazing, range conditions declined for the next 50 years. Beside forest conservation, one of the early jobs with the establishment of the Forest Service was to lower grazing animal numbers and suppress fires. Grazing began to decline around 1940's as a result of the collapse of the wool market in 1946.

Natural influences include volcanic eruptions and mud flows at Mt. Shasta. It erupted as recently as 1784 and had 5 severe mud flows from 1881 to 1931. Landscape change can be indicated by the 1924 flow which covered 1500 acres and yielded 7 million cubic yards of mud.

Vegetative Condition

The best available information on the historical vegetative conditions come from literature dealing with fire regimes, old growth studies, and through the interpretation of aerial photos taken in 1944. The interpretation of the 1944 aerial photos is not designed to set the criteria for the development of a desired future condition nor to provide a complete picture of historical conditions. Vegetative characteristics across the landscape are constantly changing. Aerial photos are a tool used to provide a point of reference or snapshot in time of what the vegetative characteristics looked like at a time prior to intensive fire suppression and vegetation management of the past 50 years on the forest landscape. They give us a view of what types of vegetative characteristic occurred prior to an extensive pre-suppression fire regime. Much of the analysis area that is capable of supporting late-successional forest was more open than today and ranged from early to late successional, with a greater diversity of patches across the landscape.

Frequent low to moderate intensity fires, over much of the forest were characteristic of the pre-suppression fire regime, created vegetative conditions that were fire adapted. In general, forested stands tended to be more open than currently found today (USDA, USDI 1994b; Agee and Edmunds 1991). There was a lot of stand or patch size diversity, with most of the patches containing trees of the same age and size class. The vegetation across the landscape was very heterogenous in the past (Skinner 1995).

The results of research over the past few years has provided additional information on the historical vegetative patterns that existed across the landscape within the Klamath Province Skinner (1995a) found that forest openings have disappeared or become smaller in remote areas of the Klamath Mountains during the period of effective fire suppression. Skinner (1995)

compared vegetation patterns as depicted in two sets of aerial photos taken 41 years apart in areas of the Happy Camp Ranger District. Changes were noted in the spatial characteristics of the openings in the landscape studied between 1944 and 1985. Openings decreased in area and perimeter over the time period. The estimated proportion of the landscape occupied by openings decreased by an estimated 10%. The pattern of change suggests a more continuous cover of forest has developed with finer grain and less variation in the pattern of forest openings. A phenomenon that was observed but not measured was a noticeable increase in the density of the forest canopy in the stands adjacent to the openings. Recent findings show much the same pattern in the Hayfork Valley area (Skinner, pers. com.)

Wills (1991) studied the relationship between historical fire return intervals and forest stand development within the Klamath Mountains. His findings suggested that high frequencies of low and medium intensity fire resulted in complex mosaics of age, size and structure. Even-aged groups of trees became established following liberation of growing space by moderate intensity forest fires, but evidence did not support the idea that stand replacing fires were frequent or extensive.

In addition, it has been noted that dead woody material (snags and down logs) density was likely lower than at the present because of frequent fires (Taylor and Skinner 1995; Agee and Edmunds 1991). Loading levels of the small fuel size classes were probably significantly less than they are today, while the greatest proportion of large down logs was found in mesic areas, north slopes and higher elevations.

There were many vegetative types that have historically existed within the LSRs to one extent or another. These have varied from west to east across the ecological subsections. The dominate ones are describe as follow:

Mixed Conifer: Two separate plant series were associated with mixed conifer stands, 1) Mixed conifer/ponderosa pine series and 2) Mixed conifer/white fir series. These plant series were generally found on the eastern proportions of the Yolla Bolla, Hayfork, and Big Bar Ranger District and most of the Weaverville, Mount Shasta, and Shasta Lake Ranger Districts. The mixed conifer/ponderosa pine series were typically found at the lower elevation, below 4,500 feet and the mixed conifer/white fir series were typically found at the higher elevations and more so on north facing slopes, 4,500 to 6,000 feet. Historical stands of both of these series were probably different in terms of structure and species composition. Stands were more open than they are today, with fewer existing as dense and multi-storied. The relatively denser stands within the watersheds were most likely found on the lower one-half of the north facing slopes, in riparian areas, and areas of deep, productive soils. More open stands occurred on south facing and the upper one-half of north facing slopes.

In the mixed conifer/ponderosa pine series no single species dominated the sites. Fire adapted conifers, i.e. ponderosa pine, Douglas fir, incense cedar, and sugar pine were the dominate species. Douglas-fir was more dominant on the north slopes and riparian zones while ponderosa pine was more dominant on the south slopes. White fir was generally absent from stands in low to mid elevation zone (below 4000 Feet) (Taylor and Skinner, 1995). California black oak and

canyon live oak were typical hardwood components with mountain whitethorn and manzanitas being the dominant shrub species.

Within the mixed conifer/white fir series, white fir formed an important but not dominant part of the overstory canopy at the high elevations. Other important species included Jeffrey pine, ponderosa pine, Douglas-fir, sugar pine, incense cedar. Canyon live oak, giant chinquapin, and black oak were the dominant hardwood with pinemat manzanita, squaw carpet, and huckleberry oak as the typical shrub species.

White Fir: This series was most prevalent between the 5,000 to 6,000 foot zone. The series tended to be single storied stands with even-sized canopy and more dense than the mixed conifer series. The lower portion of the white fir zone was commonly mixed with Douglas fir, ponderosa pine, incense cedar, and sugar pine. White fir became the dominant species with a mixture of red fir, brewer spruce in the upper elevation zone. Stand density was highly influenced by fire frequency. The Northern California Coast subsection had less frequent fires which provided for denser stands as compared to the Klamath Mountains and California Cascade portions of the analysis area which had a higher frequency of fires. Chinquapin was the most dominant tree hardwood associate. Where the overstory was more open, shrubs such as greenleaf manzanita, huckleberry oak, sadler oak, and snowbrush occurred.

Red Fir: This series typically contained uneven size canopy structure with several layers existing as small groups. This created conditions with groups of older dense trees interspersed with patches of younger trees and openings. The densest areas were typically found on the lower 2/3 of the slopes and on flatter terrain. More open conditions, intermixed with brushfields were generally found on the ridge tops and upper 1/3 of the slopes. Red fir and Shasta red fir occurred in relatively pure stands above 6,000 feet. Sugar pine, white fir, and Douglas fir were common overstory associates at the lower elevations and on southerly aspects. Mountain Hemlock, brewer spruce, and western white pine were common associates at the upper elevations and on northwest to east facing aspects. Shrubs were generally absent in the densest stands. Where stands were more open, shrub components consisted of pinemat manzanita, greenleaf manzanita, snowbrush, and sadler oak. Meadows were commonly intermixed with the red fir stands.

Douglas-fir/tanoak: This plant series was found on the very western portions of the Yolla Bolla, Hayfork, and Big Bar Ranger Districts. Stands within this series were usually two-storied with the conifers occupying the overstory and tanoak, a shade tolerant species, occupying the understory. Of all the Forest vegetation types, this was probably the densest and contained the greatest structural diversity, due to the abundance of understory hardwoods and a less frequent fire regime. This series was dominated by Douglas-fir with sugar pine being a common associate. Tanoak, Pacific madrone, and canyon live oak were the primary hardwood species present. The overstory was dominated by fairly well spaced conifers with hardwoods making up a majority of the understory. On the more mesic sites, Douglas-fir was the dominant conifer species in association with tanoak and Pacific madrone as the major hardwood components. On steep rocky slopes, canyon live oak became the dominant hardwood with scattered Douglas-fir as the primary overstory conifer. In canyon bottoms, Port-Orford cedar occurred as the primary associate. Black oak and giant chinquapin occurred with sugar pine on the drier slopes and southerly aspects. Tanoak was tree form in stands where Douglas-fir was more sparse. Where

Douglas-fir created a closed canopy, tanoak was found in a shrub form. Other understory shrub species that associated with this type include primarily hazelnut and deerbrush.

Douglas-fir/fir: This series was very similar to the Douglas-fir/tanoak series except the hardwood component of tanoak/pacific madrone were very minor components. The white fir replaced the tanoak in this series. Other overstory components include, as minor components, big-leaf maple, giant chinquapin, tanoak, sugar pine and pacific madrone. Understory shrub species include hazelnut, oceanspray, creeping snowberry, and pacific dogwood.

Structural components were probably very similar to those found in the Mixed conifer/white fir series.

Canyon live oak: The occurrence of this vegetative series was largely confined to steep slopes and areas of shallow soils. Usually located on south to southwest facing slopes. This series was probably less dense, with patches of various age classes present. With frequent fire return intervals, some stands would have been recently rejuvenated with sprouts while other stands would have consisted of small to large mast producing trees. This series contained scattered conifers that provided generally less than 10% canopy closure. Conifer species consisted of ponderosa pine, Douglas-fir, and sugar pine. Moisture on these sites is limiting. This probably caused snags to be created in pulses during periods of drought. Other shrub associates include: shrub interior live oak, pacific madrone, birchleaf mountain mahogany, redbud, poison oak, and hairy honeysuckle.

Oregon white oak: This series occurred at lower elevations on poor, exposed or droughty soils. Douglas-fir was the primary conifer associate, but provided less than 10% cover. It was usually sparsely found in this series. Other plant associates included; canyon live oak, wedgeleaf ceanothus, whiteleaf manzanita, western poison oak, western redbud, and deerbrush.

Montane Shrub: There were several shrub and chaparral series found throughout the Forest. Most of these series were associated with shallow soils, xeric sites, and/or serpentine soils. They were usually found on the drier aspects, south to southwest. The occurrence of shrub communities was determined primarily by site capability. Post-fire response for most shrub species is either vigorous root crown sprouting or germination of stored seedbanks.

Riparian Shrub: This vegetation type was generally found associated with riparian zones and wet floodplains. Dominant vegetation included willow and alder.

Meadow/Riparian Vegetation: This vegetative community was generally found in the upper elevations of the Forest. Meadows and associated riparian vegetation were common. Two different types of meadow complexes existed, dry and wet meadows. Historically, fire played an important role in the development of dry meadows. They were probably more numerous and larger in size compared to those that exist today. Fire exclusion has allowed the encroachment of conifers and shrub species in the dry meadows (Skinner 1995). Wet meadow locations and sizes were similar to those seen today. These high elevation meadow and riparian types were dominated by herbs, graminoid, and forbs. Species composition was influenced by water table levels.

Using the "Old Growth in Northwestern California National Forests" publication (Beardsley and Warbington) as a guide, the following table highlights approximate averages per acre for various components that may have been found within historical old growth stands. It must be understood that values represented in this study reflect 60-80 years of fire suppression.

Table 1-6. Old Growth Forest Components

Tree Species	Overstory Canopy Closure	#Trees 20-28" DBH per acre	#Trees >28" DBH per acre	#Snags >20" DBH per acre	#Down Logs >20" DBH per acre
Mixed Conifer	49%	12	12	3	7
White Fir	42-58%	21-27	12-20	5-9	5-10
Red Fir	40%	27	19	6	6-9
Douglas-fir/Tanoak	75%	12	13	3	9

Insects and Disease

Historically, stands were more open with less understory vegetation than what is found today. As stands developed they experienced background levels of mortality from ground fires, lightning strikes, and minor insect mortality. These factors tended to keep tree stocking below fully carrying capacity, which tended to moderate the amount of mortality experienced during drought period. Mortality levels in natural stands on the National Forests in California ranged from 0.2% to 0.5% of the overall standing volume per acre, per year. Drought conditions would have caused temporary spikes in mortality of up to 1.0% to 1.5% of the overall standing volume per acre per year (Schultz 1996).

Changes in the structure and composition of the forest result from the constant demand of each individual tree for more space and from the eventual death of even the most dominant individuals. The increasing size of the main story trees results in competition for growing space, with a few individuals gaining space, a few more holding their own, and an increasing majority losing space and eventually succumbing. The death of the dominants, due to lightning, wind, old age, or insects and diseases, releases from the main canopy a portion of the site for occupancy by a growing and developing understory. A variety of insects and diseases have always existed in the landscape. Where fire did not reduce stand density and competition levels, insects and disease might often be the limiting factors. Due to the historical vegetation conditions it can be assumed that large scale outbreaks were probably rare. Lower density levels within forested stands reduced the amount of insect and disease morality that occurred in pole and mature stands. White fir stands occasionally had epidemic levels of fir engraver beetle during dry periods and in situation where young stands were very dense and had not been thinned by fire. These localized epidemics probably influenced the occurrence of stand-replacing events as fuels built up from the insect induced mortality.

Fire History and Fire Regime

Human caused and lightning fires have been a source of disturbance to landscapes for thousands of years. Like other natural agents of disturbance fire was a strong influence which shaped the successional processes, ecosystem structure, and biochemical cycles.

Native Americans influenced vegetative patterns for possibly several thousand years by igniting fire to enhance values that were important to their culture. Burning was prevalent around village sites, selected mountain tops, and harvest areas, such as oak stands and meadow enhancement of bulbs and grasses. Early American settlers to this area used fire to improve grazing, to expose rock and soil for mining and to improve travel routes (Wills 1994).

The Shasta and the Trinity National Forests were established as reserves in 1905. The STNF was established as a unit in 1954. One of the main charges for the Forests was management of the timber reserves. Uncontrolled fires were believed to be detrimental to the growing of trees. In the early years Rangers were spread thin and fire suppression conflicted with local interests, so many fires in this area were still allowed to burn unchecked. This practice continued until after World War I, when more personnel were made available to fight fires. After 1920, suppression of all fires was attempted as suppression forces grew and the ability to aggressively enforce fire prevention policies improved. Hence, by the time the first set of aerial photos of the Forest were taken, in 1944, fire suppression had only been successful for about 20 years. This is within the interval of "natural" fire occurrence, as discussed below.

A study of historical fire frequency was recently conducted on the southwestern portion (Hayfork Ranger District) of the STNF. This study concluded that prior to European settlement fires occurred at 3 to 7 year interval, one of the shortest fire intervals reported (Skinner, unpublished). It is very apparent when looking at forest stand conditions from aerial photos taken in 1944 that large fires were a common occurrence in this area. Fire scars are visible and vegetative patterns indicate the occurrence of large disturbances. These fires were of varying severity, but severity was obviously higher on exposed south aspects, and ridges.

The west side of the STNF has relatively mild winters and hot, dry summers. Thunderstorms with accompanying lightning is common from May until the fall months. South and west aspects receive greater solar radiation than others, which will generally result in harsher growing sites and less vegetation than on other aspects.

From 1950 to present, fire suppression became fairly effective, and unnatural fuel and vegetation conditions started to develop. A comparison of aerial photos taken in 1944 with current condition show that areas that were once sparsely vegetated by conifers are now heavily stocked. Prior to fire suppression many stands were open, tree crowns were separated areas with continuous conifer overstory were primarily limited to the north and east aspects, and perennial riparian areas were less influenced by fire. Forest openings are an important component of landscape diversity as they contribute to variety through becoming patches of successive vegetation and age classes. Research completed on spatial characteristics in northwestern Siskiyou county were measured on aerial photographs, 41 years apart. This included area, perimeter, and distance between neighboring openings. The openings decreased from 25.8% to 15.6% of the study area. The perimeters and areas became smaller, and the distances from the sample point to the nearest opening and between neighboring opening became greater over the 41 years between aerial photo sets (Skinner, 1995). A phenomenon that was observed but not measured was an apparent increase in the density of the forest canopy in the stands adjacent to the openings. It has been well established that fire, as a prominent disturbance factor, played a major role in the patterning of vegetation stand structure and mosaics in the forest landscape.

Wills (1991) studied the relationship between historical fire return intervals and forest stand development within the Klamath subregion and/or province. His findings suggest that high frequencies of low and medium intensity fires resulted in complex mosaics of age, size, and structure. Even-aged groups of trees became established following liberation of growing space by moderate intensity forest fires, but evidence did not support the idea that stand replacing fires were frequent or extensive. Dominant species tended to be fire resistant species such as Douglas-fir, ponderosa pine, and sugar pine.

Fire appears to have been the primary determining factor of historical vegetation condition. Fires occurred at least 3 to 7 years within the lower part of the Klamath subsection and California Cascades Subsection. The fire frequency is probably at a somewhat longer fire interval in the California Coast subsection.] They were usually low to moderate severity fires with occasional stand replacement patches. The lower severity fires maintained open understories and kept levels of woody debris low. Fire severity varied depending upon the weather, fuels conditions, and local topography. Human caused fires generally occurred along roads or trails.

Chapter 2
Current Condition (General)

Introduction

One of the objectives of this assessment is to determine how well the LSR/MSLA network on the Shasta-Trinity National Forest is functioning. For the purpose of this document, functioning will be assessed using the following criteria:

1. Amount of total late-successional forest habitat and total per LSR.
2. Resiliency to large scale disturbance by LSR
3. Connectivity of late-successional forest habitat within the LSR/MLSAs and dispersal habitat between the LSR/MLSAs to include 100-acre cores.
4. Contribution of each LSR and the network as a whole to northern spotted owl recovery and old-growth associated species in general.

The structure and composition of the coniferous vegetation is variable due to diverse biological and physical conditions. Aspect and topography have strong influences on vegetative characteristics within each of the three ecological subsections. The strong influences of topography and aspect result in naturally diverse, fragmented vegetative patterns on the landscape.

Most of the LSR/MLSAs have had various levels of management in them. Forest vegetation management actions and wildfires account for much of the current vegetation conditions including the amount of late-successional habitat currently found today. Existing plantations have been created from past harvesting or fires. There is a variation in the percentages of plantations within the different LSR/MLSAs.

The effective suppression of fire has resulted in changes in forest structure, stand density, and species composition. Fire suppression has changed the fire regime from frequent low intensity surface fires, to infrequent, stand replacement fires. Prior to settlement by Euro-Americans, the LSR/MLSAs were characterized as having frequent (occurring every 3-7 years within the California Klamath Province and 5-30 years in the California Cascades Province) light surface fires of predominately low and moderate intensity. The current fire regime is characterized as being composed of infrequent (every 25-100 years for the Klamath and >60 years for the Cascades Province), severe crown and surface fires.

The results of these changed conditions include increases in dead and live fuel, development of fuel ladders, and closed canopies that can sustain crown fires. At the 90th percentile weather (historical weather associated with typical late summer day time conditions), the ground fuels easily burn with flame lengths greater than four feet. These flame lengths could cause torching of the understory vegetation, leading to preheating and torching of the larger trees that otherwise would be fairly resistant to fire.

The STNF LRMP identified four Key Watersheds located on the Forest directly contributing to anadromous salmonid conservation. For instance, the New River, North Fork of the Trinity River, and Canyon Creek all provide habitat for the largest remaining naturally reproducing populations of winter run steelhead salmon within the Trinity River system. All three of these lie within LSR/MLSAs. The fourth and largest Key Watershed encompasses the upper South Fork of the Trinity River and overlaps one large LSR. The drainage historically had large populations of both coho and steelhead salmon.

Current management issues include protection of key forest resources, high fire hazard conditions, and areas which may have watershed related features at risk.

Forest Wide Discussion

Table 2-1. General Acre Distribution

Area of Concern	Number of LSRs & MLSAs	Shasta-Trinity NF Acres	Other Forests/BLM Acres	Total Federal Acres
This Assessment	24	385,000	13,000	398,000
Total LSR system on Shasta-Trinity NF	27	528,000	43,000	571,000

Most of the references to acres in this assessment are based on the 385,000 acres being analyzed in the 24 different LSR/MLSAs on Shasta-Trinity National Forest only. The table below highlights the study area in relation to several other categories.

Site Capability: Based on 1994 Shasta-Trinity National Forests Soil Survey information and using the current Order 3 Soil Survey, approximately 90% acres of these LSR/MLSAs are capable of supporting dense (>40% canopy closure) or open (<40% canopy closure) late-successional coniferous forest habitat. These areas are largely represented by Forest Survey Site Class 1-5. The remaining acres within the LSR/MLSAs contain hardwood vegetation, montane shrub communities, meadow complexes, and non-vegetated areas (rock outcrop and bodies of water).

Vegetative Condition: Refer to Appendix E for a description of successional stages defined for this assessment. It must be noted the vegetation patterns identified in the Ecological Subregions of California (in the Ecological Setting) are defined as vegetation series and premised on Potential Natural Vegetation. The Shasta-Trinity National Forest database is based on "current" vegetative condition and evaluated by using the Forest vegetative data layer (timber type). It is stratified by primary and secondary species component, size class, and density class. (See appendix).

The analysis of "old-growth" late-successional acres (size class 4 and greater) is used at times in this assessment to measure current and desired optimum habitat for the system of reserves under study. It should be noted that many of the mid-successional stands (size class 3) are likely to have late-successional characteristics, although not to the optimum condition desired in reserves.

The total amount of late-successional forested habitat within the LSR/MLSAs of this assessment is approximately 90% and approximately 31,400 acres are plantations. Approximately 207,200 acres are mid-successional, early-successional account for approximately 18,200 acres.

By the current definition, there are approximately 771,000 acres of suitable NSO habitat on the Forest.

Table 2.2 shows the distribution of forest vegetation by successional class for the LSR/MLSAs as a whole.

Table 2.2. Vegetative seral types within LSR/MLSAs	
Stage of Succession	**Acres**
Late-successional (includes "Old Growth")	90,700
Mid-successional	207,200
Early-successional	18,200
Plantations	31,400
Other-shrub, hardwood, etc.	37,500
Total	385,000

*Does not in include 100 acre LSRs

The relatively wet climate conditions during the end of the nineteenth century and early years of the twentieth century (Huges and Brown 1991), combined with fire exclusion have created changes in vegetative composition, structure, and pattern across the landscapes. The vegetative composition in the mixed conifer zone has shifted from fire adapted shade intolerant conifers and hardwoods to more shade tolerant non-fire adapted conifers. Stand structure within the mixed conifer has also changed with denser tolerant understory not only found on cooler north and east aspects, but also on normally more sparse south and west aspects. (USDA, USDI 1994a)

The white fir zone has also experienced increases in stocking levels throughout the LSR/MLSAs. This has created conditions more favorable for insect outbreak which has resulted in several areas of concentrated mortality within several of the LSR/MLSAs, especially in the Southern Cascades subsection. The general trend in the development of stand-replacing fire is consistent with recent research findings and forest management strategies (Agee and Edmonds, FEMAT 1993).

The following is a general description of the major vegetation types currently found within the LSR/MLSAs. They include coniferous and other forest types stratified by size, density classes, and primary vegetation type. References for vegetation descriptions include: CALVEG descriptions for the Six Rivers and Mendocino National Forests, Taxonomy information: The Jepson Manual, Hickman, J.C., University of Calif. Press, 1993 and Draft North Coast and Montane Ecological Province Descriptions.

Red and White Fir Series

The red and white fir series were combined because of similarities between them.

White Fir: The white fir series comprises approximately 6.7% of the LSR landbase. This series generally occurs between 5,000 and 6,000 feet in elevation. This plant series can be found on all aspects but is more common on north and east facing slopes. The denser stands tend to be found on these aspects. These stands are dominated by white fir common associates of ponderosa pine, sugar pine, Douglas-fir, and incense cedar at the lower elevations. Common associates at the upper elevation zone include red fir and western white pine. Chinquapin may be an understory associate. More open stands are associated with greenleaf manzanita, snowbrush, huckleberry oak, and sadler oak. Wake Robin, vetch, and pipsissewa are occasional associates of the denser forests. Commonly associated with the more open stands of white fir are squaw carpet and barberry. Few stands are multi-storied, except in areas where gaps have occurred in the stands and allowed new trees to become established. Many stands are so densely stocked that stagnation and mortality are becoming a severe problem.

Red Fir: Red fir/Shasta red fir occur in relatively pure stands at elevations above 6,000 feet and comprise approximately 2.9% of the total LSR area. Sugar pine, white fir, and Douglas fir are common overstory associates of red fir at its lower elevations or on southerly slope. Mountain hemlock, brewer spruce, or western white pine commonly occur in this series at higher elevations or on northwest to east facing slopes. Shrubs, especially in dense red fir stands, rarely occur in this series. Pinemat manzanita, greenleaf manzanita, snowbrush, and sadler oak may be present on more open sites. Meadows commonly associate with the red fir series and alder thickets dominate moist talus slopes.

The true fir stands, red and white fir, vary from old, slow-growing to young, vigorously growing. Many of the true fir stands are naturally very open. This is usually due to site characteristics associated with shallow, rocky soils or the occurrence of a high water table.

The following seral stage description applies to both series discussed above:

Early-Seral/Pole (6-12" dbh,>40% canopy closure): The structure of these stands is fairly uniform. They tend to contain high stocking levels. Crown closure generally ranges from 80-100%. Growth rates, tree vigor, and crown ratios are variable, depending upon stocking levels. These factors tend to decline as stocking levels increase. Stands are generally even-aged and single layered. Some shrubs may still be present in the understory. Dead brush stems are commonly found within these stands. Some of these early seral stands are plantations over 20 years of age. Plantations in this plant series are less in number as compared to the mixed conifer and Douglas-fir series. Most of these plantations contain high stocking of ponderosa/Jeffrey pin mixed with white fir, red fir, and incense cedar.

Mid-Successional/Dense (13-24" dbh, >40% canopy closure): These stands are typically even-aged and single layered. Very little, if any, understory is present. Crown closure averages 50-90%. Crown ratios are presently receding with most of the trees containing only 30-40% live crown. Many of the stands within the LSR/MLSAs are at or above site capability. There are many overstocked stands within these plant series, with some stands exceeding 475 sq. ft. per acre.

Late-Successional/Dense (>25" dbh, >40% canopy closure): These stands are dense with large trees present. Many of the larger tree contain rounded or flat tops, broken tops, conks, fire scars, and/or sparse live crowns. Crown closure averages 60-90%. Multi-storied stands are common. Some pockets of regeneration or shrubs occur within openings created by overstory tree mortality. At one time these stands were more single storied but over the past 75-100 years white and red fir has established underneath many of the older stands. This encroachment of a second layer or white fir has caused an increase in competition for the available water, nutrients, and growing space. Stocking levels in many of the stands exceeds 350 sq. ft. per acre. Small amounts of ground cover are present in these stands. Disease problems are prevalent in many of the stands.

Open Stands (mid and late, <40% canopy closure): These stands contain large amounts of shrub, grass, and herbaceous material in the understory. The areas with shrub are generally associated with poor quality sites and rocky ground. Grass understory is usually associated with meadow complexes where a higher water table limits the ability for conifers to get established. There are some open true fir stands that are a result of past fire disturbances and are gradually filly in with regeneration.

Early Seral/Sapling/Seedling: This type is comprised of plantations less than 20 years of age. Most of these plantations have been planted with mixture of white fir, red fir, ponderosa pine and sugar pine. These stands range from 1-40 acres in size. Trees have crowns full to the ground and range in height from 1-15 feet. A grass/forb component exists between trees, with scattered shrubs, and hardwood sprouts. Scattered snags and hardwoods are present from the previous stands in some cases.

Douglas-fir/tanoak and Douglas-fir

Douglas-fir/tanoak: The Douglas-fir/tanoak series comprises approximately 10% of the LSR landbase. This series is generally confined to the western portion of the Forest. It is primarily confined to South Fork LSR lying with the Northern California Coast subsection. This series tends to be two storied with conifers occupying the overstory and hardwoods occupying the understory. Douglas-fir is the dominant conifer species with a common associate of sugar pine. Ponderosa pine and incense cedar are minor components. Common hardwoods include tanoak and madrone. Black oak, canyon live oak, and giant chinquapin are also found on drier sites and southerly aspects. Alders make up a minor component, specifically in the canyon bottoms. Tanoak is commonly found as tree form in the more open stands and a shrub form in the more dense stands. Common shrub species include rhododendron, salal, huckleberry, hazelnut, and deer brush.

Douglas-fir/fir: The Douglas-fir/fir series comprises approximately 38 % of the landbase. This series can be found scattered throughout most of the LSR/MLSAs in both the Klamath and California Cascade subsections. This series also tends to be two storied with conifers occupying both the overstory and understory. Structural attributes are similar to the Douglas-fir/tanoak series with white fir taking the place of tanoak. Common hardwoods include big-leaf maple, giant chinquapin, and madrone. Shrub species include hazelnut, oceanspray, creeping snowberry,

and pacific dogwood. This series is generally located on north and east facing slopes and higher elevations than the Douglas-fir/tanoak series.

The following seral stage description applies to both series discussed above:

Early-Seral/Pole (6-12" dbh, >40% canopy closure): These stands tend to be mostly even-aged with very little structural diversity. Species diversity is abundant with a good mixture of hardwoods and conifers. Stands tend to be dense, but in most cases are vigorous and growing rapidly. Stands with diameters near the upper limits of this seral stage will tend to begin slowing in growth and vigor as site conditions become limited due to high stocking levels. Many of these stands are plantations that are over 20 years old. Species within these plantations can vary from pure pine, mixed species, to pure Douglas-fir. Hardwoods and shrubs are abundant within most of the plantations, with good species mix.

Mid-Successional/Dense (13-24" dbh, >40%A canopy closure): Most of these stands are fairly even-aged and dense. Conifers occupy the overstory with hardwoods predominantly found in the understory. As a percent of basal are, conifers comprise approximately 70% of the stocking. Hardwood comprise 30% of the basal area stocking. Some of the denser stands are beginning to stagnate, with mortality occurring in the suppressed and intermediate size classes.

Late-Successional/Dense (>25" dbh, >40% canopy closure): Many of these stands tend to be multi-storied with conifers dominating the overstory and hardwoods and/or shade tolerant conifers found in the understory. In some stands, the understory is so dense that competition with the overstory for available nutrients and water is causing the overstory trees to become stressed, in some cases inducing mortality. As a percent of basal area, conifers comprise approximately 78% while hardwood occupy 22%.

Open Stands (mid and late, <40% canopy closure): These stands contain large amounts of hardwood, shrub, grass, and herbaceous material in the understory. Most of these stands are associated with rocky or otherwise soils with poor water availability, dry aspects, or meadow complexes. Increased stocking in hardwood and shrub vegetation have created stress conditions for conifers in some stands. Some stands located on good site have low crown closure due to past partial cut harvesting.

As a percent of basal area, conifers comprise approximately 65% while hardwood comprise the remaining 35%.

Early Seral/Sapling/Seedling: This type is comprised of plantations less than 20 years of age. Most of the plantations have been planted predominantly with Douglas-fir, but some of the older plantations were planted exclusively to ponderosa pine. These plantations range from 3-40 acres in size. Some contain a mixture of sugar pine, ponderosa pine and incense cedar. Trees have crowns full to the ground and range in height from 1-15 feet. A grass/forb component exists between trees, with scattered shrubs, and hardwood sprouts. Scattered snags and hardwoods are present from the previous stands in the later plantations.

Mixed Conifer Series

Mixed Conifer/Fir and Mixed Conifer/Pine: Mixed conifer stands make up 23% of the LSR/MLSAs and are dominant in both the Klamath and California Cascades subsections. There usually is no dominant conifer species with most stands. Conifer associates are usually Douglas-fir, ponderosa pine, sugar pine, incense cedar, and white fir. Minor components include Jeffrey pine, western white pine, lodgepole pine, mountain hemlock, and red fir. Largely as a result of fire suppression, many of these stands tend to be multi-layered. Understories are comprised of white fir and some hardwoods. On shallow soils, incense cedar increases in dominance.

The mixed conifer/pine series generally occurs below 5,000 feet and is found on the xeric and drier mesic soils. White fire increases in dominance on north facing, mesic soils, and higher elevations. This plant series has been most affected by fire suppression activities. Stand that were once dominated by intolerant species have been encroached by shade tolerant species over the last 80-100 years. This mixed conifer pine series is associated with hardwoods such as dogwood, black oak, big-leaf maple, and madrone. Chaparral species occur in the understory layer.

The mixed conifer/fir series generally range from 2,500 feet to 6,000 feet. White fir is more prevalent than it had been in the past due to fire suppression activities. Hardwood associates with these vegetation types include canyon live oak on poorer sites and black oak, giant chinquapin, and pacific madrone on the better sites.

Early Seral/Pole (6-12" dbh, >40% canopy closure): Early seral stands within the mixed conifer series area comprised of both natural stands and older plantations.

Natural Stands: This vegetation type currently makes up a very minor component within the LSR/MLSAs. These stands tend to be mostly even-aged with very little structural diversity and most trees within these stands are vigorous and healthy. As the stands reach the upper limits of this class they can begin to become very dense with slowing of growth.

Plantation (>20 years): Most plantations within the mixed conifer series, especially the older plantations, were planted with ponderosa pine. Plantations on the western portions of the Forest were planted with a mixture of ponderosa pine and Douglas-fir. Over the years many of the plantations have had Douglas-fir, white fir, and incense cedar establish naturally. Shrubs are prevalent in many of the plantations. Most of these plantations are very dense, with declining growth rates.

Mid-Successional/Dense (13-24" dbh, >40% canopy closure): Most of these stands are even-aged and relatively dense, due to the encroachment of shade tolerant species. Hardwoods generally make up a minor component within most mid-seral stands. Suppressed and intermediate trees are beginning to die out of the stands as competition for growing space becomes a factor.

Late-Successional/Dense (>25", >40% canopy closure): Many of these stands tend to be multi-stories. The large overstory trees are spaced fairly far apart. The large overstory trees, greater than 25 inches DBH, are dominated by shade intolerant species while white fir, some Douglas-fir, and hardwoods have grown up in the understory, increasing the vegetative biomass

to a level where competition for growing space is becoming a concern. This accounts for an increase in the number of trees per acre and high basal area, as compared to historical conditions.

Hardwoods are a minor component within most of the stands and are evenly distributed between species.

Some stands contain decadence and disease while other stands are still fairly healthy and vigorous.

Scattered Open Stands (mid and late, <40% canopy closure): These are stands of conifers that have a low percentage of canopy closure. Hardwoods may be present in the understory. Grass, forbs, and shrubs are also prevalent. Most of these stands tend to be associated with meadow complexes, rocky soils with poor water availability, and dry aspects. Increased stocking in the understory, primarily by white fir and hardwoods, has occurred in some of these stands. This increase in vegetation has created a conflict for growing space among the scattered overstory trees and the newly established vegetation. There are some stands located on good sites that have less than 40% crown closure due to past partial cut harvesting.

Early Seral/Sapling/Seedling: This type is comprised of plantations less than 20 years of age. These mixed species stands range from 5-40 acres in size. Trees have crowns full to the ground and range in height from 1-15 feet. A grass/forb component exists between trees, with scattered shrubs, and hardwood sprouts. Scattered snags and hardwoods are present from the previous stands. This type accounts for approximately 7.5% of the LSR landbase

Other Noncommercial Forest

Noncommercial forest consists of canyon live oak, Oregon white oak, gray pine, montane shrub, riparian shrub, meadow/riparian vegetation, and knobcone pine stands. It also includes rocky barren areas and water bodies. Most of these components occur mainly on rocky, south facing, steep slopes at lower elevation. Meadow and riparian shrub occur on wetter sites. Meadows are more common at the higher elevations. All of these types include scattered conifers consisting of ponderosa pine, red fir, white fir, mountain hemlock, sugar pine, and Douglas-fir. Montane shrub land can be sound almost anywhere within the LSR. They are very dependent upon the soil type. The other, non-commercial forest land comprises approximate 9.7% of the LSR landbase.

The following tables display information on average number of trees, age, basal area, and diameter taken from the old growth Forest inventory of 1992. The first table (Table 2.3) displays information for conifers and the second table (Table 2.4) displays information for hardwoods. All figures are on a per acre basis.

Table 2.3. Conifers						
Veg. Type	**# Points**	**Ave. # Trees**	**Ave. # Tree >20"**	**Mean Age**	**Basal Area**	**Mean dbh**
WF/RF mid-dense	360	173	8.4	163	219	15.3
WF/RF late-dense	108	115	12	242	200	18
WF/RF mid/late open	252	81	5.1	161	107	15.7
DF mid-dense	114	126	11.4	334	210	23.5
DF late-dense	120	128	14.7	266	239	20.9
DF mid/late open	234	191	6.8	180	128	18.4
MC mid-dense	480	158	6.6	136	167	15.2
MC late-dense	456	183	9.5	164	191	17.8
MC mid/late open	444	157	3	139	128	14.7

*Shasta and Trinity NF mixed conifer display separately due to significant differences S/T Vegetation Type Abbreviations WF: white fir; RF: red fir; DF: Douglas-fir; MC: mix conifer

Table 2.4. Hardwoods						
Veg. Type	**# Points**	**Ave. # Trees**	**Ave. # Tree >15"**	**Mean Age**	**Basal Area**	**Mean dbh**
WF/RF mid-dense	360	0	0	N/A	0	0
WF/RF late-dense	108	0	0	0	0	0
WF/RF mid/late open	252	0	0	0	0	0
DF mid-dense	114	77	11.3	N/A	57.2	19.4
DF late-dense	120	45.6	7.5	N/A	36.6	16.2
DF mid/late open	234	134	12.6	N/A	80.4	12.6
MC mid-dense*	480	4.8/61.8	0.6/4.2	N/A	2.9/33.4	10.3/14.4
MC late-dense*	456	45.5/107.3	2.3/5.5	N/A	21.2/47.3	9.7/16.2
MC mid/late open*	444	47/92.8	3.2/5.5	N/A	22.3/39.4	10.7/14.0

Snags and Logs

Large (>20 inches in diameter) coarse woody debris (CWD) and snags are important and distinguishing features within late-successional forests. Many late-successional associated wildlife species are recognized as having strong associations with snags and CWD (Thomas et. al. 1993). The occurrence of CWD and snags in forest ecosystems is quite variable and can happen in a number of ways. Recruitment can occur slowly, result from mortality of individuals, scattered trees; it can happen in waves of disturbance events such as windthrow, fire or insect and disease outbreaks.

The following table (Table 2.5) display the average number snags and CWD, per acres, taken from Forest inventory data. The figures are representative of the amounts that may be found in typical stands on the STNF. The greatest occurrence of CWD and snags tends to be in true fir stands. This is primarily due to the fact that true fir stands, generally speaking, are more dense (number of trees per acre) than mixed conifer or Douglas-fir stands.

Table 2.5. Snags and CWD Data						
Veg. Type	**# Points**	**Snags 9-15"**	**Snags 15-21"**	**Snags >21"**	**CWD 15-21"**	**CWD >21"**
WF/RF mid-dense	360	7.2	2.4	2.6	4.6	5.8
WF/RF late- dense	108	4.1	2.8	2.5	7.1	7.9
WF/RF mid/late-open	252	2.6	1.5	2.0	3.3	3.5
DF mid-dense	114	2.0	1.0	2.4	4.7	7.9
DF late-dense	120	2.9	1.6	2.8	6.0	9.1
DF mid/late open	234	4.3	1.0	2.0	4.8	8.3
MC mid-dense	480	3.3	1.6	1.9	4.9	4.8
MC late-dense	456	1.6	0.6	1.9	4.2	6.0
MC mid/late open	444	1.7	0.9	1.6	3.8	4.8

The following table (2.6) displays the distribution of CWD found in the old-growth inventory plots. The number of pieces and tons per acre represents the mean found on a particular point.

Table 2.6. Distribution of CWD						
Veg. Type	**# Points**	**# Pieces/ acres < 21"**	**# Pieces/ acre >21"**	**Tons/ acres 9-21"**	**Tons/ acres > 21"**	**Tons/ acre Total**
WF/RF mid-dense	360	12.3	5.1	2.1	3.3	5.4
WF/RF late-dense	108	13.0	7.7	2.5	7.1	9.6
WF/RF mid/late open	252	7.2	3.5	1.1	3.2	4.3
DF mid-dense	114	10.0	7.9	2.4	13.1	15.5
DF late-dense	120	14.2	9.1	3.4	13.8	17.2
DF mid/late open	234	12.5	8.3	2.8	11.4	14.2
MC mid-dense	480	11.7	5.2	2.0	6.5	8.5
MC late-dense	456	10.1	5.7	2.1	7.8	9.1
MC mid/late open	444	8.9	4.8	1.9	5.7	7.6

Insects and Disease

Portions of a number of LSR/MLSAs have been affected by insect infestations during the period of 1990-1997. Since 1993, mortality flights have observed approximately 2,771 acres of high levels of mortality (>10% of the stems have died) and 33,439 acres with moderate levels of mortality (5-9% of the stems have died). Stands type that have been most impacted by insect induced mortality include all size classes of true and mixed conifer. In recent years high levels of mortality have been particularly noted in the true type along South Fork Mountain and in the area of McCloud Flat.

Pest complexes that include the fir engraver beetle, western pine beetle, and pine engraver beetle as primary insects associated with various levels of mortality throughout the Forests.

Dwarf mistletoe is a very common parasitic plant found in these forests. White fir, red fir, and Douglas-fir are the species that appear to be most heavily infected. Ponderosa pine infections are found throughout some of the LSR/MLSAs. Cytospora canker is a very common canker found in

association with red and white fir. These two diseases, working together, are common in old growth red and white fir stands. Some of these stands are currently experiencing high levels of stress-induced mortality.

Other diseases present within the LSR/MLSAs include: Annosum root disease, Armillaria root disease, and Black Stain root disease. These diseases have local significant stand level effects but not large scale across the analysis area.

White pine blister rust is a disease that infects all white pines. It is most common is sugar pine and western white pine, but is also present in whitebark pine. The disease was introduced into North America in the early 1900's on seedlings of eastern white pine grown in Europe. It's introduction into North America resulted in one of our most serious disease outbreaks on conifers (Scharpf 1993). The infection can take place on needles of the current year but is more common on 2 to 3 year old needles. Later the disease penetrates into the stem where it will girdle the cambium. Death to the tree will occur when the main stem tree is invaded, and can result from numerous branch infections without ever reaching the main stem. Individual pines can have varying resistance to white pine blister rust, and natural selection can eventually increase the level of resistance to white pine blister rust.

A potential disease of concern for the western portion of the Forest is Port Orford-Cedar root disease. It has been found on both the Klamath and Six Rivers National Forests. The STNF has small pockets of Port Orford-Cedar in some of the LSR's. There are currently no known locations of Port-Orford-Cedar root disease anywhere on the STNF. However, the disease is present on privately owned land adjacent to the STNF.

Land Management Activities

Fuelwood Cutting: Fuelwood cutting is currently allowed in some of the LSR/MLSAs within the STNF boundary. Due to the concerns for the northern spotted owl and it's designated critical habitat, certain restrictions apply. Most district's only allow the cutting of dead and down material along open designated forest system roads from July 15th through January 31st. Chapter 4, Recommendations, identifies opportunities and impacts in terms of context and intensity of fuelwood removal from LSR/MLSA lands.

Mining Activities: There are currently no large scale mining activities that are impacting the LSR/MLSAs, however, there are some small locatable mineral operations that can have minor impacts at the local stand level.

Fire/Fuels

Fuel Models. The thirteen fuel models for fire behavior are for the severe period of the fire season when wildfires pose greater control problems and impacts on land practices are increased. Fuel models are simply tools to help the user estimate fire behavior and are described in terms of both expected fire behavior and associated vegetation. Fuel loadings across the LSR/MLSAs are variable due to past fire history, land management activities, and the occurrence of different

vegetations. Fuel models depict the types and amounts of fuels that are available to support fire. They are an important factor in determining fire behavior potential for a given site.

The fuel models are based on Land and Resource Management Plan timber type information crosswalked to a fuel model. Technical Report, USDA 1982; INT-122 was used as a reference for fuel model descriptions.

Fuel Model-Timber Type Crosswalk:	
Fuel Model	**Timber Type**
FM-2	2S, 2P
FM-4	2N, 2G
FM-6	3S, 3P, 4S, 4P
FM-9	3N, 3G, 4N, 4G
FM-10	4N, 4G +

It is important to note that duff and small diameter fuels (<3 inches in diameter) differ from large diameter fuels in their effect on fire behavior. Duff, twigs, and small branches dry out quickly and are readily available as fuel. The forest is characterized predominately by 5 different fuel models FM-2, FM-4, FM-6, FM-9, or FM-10.

FM-2 is characterized as being associated with poorer timber sites (2S and 2P) and young plantations with grass and brush . Surface fires can spread easily with pockets of fuels generating high heat intensities. This fuel model is a concern on steep slopes or hotter aspects (south to west).

FM-4 is characterized by older, unthinned plantations, stands of mature shrubs and young dense conifers stands (2N and 2G). Crown density in the plantations and shrub fields increases the likelihood of stand replacing events.

FM-6 is related to sparsely stocked conifer (3S, 3P, 4S, and 4P) stands containing large amounts of low level shrubs (less than 6 feet high). These stands are a concern if the brush is old and decadent resulting in high dead to live ratios. Fire intensities are high in these situations.

FM-9 is characterized by closed canopy conifer stands (3N, 3G, 4N, and 4G) with densely stocked pole size trees in the understory. Typically these stands contain pockets of dead and down woody fuels. These fuels create high fire intensities during ground fires that can easily spread through the understory to the crowns of the dominant conifers.

FM-10 is characteristic of dense late-successional conifer stands (4N, 4G, and greater) with heavy amounts of dead and down woody fuels. Typically the understory is densely populated with intermediate size conifers. A wild fire carried by these fuels would be intense enough to cause crowning, spotting and rapid rates of spread on steep slopes or during high winds. Large stand replacing fires can be expected.

In quantitative terms, it is difficult to assess the risk of wildfire occurring at a specific location within an LSR or its effects on an LSR without specific burn-day input. There are many factors that determine fire behavior and the final effect on wildfire. Those factors beyond our ability to control fire include: location of fire starts, multiple starts (lightning), availability of fire

suppression forces, weather, and topography. Fuels and vegetation that support wildfire are the only factors what we can manipulate. Lightning is the major source of fire starts in all three of the ecological subsections. As many as 50 fires can occur with one lightning storm and each can burn separately or they may burn together as one large complex, creating high intensity wildfires. In 1977, 1987, and 1988 thunderstorms with very little rain caused multiple fires, burned thousands of acres, and lasted for weeks. Under these conditions, suppression resources are quickly depleted and fire managers are forced to prioritize which fires will receive what type of response. Conditions most conducive for fires exist in July, August and September.

Information from the Forest's fire history database was used to assess fire risk (STNF 1994). The term "risk" as used here, is the probability of a fire occurring. Assessment of risk incorporates the total number of starts over a given period time for a specific landscape. The value derived corresponds to a likelihood of fire starts per 1000 acres per decade. Most LSR/MLSAs are within a moderate fire risk rating. Within the Northern California Coast subsection, RC-330 has a hazard/risk rating of high/high. Within the Klamath subsection 3 LSR/MLSAs have a combination of moderate/high or high/moderate and they include RC-333, RC-335, and RC-338. Within the Southern Cascade subsections 3 LSR/MLSAs and 2 MLSAs have a combination of high ratings and include RC-357, RC-359, RC-362, DD-72, and DD-76.

Fire Behavior Potential. Fire behavior potential was modeled for the LSR/MLSAs. Modeling of fire behavior potential incorporates fire risk, fuels model, 90th percentile weather data, slope data and production rates of suppression resources to portray how resistance to control an area will be if ignited under weather conditions typical of late summer. Areas of moderate and high fire behavior potential are difficult to control due to their associated flame lengths and rates of spread. Resistance to control is an indication of the likelihood that a stand would be lost to wildfire. If a wildfire occurs outside the 90th percentile, the predicted fire behavior will increase or decrease based on the actual weather during the burning period. The production rate of fire suppression forces is based on the assumption that they are available to respond in force. If initial attack forces are not immediately available, a fire will burn unchecked until such time as firefighting resources can be assigned to the fire. This often results in the development of a fire which is out of control.

Potential Wildfire Effects. The potential for fire to cause damage is the sole reason for fire protection. Fire effects are the most important consideration in fire management. Increased knowledge of the benefits of fire provides a rationale for prescribed fire uses. Quantitatively, fire severity is a better criterion for analysis in determining the importance of a fire than is fire intensity.

First Order Fire Effects Model (FOFEM) (Keane, R.E.) provides a quantitative means of planning and evaluating resource management activities. FOFEM displays effects that result directly from the combustion process and predicts fire effects for those species that are contained in FOFEMs database. For species not in FOFEM, such as hardwoods and brush, fire effects information was retrieved from Fire Effects Information System (FEIS) (Fishcher, W.C.) for analysis. All information that was available in FEIS was reviewed and a mortality rating was assigned to each species.

Fire mortality maps (see map package) display the percentage of mortality that would occur within vegetative stands where reforestation efforts would be required following a wildfire. Mortality is expressed by the percent of kill by species. FOFEM and FEIS predicts any additional mortality resulting from stress, post-fire insect infestation, or any other mortality that may be indirectly caused by fire.

Definitions:

Non-lethal = <25% mortality to the dominate species (no reforestation needed)
Mixed = 25 to 75% mortality to the dominate species (expect to do some interplanting)
Lethal = >70% mortality to the dominate species (expect to reforest larger parcels of stands)

The lethal effects along with the containment capabilities will provide a better understanding when looking at the probability of stand replacement fire.

Terrestrial Species Status

One purpose of LSR/MLSAs is to provide habitat for late-successional associated species. Literally thousands of species occupy late-successional forests of the Pacific Northwest. Several previous efforts attempted to account for the effects of various forest management plans on these species (FEMAT 1993). The Final Draft of the Recovery Plan for the Northern Spotted Owl (USDI 1992) discussed 640 terrestrial species within the range of the northern spotted owl, the majority of which were old-forest associates. The Scientific Analysis Team (Thomas et.al. 1993) assessed the effects of various forest management options on 667 species.

The following sections will highlight those late-successional associated species for which surveys have been conducted and known locations have been identified.

Survey and Manage Species. Some late-successional associated species receive special management emphasis under the NFP. Protection Buffer and Survey and Manage standards and guidelines were established to provide additional benefits to certain species. These benefits range from protecting known sites from loss through management activities, to conducting surveys in order to learn more about range and distribution. Approximately 35 Survey and Manage species are known or suspected to occur on the Forest. The following highlights those species which have been located within the LSR/MLSAs.

Amphibians. Del Norte salamander, Protection Buffer Species/Survey and Manage strategy 2, Shasta salamander, Protection Buffer Species/Survey and Manage strategy 1 and 2.

The Del Norte salamander is suspected to occur on the northwestern side of the Forest while the Shasta salamander is known to occur on the southeastern portion of the Forest. The Del Norte salamander is suspected to occur in the New River drainage and adjacent Trinity Alps Wilderness to the east. The known range of the Shasta salamander is generally centered along the limestone outcropping north and east of Shasta Lake.

Although unrelated, both species are associated with rocky substrates. They are terrestrial salamanders with no aquatic life stage. Habitat relations are not well understood and investigations are currently underway. The salamanders are dependent on cool, moist environments. They are found at or near the surface during periods in the fall and spring months. The presence of dense canopy closure may help to maintain optimum surface conditions. During periods of inhospitable environmental conditions, the salamanders retreat below the forest surface, utilizing spaces provides by down logs, deep layers of rock, talus, or limestone fissures or caverns. Although populations of the Del Norte salamander have been located in young forested stands, increased abundance is associated with older forests (Walsh and Lind 1995).

Survey effort for both species has increased since the spring of 1996 with the release of a draft survey protocol. Numerous new locations have been identified on the Klamath National Forest but, no locations have been identified on the STNF to date. On-going efforts will include further delineation of the species' range and investigations of habitat relationships.

Vascular Plants. *Cypripedium fasciculatum,* Survey and Manage strategy 1 and 2; *C. montanum,* Survey and Manage strategy 1 and 2 - These species generally inhabit shady sites within mature conifer forests. Habitat ranges from dry, rocky sites to moist seeps and streamsides on a variety of soil types and plant associations. Populations of lady slippers tend to be very small with relatively few plants.

An association with specific species of fungi is required for germination and establishment of these lady slippers, and the presence of these fungi may be more important than specific site characteristics such as moisture or elevation. The ecological relationships of these species with fire is not fully understood, although it is believed that fire suppression may be a factor in the decline or elimination of some populations. Populations have been noted thriving after low intensity fires, but other populations have been destroy underground buds that are developing as the next season's growth.

Fungi. Rare false Truffle: *Martellia monticola,* Survey and Manage strategy 1 and 3.

Habitat for this species is primarily old-growth *Abies* sp. or *Tsuga mertensiana* at mid to high elevations. There are known to be or presumably are mycorrhizal. Coarse woody debris is an important structural component of their habitat. They are hypogenous fungi that contribute to the diets of small mammals. The species is endemic to the Mt. Shasta area in general.

Rare gilled mushroom: *Cortinarius verrucisporus*, Survey and Manage strategy 1 and 3.

This is a ectomycorrhizal species associated with montane late-successional forests, normally at relatively high elevations. It is associated with true fires and other conifers. This is another hypogenous species fruiting during the late spring and summer which is thought to dispersed at least in part by small mammals.

Mollusks. *Ancotrema voyanum,Helminthoglyota hertleini, Monadenia churchi, Fluminicola seminalis, F. Spp*. and *Vespericola pressleyi*, Survey and Manage strategy 1 and 2.

Protection Buffer Species

Bat Species. Several bat species are closely associated with late-successional forests including Townsend's Big-eared bat (*Corynorhinus townsendii*), pallid bat (*Antrozous pallidus*), fringed myotis (*Myotis thysanodes*), long-eared myotis (*Myotis evotis*), long-legged myotis (*Myotis volans*), hoary bat (*Lasiurus cinereus*), and silver-haired bat (*Lasionycteris noctivagans*).

These species of bats concentrate their foraging in riparian areas and fly upland to roost. Feeding rates are significantly higher over water. Many species of bats forage over streams and in adjacent riparian habitats. They us drainages as travel corridors to reach foraging sites, and some species feed in drainages of small intermittent streams. Large snags, large green trees, and caves are important as maternity roosts, day roosts, temporary night roosts, and hibernacula. They utilize sites under bark, in crevices, or in hollows of large, old trees. Roost sites may play a major role in determining populations sizes and distributions (FEMAT 1993). Studies in Oregon have identified large, tall snags occurring along the upper portions of slopes as being important roosts sites (Clayton 1997).

Forest Service Sensitive Species

Fisher (*Martes pennanti*). Fishers are associated with low and mid-elevation forests in which deep snow packs do not accumulate. Fishers are not dependent upon late-successional forests, but appear to require closed-canopy forest that vary in age as long as they contain adequate prey populations (USDA and USDI 1994a). Fishers prefer forests that have complex physical structure near the forest floor. This structure is important for maintaining prey populations and for providing access to prey during the winter. Fishers also tend to be associated with riparian areas. The limited information available on den sites shows that only relatively large trees or snags will serve as natal dens. A seven year demographic study was conducted around the northern end of Trinity Lake. This took place in numerous LSR/MLSAs, however, the results have not been completed to date.

American marten (*Martes americana*). Key habitats for marten include downed coarse woody debris of various decay stages, large patches of late-successional forests, and intact forest along riparian zones. Martens tend to select resting sites in large diameter trees near streams. They are generally more abundant in the true fir zone (USDA and USDI 1994a). Habitat studies conducted during winter are more likely than those in summer to conclude that martens strongly prefer late-successional conifers. This is probably true, in part, due to the greater importance of structure near the ground in providing winter foraging sites (USDA 1994 Buskirk and Ruggerio).

Since the early 1990's, surveys for marten and fisher have been conducted on portions of the Forest to include surveys conducted in areas of mixed ownership by Sierra Pacific Industries, Inc. Baited track plate boxes and camera stations have been used to investigate the occurrence of these and other forest carnivores. Both fisher and marten have been detected at numerous sites.

Northern Goshawk (*Accipiter gentilis*). Northern goshawks typically nest in mature to old-growth coniferous forest stands with open understories and moderate to high canopy closure. They nest at all elevations on the forest, but appear to be more common at moderate to higher

elevations over 3,500 feet. Foraging habitat is quite variable, ranging from shrub and open hardwood areas to mature coniferous forest.

Comprehensive surveys have been conducted on the McCloud Ranger District. However, survey work on the remainder of the Forest has been less complete.

Foothill yellow-legged frog (*Rana boyii*). The Foothill yellow-legged frog is a riparian area obligate associated with shallow, flowing water, apparently preferentially in small to moderate-size stream situations with at least some cobble-sized substrate.

Surveys have taken place across the Forest which have indicated that yellow-legged frogs on the STNF are fairly widespread.

Northern red-legged frog (*Rana aurora aurora*). The red-legged frog is the largest native ranid frog in California and inhabits still or slow water in streams, marshes, ponds, reservoirs, and canals. Deep pools are necessary for many aspects of the species life cycle. Red-legged frogs require cool water. This species may move out of the riparian zone into adjacent upland forests during the non-breeding season. Nussbaum et. al. (1983) reported northern red-legged frogs 200-300m from water.

Northern red-legged frogs have been identified on the Forest. However, no systematic surveys have occurred nor are any planned in the foreseeable future.

Northwestern Pond Turtle (*Clemmys marmorata marmorata*). The northwestern pond turtle inhabits a wide range of fresh or brackish, permanent and intermittent water bodies from sea level to about 4,500 feet. It is the only fresh water turtle native to most of the west coast temperate North America.

Although adult pond turtles are habitat generalist, hatchlings and juveniles have relatively specialized habitat requirements, and the microhabitats used by these age classes are locally and frequently very limited. Turtles are often concentrated in low flow regions of rivers, such as side channels and backwater eddies. They prefer creeks that have deep, still water and sunny banks. Hatchlings are small and cryptic, and require shallow, edgewater areas with minimal currents. Northwestern pond turtles rely on basking to maintain their body temperate during the active. This species leaves the aquatic environment and migrates over one-quarter mile upland to breed.

Threatened and Endangered Species

Northern Spotted Owl. Northern spotted owls are associated with late-successional coniferous forest. Local suitable nesting and roosting NSO habitat is defined as: mixed conifer, Douglas-fir and true fie stands below 6,000 feet in elevation; with an overstory of Douglas-fir, ponderosa pine, sugar pine, incense cedar, white fir and/or red fir, averaging or above 18 inches dbh; a mid-story composed of the same species with or without hardwoods; a total canopy cover of 50% to 100%; minimum of 1.5 snags per acre >40" dbh and 6-8 down logs per acres >10" diameter. Foraging habitat equates to any stand having a canopy closure of anything >40%.

In 1990, the definition NSO habitat was compared with the Forest LRMP timber type vegetation data layer. The final product provided a general assessment of vegetation conditions forestwide. Use of variables, such as elevation and conifer species, are meant to describe tendencies of variations in forest stand types. Foraging habitat was included in the model and is distinguished from nesting and roosting habitat. Those stands modeled as foraging still may reflect a conservative estimate and include some of the more upon conifer and conifer hardwood stands.

At the project level, suitable habitat is often assessed using other site-specific information, and therefore, suitable habitat figures reported in project specific documents may differ slightly from the forest-wide LRMP-based results. Unless other noted, all suitable spotted owl habitat figures reported in this assessment are derived from the forest-wide LRMP database layer.

Table 2.7 displays suitable spotted owl habitat, within each LSR, as a proportion of the amount of LSR which is capable of producing suitable spotted owl habitat. Capable is defined as all stands within the present definition or those stands having a Dunning site class 3 or greater.

Table 2.7. Northern Spotted Owl Habitat relative to capable lands and total LSR acreage

LSR	Baseline Zone*	Total Existing	Total Capable	Percent of Capable	Total LSR Acres	Percent of Total
RC-328	WK	1,188	1,287	92	1,644	72
RC-330	WK	54,652	65,527	87	80,415	68
RC-331	WK	12,962	16,652	78	22,526	58
RC-332	WK	40,950	53,303	77	78,634	52
RC-333	WK	9,028	10,039	90	16,473	55
RC-335	EK	63,878	67,731	94	89,141	72
RC-337	EK	5,603	6,231	90	7,044	80
RC-338	EK	3,343	3,597	93	3,832	87
RC-339	EK	2,328	2,571	91	2,588	90
RC-340	EK	18.079	20,067	90	23,509	77
RC-341	EK	2,410	2,594	93	2,723	89
RC-342	EK	3,856	4,487	86	5,932	65
RC-357	WC	14,544	18,758	76	25,498	57
RC-358	M	246	448	55	1,070	23
RC-359	M	1.033	1,781	58	2,223	46
RC-360	M	1,353	2,034	67	3.056	44
RC-361	M	5,746	11,013	52	14,504	40
RC-362	M	2,779	3,763	74	4,922	56
DD-67	EK	1,588	1,845	86	1,910	83
DD-72	M	450	893	50	1,243	36
DD-76	WC	1,631	2,304	71	2,596	62
DD-78	M	462	498	93	1,138	41
DD-79	WC	1,073	1,120	96	1,393	77
DD-83	EK	441	451	98	1,796	25

*WK = Western Klamath, EK = Eastern Klamath, WC = Western Cascades, M = Modoc

The amount of suitable habitat, as a percentage of capable ground within each LSR, ranges from `50% to 98%. Using these figures as a maximum and minimum, a scale by which to rate the existing level of capability of each LSR was developed. This scale is as follows: High = 82% to 98% of capable; Moderate = 67% to 82% of capable; Low = 50% to 66% of capable.

Surveys for NSOs have been conducted within LSR/MLSAs at varying levels of effort and coverage. A total of 262 NSO activity centers (defined as pairs and territorial singles) are currently identified for the Forest. One-hundred thirty-six of them are located in mapped LSR/MLSAs (as defined in the ROD). An additional 109 are located in 100-acre LSR/MLSAs with the remaining located within wilderness or other land allocations.

Estimated Owl Territories. Areas of unsurveyed suitable habitat occur across the Forest, and certainly, additional spotted owl territories occur but have yet to be discovered. In response to this, estimates of additional owl territories, within LSR/MLSAs, were made. These estimates were conservative, and were made using combination of LRMP-suitable habitat map, historical sightings, and personal knowledge of habitat condition on the ground. The results of this assessment are discussed in the individual LSR sections.

Home Range Assessment. Individual LSR sections will include tables which display amounts of habitat within 0.7 and 1.3 mile home ranges around spotted owl activity centers which are located within the LSR boundary. The objective of assessing habitat within home ranges is to give a indication of the quality and quantity of habitat within an area surrounding spotted owl activity centers. Habitat thresholds have been described relative to home ranges. When habitat within the 0.7 mile home range is below 500 acres and habitat within the 1.3 mile home range is below 1,336 acres, further reduction of habitat may result in a "take," as defined under the Federal Register (June 23, 1990).

Northern Spotted Owl Critical Habitat

The combination of LSR/MLSAs, other reserve land allocations, and standards and guidelines were judged to adequately provide for the continued viability of the northern spotted owl on federal lands. Furthermore, it was determined that these land allocations, standards and guidelines would provide the federal lands contribution to recovery of the NSO under the Federal Endangered Species Act (USDA and USDI 1994b). The alternative adopted under the Northwest Forest Plan was considered by FEMAT to have a 83 percent likelihood of providing habitat to support a well distributed population of the species on federal lands in one hundred years time (USDA and USDI 1994a).

Most LSR/MLSAs overlap with NSO critical habitat. According to the Biological Opinion issued for the Northwest Forest Plan, the management of LSR/MLSAs was determined to be compatible with the objectives identified for critical habitat. The determination was made based on 4 measures of comparison: 1) the gross acres provided; 2) the degree of overlap between the two designations; 3) the distribution of the reserve units to maintain a well distributed population of Federal lands; and 4) the ability of the two designations to provide for dispersal between adjacent areas (USDA and USDI 1994a).

In conclusion, the selected alternative, with its combination of LSR/MLSAs, riparian reserves, Congressional reserves and matrix prescriptions, should enable critical habitat to perform the biological function for which it was designated. "Any site specific consideration of critical habitat in the matrix are considered minimal and will be evaluated through watershed analysis and addressed in area-specific or [project] plans, as appropriate (USDA and USDI 1994a)." The 4 measures described above will be used to assess NSO critical habitat. In addition, each LSR/CHU unit will be assessed as to the degree in which the LSR performs the intended function of each CHU (USDI 1992a). Spotted owl critical habitat remains a legal designation. Any management activities proposed by the Forest, within critical habitat, will be analyzed for its effects on both the NSO and it's critical habitat. The intent of this assessment is to highlight the protection to spotted owls, now afforded by Late-Successional Reserves, and other reserved land allocations, so that it may have bearing on such future determinations of effects.

Gross acreage and degree of overlap. There are approximately 528,000 total acres of mapped LSR/MLSA on the Forest. Additionally, the Forest has another 932,900 acres of other reserve land allocations (wilderness, administrative withdrawal, riparian reserve, etc.). Spotted owl critical habitat on the STNF totals 493,800 acres. Eighty-seven percent of those acres are within LSR/MLSAs leaving 13% or 65,980 acres of critical habitat in "matrix" land allocations. However, when looking at the overall picture the LSR/MLSA system on the STNF is approximately 8% larger than the CHU system. The table below displays CHU overlap with other land allocations.

Distribution of the reserve units. Late successional reserves are well distributed across the Forest. Many LSR/MLSAs are larger and more extensive that the original CHUs. For example, in the western or Trinity side of the Forest both LSRs RC-330 (CA-38) and RC-332 (CA-34) were extended to pick up additional late-successional habitat and to provide for better connectivity to adjacent LSRs.

Table 2.8. Acres of NSO critical habitat units (CHU) that overlap with Late-Successional Reserves (LSR) and other "reserved" land allocation and "matrix" land allocations

CHU #	Acres of overlap with LSR/reserved	Acres of overlap with Matrix	Other reserves	Total
CA-2	31,694	40,886	2,975	75,535
CA-3	19,771	0	906	20,618
CA-4	77,741	1,536	255	79,531
CA-5	0	1,855	958	2,813
CA-6	3,771	652	0	4,422
CA-7	7,591	7,847	1,039	16,478
CA-8	11,609	3,370	579	15,558
CA-10	6,182	853	1,156	8,191
CA-11	2,920	19	158	3,096
CA-12	3,674	82	0	3,756
CA-13	40,955	1,840	0	42,795
CA-30	30,815	2,121	1,659	34,596
CA-31	4,933	4,218	1,650	10,802
CA-32	8,935	320	28	9,282

Table 2.8. Acres of NSO critical habitat units (CHU) that overlap with Late-Successional Reserves (LSR) and other "reserved" land allocation and "matrix" land allocations

CHU #	Acres of overlap with LSR/reserved	Acres of overlap with Matrix	Other reserves	Total
CA-33	18,652	579	135	19,365
CA-34	54,771	476	25	55,272
CA-35	4	12,366	8	12,378
CA-36	20,056	761	73	20,890
CA-38	44,164	4,574	6,452	55,190

Dispersal between LSR/MLSAs/CHUs. Within some CHUs, areas of suitable habitat were added around spotted owl pairs in order to facilitate dispersal. Where distance between adjacent CHUs was great, or where habitat conditions were extremely degraded, the additional habitat was intended to decrease the distance between reproductive owl pairs (USDA and USDI 1994a). The following table highlights those CHUs which specifically had a dispersal or connectivity objective. Further, it describes the dispersal or connectivity function as currently provided for by corresponding LSR/MLSAs.

Table 2.9. Relationship between spotted owl critical habitat units (CHU) and Late-Successional Reserves. This table compares those CHUs which had a dispersal or connectivity objective, as described at the time of designation with the current situation with LSR/MLSAs.

CHU	Dispersal/Connective Habitat Intent at the time of Designation	Current Situation
CA-29 and CA-31	The most important function of CA-29, aside from protecting pairs, is to extend protected habitat westward towards CHUs CA-30, CA-47, and CA-24	LSRs RC-305 and RC-333 have nearly complete overlaps with CA-29 and CA-31, respectively and are connected via Trinity Alps Wilderness. RC-305 also envelops CA-30 to the west.
CA-32 and CA-33	These CHUs function to extend protected habitat eastward to the Shasta-McCloud subprovince, represented by CHU-13 on the other side of Claire Engle Reservoir.	CA-32, CA-33, and CA-13 have all be combined with minor expansion to form RC-334 providing connectivity to the east.
CA-35	This relatively small CHU was created to fill a large void around the Hayfork area of Trinity Co.	CA-35 has been completely eliminated as part of the LSR system. Connectivity across this area is now being provided via the riparian reserves, 15% OG and stands having CC >40%.
CA-2	The CHU will also maintain easterly distribution of the subspecies.	LSR/MLSAs RC-357, RC-360, and the southern portion of RC-361 were completely covered within CA-2, CA-2 providing linkage to the California subspecies to the east and south. In addition, DD-76, 78, and 79 lie within CA-2. The distance between RC-361 and RC360 is 5 miles and from RC-360 to RC-357 is 4 miles.
CA-3	Its position on the landscape makes the area extremely important in maintaining linkage and distribution.	LSR RC-336 completely overlaps CA-3 and is still providing to linkage to the California subspecies.
CA-4	It is also a vital area for providing linkage and an opportunity for genetic interchange between the northern and California subspecies.	LSR RC-335 has considerable overlap with CA-4 acts as a linkage to the California subspecies, with additional acres added to the west to enhance the connectivity.

Table 2.9. Relationship between spotted owl critical habitat units (CHU) and Late-Successional Reserves. This table compares those CHUs which had a dispersal or connectivity objective, as described at the time of designation with the current situation with LSR/MLSAs.

CHU	Dispersal/Connective Habitat Intent at the time of Designation	Current Situation
CA-5	The area is intended to function as a "stepping stone" between the Shasta-McCloud and Northern-Interior Province.	CA-5 is not part of the LSR system.
CA-6	The area was designated to act as a "stepping stone"....	LSR RC-362 has considerable overlap with CA-6 and still acts as a "stepping stone".
CA-13	The location of this CHU provides a connection from the Northern Interior Coast Range subprovince northeast into the Shasta-McCloud subprovinces.	LSR RC-334 absorbed CA-13 large combined LSR providing connection northeast to the Shasta-McCloud area from the west.

In addition to dispersal objectives, many of the Critical Habitat units had specific spotted owl pair objectives. The table below compares the spotted owl pair objectives for critical habitat units with the number of known spotted owl activity center within the Late-Successional Reserves.

Table 2.10. Spotted owl pair goals in Critical Habitat (CHU) compared with activity centers in Late-Successional Reserves

CHU	Spotted Owl Pair Goal	Corresponding LSR or Wilderness Area	Known Activity Centers in Corresponding LSR or Wilderness Area
CA-29, CA-31	40 pairs	RC-305, RC-333	35 ACS (RC-305), 3 Acs (RC-333), 8 TAW
CA-32, CA-33, CA-13	17 pairs	RC-334	20 ACS
CA-34	24 pairs	RC-332	28 ACS
CA-35	0 pairs	matrix	
CA-36	None IDed	RC-331	6 ACS
CA-38	22 pairs	RC-330	31 ACS
CA-2	15 pairs	DD-76, DD-78, DD-79, RC-360, RC-357, and southern portion RC-361	12 ACS
CA-3	4 pairs	RC-336	3 ACS
CA-4	15 pairs	RC-335	17 ACS
CA-5	1 pair	matrix	
CA-6	1 pair	RC-362	0
CA-7	5 pairs	DD-67, RC-342	2ACS
CA-8	4-5 pairs	Northern portion of RC-340 and RC-341	5ACS
CA-10, CA-11, CA-12	3 pairs	Southern portion of RC-340 and entire RC-339, RC-338, and RC-337	5ACS

General Assessment of Habitat for late-successional associated Species

The amount of late-successional forest currently available in LSR/MLSAs, relative to each LSR, will be assessed as an indicator of how well the LSR/MLSAs are providing for late-successional associated species. Many of the species that have been identified as being closely associated with late-successional forests also use mid-successional stands, as primary or secondary habitat (Thomas. et. al. 1993). Tables 2.5 and 2.6 indicated that mid-successional stands can provide

large snags and CWD, although at levels less than what typically occurs in late-successional forests.

The table below summarizes the amount of late-successional, and late-successional and mid-successional habitat, currently available in each LSR.

Table 2.11. Capable and existing acreage of late-successional and mid-successional habitat (STNF)

LSR	Capable Acres	Late-successional Acres	Mid-successional Acres
RC-328	1,569	847	623
RC-330	76,398	40,400	22,853
RC-331	20,530	4,497	12,296
RC-332	72,274	10,510	49,300
RC-333	6,977	1,292	4,714
RC-335	76,409	25,010	47,546
RC-337	6,474	1,905	3,941
RC-338	3,684	698	2,732
RC-339	2,571	0	2,328
RC-340	19,959	411	18,305
RC-341	2,701	0	2,517
RC-342	4,886	114	4,141
RC-357	23,726	945	18,567
RC-358	840	163	513
RC-359	2,196	20	1,429
RC-360	2,836	1,307	849
RC-361	10,640	786	5,909
RC-362	4,484	989	2,510
DD-67	1,877	0	1,620
DD-72	999	479	77
DD-76	2,565	0	1,892
DD-78	1,138	0	1,102
DD-79	1,299	0	1,252
DD-83	539	359	170

The ability to move across the landscape is important to the long-term persistence and viability of some wildlife species. It is particularly important to late-successional habitat associated species. The movement or dispersal of these species across the landscape is provided by large blocks of late-successional habitat in the LSR/MLSAs and through management objectives and various land allocations between the LSR/MLSAs. Those management objectives and land allocations include: riparian reserves, administrative withdrawn areas, management prescriptions, retention of old-growth fragments in Matrix, and 100-acre LSRs. As defined in the NW Forest Plan (1994a), connectivity is a measure of the extent of which the landscape pattern of the late-successional and old-growth ecosystem provides for biological and ecological flows that sustain late-successional and old-growth associated animal and plant species across the of the northern spotted owl. Connectivity does not necessarily mean that late-successional and old-growth areas have to be physically joined in space because many late-successional species can move across areas that are not in late-successional ecosystem conditions.

In the conservation strategy for the northern spotted owl, the Interagency Scientific Committee (ISC) did not designate discrete habitat corridors (Thomas 1990). It was determined that entire landscape mosaics rather than the size and shape of individual habitat patches are important to owls. As a result, the ISC's conservation proposal included guidelines for maintaining a "well-managed landscape matrix" surrounding habitat conservation areas. The issue of connectivity and corridors has been raised with respect to management of other forest dwelling species, including forest carnivores. Authors have indicated that responses of marten to numerous landscape attributes, including corridors and connectivity are largely unknown. This probably hold true for fisher as well. It is generally agreed, though, that maintaining habitat linkages between populations may be important to ensure the long-term viability of isolated furbearer populations (Ruggiero et. al. 1994).

The NW Forest Plan (1994a-3&4-40) measured connectivity based on two features; 1) the distance between late-successional areas and 2) forest conditions between late-successional areas. Four outcomes were developed from these measurement, ranging from very strong connectivity, to weak connectivity. Using the distance criteria, connectivity between LSR/MLSAs were very high (less than 6 miles on the average).

Road Management and Terrestrial Species

Roads can adversely affect and can benefit ecosystems in several ways. Road construction can remove and fragment habitat, increase sedimentation in streams, impede stream flow, affect wildlife distribution and movement, and increase the potential for outside disturbance factors (Brown 1985). Road construction can prove prove access to areas to provide for protection and important ecosystem management actions. Knowledge regarding specific effects of roads is limited, however. We do not know how adaptable most populations are to habitat alteration. We do not know how adaptable most populations are to disturbance, although regular ongoing use of roads for forest management activities seems to be less disruptive than intermittent use (Brown 1985; Knight and Gutxwiller 1995).

Existing roads, within LSR/MLSAs are beneficial to providing access for control wildfire and to function as fire lines in prescribe burns, to provide access for other habitat management actions such as thinning and pest control. However, in most cases new roads should be constructed in LSR/MLSAs only when they are connected to a larger action that results in a long term benefit to late-successional habitat. Some exceptions include access to private inholdings and improvements to provide for increased public safety.

Exact thresholds are not determined concerning maximum acceptable road densities within LSR/MLSAs. Some investigations into effects of roads on deer and elk suggests that general use of habitat decreases from moderate to low at between 2.0 to 3.5 miles of open road per section (Brown 1985). Freel (1991) included road density in his marten and fisher habitat capability models, though figures were derived from information pertaining to other species. It concluded by stating that areas adjacent to established roads may still be used if the road density and human activity is low. Cooperative efforts between Humboldt State University and the STNF indicate that open roads within fisher habitat are a major limiting factor in populations levels, i.e. lead to

high levels of mortality. Based on the sources referenced above, open road densities above 3 miles per square mile of habitat could be a practical threshold to consider.

Assessments of open road density within LSR/MLSAs indicates a range from 1.4 to 5.0 miles of open road per square mile.

Chapter 2
Current Condition (Individual LSRs)

Late-Successional Reserve RC-328 Yolla Bolla

Introduction

The Yolla Bolla LSR consists of 1,644 acres entirely of National Forest System lands and is linked to the Yolla Bolla Wilderness to the south. It is a small LSR located approximately 6 miles south of the much larger LSR RC-330 and lies at the southern edge of the South Fork Management Unit. The Douglas-fir, white fir and canyon live oak vegetation types dominate most the LSR with lesser amounts of mixed conifer and white fir/ponderosa pine. There are small pockets of naturally occurring oak-savannah along minor ridges having southerly aspects. Riparian habitat is in the form of coniferous vegetation along the 2.6 miles of perennial streams.

Table 2.12. LSR RC-328 Yolla Bolla - General Status

Total Acres (Shasta-Trinity NF)	1,644
Acres Capable of Supporting Late-Successional Habitat	1,569
Acres Currently Supporting Late-Successional Habitat	847
Percent of LSR subject to Lethal Affects	68%
Acres of Early-Successional Habitat	99
Acres of Riparian Reserve	189
Suitable Owl Habitat as a % of Capable Habitat	99
Miles of Road	5.5
Road Density	2.2

Elevation within the LSR varies from approximately 3700 feet to 5,800 ft. along the southern ridgeline. There are 5.5 miles of road leading to a road density of 2.1 miles per square mile of LSR.

Vegetative Condition

The following table highlights the general vegetative conditions for the Yolla Bolla LSR. Late-Successional and mid-Successional conditions account for 94% of the capable land base. Early-successional stands account for 6% of the current land base and are all >20 years of age. The 99 acres of plantations are stocked with a mixture of Douglas-fir, ponderosa pine and white fir. Many of the plantations are showing signs of intertree competition due to high stocking densities.

Table 2.13. LSR RC-328 - Vegetative Condition	
Vegetative Condition	**Acres**
Late-Successional/Open	0
Late-Successional/Dense	847
Mid-Successional/Open	282
Mid-Successional/Dense	341
Early-Successional/Pole	99
Early-Successional/Sapling, seedling	0
Other	84
Total	**1,644**

The dominant vegetation in the LSR is Douglas-fir/fir. It accounts for approximately 95% of the landbase. The non-commercial/other type accounts for only about 5% and is primarily open meadow and oak/savanna

Insect and Disease

Since 1993 mortality observation flights have observed endemic levels of mortality during the years of 1993, 1994 and 1997. There is no observable indication of accelerated levels of insect or disease related mortality in the Yolla Bolla LSR.

Vegetative Sustainability Discussion

This LSR is doing relatively well in terms of late-successional habitat, 54% of the capable land base. In addition, it is connected directly to the Yolla Bolla Wilderness Area. Protection of late-successional stands is important within this LSR. Management of early successional vegetation in the development of future late-successional habitat is not of great importance with this LSR with only 6% of the land base in this classification. There are relatively large patches of late-successional habitat located in both the Douglas-fir and white fire types. This LSR exhibits a moderate amount of fragmentation, both human induced and natural.

Fire and Fuels

With late-successional/dense Douglas-fir as the dominant vegetation type, fuel loadings over 50% of the area are described as a fuel model 10. Fire control is more difficult in fuel model 10, due to crowning and spotting potential and torching of individual trees. Higher stand densities and fuel loading increase the potential for a large fire event. There are three additional fuel models represented in the LSR including fuel models 2, 6 and 9 with each representing 6%, 17% and 21% , respectively, of the land base.

The fire risk is rated as low. The low rating represents a recorded frequency of at less one fire to occur per thousand acres in a >20 year period. There have been no human caused fires in this LSR. Records show that there have been 9 fire starts within the LSR boundaries since 1910. In excess of 20 additional fires less than 100 acres have been recorded within 1 mile of it's boundary. In 1988, the Hermit fire (7426 acres) burned to within 1/3 of a mile of the boundary. In 1996, the Rock Fire burn an additional 2540 acres just to the northeast. The majority of the

acres burned were stand replacing in nature. It appears that 341 acres of unmanaged stands developed as a result of stand replacing fires which occurred in the latter part of the 1800s.

Road accessibility and steepness of slope play an important role in the expected containment capability for this area. The area is rugged, steep and road access is limited. Travel time would play a role in early containment if fire should occur.

Table 2.14 illustrates the FOFEM projected mortality in terms of high (>70%), medium (25% to 70%)and low (<25%).

Table 2.14. LSR RC-328 - Percent mortality by mortality rating (Percent of LSR)		
Mortality Rating		
High	**Medium**	**Low**
68%	31%	0

Plantations have a high potential to be lost in the event of wildfire. Many have high stocking densities coupled with high levels of shrubs cover forming extremely hazardous fuels. This situation increases the likelihood for crown fires. The plantations are scattered throughout the center portion of the LSR.

Terrestrial Species Status

Federally Listed Endangered, Threatened or Proposed Species. The NSO is the only listed terrestrial species know to occupy the Yolla Bolla LSR. The upper portion of the South Fork provides both spawning and rearing habitat for Klamath Mountains Province steelhead, however, the importance of Mule Gulch in terms of steelhead habitat is unknown.

Forest Service Sensitive Species. Habitat exists for a number of Forest Service animal and plant sensitive species to include northern goshawk, fisher, and marten.

There are a number of known or suspected Forest Service Sensitive plant species within this small LSR. Table 2.15 summarizes the species, its occurrence, and its habitat requisites.

Table 2.15. LSR RC-328 - Forest Service Sensitive Plants		
Species	**Known (K) or Suspected (S)**	**Habitat**
Epilobium oreganum, Oregon willow herb	K	Wet, gently sloping stream banks, meadows, and bogs, generally on ultramafic soils. 500 - 7,800 feet elev.
Linanthus nuttallii ssp. *howelli*, Tedoc Mountain linanthus	K	Jeffrey pine/incense forest, sometimes on utramafic soil. 4,000 - 5,400 feet elev.
Raillardiopsis scabrida, rough raillardiopsis	K	Rocky, open subalpine slopes. 5,500 - 7,500 feet elev.
Sedum laxum ssp. flavidum, pale yellow stonecrop	K	Rocky outcrops, usually in mixed conifer-oak woodland. 1,150-6,000 feet elev.
Swertia fastigiata, Umpqua green gentian	K	Cool, moist Douglas-fir/white fir forest margins or openings. 5,000 - 6,000 feet elev.

Survey and Manage Species. Botanical surveys over the past several years have confirmed the presence of 4 Survey and Manage vascular plant species within the LSR. Cursory surveys for lichen and fungi have identified suitable habitat for several species in portions of the LSR. No amphibian surveys have occurred as no Survey and Manage amphibian species habitat occurs in this LSR. Table 2.16 summarizes the locations of Survey and Manage species within the Yolla Bolla LSR.

Table 2.16. LSR RC-328 - Results of Surveys for Survey and Manage Species		
Vascular Plants		
Species Name	**Strategy**	**Location/Notes**
Allotropa virgata	1&2	Old-growth forest; dry or damp, rocky to loamy sites, 60-100% shade. Elevation 1,300 to 7,300 feet.
Cypripedium fasciculatum	1&2	Old-growth forest; moist sites but may occur on dry sites. Elevation 650 to 7,000 feet.
Cypripedium montanum	1&2	Old-growth forest; dry, well drained soils. Appears substrate specific to decaying fir. Elevation 250 to 10,000 feet.

Bryophyte		
Species Name	**Strategy**	**Location/Notes**
Ptilidium californicum	1&2	Grows on conifer bark and logs, requiring cool, moist conditions. White fir forest around 5,000 feet elevation.

Northern Spotted Owl

The Yolla Bolla LSR provides approximately 1019 acres of nesting/roosting habitat and 169 acres of existing foraging habitat for a total of 1188 acres of suitable spotted owl habitat. There is no private inholdings within the home range.

The Yolla Bolla LSR is the northern extension of the Yolla Bolla Wilderness linking LSRs on the Mendocino National Forest to those on the Shasta-Trinity and Six Rivers National Forests. The combined habitat within the LSR and the adjacent wilderness area enable this area to function as a large refugia for multiple pairs of spotted owls. Most of the Yolla Bolla Wilderness Area remains unsurveyed.

Table 2.17. LSR RC-328 - Acres of suitable spotted owl habitat within 0.7 and 1.3 mile home ranges						
Activity Center	**Habitat within 0.7 mile**			**Habitat within 1.3 mile**		
	N/R	**F**	**Total**	**N/R**	**F**	**Total**
TR035	434	95	529	1152	363	1515

All of the Yolla Bolla LSR surveyed to protocol in 1989 and 1990. Although single birds were identified at different locations, there has been only one activity center delineated. Table 2.17 summarizes habitat within the 0.7 and 1.3 mile home ranges. The 1.3 mile home range lies completely within the LSR boundaries.

Estimated Owls. The entire LSR is smaller than the accepted home range size for the Klamath Mountains. Additional spotted owls may be present but are unlikely due to the size and drainage pattern of this LSR.

Northern Spotted Owl Critical Habitat. The Yolla Bolla LSR was never considered in the designation of critical habitat. However, it does lie approximately 4 miles south of CHU 38 (South Fork Mountain) and abuts up to the Yolla Bolla Wilderness Area. It does provide linkage between CHU 38 and the Yolla Bolla Wilderness by narrowing the dispersal distance between them.

General Assessment of Habitat for Late-successional-associated Species

Approximately 1,569 acres of the LSR are capable of producing late-successional habitat. Currently, 843 acres or 54% of capable, are vegetated in late-successional habitat. The combined acres vegetated by late-successional and mid-successional forest are 1,467 acres or 94% of capable. Relative to other Forest LSRs, Yolla Bolla ranks high in the proportion of late-successional and combined late-successional/mid-successional forested habitat.

Distribution and Connectivity of Habitat

The Yolla Bolla LSR has relatively large and continuous stands of late-successional habitat. This area is adjacent to the Yolla Bolla Wilderness Area to the south which forms a large refugia of late-successional. It is connected to LSR 330 to the north via both upland and riparian habitat in the Mule Creek drainage to the South Fork Trinity River. Connectivity to the northeast has been disrupted by two large stand replacing fires over the last decade. Regeneration has occurred resulting in a number of patches of early successional vegetation.

Other Resources

Sheep and cattle grazing occurred in this area as early as the mid to late 1800s through the present. Records show that the Upper South allotment (a consolidation of 5 smaller allotments) apparently had in excess of 3600 head of cattle and horses and 3760 head of sheep and goats grazing in the period prior to 1908. By 1910 these numbers dropped to 1342 cattle and horses with no sheep or goats. Most of the heavy grazing took place in Cedar Basin now within the Yolla Bolla Wilderness area south of RC-328. The number of head fluctuated greatly in the 30s through the early 50s. The number of head of cattle stabilized in the allotment around 1953 to 25 head having a normal grazing season of 6/16 to 10/31. The Forest issued a ten-year term grazing permit for the allotment in 1990. This permit authorized the grazing of 110 head for months. It also provided for variation in the number according to a specific set of guidelines. An additional 20 head of cattle have been allowed since 1990. Cattle are scatted through the allotment and are allowed to roam freely through much of the grazing season. It is uncertain what the actual use has been within the LSR.

Recreation is limited to dispersed activities such as hunting and fishing during the later part of the summer and fall months.

Late-Successional Reserve RC-330 South Fork

Introduction

South Fork LSR is shared between the Shasta-Trinity National Forests and the Six Rivers National Forest. It consist of 85,917 acres; 78,968 acres on the Shasta-Trinity, 1,483 on the Six Rivers and 5,466 in private ownership. This LSR is a long narrow strip running from the northwest to southeasterly direction. It originates at Grassy Flats, runs the length of South Fork Mountain and terminates at Rat Trap Gap. It's eastern boundary is the South Fork Trinity River and it's western boundary is the crest of South Fork Mountain. There are a few exceptions where the boundary extends across the South Fork Trinity River to the east and across South Fork Mountain crest to the west. These extensions were originally made to incorporate additional owls during the listing of Designated Critical Habitat. Total length is approximately 29 miles with an average width of approximately 4 miles. Adjacent LSRs include RC-328 lying approximately 4 miles to the south, RC-332, 7 miles to the north, RC-331 to the west, and RC-333, 6-14 miles north and east.

Table 2.18. LSR RC-330 South Fork - General Status

Total Acres (Shasta-Trinity NF and Six Rivers NF)	80,451
Acres Capable of Supporting Late-Successional Habitat	78,717
Acres Currently Supporting Late-Successional Habitat	42,029
Percent of LSR Subject to Lethal Effects	44%
Acres of Early-Successional Habitat	13,145
Acres in Riparian Reserve (perennial)	12,945
Suitable Owl Habitat as a Percent of Capable Owl Habitat	87%
Miles of Road	292
Road Density	2.4
Private Land	5,466

Fire has had a significant influence on the LSR and surrounding area during the past century. Potential for large, high intensity fire is a primary concern with this LSR. The relatively extensive amount of mid-successional natural stands is indicative of past conflagrations in this area.

This LSR experiences coastal influences. Douglas-fir is the dominate vegetation type with true firs, both white and red, at higher elevations and ponderosa pine on pronounced southerly aspects. Tan oak, black oak and madrone are major understory components. Riparian habitat is primarily in the form of coniferous forest along it's 178 miles of perennial streams. In addition, there are a total of 315 miles of road leading to a road density of 2.6. The LSR is bisected by State Highway 36, an east west running road connecting the Sacramento Valley to the Pacific Coast.

Vegetative Condition

Table 2.19 highlights the general vegetative condition for the South Fork LSR. Late-successional and mid-successional conditions accounts for 83% of the capable land base. Plantations account

for 13% of the capable land base (all <20 years of age). All of the plantations are currently stocked with a mixture of Douglas-fir, ponderosa pine and white fir. Overstocking in many of the older plantations is leading to a loss of vigor.

The dominant conifer type in the LSR is Douglas-fir which accounts for 72% of the landbase. Mixed conifer, white fir and ponderosa pine types are also major components within the LSR. They account for approximately 5.5%, 5.0% and 2.4%, respectively. The other types, red fir and noncommercial/other account for about 10% of the total landbase.

Table 2.19. LSR-330 - Vegetative Condition

Vegetative Condition	Acres
Late-successional/Open	949
Late-successional/Dense	40,938
Mid-successional/Open	10,141
Mid-successional/Dense	13,303
Early-successional/Pole	6,224
Early-successional/sapling, seedling	7,062
Other	1,834
Total	80,451

Vegetative Sustainability Discussion

There is currently a substantial amount of late-successional habitat within the LSR, 53% of the capable land base. Approximately 13% of the total land base is in plantations. There are an unknown number of acres which have been selectively harvested or salvaged in the past. Management of the early and mid-successional vegetation could be key for the development of future late-successional habitat. Stocking levels need to be managed in order to allow for these stands to progress through the various successional stages.

Fire and Fuels

Late-successional Douglas-fir and mixed conifer are the dominant species in the LSR and account for approximately 40,900 acres. Another 23,400 acres are in the same type within the mid-successional stage. This accounts for 78% of the land base in fuel models 9 and 10. Fuel model 10 is where the ground fires will be more intense than the other timber models making initial attack more difficult. Fuel model 9 tends to have closed canopy conifer stands densely stocked pole size trees in the understory. Typically, these stands contain pockets of dead and down woody fuels. These fuels create high fire intensities during ground fires that can easily spread through the understory to the crowns of dominant conifers. Terrain is very rugged and access is limited in much of this LSR. Generally, aspect in easterly throughout most of the north half with the southern half having a general northern aspect.

South Fork has been identified as having a hazard/risk rating of Moderate/High. The majority of this LSR has east facing slopes which lower the fire behavior potential. Pockets of High/High occur on intermingling private lands due to higher down/dead fuel loadings. This LSR has a high occurrence of lightning fires (79%). Numerous large fires have occurred within the past 20 years.

Records show that there have been 339 fires recorded since 1910 with an average of about 20 per decade. Most of the recorded fires have been less than 1 acres in size. However, approximately 43,200 acres have burned within or immediately adjacent to the LSR, 38,236 acres burned in this immediate area during the 1987 siege.

There are about 13,000 acres of unmanaged stands in an age class which would indicate that they originated from a fire type disturbance around the later part of the 1800s. Based on the past fire history and the present hazard/risk assessment the potential is high for fire starts in this LSR.

Plantations make up approximately 13% of the LSR land base, most of which are 20 years of age or younger. Most of these plantations are located in the southern portion of the LSR. The dense stocking in many plantations presents a fire hazard due to the tightly packed crowns, increasing the likelihood of a crown fire.

Table 2.20 illustrates the FOFEM projected mortality in terms of high (>70%), medium (25% to 70%) and low (<25%).

Table 2.20 LSR RC-330 - Percent mortality by mortality rating (Percent of LSR)		
Mortality Rating		
High	**Medium**	**Low**
44%	50%	6%

There is two active fire lookouts (Limedyke Mtn. and Pickett Peak) used for observation of this area during the fire season.

Terrestrial Species Status

Federally Listed Endangered, Threatened or Proposed Species. There are five Federally listed species known to occur within the South Fork LSR; the peregrine falcon is listed as endangered, the bald eagle, northern spotted owl and, coho salmon are listed as threatened, and Klamath Mountains Province steelhead is proposed for listing. In addition, much of this LSR serves as northern spotted owl designated critical habitat.

Forest Service Sensitive Species. Habitat exist for a number of Forest Service sensitive plant and animal species to include northern goshawk, fisher, marten, northern red-legged frog and, northwestern pond turtle.

There are five species of sensitive plants known to occur within this LSR and an additional 10 species suspected of occurring. Table 2.21 summarizes the species, their known occurrences, and habitat requisites.

Table 2.21. LSR RC-330 - Forest Service Sensitive Plants		
Species	**Known (K) or Suspected (S)**	**Habitat**
Chaenactis suffrutescens, Shasta chaenactis	S	Rocky open slopes, cobbly river terraces; on ultramafic soils or glacial till w/ ultramafic included. 2,600 - 6,900 feet elevation
Cypridpedium fasciculatum, Brownie lady's slipper	K	Mixed conifer or oak forests on a variety of soil types, often but not always associated with streams; 1,300 - 6,000 feet elevation
Cypripedium montanum, Mountain lady's slipper	S	Mixed conifer or oak forests on a variety of soil types, often but not always associated with streams; 1,300 - 6,000 feet elev.
Epilobium oreganum, Oregon willow herb	S	Wet, gently sloping stream banks, meadows and bogs, generally on ultramafic soil. 500 - 7,800 feet elev.
Eriastrum brandegeae, Brandagee's woolly-stars	S	Dry gravelly to loamy soils on flats and benches; closed cone pine forest or chaparral. 1,000 - 2,800 feet elev.
Madia doris-nilesiae, Niles' madia	K	Rocky ultramafic ridgetops and slopes with Jeffrey pine, gray pine, and shrub. 2,100 - 5,500 feet elev.
Madia stebbinsii, Stebbins' madia	K	Rocky ultramafic semi-barrens with Jeffrey pine, gray pine, and shrubs. 2,100 - 6,000 feet elev.
Minuartia rosei, Peanut sandwort	S	Gravelly serpentine barrens and opening in Jeffrey pine/mixed conifer forest. 2,500 - 5,800 feet elev.
Smilax jamesii, English Peak greenbriar	S	Shaded riparian habitat above 4,000 feet elev.
Swertia fastigiata, Umpqua green gentian	K	Cool, moist Douglas-fir/white fir forest margins or openings. 5,000 - 6,000 feet elev.

Survey and Manage species. There are three Survey and Manage species known to occur in this LSR. These species include Townsends big-eared bat (*Clrynorthinus townsendii*) and two mollusks, *Monodenia churhi* and *Helminthoglypta hertleini*. There are no doubt additional species which have not been inventoried for and/or additional sights which have not been discovered due to a lack of surveys. As an example, Del Norte salamander has been located on both the Six Rivers and Klamath National Forests. The northern portion of the LSR fall within the 25 mile inventory zone from last identified location, yet, surveys have not been completed. Table 2.22 summarizes the locations of Survey and Manage species within the South Fork LSR.

Table 2.22. LSR RC-330 - Summary of Survey and Manage Species		
Bats		
Species Group	**Species Name**	**Strategy**
Mammal	*Clrynorthinus towndsendii*	Buffer

Mollusk		
Species Group	**Species Name**	**Strategy**
Mollusk	*Monodenia churchi*	1&2
Mollusk	*Helminthoglypta hertleini*	1&2

Northern Spotted Owl

This LSR currently provides a total of 49,185 acres of existing nesting/roosting habitat and an additional 5,467 acres of foraging habitat. The total amount of nesting/roosting and foraging habitat is 54,652. The habitat varies with soil type and aspect across the LSR. An additional 10,875 acres are capable of providing suitable spotted owl habitat giving a total NRF capability of 65,527 acres.

Spotted owl surveys have been conducted throughout much of the LSR. South Fork LSR presently supports 29 activity centers. There are nine additional activity center outside the LSR having a significant portion of their home range 1.3 mile radius circle within the LSR. There are 14 reproductive pairs, 9 pairs with productive status unknown and, 6 territorial singles. The table below summarizes suitable habitat within 0.7 and 1.3 mile home ranges.

Table 2.23. LSR RC-330 - Acres of suitable spotted owl habitat within 0.7 and 1.3 mile home ranges

Activity Center	**Habitat within 0.7 miles**			**Habitat within 1.3 miles**		
	N/R	**F**	**Total**	**N/R**	**F**	**Total**
TE059	452	126	578	1,500	467	1,967
TE088	552	66	618	1,731	436	2,169
TR005	422	100	522	1.313	315	1,628
TR006	554	30	584	1,510	213	1,723
TR007	686	19	705	1,833	175	2,008
TR008	682	33	715	2,633	121	2,754
TR010	595	75	670	1,894	297	2,191
TR011	662	82	744	2,489	191	2,680
TR012	579	94	673	1,699	499	2,198
TR-013	618	134	752	1,735	494	2,229
TR015	787	60	847	2,490	355	2,845
TR028	293	105	398	1,290	313	1,603
TR081	270	243	513	963	784	1,747
TR085	511	156	667	1,113	648	1,761
TR086	438	178	616	1,218	768	1,986
TR090	554	191	745	1,537	422	1,959
TR096	878	0	878	2,157	93	2,250
TR097	207	172	379	984	431	1,414
TR100	843	54	897	2,667	358	3,025
TR101	810	23	833	2,200	295	2,495
TR130	741	138	879	1,628	526	2,154
TR168	506	205	711	1,328	892	2,220
TR260	401	61	462	1,413	247	1,660

Table 2.23. LSR RC-330 - Acres of suitable spotted owl habitat within 0.7 and 1.3 mile home ranges						
Activity Center	**Habitat within 0.7 miles**			**Habitat within 1.3 miles**		
	N/R	**F**	**Total**	**N/R**	**F**	**Total**
TR269	431	72	503	1,640	204	1,844
TR270	888	18	906	2,476	119	2,595
TR272	790	132	922	2,136	646	2,782
TR273	663	195	858	1,904	727	2,631
TR296	556	48	604	1,570	287	1,857
TR360	864	70	934	2,834	147	2,981

Table 2.23 show the acres of suitable spotted owl habitat within the 0.7 and 1.3 mile home ranges. Habitat figures for the 29 activity centers were derived from the STNF LRMP timber data base with updating from R-5 Remote Sensing Laboratories old-growth plot inventories.

Estimated Owls. It is estimated that an additional 6 pairs may be occupying this LSR.

Northern Spotted Owl Critical Habitat. This LSR overlaps considerably with critical habitat unit CA 38. The critical habitat unit totals 55,190 and occurs as one continuous unit, except for a few minor inholdings.

CA-38 is a large north and south configured unit approximately 21 miles in length and 4 miles in width running along South Fork Mountain. The original intent was to provide habitat for at least 21 pairs of owls. In addition, it was delineated to provide for movement from east to west from adjacent CHU units CA-37 and north to south movement from the Yolla Bolla Wilderness area to CHU unit CA35, etc.

The table below summarizes overlap of CA-38 with the South Fork LSR and other land allocations. Included in the overlap assessment is the amount of spotted owl nesting/roosting and foraging habitat. Approximately 92% of the critical habitat unit overlaps with the LSR and other reserve land allocations.

Table 2.24 shows the acres of spotted owl habitat within CA-38 overlaid with LSR and other forest land allocations. "Other Reserves" refers to land allocations from which no scheduled timber harvest is planned. "Matrix" refers to land allocations from which scheduled timber harvest is planned.

Table 2.24. Acres of spotted owl habitat within CA-38 overlaid with LSR and other forest land allocations				
Land Allocations	**Nesting/Roosting**	**Foraging**	**Other**	**Total**
LSR	32,634	3,317	11,809	47,760
Other Reserves	1,469	342	595	2,406
Matrix	2,927	496	1,652	5,075

This LSR expanded CA-38 to the north and south easterly direction, adding approximately 30,000 addition acres. This expansion included additional owl activity centers and a significant amount of additional late-successional and owl habitat. This expansion enhanced the quality of

the original CHU by provide additional owl habitat and owl pairs and providing better connectivity to adjacent CHUs and/or LSRs, Coral Bottom and Chanchellula LSRs specifically. Also, it provided better connectivity to the Yolla Bolla wilderness and the southern portion of the owls range.

In summary, the South Fork LSR exceeds the functional expectations of the original CHU.

General Assessment of Habitat for Late-successional Associated Species

Approximately 78,717 acres of this LSR are capable of producing late-successional habitat. Currently, 42,029 acres, or 54% of capable, are vegetated in late-successional habitat. The combined acres vegetated by late-successional and mid-successional forest totals approximately 65,331 acres, or >80% of capable. Relative to other Forest LSRs, South Fork ranks high for the proportion of late-successional and combined mid-successional/late-successional forested habitat.

Distribution and Connectivity of Habitat

Forested stands within LSR RC-330 form a contiguous "band" of late-successional habitat from it's north most location, at Grassy Flats, to it's southeastern most reaches at Rat Trap Gap. Intermingled with this contiguous band of late-successional are large stands of mid-successional habitat. Late-successional and mid-successional habitat is well distributed within the South Fork LSR. Current forested habitat is providing adequate connectivity within the LSR. Early successional vegetation and plantations are not the dominant landscape features and appear to be functioning more as islands with the much larger late/mid-successional landscape.

Connectivity to the adjacent, southerly Yolla Bolla Wilderness area is adequate. Connectivity to the Chanchellula LSR is via the southern portion of the LSR. Connectivity to the northern Corral Bottom LSR is provided via Allen Creek and Underwood Creek Drainages. These two drainages continue to provide adequate connectivity and late-successional habitat. In general, connectivity to the east, along most of this 26 mile LSR is more limited due to large conflagration which occurred in 1987. Connectivity to the west becomes somewhat limited along the west aspects of South Fork Mountain because this area consists of large dry mountain meadows and extensive oak-savannah. However, there are stands of both late-successional and mid-successional habitat connecting South Fork LSR to those to the west.

Other Resources

Sheep and cattle grazing occurred in this area as early as the mid to late 1800s with sheep dropping out of the picture in the early 1900's. There are three cattle and horse allotments within RC-330, Upper South Fork, South Fork, and Lamb Gap. Records show that the Upper South allotment (a consolidation of 5 smaller allotments) apparently had in excess of 1342 head of cattle in the period of years around 1915. Most of the heavy grazing took place in Cedar Basin now within the Yolla Bolla Wilderness area south of RC-328. The number of head fluctuated greatly in the 30s through the early 50s. The number of head of cattle stabilized in the allotment around 1953 to 25 head having a normal grazing season of 6/16 to 10/31. The Forest issued a

ten-year term grazing permit for the allotment in 1990. This permit authorized the grazing of 110 head per season. It also provided for variation in the number according to a specific set of guidelines. An additional 20 head of cattle have been allowed since 1990. Cattle are scatted through the allotment and are allowed to roam freely through much of the grazing season.

The South Fork Allotment lies to the north of the Upper South Fork Allotment and due south of the Lamb Gap allotment. Records show that little grazing took place in this allotment until after the first commercial timber sale converted dense stands of conifer to open plantations in the mid 1970. The allotment is entirely transitional range and is divided into two pasture units. The term permit was last issued in 1989. Presently, there are forty-four cow/calf pairs accounting for a total of 154 animal months. Since the issuance of the original permit in 1977, the number of cow/calf pair and/or AM's has very from 26 to the present day 44. During years with normal weather patterns, the turn on date is June 1 and runs through September 15th.

The Lamb Gap Cattle and Horse allotment has received occasional use since the early 1990's. At that time, sheep were trailed from the California Central Valley. In addition, livestock owned by local residents made use of the area. In 1954, grazing capacity was set at 275 AM's. By 1970, no authorized grazing occurred on the allotment. However, in 1982 a temporary grazing permit for 117 AM's was issued. Since 1983 the AM's have fluctuated from 104 Am's to 154 AM's.

RC-330 experiences a wide variety of recreational use such as offroad vehicle use, disperse camping, and hunting. There is one developed campground located at Forest Glenn along the east boundary of the LSR.

Late-Successional Reserve RC-332 Corral

Introduction

The Corral LSR is entirely within the boundaries of the Shasta-Trinity National Forests. It is a relatively large, 86,778 acres, LSR paralleling the Trinity River and running in an east west direction. It originates in the Barker Mountain-Soldier Creek area to the east and runs to Hennessy Mountain in the west. It is approximately 27 miles in length and averages approximately 6 to 7 miles in width. Of the 86,778 acres, 8,144 acres are in private ownership. Elevations varies from 1,140 feet at Sandy Bar along the Trinity River to 5,800 feet at Hayfork Bally along the southern boundary of the LSR. The terrain is steep and is dissected by sharp ridges and streams. A number of private land holding lie within this LSR. Adjacent LSRs include South Fork (RC-330) 5 miles to the southwest, Chanchellula (RC-331) 13 miles to the southeast, Canyon Creek (RC-333) 5 miles to the northwest, and New River (RC-305) 4 miles to the northwest.

Portions of this LSR were formerly a Habitat Conservation Area under the ISC strategy. The intent of the designation was to provide habitat for a area that would support 20 pairs of spotted owl in the future (adjusted for demographic and environmental uncertainty). Table 2.25 list the current conditions by acreage with the LSR.

Table 2.25. LSR RC-332 Corral - General Status	
Total Acres (Shasta-Trinity NF)	78,634
Acres Capable of Supporting Late-Successional Habitat	72,274
Acres Currently Supporting Late-Successional Habitat	10,510
Percent of LSR Subject to Lethal Effects	56%
Acres of Early-Successional Habitat	12,465
Acres of Riparian Reserves	12,218
Suitable Owl Habitat as a Percent of Capable Owl Habitat	77%
Mile of Road	357.2
Road Density	2.9
Private Land	8,144

Vegetative Condition

Table 2.26 highlights the general vegetative conditions for the Corral LSR. Late-successional and mid-successional conditions account for 83% of the capable land base. Plantations account for 6% of the current land base (all less the 20 years of age).

Table 2.26. LSR RC-332 - Vegetative Condition	
Vegetative Condition	**Acres**
Late-successional/Open	215
Late-successional/Dense	10,296
Mid-successional/Open	18,758
Mid-successional/Dense	30,542
Early-successional/Pole	7,574
Early-successional/Seedlings/Saplings	4,891
Other	6,360
Total	**78,634**

The dominant vegetation type in the Corral LSR is Douglas-fir, white fir, ponderosa pine and mixed conifer. They account for approximately 70%, 3%, 3%, and 2% respectively. The red fir type accounts for less than 1%. This LSR has a large number of acres that are on south and west aspects that contain shallow soils and hot dry exposures, primarily in the Trinity River Canyon. Most of these slopes contain vegetation that are not conducive to dense coniferous stands, as shown in the large percentages of other stands.

Insects and Disease

Since 1993, observation flights have observed mortality during the years 1993-1996. Mortality was found throughout the LSR during the observations. High elevation true fir and mixed conifer stand on south slopes appeared to be the most vulnerable. The fir engraver beetle, western pine beetle, and pine engraver beetle have been the primary insects responsible for the various levels of mortality throughout this LSR.

Vegetative Sustainability Discussion

Late-successional habitat accounts for 15% of the capable land base with mid-successional habitat making up an additional 68%. Much of the mid-successional habitat presently exhibiting the same structural characteristics associated with late-successional habitat. For those stands in the mid-successional category not exhibiting late-successional characteristic, there is a potential for the development of late-successional habitat within the next 20 to 50 years as the mid-successional habitat continues to grow.

Past harvesting has had minor impact on late-successional habitat as only 10% of the LSR is in plantations.

The limited amount of late-successional habitat is a result of early mining activity, and fire history. The protection and management of the existing late and mid-successional vegetation will be important if more late-successional habitat is desired.

Stocking levels of mid-successional and early successional pole stands needs to be carefully assessed. High levels of mortality is occurring due to overcrowded stand densities, especially in the older ponderosa pine plantations, pole, and mid-successional stands. Management options should be explored to reduce the overstocking levels in the mid and early-successional stands, including plantations.

Fire and Fuels

Mid-successional Douglas-fir is the dominant species in the LSR and accounts for approximately 46,000 acres or 64% of the capable land base. Mixed conifer, white fir, and ponderosa pine account for an additional 3,200 acres or 4.5% of the capable land base. Approximately 10,100 acres of Douglas-fir are in the late-successional stage while a very limited amount of mixed conifer, white fir, and ponderosa pine (370 acres) are in this stage. This accounts for approximately 76% of the of the total land base in fuel models 9 and 10. Fuel model 10 is where the ground fires will be more intense than the other timber models making initial attack more difficult. Fuel model 9 tend to have closed canopy conifer stands densely stocked pole size trees in the understory. Typically, these stands contain pockets of dead down woody fuels. These fuels create high fire intensities during ground fires that can easily spread through the understory to the crowns of dominant conifers.

Corral has been identified as having a hazard/risk rating of Moderate/High. Some pockets of High/High occur on the steeper southwest facing slopes. This LSR has had a large number of lightning cause fires, 287 or 59% of the total recorded fire starts. Human caused fires are a threat along the Highway 299 corridor. Numerous fires have occurred within the past 20 years. Records show that there have been 485 fires recorded since 1910 with an average of 54 per decade. Most of the recorded fires have been less than 1 acres. However, approximately 14,977 acres have been burned within or immediately adjacent to the LSR.

There are approximately 46,000 acres of unmanaged stands in an age class which would indicate that they originated from fire type disturbance around the latter part of the 1800s. Based on the

past fire history and the present hazard/risk assessment, one would expect a high number of starts in this LSR during the next decade.

Plantations make up approximately 11% of the capable land base, most of which are 20 years of age or younger. These plantations are fairly well distributed throughout the LSR. The dense nature of plantations creates a continuous fuel condition with the dense tightly packed crowns, increasing the likelihood of a crown fire.

Table 2.27 illustrates the FOFEM projected mortality in terms of high (>70%), medium (25% to 70%) and low (<25%).

Table 2.27. LSR RC-332 - Percent mortality by mortality rating (Percent of LSR)		
Mortality Rating		
High	**Medium**	**Low**
56.4%	33.7%	<1.0%

There is one lookout within the LSR (Hayfork Bally) used for observation of this area during the fire season.

Terrestrial Species Status

Federally Listed Endangered, Threatened or Proposed Species. There are three Federally listed know to occur within the Corral LSR; the peregrine falcon is listed as endangered, the bald eagle and northern spotted owl are listed as threatened. A number of drainages within the LSR serve as habitat for the proposed Klamath Mountains Province steelhead. In addition, much of this LSR serves as northern spotted owl designated critical habitat.

Forest Service Sensitive Species. Habitat exist for a number of Forest Service sensitive plant and animal species to include northern goshawk, fisher, marten, northern red-legged frog and, northwestern pond turtle.

There are sensitive plant species known to or suspected of occurring within the LSR which include Table 2.28 summarizes the species, species occurrence, and general habitat requisites.

Table 2.28. LSR RC-332 - Forest Service Sensitive Plants		
Species	**Known (K) or Suspected (S)**	**Habitat**
Chaenactis suffrutescens Shasta chaenactis	K	Rocky open slopes, cobbly river terraces; on ultramafic soils or glacial till w/ ultramafic included. 2,600 - 6,900 feet elevation
Cypridpedium fasciculatum Brownie lady's slipper	S	Mixed conifer or oak forests on a variety of soil types, often but not always associated with streams; 1,300 - 6,000 feet elevation
Cypripedium montanum Mountain lady's slipper	S	Mixed conifer or oak forests on a variety of soil types, often but not always associated with streams; 1,300 - 6,000 feet elev.
Epilobium oreganum Oregon willow herb	K	Wet, gently sloping stream banks, meadows and bogs, generally on ultramafic soil. 500 - 7,800 feet elev.

Table 2.28. LSR RC-332 - Forest Service Sensitive Plants		
Species	**Known (K) or Suspected (S)**	**Habitat**
Eriastrum brandegeae Brandegee's woolly-stars	K	Dry gravelly to loamy soils on flats and benches; closed cone pine forest or chaparral. 1,000 - 2,800 feet elev.
Ericameria opthitidis Serpentine goldenbush	K	Serpentine semi-barrens or openings in Jeffrey pine-incense cedar woodland. 2,600 - 5,600 feet elev.
Eriogonum libertini Dubakella Mountain buckwheat	K	Openings in Jeffrey pine-incense cedar woodland or chaparral, always on ultramafic soils. 2,500 - 5,500 feet elev.
Lewisia cotyledon var. *howelli* Howell's lewisia	K	Shaded rock faces and outcrops, often near streams. 1,000 - 8,000 feet elev.
Lewisia nuttallii ssp . *howellii* Tedoc Mountain lewisia	K	Rock outcrops in chaparral. oak, or conifer forests. 500 - 4,500 feet elev.
Madia doris-nilesiae Niles' madia	K	Rocky ultramafic ridgetops and slopes with Jeffrey pine, gray pine, and shrub. 2,100 - 5,500 feet elev.
Madia stebbinsii Stebbins' madia	K	Rocky ultramafic semi-barrens with Jeffrey pine, gray pine, and shrubs. 2,100 - 6,000 feet elev.
Minuartia rosei Peanut sandwort	K	Gravelly serpentine barrens and opening in Jeffrey pine/mixed conifer forest. 2,500 - 5,800 feet elev.
Raillardiopsis scabrida Rough raillardella	S	Rocky, open subalpine slopes. 5,500 - 7,500 feet elev.
Sedum laxum ssp. *flavidum* Pale yellow stonecrop	S	Rocky outcrops in forest or woodland openings. 960 - 6,500 elev.
Swedum paradisum Canyon Creek stonecrop	K	Rock outcrops in forest or woodland openings 960 - 6,500 elev.
Smilax jamesii English Peak greenbriar	S	Shaded riparian habitat above 4,000 feet elev.
Swertia fastigiata Umpqua green gentian	K	Cool, moist Douglas-fir/white fir forest margins or openings. 5,000 - 6,000 feet elev.

Survey and Manage Species. There are five Survey and Manage species know to occur in this LSR. These species include three mollusks; *Ancotrema voyanum, Monodenia churchi,* and *Vespricola pressleyi*. There are 16 known locations for these mollusks. There are two vascular plant species, *Cypripedium fasiculatum* and *C. montanum* which are known at 7 different sites. Table 2.29 summarizes the locations of Survey and Manage species within the Corral LSR.

Table 2.29 Results of Survey and Manage species within Corral LSR. The table lists occurrence by species group, species name, and Survey and Manage survey strategy.

Table 2.29. LSR RC-332 - Summary of Survey and Manage Species		
Vascular Plants		
Species Name	**Strategy**	**Location/notes**
Cypripedium fasiculatum	1&2	Old-growth; moist sites but may occur on dry sites. Elevation: 650 to 7,000 feet
Cypripedium montanum	1&2	Old-growth; dry, well drained soils. Appears substrate specific to decaying fir. Elevation: 250 to 10,000 feet

Mollusk		
Species Name	**Strategy**	**Location/notes**
Ancotrema voyanum	1&2	Terrestrial habitats along permanent streams and small headwaters.
Monodenia churchi	1&2	Hayfork AMA associated both with limestone outcrops in upland sites and varied rock types in riparian corridors
Vespricola pressleyi	1&2	Hayfork AMA in both riparian and upland. Only 4 sites known

Northern Spotted owl

This LSR currently provides a total of 28,513 acres of existing nesting/roosting habitat and an additional 12,437 acres of foraging habitat The total amount of nesting/roosting and foraging habitat is 46,950 acres. The habitat varies with soil type and aspect across the LSR. An additional 12,353 acres are capable of providing suitable owl habitat giving a total NRF capability of 53,303 acres.

Spotted owl surveys have been conducted throughout much of the LSR. Corral LSR presently supports 25 activity centers. There are three additional activity centers outside the LSR having a significant portion of their home range 1.3 mile radius circle within the LSR. There are 15 reproductive pairs, 10 additional pairs with reproductive status unknown and, 3 territorial singles. The table below summarizes suitable habitat within 0.7 and 1.3 mile home ranges.

Table 2.30 shows the acres of suitable spotted owl habitat within the 0.7 and 1.3 mile home ranges. Habitat figures for the 28 activity centers were derived from the STNF LRMP timber data base with updating from R-5 Remote Sensing Laboratories old-growth plot inventories.

Table 2.30. LSR RC-332 - Acres of suitable spotted owl habitat within 0.7 and 1.3 mile home ranges						
Activity Center	**Habitat within 0.7 miles**			**Habitat within 1.3 miles**		
	N/R	**F**	**Total**	**N/R**	**F**	**Total**
TR002	335	315	650	1435	789	2224
TR025	188	248	422	1170	694	1864
TR026	329	198	527	1074	728	1802
TR057	290	19	309	645	295	940
TR073	396	146	542	1090	638	1728
TR074	358	157	515	881	585	1466
TR076	252	178	430	1508	675	2183

Table 2.30. LSR RC-332 - Acres of suitable spotted owl habitat within 0.7 and 1.3 mile home ranges						
Activity Center	**Habitat within 0.7 miles**			**Habitat within 1.3 miles**		
	N/R	**F**	**Total**	**N/R**	**F**	**Total**
TR078	561	129	690	1604	548	2152
TR083	569	156	725	1769	562	2331
TR113	416	182	598	740	250	990
TR117	622	120	742	1297	706	2003
TR118	90	373	463	212	1036	1248
TR135	262	138	400	576	798	1374
TR140	4	399	403	131	1036	1167
TR164	167	378	545	407	1236	1643
TR165	162	431	593	578	1188	1766
TR167	506	205	711	1328	892	2220
TR174	198	113	311	559	478	1037
TR181	427	170	597	998	1018	2016
TR197	610	201	811	2138	474	2612
TR255	351	238	589	1210	644	1854
TR262	281	141	422	697	920	1617
TR294	473	214	687	1504	863	2367
TR322	425	269	694	1532	931	2463
TR348	604	120	724	2078	454	2532
TR349	523	114	637	1854	480	2334
TR352	361	270	631	1193	669	1862
TR353	615	171	786	1504	781	2285

Estimated Owls. It is estimated that an additional 3-4 pairs may be occupying this LSR.

Northern Spotted Owl Critical Habitat. This LSR overlaps considerably with critical habitat CA 34. This critical habitat unit totals 55,272 acres and occurs as one continuous unit, except for a few minor inholdings. The Corral LSR is 78,634 acres. CA-34 is a large east/west configured unit approximately 21 miles in length and approximately 7 miles in width. Corral LSR extended approximately 6 miles to the west providing for better connectivity in a east/west directions. CA-34 was established to provide for east/west movement and dispersal. Its importance is in providing 20+ pairs unit between the Trinity Alps Wilderness to the north and CA-38 to the south. The objective for the CHU was to support 24 pairs over time. There is a 98% overlap of CA-34 with LSR 332.

Table 2.31. Acres of spotted owl habitat within CA-34 overlaid with late-successional reserves and other Forest land allocations. "Other Reserves" refers to land allocations, such as wilderness or riparian reserves, from which no schedule timber harvest is planned. "Matrix" refers to land allocations from which scheduled timber harvest is planned.

Table 2.31. LSR RC-332 - Overlap of CA-34 with LSR RC-332				
Land Allocation	**Nesting/Roosting Habitat Acres**	**Foraging Habitat Acres**	**Other Reserves**	**Total**
LSR	25,017	8,286	20,302	53,605
Other Reserves	0	0	0	0
Matrix	13	2	5	20

The Corral LSR exceeds CA-34 in both the acreage (42% greater) and intended number of pairs (17%). Given the high degree of overlap between CA-34 and LSR RC-332, the LSR meets the intent of the original critical habitat unit.

Table 2.32. Spotted owl pair goals in Critical Habitat (CHU) compared with activity centers in Late-Successional Reserves.

Table 2.32. LSR RC-332 - Spotted owl pair goals in Critical Habitat compared with activity centers in LSRs			
Critical Habitat Unit	**Spotted Owl Pair Goal**	**Corresponding LSR**	**Known Activity Center in Corresponding LSR**
CA-34	24 pairs	RC-332	28 activity centers

Other Resources

Livestock grazing occurred in this area as early as the mid to late 1800s. As with most of the Forest, permitted sheep grazing was terminated in this area in the early 1900's. There are three cattle and horse allotments within RC-332. From east to west they include the Big Bar, Corral Bottom and Big Lake Cattle and Horse Allotments. Since the designation of the Trinity National Forest, 6 cattle and horse allotments have been recognized. From west to east they included, Burnt Ranch (1911-1955), Big Lake (1974-1997), Corral Creek (1912-present), S.O. Big Bar (1915-1984), Price Creek (1916-1972), and Sailor Bar (1968-1996). These allotments have been reorganized and today there are 4 remaining, Big Lake, Corral Creek, Big Bar and Sailor Bar. Both the number of AUMs and grazing period varied since the early 1900s. Year around grazing did take place on both Price Creek (1938) and Burnt Ranch (1923 and 1924). The "normal" grazing period today is generally May or June through October.

Late-Successional Reserve RC-331 Chanchellula

Introduction

The Chanchellula LSR is located on the eastern edge of the Trinity National Forest and surrounds much of the Chanchellula Wilderness Area. It encompasses portions of the headwaters of Chanchellula Creek and Browns Creek with Hayfork Creek bisecting the LSR. It consist of 26,389 acres of which 3,863 acres are in private ownership. Elevation varies from 2,000 feet along Hayfork Creek to 5,753 feet at Chanchellula Peak. Adjacent LSRs include South Fork approximately 6 miles to the south and Corral approximately 12 miles to the north. To the immediate west lies NFS lands classified as Matrix. To the east the LSR tend to about the "front" country which consist of oak and/or open grey pine stands.

This LSR is bisected by State Highway 36 an east-west route connecting the Sacramento Valley to the Pacific Coast. In addition, County Route 302 (Wildmad road) bisects this LSR in a north-south direction.

This LSR has its origins as a Habitat Conservation Area under the ISC strategy. Its primary intent was to provide connectivity to HCAs to the south along the east fringe of NFS lands. Its future expected spotted owl pairs, adjusted for demographic and environmental uncertainty was 7 pairs (Thomas et. al. 1990).

Table 2.33. LSR RC-331 Chanchellula - General Status	
Total Acres (Shasta-Trinity NF)	22,526
Acres Capable of Supporting Late-Successional Habitat	20,530
Acres Currently Supporting Late-Successional Habitat	4,498
Percent of LSR subject to Lethal Affects	33%
Acres of Early-Successional Habitat	3,737
Acres of Riparian Reserve	2,575
Suitable Owl Habitat as a % of Capable Habitat	78%
Mile of Road	112.2
Road Density	3.2
Private Land	3,863

Vegetation Condition

Table 2.34 highlights the general vegetation conditions for the Chanchellula LSR. Late-Successional and mid-successional conditions account for 818% of the total capable land base. Plantations account for 9% of the total capable land base (7% <20 years and 2% >20 years).

Table 2.34. LSR RC-331 Chanchellula - Vegetative Condition	
Vegetation Condition	**Acres**
Late-Successional/Open	47
Late-Successional/Dense	4,451
Mid-Successional/Open	3,832
Mid-Successional/Dense	8,464
Early-Successional/Pole	1,853
Early-Successional/Sapling, Seedling	1,883
Other	1,996
Total	**22,526**

Douglas-fir is the dominant coniferous vegetation type followed by ponderosa pine and mixed conifer. Douglas-fir accounts for approximately 60% of the land base while ponderosa pine and mixed conifer account for 10.6% and 8.8%, respectively. The non-commercial/other accounts for another 8.8% of the total land base. Black oak and white oak tend to be the dominate tree form understory components. Riparian habitat is primarily in the form of coniferous vegetation except on some the harsher soils which as riparian vegetation consisting of canyon live oak or Oregon white oak. The large contiguous L-shape private land is predominately oak/savannah and pasture land/meadow.

Insects and Disease

Since 1993 mortality observation flights have observed light to moderate mortality over the past 5 years of monitoring. However, there have been pockets of high mortality over the past few years, primarily in older plantations. Mortality and top dieback are common in overstory trees. Mortality in the pines is disproportionately high. The current situation is that the older overstory is beginning to die at an accelerating rate and the stagnated, shade-tolerant understory will not provide similar replacement trees.

Mortality was located throughout the LSR during the observations. Douglas-fir and ponderosa pine are the primary species being affected at the lower elevation while white fir is being affect at the upper elevations or as an understory species. Endemic levels of fir engraver, western pine beetle, and pine engraver have been the primary insects responsible for the various levels of mortality.

Vegetative Sustainability Discussion

About 22% of the capable land base of this LSR is late-successional. Significant portions of the LSR were intensively burned by wildfires during the mid-1800s. That disturbance created many of the mid-successional forests presently found in this LSR. Areas within Browns Creek and Chanchellula Creek did experience timber harvest during this period to support both homesteading, mining and the early timber industry. This created many of the young dense stands which presently exist in the LSR. Without treatment overstocked stands will continue to experience an increase in mortality and decline in development towards late-successional conditions.

Mid-Successional stands currently account for 60% of the capable land base and the early-successional pole and sapling/seedling account for an additional 18%. The protection and management of these stands is critical to the future development of late-successional habitat. Stocking control will be essential to the development of future late-successional habitat. Some of the stands may be beyond the point of responding to stocking control treatments.

Fire and Fuels

With mid-successional Douglas-fir as the dominant vegetation type, fuel loading over 37% of the area is described as a fuel model 9 with fuel models 10 and 6 covering 20% and 17%, respectively. Closed canopy conifer stands with densely stocked pole size trees in the understory are characteristic of fuel model 9. Typically, these stands contain pockets of dead and down woody fuels. These fuels create high fire intensities during ground fires that can easily spread through the understory to the crowns of the dominant conifers. Fuel model 10 is characterized by dense late-successional conifer stands with heavy amounts of dead and down woody fuels. Typically the understory is densely populated with intermediate size conifers. A wild fire carried by these fuels would be intense enough to cause crowning, spotting and rapid rates of spread on steep slopes or during high winds. Large stand replacing fires can be expected. Sparsely stocked conifers containing large amounts of low level shrubs (less than 6 feet high) are characteristic of

fuel model 6. These stands are a concern if the brush is old and decadent resulting in high dead to live ratios. Fire intensities are high in these situations.

The fire hazard/risk rating for the Chanchellula LSR is Moderate/Moderate. Large pockets of High/Moderate occur on the south facing slopes. Human caused fires are a concern and have caused several large fires. There have been a total of 119 fires recorded since 1910 for an average of 13 fire started recorded per decade. There have been in excess of 50 additional start within 0.5 miles of the LSR boundary. This area avoid the conflagrations of 1987 and 1988. Approximately 1,772 acres have burned within the boundaries this century. Of all the recorded fires, 54% were cause by lightning with the remaining 46% resulting from human activity. There appears to be approximately 7,500 acres of naturally occurring stands developed as a result of stand replacing fires which occurred in the latter part of the 1800s.

Road accessibility and steepness of slope play an important role in the expected containment capability for this area. Expect for the wilderness area, the LSR tends to be well road providing for relatively quick access to much of the area.

Table 2.35 illustrates the FOFEM projected mortality in terms of high (>70%), medium (25% to 70%) and low (<25%).

Table 2.35. LSR RC-331 - Percent mortality by mortality rating (Percent of LSR)		
Mortality Rating		
High	**Medium**	**Low**
33.2%	52.1%	<1.0%

Plantations are a major concern for fire effect due to the potential of loss. Most have not been thinned and tend to be overstocked, mixed with brush, and have limbs reaching the ground forming extremely hazardous "ladder" fuels. This situation increases the likelihood for crown fires in adjacent stands. The plantations are scattered throughout the LSR.

Terrestrial Species Status

Federally Listed Endangered, Threatened or Proposed Species. The only known, Federally listed species in this LSR is the northern spotted owl which is classified ay threatened. The Klamath Mountains Province steelhead is presently proposed and can be found in Hayfork Creek. Much of the Chanchellula LSR is considered as northern spotted owl designated critical habitat.

Forest Service Sensitive Species. Habitat exists for a number of Forest Service animal species to include northern red-legged frog, northwestern pond turtle, willow flycatcher, northern goshawk, fisher and marten. There are two Forest Service sensitive plant species (*Ericaneria ophitidis* and *Eriogonum libertini*) and 11 additional plant species suspect within the LSR. Table 2.36 summarizes the species, known or suspected occurrence, and generally habitat requisites.

Table 2.36. LSR RC-331 - Forest Service Sensitive Plants		
Species	**Known (K) or Suspected (S)**	**Habitat**
Chaenactis suffrutescens Shasta chaenactis	S	Rocky open slopes, cobbly river terraces; on ultramafic soils or glacial till w/ ultramafics included; 2,600 - 6,900 feet elev.
Epilobium oreganum Oregon willow herb	S	Wet, gently sloping stream banks, meadows and bogs, generally on ultramafic soil. 500 - 7,800 feet elev.
Eriastrum brandegeae Brandegee's woolly-stars	S	Dry gravelly to loamy soils on flats and benches; closed cone pine forest or chaparral. 1,000 - 2,800 feet elev.
Ericameria ophitidis Serpentine goldenbush	K	Serpentine semi-barrens of openings in Jeffrey pine-incense cedar woodland. 2,600 - 5,600 feet elev.
Eriogonum libertini Dubakella Mountain buckwheat	K	Openings in Jeffrey pine-incense cedar woodland or chaparral, always on ultramafic soils. 2,500 - 5,500 feet elev.
Lewisia cotyledon var. *heckneri* Herkner's lewisia	S	Shaded rock faces and outcrops. Often near streams. 1,000 - 8,000 feet elev.
Lewisia cotyledon var. *howellii* Howell's lewisia	S	Rock outcrops in chaparral, oak, or conifer forest. 500 - 4,500 feet elev.
Madia doris-nilesiae Niles' madia	S	Rocky ultramafic ridgetops and slopes with Jeffrey pine, gray pine, and shrubs. 2,100 - 5,500 feet elev.
Madia stebbinsii Stebbins' madia	S	Rocky ultramafic semi-barrens with Jeffrey pine, gray pine, and shrubs. 2,100- 6,000 feet elev.
Minuartia decumbens The Lassics sandwort	S	Dry, gravelly serpentine barrens. 4,500 - 5,500 feet elev.
Minuartia rosei Peanut sandwort	S	Gravelly serpentine barrens and openings in Jeffrey pine/mixed conifer forest. 2,500 - 5,800 feet elev.
Raillardiopsis scabrida Rough raillardella	S	Rocky, open subalpine slopes. 5,500 - 7,500 feet elev.
Sedum laxum ssp. *flavidum* Pale yellow stonecrop	S	Rock outcrops, usually in mixed conifer-oak woodland. 1,150 - 6,000 feet elev.
Sedum paradisum Canyon Creek stonecrop	S	Rock outcrops in forest or woodland openings. 960 - 6,500 feet elev.
Smilax jamesii English Peak greenbriar	S	Shaded riparian habitat above 4,000 feet elev.
Swertia fastigiata Umpqua green gentian	S	Cool, moist Douglas-fir/white fir forest margins or openings. 5,000 - 6,000 feet elev.

Survey and Manage Species. Botanical surveys over the past several years have confirmed the presence of only 1 vascular plant species. No amphibian surveys have occurred to date in the LSR. Only one mollusk is known to occur. Table 2.37 summarizes the habitat locations of Survey and Manage species within the Chanchellula LSR.

Table 2.37. LSR RC-331 - Summary of Survey and Manage Species		
Vascular Plants		
Species Name	**Strategy**	**Location/Notes**
Cypripedium fasciculatum	1&2	Old-growth forest; moist sites but may occur on dry sites. Elevation 650 to 7,000 feet

Mollusk		
Species Name	**Strategy**	**Location/Notes**
Monodenia churchi	1&2	Associated with both limestone outcrops and with varied rock types in riparian corridors

Bats*		
Species Name	**Strategy**	**Location/Notes**
Corynorhinus townsendii	S&G	Wide variety of microhabitats within the forested environment

*treated much the same as S&M species.

Northern Spotted Owl

The Chanchellula LSR provides approximately 9,071 acres of nesting and roosting habitat and approximately 3,891 acres of foraging habitat for a total of 12,962 acres. An additional 3,690 acres have the potential to provide spotted owl habitat. This LSR is presently at 78% of it capability.

A total of 6 activity centers occur within the boundary of this LSR. There are 3 activity centers outside the LSR having a significant portion of the 1.3 mile home range overlapping the LSR. The table below summarized suitable habitat within 0.7 and 1.3 mile home ranges.

Table 2.38. Acres of suitable owl habitat with 0.7 and 1.3 mile home ranges. Nesting/roosting (N/R) habitat is distinguished from foraging (F) habitat.

Table 2.38. LSR RC-331 - Acres of suitable spotted owl habitat with 0.7 and 1.3 mile home ranges						
Activity Center	**Habitat within 0.7 mile**			**Habitat within 1.3 mile**		
	N/R	**F**	**Total**	**N/R**	**F**	**Total**
TR094	454	251	705	1462	851	2313
TR098	599	136	735	996	621	1617
TR228	393	175	568	661	466	1127
TR267	571	149	720	1076	368	1444
TR268	445	293	738	1263	843	2105
TR320	662	159	821	1668	532	220

Three of these activity centers are known to have produced young. Reproduction has not been confirmed for the remaining three.

Estimated Owls. There are no additional owl territories estimated to occur in the Chanchellula LSR.

Northern Spotted Owl Critical Habitat. Chanchellula LSR overlaps almost entirely with CA-36. This CHU is smaller in size than the original Habitat Conservation Area identified for this area. This LSR is important in that it adds protected habitat around the Chanchellula Wilderness Area and fills a void in the southeastern part of Trinity County.

Critical habitat unit 36 is about 20,890 acres. The table below summarizes overlap of CA-36 with the Chanchellula LSR and other land allocations. Included in the overlap assessment is the amount of spotted owl nesting/roosting and foraging habitat. Approximately 96% of the critical habitat overlaps with the LSR with a minor amount overlapping "other" reserves.

Table 2.39. Acres of spotted owl habitat within CA 36, overlaid with Late-Successional Reserves and other Forest land allocations. "Matrix" refers to lead allocations from which scheduled timber harvest is planned.

Table 2.39. LSR RC-331 - Acres of spotted owl habitat within CA 36				
Land Allocation	**Nesting/Roosting Habitat Acres**	**Foraging Habitat Acres**	**Other**	**Total**
LSR	8,185	4,218	7,479	19,882
Other Reserves	58	34	47	139
Matrix	0	0	0	0

The Chanchellula LSR includes 6 spotted owl activity centers. There was no pair objective assigned to this LSR in the Critical Habitat description. The original ISC adjusted future pairs was 7 with the original HCA having 45,000 acres (including wilderness). Critical habitat encompassed a much smaller area but maintaining protection of 6 pairs of owls on approximately half the HCA acreage. There are no additional owl activity centers in the "matrix-portion" of critical habitat.

Table 2.40. Spotted owl pair goals in Critical Habitat (CHU) compared with activity centers in Late-Successional Reserves

Table 2.40. LSR RC-331 - Spotted owl pair goals in Critical Habitat (CHU) compared with activity centers in Late-Successional Reserves			
Critical Habitat Unit	**Spotted Owl Pair Goal**	**Corresponding LSR**	**Known Activity Center in Corresponding LSR**
CA-36	7 pairs	RC-331	6 activity centers

In conclusion, Chanchellula LSR performs the intended function of CA 36. It continues to protect habitat around the Chanchellula Wilderness and provides habitat for owl pairs.

General Assessment of Habitat for Late-successional-associated Species

Approximately 20,530 acres of the Chanchellula LSR are capable of producing late-successional habitat. Currently 4,498 acres or 22% of capable, are vegetated in late-successional habitat. The combined acres of vegetated by late-successional and mid-successional forest are 16,794 acres or 82% of capable.

Distribution and Connectivity of Habitat

The distribution of late-successional habitat throughout the LSR is adequate. There is a relatively large piece of private ownership in the middle which consist of primarily meadow and agricultural land. However, there are relatively large scatted stands of late-successional in both the Hayfork Creek and Browns Creek drainages.

Stands of late-successional habitat are well-connected, except on the private land where habitat is less continuous. Stands of late-successional habitat are patchy. There are areas of dense, mid-successional habitat throughout the LSR. These mid-successional stands are important in providing connectivity throughout most of the LSR. The forested stands outside the LSR (Chanchellula Wilderness and Hayfork Creek) are important in providing connectivity both within the LSR and to LSRs to the south and north.

Given its small to moderate size and it's juxtaposition to the Chanchellula Wilderness area, Chanchellula LSR plays an important role in providing a refugia for spotted owls and numerous other late-successional associated species. The importance of the combination of the LSR and adjacent wilderness is emphasized by the significant portions of adjacent habitat to the west that were lost in the conflagration of 1987.

Other Resources

Settlers came into this area in the mid 1800's bringing with them variety of livestock to include cattle, horses, sheep, and goats. From about 1850 through 1905 there were few limitations on grazing in this area. Fire, both from Native Americans and rancher, was used quite extensively as a management tool. With the establishment of the Trinity National Forest in 1905, fire as a management tool was eliminated and managed range allotment were defined by the Forest Service. Two range allotments, Wildwood and Hayfork Canyon, were established in 1910. The number of head of cattle, AMs, and grazing season varied over time. Grazing in this area peaked at approximately 2000 AMs for both allotments during World War I and into the early 1930's. This included up to 240 head of cattle on the Wildwood allotment and 159 head of cattle on the Hayfork Canyon allotment which were allow to grazing from May 1 through Nov 15. Sheep were nonexistent in these allotments by the early 30's.

Currently, only the Wildwood allotment exist as an active allotment in this area and is located on the western edge of RC-331. This allotment permits 30 head of cow/calf pair and 8 head of horses/mules with an average 195 AMs per year and having a grazing season running from May 15 through September 30. The forage base is primarily transitional range.

There is one developed recreation site with RC-331, Deer Lick Springs. There are two day use sites within the interior of RC-331 along Hayfork Creek. This LSR provides access to the Chanchellula Wilderness which divide the LSR. The remainder of the LSR provides for wide variety of dispersed recreational uses.

Late-Successional Reserve RC-333 Canyon Creek

Introduction

The Canyon Creek LSR lies north of the Trinity River and is shared with the Redding Resource Area of the Bureau of Land Management. It consist of 16,473 gross acres; 8,479 acres on the Shasta-Trinity National Forest, 6210 acres on the Redding BLM Resource Area, and 1784 under private ownership. It is one of the moderate size LSRs and lies within the Canyon Creek and North Fork Trinity River drainages outside of the Trinity Alps Wilderness. This LSR is split by a prominent ridge separating these to drainages. It should be noted that there is significant acreage of late-successional in both of these drainages within the wilderness and that RC-333 is confined to the area outside of the wilderness.

Elevations 1440 along the Trinity River to over 7,000 along the upper ridgelines. The terrain is steep, and is dissected by sharp ridges and streams. There are two roads supplying access to Canyon Creek LSR both originating from State Highway 299. County Road 401 access Canyon Creek and Forest Service Road 34N07Y accesses the upper portion of the North Fork Trinity River.

The LSR has its origin as part of a massive Habitat Conservation Area under the ISC' strategy. Together with the Trinity Alps Wilderness Area, this HCA was intended to ultimately support an adjusted future expected 36 pairs (Thomas et .al. 1990).

Table 2.41. LSR RC-333 Canyon Creek - General Status

Total Acres (Shasta-Trinity NF)	18,138
Acres Capable of Supporting Late-Successional Habitat	13,380
Acres Currently Supporting Late-Successional Habitat	2,651
Percent of LSR Subject to Lethal Affects	69%
Acres of Early-Successional Habitat	478
Acres of Riparian Reserves	3,116
Suitable Owl Habitat as a % of Capable	90%
Miles of Road	46.2
Road Density	3.5
Private Land	1,784

Vegetative Condition

Table 2.42 highlights the general vegetative conditions for the Canyon Creek LSR. Late-successional and mid-successional conditions account for 92% of the capable land base. Plantations account for 3% of the current land base (1% <20years and 2% >20years). Some pine plantations are rapidly losing vigor due to the high stocking levels.

Table 2.42 LSR RC-333 - Vegetative Condition	
Vegetative Condition	**Acres**
Late-Successional/Open	28
Late-Successional/Dense	2,622
Mid-Successional/Open	3,313
Mid-Successional/Dense	6,077
Early-Successional/Pole	875
Early Successional/Sapling, seedling	164
Other	3,256
Total	16,335

The dominant vegetation type in the LSR is Douglas-fir followed secondly by ponderosa pine, 63% and 12% respectively. The non-commercial/other type accounts for 20% of the land base. There are minor amounts of white fir. The non-commercial/other is comprise of a variety of hardwood tree and brush species to include Canyon live oak and Oregon white oak.

Insects and Disease

Since 1993 mortality observation flights have been observed at a low to moderate level of mortality during the flight years 1994 through 1997.

Vegetative Sustainability Discussion

This LSR currently has about 20% of the capable land base in late-successional forest. However, its relative position with the Trinity Alps Wilderness Area results in an extensive area of late-successional forest. Protection of existing late-successional stands is extremely important within this LSR. Management of both mid-successional and early successional vegetation will be important for future development of late-successional habitat. Stand structure is a primary component to be concerned with especially in plantations and denser early successional stands.

Fire and Fuels

With the dominant vegetation type being mid-successional Douglas-fir followed by dense brushfields and late-successional Douglas-fir, fuel loadings over most of the area are described as either fuel models 4, 9 or 10. All three of these fuel models tend to be difficult in terms of fire control. Fuel model 4 (approximately 4,100 acres) is characterized by older, unthinned plantations, stands of mature shrubs and conifers. Crown density in the plantations and shrubfields increases the likelihood of stand replacing events. Fuel model 9 (approximately 6,077 acres) is characterized by closed canopy conifer stands with densely stocked pole size trees in the understory. Typically, these stands contain pockets of dead and down woody fuels. These fuels create high fire intensities during ground fires that can easily spread through the understory to the crowns of dominant conifers Fuel model 10 is characterized by dense late-successional conifer stands with heavy amounts of dead and down woody fuels. Typically the understory is densely populated with intermediate size conifers. A wild fire carried by these fuels would be intense enough to cause crowning, spotting and rapid rates of spread on steep slopes or during high winds. Large stand replacing fires can be expected.

The fire hazard/risk rate is Moderate/High on the west side of the LSR and High/High on the east side. This LSR has the highest ratio of human caused fires of any LSR on the Forest. There are 63% of the fires cause by humans. There have been a total of 80 starts recorded in the LSR since 1910, many of which have led to major conflagrations. In 1987, 11,980 acres burned within or immediately adjacent to the LSR. Common weather patterns from late spring through early fall month are such that this area receives a high level of lightning storm activity.

Plantations are a major concern for fire effect due to the potential loss, especially when they lay adjacent to dense shrub fields. Most of the plantations and/or dense fire stands have not been thinned and tend to be overstocked, mixed with brush, and have "ladder" fuels reaching the ground. This situation increases the likelihood for crown fires.

Table 2.43 illustrates the FOFEM projected mortality in terms of high (>70%), medium (25% to 70%) and low (<25%).

Table 2.43. LSR RC-333 - Percent mortality by mortality rating (Percent of LSR)		
Mortality Rating		
High	**Medium**	**Low**
68.8%	26.4%	<1.0%

The entire east side of Canyon Creek proper was burned during 1987. This included brushstands at the low end of the drainage near Highway 299 to the upper reaches of the Canyon Creek drainage with the wilderness. In addition, much of the upper portion (within the wilderness) of the North Fork Trinity River was burned in varying intensities.

Terrestrial Species Status

Survey and Manage Species. Botanical surveys over the past several years have not confirmed the presences of any Survey and Manage vascular plant species within the LSR. Habitat does exist for a number of other Survey and Manage Species, however, surveys have not been conducted to confirm either presence or absence.

Forest Service Sensitive Species. There are a number of Forest Service Sensitive species, many of which are old-growth associates, within and adjacent to the Canyon Creek LSR. These include northern goshawk, marten, and fisher. Table 2.44 illustrates the known populations of Forest Service Sensitive plants occurring within the LSR.

Table 2.44. LSR RC-333 - Forest Service Sensitive Species		
Species Name	**Known or Suspect (K/S)**	**Habitat**
Chaenactis suffrutescens Shasta chaenactis	K	Rocky open slopes, cobbly river terraces; on ultramafic soils or glacial til w/ ultramafics. 2600 to 6900 ft. elev.
Epilobium oreganum Oregon willow herb	S	Wet, gently sloping stream banks, meadows & bogs, generally on ultramafics soil. 500-7800 ft. elev.
Erythronium citrinum Scott Mountain fawn lily	S	Mixed conifer forest on ultramafic or granitic soils. 900-4000 ft. elev.

Table 2.44. LSR RC-333 - Forest Service Sensitive Species		
Species Name	**Known or Suspect (K/S)**	**Habitat**
Lewisia cotyledon var. *heckneri* Heckner's lewisia	K	Shaded rock faces and outcrops, often near streams. 1000-8000 ft. elev.
Lewisia cotyledon var. *howellii* Howell's lewisia	S	Rock outcrops in chaparral, oak, or conifer forest. 500-4500 ft. elevation
Phacelia leonis Siskiyou phacelia	S	Rocky to sandy openings in montane mixed conifer forest, often on ultramafics. 3900-6500 ft. elev.
Sedum laxum ssp. *flavidum* Pale yellow stonecrop	S	Rock outcrops, usually in mixed conifer-oak woodland. 1150-6000 ft. elev.
Sedum paradisum Canyon Creek stonecrop	S	Rock outcrops in forest and woodland openings. 960-6500 ft. elev.
Smilax jamesii English Peak greenbriar	S	Shaded riparian habitat above 4000 ft. elevation

Northern Spotted Owl

Canyon Creek provides approximately 6,287 acres of nesting/roosting habitat and 2,741 acres of foraging habitat for a total of 9,028 acres of suitable habitat. An additional 1,011 acres could potentially provide spotted owl habitat. The LSR is presently at 90% of capable.

There are three spotted owl activity centers that have been located within the boundary of Canyon Creek LSR. Approximately 60% of the Canyon Creek LSR has historically been survey to protocol. There is a good chance that additional owls may be present. Table 2.45 summarizes suitable habitat within each of the 0.7 and 1.3 mile home ranges. Nesting/roosting (N/R) habitat is distinguished from foraging (F) habitat.

Table 2.45. LSR RC-333 - Acres of suitable spotted owl habitat within 0.7 and 1.3 mile home ranges						
Activity Center	**Habitat within 0.7 mile**			**Habitat within 1.3 mile**		
	NR	**F**	**Total**	**NR**	**F**	**Total**
TR183	376	301	677	752	1062	1814
TR300	275	175	450	729	323	1052
TR313	233	152	385	995	463	1458

Estimated Owls. It is estimated, based the amount of unsurveyed habitat, that there could be two additional territories within the boundaries or overlapping with the wilderness area.

Northern Spotted Owl Critical Habitat. The eastern portion of the Canyon Creek LSR was once part of the larger HCA C-11. This area was reconfigured by combining the North Fork Trinity River and Canyons Creek to form Designated Critical Habitat unit CA-31 to the east and CA-29 (now LSR RC-305) to the west. The objectives for this unit, aside from protecting owl pairs, was to extend protected habitat westward towards CHUs CA-30, CA-47, and CA-24. CA-31 links CA-34 and CA-33, and extends to the southwest to protect this portion of the edge of the

subspecies' range. It was expected that these CHUs, combined (CA-29 and CA-31) with contiguous suitable habitat in the Salmon-Trinity Alps Wilderness, will support 40 pairs over time.

Critical habitat unit CA-31 is approximately 5,572 acres in size. Approximately 99% of CA-31 overlaps with Canyon Creek LSR and other "reserves." However, the LSR was adjusted to and extended to match the wilderness area boundary and is now 16,335 acres. Table 2.46 summarizes the overlap of CA-31 with Canyon Creek LSR.

Table 2.46. LSR RC-333 - Acres of spotted owl habitat within CA-31 overlaid with Canyon Creek LSR and other Forest land allocations

Land Allocation	Nesting/Roosting Habitat Acres	Foraging Habitat Acres	Other	Total
LSR	1,122	771	2,485	4,378
Other Reserves	507	119	541	1,167
Matrix	1	4	22	27

Table 2.47 compares the spotted owl pair objectives in critical habitat units with the total known activity centers in Canyon Creek LSR. The total activity centers within the LSR is only a portion of that which was identified for a larger expanded land base.

Table 2.47. LSR RC-333 - Comparison of the spotted owl pair objectives in critical habitat units with the total known activity centers in Canyon Creek LSR

CHU	Spotted Owl Pair Goal	LSR	Known Activity Centers in Corresponding LSR
CA-31	40 in combination with expanded land base TWA & RC-305	RC-333	3 activity centers

In conclusion, the Canyon Creek LSR is performing the intended function as the smaller CA-31. There is a very minor portion of the LSR that fell into "matrix," but the intent of the critical habitat designation is exceeded by the LSR.

General Assessment of Habitat for Late-successional-associated Species

Approximately 13,380 acres of Canyon Creek LSR are capable of producing late-successional habitat. Currently, 2,650 acres or 20% of capable are forested in late-successional habitat. The combined acres covered by late-successional and mid-successional forest are 12,341 acres, or 92% of capable. Relative to other Forest LSRs, Canyon Creek ranks fairly high.

Distribution and Connectivity of Habitat

The distribution of late-successional habitat is somewhat fragmented within the Canyon Creek drainage due to topography and past fire activity. There are still moderate size stands remaining and connected by mid-successional denser stands. The upper 1/3 of most slopes are dominated by large contiguous shrub fields and granitic, barren ridgelines. Southerly aspects in Canyon Creek are primarily plantations and shrubs field resulting for the 1987 fires. Connectivity from

the Canyon Creek drainage is either over open ridglelines or open conifer stands at lower elevations. The North Fork Trinity River is similar but contains larger stands of late-successional and continuous forested cover, primarily mid-successional, through the entire length of this very linear portion of the LSR.

Other Resources

There has been a long history of mining activity in RC-333. A number of mines continue to be noticeable along the steep mountainsides within the Canyon Creek drainage. Three historical and prominent mining towns were located in this LSR while two continue to persist. Helena lies within the North Fork Trinity River drainage and has a remnant population of 120. Canon City is located along County Road 401 approximately 6 miles off Highway 299. Dedrick was located 11 miles up the canyon, however, no trace of the city remains today. Canon City has a remnant population of 50 people. Mining activity dating back to the early 1850s shaped much of the present day Canyon Creek and North Fork areas. Early mining was limited to sluice box and rocker and than quickly moved on to major hydraulic operations. As hydraulic mining continued along the lower slopes of these drainages, hard rock mining began to develop on the upper slopes. Population peaked around the turn of the century and crashed along with the mining activity. Much of the mining activity subsided in the early 1920s to 1930s. Very little evidence of this areas mining "heyday" remains.

Sheep and cattle grazing occurred in this area as early as the mid to late 1800's with sheep continuing up until the late 1930s. Most of the grazing was limited in nature due to topography. There are no allotments within this LSR. Incidental recreational grazing does occur in the adjacent wilderness, but is limited to horses.

Late-Successional Reserve RC-337 Buckeye

Introduction

The Buckeye LSR is entirely within the boundaries of the Shasta-Trinity National Forests but is heavily influence by checker board ownership. It is one of several smaller, "steppingstone" LSRs established around individual owl pairs and having an objective of providing for dispersal. This LSR is located at the northern end of Trinity Lake and is bisect north to south by this narrow portion of the lake. It is bisected east to west by Buckeye Creek. It is approximately 3 miles wide and 6 miles in length. Of the 10,881 total acres, 3,837 are owned by Sierra Pacific Industries with the remaining 7,044 National Forest System lands. Adjacent LSRs include RC-334 approximately 5 miles to the south and southeast surrounding Trinity Lake and RC-338 approximately 2 miles to the north. This LSRs western boundary abuts the Trinity Alps Wilderness Area. There is a significant amount of suitable late-successional habitat in the wilderness adjacent to the RC-337. Elevation varies from 2,460 feet at the Trinity River to 6,100 feet at the Trinity Alps Wilderness boundary.

Table 2.48. LSR RC-337 Buckeye - General Status	
Total Acres (Shasta-Trinity NF)	7,044
Acres Capable of Supporting Late-Successional habitat	6,474
Acres Currently Supporting Late-Successional Habitat	1905
Percent of LSR Subject to Lethal Affects	31%
Acres of Early-Successional Habitat	628
Acres in Riparian Reserves	1,591
Suitable Owl Habitat as a Percent of Capable Owl Habitat	90%
Miles of Road	48.4
Road Density	4.4
Private Land	3,837

Vegetative Condition

Table 2.49 highlights the general vegetative condition for the Buckeye LSR. Late-successional conditions account for 29% of the capable land base. Early-successional stands account for 10% of the current capable land base. All plantations are less than 20 years of age. All plantations in this LSR were planted with a mixture of Douglas-fir, white fir, ponderosa pine and minor amount of sugar pine. There is an unknown number of acres which were partial cut at varying leave tree densities. Salvaging in the area has been common in the past.

Table 2.49. LSR RC-337 - Vegetative Condition	
Vegetative Condition	**Acres**
Late-Successional/Open	245
Late-Successional/Dense	1,660
Mid-Successional/Open	1,624
Mid-Successional/Dense	2,317
Early-Successional/Pole	3
Early-Successional/Sapling, Seedling	625
Other	570
Total	**7,044**

This LSR is dominated by Douglas-fir which accounts for 52% of the capable land base, with lesser amounts of mixed conifer (21.5%), ponderosa pine (16.6%), white fir (6%), and nonforested brushfields (8.8%). Black oak and shrub-form tanoak are the major understory components.

The non-commercial/other, accounts for approximately 8% of the land base.

Vegetative Sustainability Discussion

There is currently about 29% of the capable land base in late-successional forest within this LSR. Approximately 10% of the capable acres are presently in plantations. Management of the early successional vegetation is key for the development of future late-successional habitat. Stocking level need to be managed in order to allow for these younger stands to progress through the various successional stages.

Fire and Fuels

The Trinity Alps abuts the western edge of Buckeye LSR. Douglas-fir, mixed conifer, ponderosa pine, and white fir are the dominant species both inside the LSR and in this portion of the wilderness. These vegetation types are both open and dense stands and have been identified as being in fuel models 6, 9, and 10. 33% of the land base lies in FM-10, 26% in FM-6, and 24% in FM-10. There is no concentration of any one of these fuel models making the landscape difficult for fire control. Fuel model 6 typifies sparsely stocked conifer stands containing large amounts of low level shrubs (less than 6 feet in height). These stands are a concern if the brush is old and decadent resulting in high dead to live ratios. Fires intensities are high in these situations. Fuel Model 9 is characterized by closed canopy conifer stands with densely stocked pole size trees in the understory. Typically, these stands contain pockets of dead and down woody fuels. These fuels create high fire intensities during ground fires that can easily spread through the understory to the crowns of the dominant conifers. Fuel Model 10 is characteristic of dense late-successional conifer stands with heavy amounts of dead and down woody fuels. Typically the understory is densely populated with intermediate size conifers. A wild fire carried by these fuels would be intense enough to cause crowning, spotting, and rapid rates of spread on steep slopes or during high winds. Large stand replacing fires can be expected. Fire access is good both by road and by air.

There have been 79 fire starts recorded in this LSR since 1910. There has been a average of 8 starts per decade most of which have been less than an acre in size. Major fires occurred in the western and northeastern portions of the LSR in the 20s, followed by similar fires in the 30s. There was little to no fire activity in Buckeye during the 1987 "siege." 59% of the fire starts in this area have resulted from lightning while the remaining 49% have been human caused. The Hazard/Risk rating for Buckeye is Moderate/Moderate. Several large pockets of High/Moderate exist both within and adjacent to the LSR. Several large fires have burned within the outer boundaries.

Plantations make up only 8% of the land base. However, much of the non-commercial/other category consist of large, dense shrub fields having similar fuel model characteristics. These areas are scattered throughout the LSR. The closed nature of plantations and dense shrub fields creates a continuous fuel condition with the dense tightly packed crowns, increasing the likelihood of a crown fire. Generally, conditions outside the LSR are very similar to those inside which poses the same Hazard/Risk of Moderate/Moderate.

Table 2.50 illustrates the FOFEM projected mortality in terms of high (>70%), medium (25% to 70%) and low (<25%).

Table 2.50. LSR RC-337 - Percent mortality by mortality rating (Percent of LSR)		
Mortality Rating		
High	**Medium**	**Low**
30.6%	32.9%	1.1%

Terrestrial Species Status

Federally listed Endangered, Threatened, or Proposed Species. There are two listed species known to occur within this LSR, NSO (addressed below) and bald eagle. The closest known nesting bald eagle territory is approximately 1.5 miles to the south. That portion of the Trinity Lake extending into the LSR has been identified as foraging habitat.

Forest Service Sensitive Species. There are 5 terrestrial and/or aquatic species occurring which includes fisher, marten, goshawk, northwestern pond turtle and red-legged frog. ADD BATS In addition, there are a number of plant species known or suspected of occurring within the LSR. Table 2.51 illustrate the species, its occurrence and habitat.

Table 2.51. LSR RC-337 - Forest Service Sensitive Plants

Species	Known (K) or Suspected (S)	Habitat
Arnica venosa Veiny arnica	K	Mixed conifer or conifer/oak forest, especially on ridgetops & old road cuts. 2000-5200 feet elev.
Balsamorhiza hookeri var *lanata* Woolly balsamroot	S	Dry, open woodlands & grassy foothills on rocky soil under oak, pine, or possibly juniper; parent material varies. 4000-5000 feet elevation
Erythronium citrinum var *roderickii* Scott Mountain lawn lily	K	Mixed conifer forest on ultramafic or granitic soils. 900-4000 feet elevation
Lewisia cotyledon var *heckneri* Heckner's lewisia	S	Shaded rock faces & outcrops, often near streams. 1000-8000 feet elevation
Lewisia cotyledon var. *howellii* Howell's lewisia	S	Rock outcrops in chaparral, oak, or conifer forest. 500-4500 feet elevation
Ophioglossum pusillum Northern adder's-tongue fern	S	Meadows, marshes, moist forests. Elevation: 1000 feet.
Raillardiopsis scabrida Rough raillardella	S	Rocky, open subalpine slopes. 5500-7500 feet elevation
Sedum paradisum Canyon Creek stonecrop	S	Rock outcrop in forest or woodland openings 960-6500 feet elevation
Smilax jamesii English Peak greenbriar	S	Shaded riparian habitat above 4000 feet.
Trillium ovatum ssp. *oettingeri* Salmon Mountains wakerobin	S	Shaded riparian forest with white fir or red fir. 4000 -6400 feet.

Survey and Manage Species. Botanical surveys over the past several years have not confirmed the presence of any of the Survey and Manage species to date.

Other Late-Successional Species. A number of late-successional-associated species are known or suspected of being present within the Buckeye LSR. These species include fisher and goshawk. Fisher have been monitored in this area over the past 6 years under cooperative

agreement with Humboldt State University. Goshawks have been observed foraging in and around this LSR however, no nest has been located.

Northern Spotted Owl

The Buckeye LSR provides approximately 2,300 acres of nesting/roosting habitat and 3,303 acres of foraging habitat, for a total of 5,603 acres of suitable spotted owl habitat. An additional 1,628 acres have the potential of providing suitable spotted owl habitat. This LSR is presently 90% of its' potential capability.

The LSR boarders the Trinity Alps Wilderness to the West. The combined habitat within the LSR and the adjacent wilderness area enable this area to function as a larger refugia for multiple pairs of owls.

All of the Buckeye LSR has been surveyed for spotted owls over the years. The entire LSR was survey during the period of 1990 to 1992. Since then, portions of the LSR have been resurveyed to facilitate project activities. A total of 3 spotted owl activity centers occur within the boundaries of this LSR. Table 2.52 summarized suitable habitat within 0.7 and 1.3 mile home ranges. Nesting/roosting habitat (NR) is distinguished from foraging (F) habitat.

Table 2.52. LSR RC-337 - Acres of suitable spotted owl habitat within 0.7 and 1.3 mile home ranges

Activity Center	Habitat within 0.7 mile			Habitat within 1.3 mile		
	NR	F	Total	NR	F	Total
TR064	119	248	367	332	407	739
TR243	217	276	493	729	761	1490
TR250	221	346	567	400	789	1189

Estimated Owls. There are no additional spotted owl territories estimated to occur in Buckeye LSR.

Northern Spotted Owl Critical Habitat. Buckeye LSR overlaps almost entirely (98%) with critical habitat unit CA-12. This unit, in conjunction within two others form a line of one to two pairs CHUs running north to south along the east edge of the Trinity Alps Wilderness, each separated by approximately 2 miles. The area serves to protect the intervening checkerboarded habitat between eastern Trinity County and the Klamath National Forest. CA-11 and CA-12 are largely unchanged from their associated HCA, and are expected to provide habitat for 1 and 2 pairs, respectively.

Critical habitat unit CA-12 is about 3,756 acres. Included in the overlap assessment is the amount of spotted owl nesting/roosting and foraging habitat. Approximately 98% of the critical habitat unit overlaps with LSR. This Buckeye LSR was expanded to a total of 7,044 acres. There is no overlap with other served land allocations.

Buckeye LSR includes 3 spotted owl activity centers. This exceeds the spotted owl pair objective for the critical habitat unit. There are no additional spotted owl activity centers included in the "matrix-portion" of critical habitat.

In conclusion, Buckeye LSR performs the intended function of CA-12. It functions to provide habitat for two pairs of spotted owls and to protect intervening checkerboard habitat by providing a "stepping stone" in a north and south direction.

General Assessment of Habitat for late-successional-associated Species

Approximately 6,474 acres of the Buckeye LSR are capable of producing late-successional habitat. Currently, 1,905 acres or 29% of capable, are forested by late-successional habitat. A relatively large proportion of the LSR is cover by mid-successional habitat. The combined acres covered by late-successional and mid-successional forest are 5,846 acres, or 90% of capable. Relative to other "steppingstone" type LSR, Buckeye is high for both the proportion of late-successional habitat and combined mid-successional/late-successional habitat.

Distribution and Connectivity of Habitat

There are numerous small stands of late-successional forest in the Buckeye LSR. The stands that do occur are scattered across the federal portions of the LSR. There is a preponderance of mid-successional stands adjacent to most of the late-successional. Stands of relatively dense mid-successional habitat are much like the late-successional stands and scattered across the federal ownership. This combination of late-successional and mid-successional stands do provide for connectivity both within the LSR and to adjacent LSRs.

Other Resources

Livestock grazing occurred in this area as early as the mid to late 1800s. As with most of the Forest, permitted sheep grazing was terminated in this area in the early 1900's. Grazing occurred in RC-337 from around 1912 through most of 1950s within the Buckeye Allotment. Grazing within the Buckeye Allotment terminated in 1955. The southern portion of the LSR was within an historical range allotment, the Swift Creek Allotment. The permit for this allotment was terminated in mid 1940's. To the west of the LSR lies the Battle Canyon Allotment. The Battle Canyon Allotment was active under temporary use permit until 1995.

Late-Successional Reserve RC-338 Eagle

Introduction

The Eagle LSR is entirely within the boundaries of the Shasta-Trinity National Forest. It is another one of the "stepping stone" LSRs located on the west side along the upper Trinity River. It originates at Trinity Center to the south and extends north to Horse Flat. This LSR abuts the Trinity Alps Wilderness to the west. It is approximately 5 miles in length and is approximately 3.5 miles wide at it's widest point. Adjacent LSRs include Buckeye (RC-337) 2 miles to the south, Graves (RC-339) 2 miles to the northeast, and Scott Mountain 4 miles to the north. This small LSR contains 5,259 acres of land with 3,832 acres in NFS lands and 1,427 in private ownership. The system of roads within the LSR provides access to 2 major trailheads leading into the Trinity Alps, the Stoddard Lake and Eagle Creek trails. State Highway 3 forms the

eastern border of RC-338. Elevation varies from 2,720 feet along the Trinity River to approximately 5,331 feet along the wilderness boundary.

The LSR has its origins as an HCA under the ISC's strategy. Its primary intent was to provide connectivity to HCAs to the north and/or south. Its future expected spotted owl pairs, adjusted for demographic and environmental uncertainty was no pairs (Thomas et. al. 1990). Table 2.54 lists the current condition by acres within the LSR.

Table 2.54. LSR RC-338 Eagle - General Status	
Total Acres (Shasta-Trinity NF)	3,832
Acres Capable of Supporting Late-Successional Habitat	3,684
Acres Currently Supporting Late-Successional Habitat	699
Percent of LSR subject to Lethal Affects	42.4%
Acres of Early-Successional Habitat	254
Acres in Riparian	965
Suitable Owl Habitat as a Percent of Owl Capable Habitat	93%
Miles of Road	24.8
Road Density	4.1
Private Land	1,427

Vegetative Condition

Table 2.55 highlights the general vegetative conditions for the Eagle LSR. Late-successional and mid-successional conditions account for 93.1% of the capable land base. Plantations account for approximately 1% of the capable land base with all of them less than 20 years of age.

Table 2.55. LSR RC-338 - Vegetative Condition	
Vegetative Condition	**Acres**
Late-successional/Open	134
Late-successional/Dense	565
Mid-successional/Open	1,722
Mid-successional/Dense	1,010
Early-successional/Pole	211
Early-successional/Sapling, Seedling	43
Other	148
Total	3,832

Eagle LSR is dominated by Douglas fir which accounts for 34% followed by mixed conifer (32%), ponderosa pine (26%) and white fir (6%). Black oak, chinquapin and shrubform tanoak are the major understory species.

Insects and Disease

Since 1993, observation flights have observed mortality at normal endemic levels during the years 1993-1995.

Vegetative Sustainability Discussion

Late-successional habitat within this LSR is currently 20% of capable land. Much of the mid-successional stands are a result of wild fires of the mid to late 1880s. There are numerous dense early and mid-successional stands, and poor stand development towards late-successional conditions is apparent in some parts of the LSR. Mid-successional stands currently account for 73% of the capable land base and early-successional pole and seedling/sapling account for an additional 7%. The protection and management of these stands is critical to the future development of late-successional habitat. Stocking control will be essential to the development of future late-successional habitat.

Fire and Fuels

The area generally has a good distribution of mixed conifer, Douglas-fir and ponderosa pine. The primary fuel model identified for this LSR is Fuel Model 6, 48% of the area. This is followed by Fuel Model 9 which accounts for another 26% of the LSR. Fuel Model 6 is characterized by sparsely stocked conifer stands containing large amounts of low level shrubs. These stands are a concern if the brush is old and decadent resulting in high dead to live ratios. Fire intensities are high in these situations. Fuel Model 9 is characterized by closed canopy conifer stands with densely stocked pole size trees in the understory. Typically, these stands contain pockets of dead and down woody fuels. These fuels create high fire intensities during ground fires that can easily spread through the understory to the crowns of the dominant conifers.

This fire risk for the Eagle LSR has been rated as Moderate-High/Moderate. There are many pockets of high hazard within this LSR to warrant a rating above moderate. Several large human caused fires have occurred historically. There have been 26 recorded fires since 1910. Fifty percent of the fires have been human cause. Approximately 1/3 of the LSR has been influenced by human caused or natural fires. Large fires of moderate to high intensity have occurred to the east of the LSR with the most recent being in the Doe Fire in 1987.

The primary concern for potential effects and fire behavior are that adjacent private lands. The area is checkerboard ownership with high levels of harvest occurring over the past several years. Fuels have been allowed to accumulate, increasing the fire hazard. When considering the surrounding area of high fuel accumulation from activity fuels, the fire behavior potential can change dramatically. Flame lengths would be at a point to where aircraft and equipment would be needed. This increase in fuels significantly increases the probability of a stand replacement fire.

Table 2.56 illustrates the FOFEM projected mortality in terms of high (>70%), medium (25% to 70%) and low (<25%).

Table 2.56. LSR RC-338 - Percent mortality by mortality rating (Percent of LSR)

Mortality Rating		
High	**Medium**	**Low**
42.4%	30%	27%

Terrestrial Species Status

Federally Listed Endangered, Threatened or Proposed Species. The only Federally listed species known to occur within this LSR is the Northern Spotted Owl (see below).

Forest Service Sensitive Species. Habitat exist for a number of Forest Service Sensitive species including fisher, goshawk, northern red-legged frog and northwestern pond turtle. Fisher have been monitored in this area as part of a large scale 7 year research project conducted through cooperative agreement with Humboldt State University.

There are a number of known and suspected Forest Service Sensitive plant species within the Eagle LSR. Table 2.57 summarizes the species occurrence and general habitat requisites.

Table 2.57. LSR RC-338 - Forest Service Sensitive Plants

Species	Known (K) or Suspected (S)	Habitat
Botrychium pinnatum Northwestern moonwort	S	Fields, shrubby slopes, may be near stream or spring; +/- 6,000
Chaenactis suffrutescens Shasta chaenactis	K	Rocky slopes, cobbly river terraces; on ultramafic soils or glacial till w/ ultramafics included. 2600-6900 feet.
Epilobium oreganum Oregon willow herb	S	Wet, gently sloping stream banks, meadows, and bogs, generally on ultramafic soil. 500-7800 feet elev.
Erythronium citrinum var. *roderickii* Scott Mountain fawn lily	K	Mixed conifer forest on ultramafic or granitic soils. 900-4000 feet elev.
Ivesia pickeringii Pickering's ivesia	K	Ephemeral drainages and seasonally wet grassy slopes in mixed conifer forest, on ultramafic soils. 2500-4500 feet elev.
Lewisia cotyledon var. *herkneri*	S	Shaded rock faces and outcrops, often near streams. 1000-8000 feet elev.
Lewisia cotyledon var. *howellii* Howell's lewisia	S	Rock outcrops in chaparral, oak, or conifer forest. 500-4500 feet elev.
Minuartia stolonifera Scott Mountain sandwort	S	Rocky slopes on ultramafic soils, montane mixed conifer forest. 4100-5300 feet elev.
Ophioglossum pusillum Northern adder's- tongue fern	S	Meadows, marshes, moist forests 1000 feet elev.
Penstenom filiforms Thread-leaf beardtongue	K	Rocky opening in lower montane conifer forest on ultramafic soils. 2000-6000 feet elev.
Sedum paradisum Canyon Creek stonecrop	S	Rock outcrops in forest or woodland openings 960-6500 feet elev.

Survey and Manage Species. Botanical surveyed over the past few years have not confirmed any of the survey and manage plant species. No surveys for fungi, lichens, or bryophytes have taken place to date. Surveys for Del Norte Salamander are scheduled for fiscal year 1999. This area does lie within a 25 mile radius of the last verified Del Norte Salamander site.

Northern Spotted Owl

The Eagle LSR is the second of three "steppingstone" LSRs. It provides approximately 651 acres of nesting/roosting habitat and 2,692 acres of foraging habitat for a total of 3,343 acres of spotted owl habitat. An additional 254 acres have the potential to provide spotted owl habitat. The LSR is presently 93% of capable.

All of the Eagle LSR has been surveyed for spotted owls over the years. The entire LSR was surveyed during the period of 1989 to 1992. Since then, additional surveys have occurred but not on a annual basis. Two spotted owl activity centers have been identified within the boundaries of the LSR. Table 2.58 summarizes suitable habitat within 0.7 and 1.3 mile home ranges. Nesting/roosting (N/R) is distinguished from foraging (F) habitat.

Table 2.58. LSR RC-338 - Acres of suitable Spotted Owl habitat within 0.7 and 1.3 mile home ranges

Activity Center	Habitat within 0.7 mile			Habitat within 1.3 mile		
	N/R	F	Total	N/R	F	Total
TR302	198	339	537	407	983	1390
TR358	120	375	495	271	823	1094

Estimated Owls. There are no additional spotted owl territories known or thought to exist in the Eagle LSR.

Northern Spotted Owl Critical Habitat. Eagle LSR overlaps almost entirely with critical habitat unit CA-11. This unit is the second of three "stepping stone" identified as critical habitat in this area. The objectives for this CHU were threefold. The first was to protect the intervening checkerboard habitat between eastern Trinity County and the Klamath National Forest. They were established to provide connectivity and dispersal in a north-south direction. This CHU was expected to provide habitat for a single pair owls. Included in the designation was the acknowledgment of discontinuous habitat conditions presented by the intermingled private and federal ownership of land.

Critical habitat unit CA-11 contains approximately 3,096 acres. Table 2.59 summarizes the overlap of CA-11 with the Eagle LSR and other land allocations. Included in the overlap assessment is the amount of spotted owl nesting/roosting and foraging habitat. Approximately 94% of the critical habitat unit overlaps with the LSR with an additional 5% in other reserves, primarily riparian reserves within the CHU.

Table 2.59. LSR RC-338 - Acres of spotted owl habitat within CA-11 overlaid with the Eagle LSR and other Forest land allocations

Land Allocation	Nesting/Roosting Habitat Acres	Foraging Habitat Acres	Other	Total
LSR	580	1,961	456	2,997
Other Reserves	47	39	86	172
Matrix	0	6	8	14

Eagle LSR includes only two activity centers. This exceeds the spotted owl objective of only a single spotted owl pair. There are no additional spotted owl activity centers included in the "matrix-portion" of critical habitat.

In conclusion, Eagle LSR performs the intended function of CA-11. It functions extend protected habitat northward, it provides for connectivity and dispersal, and provides habitat to at least a single pair of spotted owls.

General Assessment of Habitat for Late-successional-associated Species

Approximately 3,684 acres of Eagle LSR are capable of producing LS/OG habitat. Currently, 699 acres or 20% of capable are vegetated in LS/OG habitat. This is representative on many of the smaller LSRs across the Forest. A large portion of the LSR is vegetated in mid-successional habitat, or 73.1% of capable. The combined acres vegetated in LS/OG and mid-successional forest are 3,431, or 93.1% of capable. Relative to other small LSR on the Forest, Eagle LSR, has low amount of LS/OG habitat and a high amount of combined mid-successional/LS/OG habitat.

Distribution and Connectivity of Habitat

There are few stands of LS/OG forest in the Eagle LSR. These few stands of LS/OG forest that occur are located in the northern portion of the LSR. Overall, the distribution of LS/OG habitat throughout the LSR is poor. Dense, mid-successional habitat are scattered in larger stands through the LSR, usually adjacent to or intermingling with the LS/OG habitat.

Livestock grazing occurred in this area as early as the mid to late 1800s. As with most of the Forest, permitted sheep grazing was terminated in this area in the early 1900s.

Late-Successional Reserve RC-339 Graves

Introduction

The Graves LSR is entirely within the boundaries of the Shasta-Trinity National Forests. It is another relatively small 2,588 acre "steppingstone" LSR paralleling the Trinity River to the east. It is approximately 4 miles in length and approximately 2.5 miles in width. It lies primarily within the Grave Creek drainage. Within the boundaries of the LSR, 1,193 acres are in private ownership and another 17 acres of nonforested land. The ownership pattern is the typical older railroad checkerboard pattern. Adjacent LSRs include the Scott Mountain LSR (RC-340) directly to the north and the Eagle Creek LSR 1 mile to the southwest. Elevations ranges from 3,100 feet along the Trinity River to 5,800 feet at the upper reaches of Graves Creek. The terrain is steep and is dissected by sharp ridges and streams.

Table 2.60. LSR RC-339 Graves - General Status

Total Acres (Shasta-Trinity NF)	2,588
Acres Capable of Supporting Late-successional Habitat	2,571
Acres Currently Supporting Late-successional Habitat	0
Percent of LSR Subject to Lethal Affects	44%

Table 2.60. LSR RC-339 Graves - General Status	
Acres of Early-Successional Habitat	242
Acres of Riparian Reserves	601
Suitable Owl Habitat as a Percent of Capable	91%
Miles of Road	9.3
Road Density	2.3
Private Land	1,193

The LSR has its origins as an HCA under the ISC's strategy. Its primary intent is similar to that of the Eagle and Buckeye LSRs, to serve to protect the intervening checkerboard habitat between eastern Trinity County and the Klamath National Forest, to provide for connectivity and dispersal in a north/south direction and, too provide for one owl pair. Table 2.60 lists the current condition by acreage within the LSR.

Vegetative Condition

Table 2.61 highlights the general vegetative condition for the Graves LSR. Late-successional and mid-successional conditions account for 90.5% of the capable land base. Plantations account for 9% of the capable land base. All plantations are less than 20 years of age.

Table 2.61. LSR RC-339 - Vegetative Condition	
Vegetative Condition	**Acres**
Late-successional/Open	0
Late-successional/Dense	0
Mid-successional/Open	940
Mid-successional/Dense	1388
Early-successional/Pole	1
Early-successional/Sapling, seedling	242
Other	17
Total	2,588

The LSR is dominated by ponderosa pine which accounts for 53% (1,369 acres) of the coniferous vegetation with lesser amounts of mixed conifer (24%) and Douglas fir (14%). Understory vegetation is dominated by shrubform tanoak and manzanita.

Insect and Disease

Since 1993, observation flights have observed mortality during the years 1993-1995. The level of mortality observed does not appear to be exceeding normal endemic level.

Vegetative Sustainability Discussion

Late-successional habitat is currently low within this LSR. Historic fire occurrence has had extensive impact. It appears that natural establishment of late-successional habitat has been slow to develop within the LSR. The preponderance of dense mid-successional stands may be a

contributing factor to the slow development of late-successional habitat. Mid-successional stands account for 91% of the capable land base and early-successional pole and sapling/seedling account for only 9%. The protection and management of these stands is critical to the future development of late-successional habitat.

Fire and Fuels

This area is generally dominated by ponderosa pine. The primary fuel models identified for this LSR are Fuel Model 9 (54% of the area) and Fuel Model 6 (35% of the area). Fuel Model 9 is characterized by closed canopy conifer stands with densely stocked pole size trees in the understory. Typically these stands contain pockets of dead and down woody fuels. These fuels create high fire intensities during ground fires that can easily spread through the understory to the crowns of the dominant conifers. Fuel Model 6 can be characterized as sparsely stocked conifers containing large amounts of low level shrubs. These stands area a concern if the brush is old and decadent resulting in high dead to live ratios. Fire intensities are high in these conditions.

The hazard/risk assessment has defined Graves LSR as Moderate-High/High. There are many pockets of high hazard within this LSR to warrant a rating above moderate. Several large human caused fires have occurred with this LSR. Approximately 56% of the LSR has been influenced by fire, most during a 1981 fire occurring in the northern portion of the LSR . There have been 18 fire starts recorded in 1910 of which 83% have been lightning caused and the remaining 17% human caused.

A primary concern for potential fire effects and fire behavior that were not part of this analysis are the adjacent private lands. The area is checkerboard ownership with high levels of harvest occurring over the past several years. Fuels have been allowed to accumulate, increasing the fire hazard. When considering the surrounding area of high fuel accumulations from the activity fuels, the fire behavior potential can change dramatically. Flame lengths would be at a point to where aircraft and equipment would be needed. This increase in fuels significantly increases the probability of a stand replacing fire.

Table 2.62 illustrates the FOFEM projected mortality in terms of high (>70%), medium (25% to 70%) and low (<25%).

Table 2.62. LSR RC-339 - Percent mortality by mortality rating (Percent of LSR)		
Mortality Rating		
High	**Medium**	**Low**
44%	24%	31%

Terrestrial Species Status

Federally Listed Endangered, Threatened or Proposed. The NSO is the only listed terrestrial species know to occupy the Graves LSR (See NSO below).

Forest Service Sensitive Species. Habitat exists for a number of Forest Service animal and plant sensitive species. Terrestrial animal species include fisher, goshawk, and northern red-legged

frog. Fisher have been monitored within the Graves LSR as part of a larger 7 years project being conducted via cooperative agreement between the Forest Service and Humboldt State University.

Table 2.63 illustrates the species known or suspected to occur within the Graves LSR.

Table 2.63. LSR RC-339 - Forest Service Sensitive Plants		
Species	**Known (K) or Suspected (S)**	**Habitat**
Balsamorhiza hookeri var *lanata* Woolly balsamroot	S	Dry, open woodlands and grassy foothills on rocky soil under oak' pine, or possibly juniper; parent soil varies. Elev. 4000 to 5000 ft.
Chaenactis suffrutescens Shasta chaenactis	S	Rocky open slopes, cobbly river terraces; ultramafic soils or glacial till w/ ultramafics included. 2600 to 6900 ft. elev.
Epilobiom oreganum Oregon willow herb	S	Wet, gently sloping stream banks, meadows, and bogs, generally on ultramafic soil. 500 to 7800 ft. elev.
Erythronium citrinum var *roderickii* Scott Mountain fawn lily	S	Mixed conifer forest on ultramafic or granitic soils. 900-4000 ft. elev.
Ivesia pickeringii Pickering's ivesia	S	Ephemeral drainages and seasonally wet grassy slope in mixed conifer forest on ultramafic soils. 2500-4500 ft. elev.
Lewisia cotyledon var. *heckneri*	S	Shaded rock faces and outcrops, often near streams. 1000-8000 ft. elev.
Lewisia cotyledon var. *howellii* Howell's lewisia	S	Rock outcrops in chaparral, oak, and conifer forest. 500-4500 ft. elev.
Penstemon filiformis Thread-leaf beardtongue	S	Rocky openings in lower montane conifer forest on ultramafic soils. 2000-6000 ft. elev.
Phacelia leonis Siskiyou phacelia	S	Rocky to sandy openings in montane mixed conifer forests, often on ultramafics. 3900-6500
Raillardella pringlei Showy railardella	S	Wet ultramafic meadows, seeps and streambanks. 4000-7500 ft. elev.
Sedum paradisum Canyon Creek stonecrop	S	Rock outcrops in forest or woodland openings. 960-6500 ft. elev.
Smilex jamesii English Peak greenbriar	S	Shaded riparian habitat above 4000 ft.
Trillium ovatum ssp. *oettingeri* Salmon Mountains wakerobin	S	Shaded riparian forest with white fir or red fir 4000-6400 ft. elev.
Ophioglossum pusillum Northern adder's-tongue fern	S	Meadows, marshes, moist forests. 1000 ft elev.

Survey and Manage Species. No surveys for survey and manage species have occurred within this LSR. Subsequently, there are no known locations identified within its boundaries. The Graves LSR does lie within a 25 miles radius of the last known location of the Del Norte Salamander.

Northern Spotted Owl

This LSR originated as a Habitat Conservation Area under the ISC's spotted owl management strategy. It was intended to provide for 1 pair of spotted owl in the future, that figure adjusted for demographic and environmental uncertainty.

Currently, the LSR provides approximately 90 acres of nesting/roosting habitat and 2,238 acres of foraging habitat, for a total of 2,328 acres of spotted owl habitat. Another 243 acres have the potential of providing habitat in the future. This LSR is presently at 91% of capable.

There is one spotted owl activity center located within the boundary of the LSR. Table 2.64 list acres of suitable owl habitat within 0.7 and 1.3 mile home ranges. Nesting/roosting (N/R) habitat is distinguished from foraging (F) habitat. The 1.3 mile home range does extend beyond the boundary of the LSR.

Table 2.64. LSR RC-339 - Acres of suitable Spotted Owl habitat with 0.7 and 1.3 mile home ranges

Activity Center	Habitat within 0.7 mile			Habitat within 1.3 mile		
	N/R	F	Total	N/R	F	Total
TR062	13	459	472	24	1063	1087

Estimated Owls. There are no additional spotted owl territories known or thought to exist in Graves LSR.

Northern Spotted Owl Critical Habitat. Graves LSR overlaps entirely with critical habitat unit CA-10. Much of CA-10 also overlaps with the south portion of the Scott Mountain LSR, one mile to the north of Graves LSR. Graves is the last of 3 "stepping stone" critical habitat units having the intent of protecting intervening checkerboard habitat between Trinity County and the Klamath National Forest. In addition, CA-10 was augmented to protect two additional owl sites (now in Scott Mountain LSR) with CA-10 expected to protect 3 owl pairs.

Given the complete overlap with CA-10 and much of the remainder overlapped with Scott Mountain LSR, the intent of the critical habitat unit is met. This LSR in combination with Scott Mountain LSR meet the spotted owl pair objective.

Table 2.65. LSR RC-339 - Acres of Spotted Owl habitat within CA-10 overlaid with the Graves LSR and other Forest land allocations

Land Allocation	Nesting/Roosting Habitat Acres	Foraging Habitat Acres	Other	Total
LSR	339	4,672	1,323	6,334
Other Reserves	252	831	156	1,239
Matrix	3	651	16	670

General Assessment of Habitat for Late-successional-associated Species

Approximately 2,571 acres of the Graves LSR are capable of producing late-successional habitat. Currently, there is no late-successional habitat (as defined by LRMP data) within the LSR. The

combined acres of late-successional and mid-successional forest are 2,328 acres or 90.5% of capable.

Distribution and Connectivity of Habitat

There are no stands of late-successional within the LSR. Dense mid-successional habitat is well distributed through the LSR and are providing connectivity to late-successional habitat out the LSR boundaries.

This LSR will, in the future, provide for a relatively small area of late-successional habitat. Probably its most important value for late-successional-associated species is as a "stepping stone" for north-south dispersal. This area is checkerboard in nature and will have limited value in providing any sizeable stand(s) of late-successional habitat. If will provide habitat for at least 1 spotted owl pairs and other late-successional associated species.

Other Resources

Livestock grazing occurred in this area as early as the mid to late 1800's. As with most of the Forest, permitted sheep grazing was terminated in this area in the early 1900's. There are no allotments present existing within RC-339.

Late-Successional Reserve RC-340 Scott Mountain

Introduction

The Scott Mountain LSR is shared with the Klamath National Forest. The Shasta-Trinity National Forests agreed to take the lead with RC-340 because a preponderance of the acreage lies within the Shasta-Trinity National Forest boundary. RC-340 is a moderate size LSR containing approximately 38,814 total acres. It's orientation is predominately in a north-south direction running from Tangleblue Creek in the south to the South Fork of Willow Creek in the north. It is approximately 16 miles in length and 5 miles in width. Of the 38,814 acres, 13,176 acres are in private ownership and 3,616 acres are on the Klamath National Forest. This LSR is dominated by checkerboard ownership with Sierra Pacific Industries being the primary private land owner. Adjacent LSRs include Graves (RC-339) 1 mile to the southeast, Eagle (RC-338) 4 miles to the south and, Eddy (RC-341) 3 miles due east. The southern portion of the LSR is connected to the Trinity Alps Wilderness areas which includes an extensive amount of higher elevation late-successional. As one moves north from Scott Mountain, coniferous forests fades into Scott Valley 4 miles to the west and Shasta Valley to the north. The eastern boundary parallels the Upper Trinity River and County Rd. 17, part of the Trinity Heritage Scenic Byway. Elevation varies from 3,220 feet along the Trinity River to 8,500 feet China Mountain along the northwestern boundary of the LSR. Table 2.66 illustrates the status for the Scott Mountain LSR.

Table 2.66. LSR RC-340 Scott Mountain - General Status	
Total Acres (Shasta-Trinity NF and Klamath NF)	25,638
Acres Capable of Supporting Late-successional Habitat	22,702
Acres Currently Supporting Late-successional Habitat	1,715

Table 2.66. LSR RC-340 Scott Mountain - General Status	
Percent of LSR Subject to Lethal Affects	53.2%
Acres of Early-Successional Habitat	1,243
Acres of Riparian Reserve	5,187
Suitable Owl Habitat as a percent of Capable	90%
Total Miles of Roads	72.2
Road Density	2.1
Private Land	13,176

Vegetative Condition

Table 2.67 highlights the general vegetative condition for the Scott Mountain LSR. Late-successional and mid-successional conditions accounts for 94.5% of the capable land base. Plantations account for approximately 4% of the capable land base.

Table 2.67. LSR RC-340 - Vegetative Condition	
Vegetative Condition	**Acres**
Late-successional/Open	970
Late-successional/Dense	745
Mid-successional/Open	10,608
Mid-successional/Dense	8,392
Early-successional/Pole	991
Early-successional/Sapling, seedling	996
Other	807
Total	23,509

This LSR tends to be at higher elevation and is highly influenced by ultramafic soils. It is dominated by ponderosa/Jeffrey pine which accounts for 39% of the coniferous vegetation with lesser amounts of red fir (20%) and white fir (15%). Mixed conifer accounts for approximately 14%. Manzanita (sp.) and ceanothus (sp) are the dominate understory species. The remainder of the land base is comprised of non-commercial/other.

Vegetative Sustainability Discussion

This LSR is currently lacking in the amount of late-successional habitat, 7.5% of the capable land base. In the past this LSR has had minor amounts of regeneration harvest, 4% in plantations, and extensive management of mid-successional stands through thinning, selection, and salvage harvests. There is a large proportion of the capable ground in mid-successional habitat, 87%. The slow development of late-successional habitat can partially be attributed to the slow growing conditions (Dunning site class 4, 5 and 6) found on the higher elevation sites and poorer growing ultramafic soils within the LSR, and true fir stands located at higher elevations take a longer time to transition from the early-successional stage.

Fire and Fuels

Mixed conifer, white fir, and red fir represents the majority of the area. Much of the area has varying amounts of undergrowth and moderate levels of ground fuels. This LSR is dominated by Fuel Model 6 which is characterized by sparsely stocked conifers containing large amounts of low level shrubs (less than 6 feet). These stands are a concern if the brush is old and decadent resulting in high dead to live ratio. Fire intensities are high in these situations. Fuel Model 9 is playing a significant role in the Scott Mountain LSR. This Fuel Model is characterized by closed canopy conifer stands with densely stocked pole size trees in the understory. Typically these stands contain pockets of dead and down woody fuels. These fuels create high fire intensities during ground fires that can easily spread through the understory to the crowns of the dominant conifers.

The fire hazard/risk rating is moderate/moderate. The private land is a concern and these areas could be considered High/Moderate and a threat to NFS lands. Lightning caused fires are high in this LSR There have been in excess of 104 fires within the LSR with 78% of those starts cause by lightning with the remaining 22% caused by human activities. Records dating back to 1910 show that only a small portion (less than 2%) of the LSR has been influenced by fire. This along with general fire suppression practices has lead to local fuel build-up, increasing the potential for fire intensities to exceed expected levels. A primary concern for potential effects and fire behavior are the adjacent private lands. The area is checkerboard ownership with relatively high levels of harvesting occurring over the past several years. Fuels have been allowed in accumulate increasing the fire hazard. When considering the surrounding area of high fuel accumulation from the activity fuels, the fire behavior potential can change dramatically.

Table 2.68 illustrates the FOFEM projected mortality in terms of high (>70%), medium (25% to 70%) and low (<25%).

Table 2.68. LSR RC-340 - Percent mortality by mortality rating (Percent of LSR)		
Mortality Rating		
High	**Medium**	**Low**
53.2%	7.3%	2.4%

Terrestrial Species Status

Federally Listed Endangered, Threatened or Proposed Species. There is only one Federally listed or proposed species known to occur with the Scott Mountain LSR, the threatened northern spotted owl (see below).

Forest Service Sensitive Species. There is habitat for a number of Forest Service sensitive species which includes northern red-legged frog, willow flycatcher, goshawk, marten and fisher. This area served as the northern end of a 7 year fisher study through cooperative agreement between the Shasta-Trinity National Forests and Humboldt State University. This LSR are was established as part of the Forest habitat network and home range connectivity for both marten, at the higher elevation and fisher at the lower elevations. This area was necessary to provide linkage with the Klamath National Forest and the Salmon-Trinity Alps Wilderness Area.

Botanical surveys have been conducted in this LSR for many years. Table 2.69 illustrates the sensitive plant species suspected or known to occur with Scott Mountain LSR. Most of the sensitive plant species are local endemics associated with ultramafic soils.

Table 2.69. LSR RC-340 - Forest Service Sensitive Plants

Species	Known (K) or Suspected (S)	Habitat
Arctostaphylos klamathenis Klamath manzanita	S	Rocky ultramafic or gabbro soils in upper montane and subalpine conifer forests, montane chaparral; 5700-6500 ft elev.
Botrychium pinnatum Northwestern moonwort	S	Field, shrubby slopes, may be near streams or springs; +/- 6000 ft. elev.
Campanula wilkinsiana Wilkin' harebell	S	Streambanks and springs in red fir and subalpine forests; 5500-8600 ft. elev.
Chaenactis suffrutescens Shasta chaenactis	S	Rocky open slopes, cobbly river terraces; on ultramafic soils or glacial till w/ ultramafic included. 2600-6900 ft. elev.
Cordylanthus tenuis ssp. *pallescens*	S	Lightly disturbed openings in ponderosa pine forest; gravelly volcanic or ultramafic soils. 3600-5200 ft. elev
Draba aureola Golden draba	S	Among rocks on ridges, fell-fields; subalpine forest; 7000-9000 ft elev.
Epilobium oreganum Oregon willowl herb	S	Wet, gently sloping stream banks, meadows, and bogs generally on ultramafic soil. 500-7800 ft. elev.
Epilobion siskiyouense Siskiyou fireweed	K	Exposed, rocky serpentine ridges and slopes; 5000-8000 ft elev.
Eriogonum alpinum Trinity buckwheat	K	Exposed rocky serpentine ridges and slopes; 5000-8000 ft. elev.
Eriogonum umbellatum ssp. *humistratum* Mt. Eddy buckwhear	S	Serpentine slopes and outcrops, mixed conifer to subalpine forests. 5700-9000 ft. elev.
Erythronium citrinum var *roderickii* Scott Mountain fawn lily	K	Mixed conifer forest on ultramafic or granitic soils. 900-4000 ft. elev.
Galium serpenticum ssp. *scotticum* Scott Mountain bedstraw	K	Talus slopes and rock outcrops of ultramafic rock. 5100-7600 ft. elev.
Lewisia cotyledon var. *heckneri*	S	Shaded rock faces and outcrops, often near streams. 1000-8000 ft. elev.
Minuartia stolonifera Scott Mountain sandwort	S	Rocky slopes on ultramafic soils; montane mixed conifer forest. 4100-5300 ft. elev.
Phacelia dalesiana Scott Mountain phacelia	K	Ultramafic soils in upper montane mixed conifer forest. 5300-7000 ft elev.
Phacelia greenei Scott Valley phacelia	K	Gravelly serpentinized slopes and forest openings 5000-7000 ft. elev.
Phacelia leonis Siskiyou phacelia	K	Rocky to sandy openings in montane mixed conifer forests, often on ultramafics. 3900-6500 ft. elev.
Potentilla cristae Klamath potentilla	K	Rocky slopes and basins; ultramafic of basic substrate. 7000-9000 ft. elev.
Raillardella pringlei Showy raillardella	K	Wet ultramafic meadows, seeps, and streambanks. 4000-7000 ft. elev.
Smilax jamesii English Peak greenbriar	S	Shaded riparian habitat above 4000 ft. elev.
Trillium ovatum ssp. *oettingeri* Salmon Mountain wakerobin	K	Shade riparian forest with white fir or red fir 4000-6000 ft. elev.

Survey and Manage Species. Botanical surveys over the past several years have confirmed the presence of one Survey and Manage species, *Cypridium fasciculatum*. This specimen was located in a meadow at Scott Mountain campground. This LSR does lie within 25 miles of the last known Del Norte salamander site.

Northern Spotted Owl

The Scott Mountain LSR provides approximately 2,278 acres of nesting/roosting habitat and 15,200 acres of foraging habitat for a total of 18,078 acres of spotted owl habitat. An additional 989 acres have the potential of provide spotted owl habitat in the future. This places the Scott Mountain LSR at 90% of capable.

All of the Scott Mountain LSR has be surveyed over the years. The entire LSR was survey during the period of 1989 to 1992. Since then, some surveys have occurred as a result of proposed projects. There are 5 known activity centers located within the boundary of this LSR. Table 2.70 summarizes acres of suitable habitat with the 0.7 and 1.3 mile home range.

Table 2.70. LSR RC-340 - Acres of suitable Spotted Owl habitat within 0.7 and 1.3 mile home ranges

Activity Center	Habitat within 0.7 mile			Habitat within 1.3 mile		
	N/R	F	Total	N/R	F	Total
SK227	166	462	628	517	1263	1780
SK471	50	285	335	165	645	810
TR061	3	421	424	107	800	907
TR063	249	199	448	248	367	615
3037*	521	149	670	866	1496	2362

* Klamath NF number

Estimated Owls. There are no additional known owl pairs in the Scott Mountain LSR . Habitat is limited due to the site potential. Much of the LSR is a lower growing site, not conducive to the development of suitable owl habitat within an reasonable time frame.

Northern Spotted Owl Critical Habitat. The Scott Mountain overlaps approximately 60% of the original critical habitat unit CA-8. The remainder of CA-8 is overlapped with LSR RC-341 Eddy with 3,370 acres in the matrix allocation. The original CA-8 had a northwest/southeast orientation. Scott Mountain is primarily north/south in orientation.

Critical habitat unit CA-8 is about 15,640 acres in size with little of it in private ownership. Scott Mountain is 23,509 acres in size with an additional 13,176 acres of private land within its boundary. Table 2.71 summarizes overlap of CA-8 with Scott Mountain LSR and other land allocations. Include in the overlap assessment is the amount of spotted owl nesting/roosting (N/R) and foraging (F) foraging habitat.

Table 2.71 lists the acres of spotted owl habitat within CA-8, overlaid with LSR and other Forest land allocations. "Other Reserves" refers to land allocations, such as wilderness or riparian

reserves, from which no scheduled timber harvest is planned. "Matrix" refers to land allocations from which scheduled timber harvest is planned.

Table 2.71. LSR RC-340 - Acres of spotted owl habitat within CA-8, overlaid with LSR RC-340 and other Forest land allocations

Land Allocation	Nesting Roosting Habitat Acres	Foraging Habitat Acres	Other	Total
LSR	1,240	7,951	2,298	11,489
Other Reserves	141	369	68	578
Matrix	197	2,854	523	3,574

The original intent of CA-8 was to tie together two single-pair HCAs and in doing so incorporate an additional spotted owl site. There were a total of three activity centers in this CHU. This area of relatively contiguous federal ownership provided a reasonable opportunity for a multiple-pair CHU in the subprovince and should be capable of supporting 4-5 pairs in the future. This area is important in maintaining habitat/owl distribution.

Table 2.72 lists the Spotted Owl pair goals in Critical Habitat compared with activity centers in Scott Mountain LSR RC-340 and Eddy LSR RC-341.

Table 2.72. LSR RC-340 - Spotted Owl pair goals in Critical Habitat (CHU) compared with activity centers in LSR RC-340

CHU	Spotted Owl Pair Goal	Known Activity Centers in Corresponding LSR
CA-8 CA-10	4-5 pairs 2 pairs	5 known activity centers within the boundary of Scott Mountain LSR

The matrix portion of CA-8 contains no additional spotted owls. Known activity centers in CA-8 are presently being protected in Scott Mountain or Eddy LSRs. Scott Mountain joins suitable spotted owl habitat within the Trinity Alps Wilderness, in the south, northward and to the east towards the southern Cascades area or "Shasta/McCloud Area of Concern."

In conclusion, Scott Mountain LSR, Trinity Alps, and other adjacent "reserved" land allocations are performing the intended function of CA-8. The LSR has a different orientation including a large number of private parcels in "checker board" ownership pattern with National Forest lands, management of which can enhance or detract from the functionality of this area.

General Assessment of Habitat for Late-successional-associated Species

Approximately 22,702 acres of this LSR are capable of producing late-successional habitat. Currently, 1,715 acres or 7.5% of capable, are vegetated in late-successional habitat. The combined acreage vegetated by late-successional and mid-successional forest are 20,715 acres, or 94.5% of capable. Relative to other LSRs, Scott Mountain has a relatively low amount of existing late-successional but a relatively high of amount of combined mid-successional/late-successional forested habitat.

Note: *Scott Mountain LSR was designated as an LSR to function as a north/south linkage between LSRs.*

Distribution and Connectivity of Habitat

Scott Mountain LSR has few large or contiguous blocks of late-successional habitat. However, there is a significant amount of mid-successional habitat in large blocks in the northern portion of the LSR. Much of the central and southern portion of the LSR lies in a checkerboard ownership, where regeneration has occurred more extensively than on Federal lands. The extensive area covered by mid-successional forests makes this area highly beneficial as a dispersal corridor.

This LSR is connected to the Trinity Alps Wilderness leading to large contiguous, unsurvey stands of late-successional. This LSR, as noted early, is unique in that it tends to be high elevation on ultramafic soils. As a result of these to factors, what has been defined as mid-successional habitat may indeed have the characteristics and be functioning as late-successional habitat.

Late-Successional Reserve RC-341 Eddy

Introduction

The Eddy LSR is entirely within the boundaries of the Shasta-Trinity National Forests. It is a small LSR, 2,723 acres, established around a single pair of NSO. It's original intent was to provide habitat for a single known pair plus provide for owls moving across the landscape. It is "sandwiched" between Eddy Creek to the north and Dole Creek to the south. It is approximately 2 miles in length and 2 miles in width Adjacent LSRs include Scott Mountain (RC-340) 3 miles to the west, Deer (RC-342) 4 miles to the southeast and, Wagon (RC-362) approximately 11 miles to the east. There is a small parcel of private land located at the northwestern portion of the LSR. Elevation varies from 4,500 feet along Eddy Creek to approximately 6,128 feet at the southwestern edge of the LSR.

Like most LSRs on the Forest, Eddy originated as a Habitat Conservation Area under the ISC's spotted owl management strategy. It was identified as an area of important late-successional habitat during the late-successional mapping effort (Johnson et. al. 1991). Table 2.73 summarizes the status for LSR RC-341.

Table 2.73. LSR RC-341 Eddy - General Status	
Total Acres (Shasta-Trinity NF)	2,723
Acres Capable of Supporting Late-Successional Habitat	2,701
Acres Currently Supporting Late-Successional Habitat	0
Percent of LSR Subject to Lethal Affects	96%
Acres of Early-Successional Habitat	184
Acres of Riparian Reserves	212
Suitable Owl Habitat as a Percent of Capable Owl Habitat	93%
Miles of Road	11.9
Road Density	2.8
Private Land	13

Vegetative Condition

Table 2.74 highlights the general vegetative condition for the Eddy LSR. There is no Late-successional conditions, as defined by LRMP 93 data) in the LSR. Mid-successional conditions account for 93% of the capable land base. Plantations account for 0% of the capable land base.

Table 2.74. LSR RC-341 - Vegetative Condition	
Vegetative Condition	**Acres**
Late-successional/Open	0
Late-successional/Dense	0
Mid-successional/Open	914
Mid-successional/Dense	1603
Early-successional/Pole	180
Early-successional/Sapling, Seedling	4
Other	22
Total	**2,723**

This LSR is dominated by true fir and ponderosa/Jeffrey pine. White fir accounts for 33% of the coniferous acres and red fir accounts for another 20%. Ponderosa/Jeffrey pine accounts for approximately 19% while mixed conifer is represented by 28%. Other vegetative type and non-commercial-other accounts for a minor portion of the LSR, less than 1%.

There are no plantations in this LSR. Most of RC-341 is in size class 3 (S, P, N, G) stands. Past management practices have included some sanitation and selection treatments and fire suppression. All of the late-successional habitat lies in the white fir vegetation type.

Vegetative Sustainability Discussion

This is currently no late-successional habitat identified within the LSR. The current forest condition is primarily a result of wildfire events that occurred over 100 years ago, and forest protection measures, such as fire suppression that have occurred since. Management of early and mid-successional stands are key to reducing the risk of loss of future habitat in this LSR. Our analysis identified this area as a high risk to almost 100% stand replacement in the event of wildfire.

Fire and Fuels

The Eddy LSR has a fairly even representation of 4 vegetation type, those being white fir, mixed conifer, red fir and ponderosa/Jeffrey pine. Conditions are such that this vegetative mosaic is dominated by two fuel models, FM 6 and FM 9. Thirty-four percent of the LSR is described as fuel model 6 while 59% of the LSR is described as fuel model 9. Fuel model 6 can be characterized as sparsely stocked conifer stands containing large amounts of low level shrubs (less than 6 feet high). These stands are a concern if the brush is old and decadent resulting in high dead to live ratios. Fire intensities are high in these situations. Fuel model 9 is characterized by closed canopy conifer stands with densely stocked pole size trees in the understory. Typically these stands contain pockets of dead and down woody fuels. These fuels create high fire

intensities during ground fires that can easily spread through the understory to the crowns of the dominant conifers. The LSR is primarily a rugged, rounded ridgeline separating to drainages. Much of it is accessible by roads.

Eddy LSR has been identified as having a Hazard/Risk rating of high. There has historically been a very low occurrence of fire within this LSR. There have been only 5 fire starts recorded since 1910. However, in 1939 a relatively large conflagration (17,410 acres) affected much of the LSR and adjacent habitat. Of the 5 fires recorded, 60% were a result of lightning and 40% were human caused.

Generally, conditions outside the LSR poses a moderate to high threat from wildfire with the most potential from the private lands to the east.

Table 2.75 illustrates the FOFEM projected mortality in terms of high (>70%), medium (25%-70%) and low (<25%).

Table 2.75 LSR RC-341 - Percent mortality by mortality rating (Percent of LSR)		
Mortality Rating		
High	**Medium**	**Low**
96%	3%	0%

Terrestrial Species Status

Federally Endangered, Threatened and Proposed Species. There is only one Federally listed species known to occur within LSR RC-341, the NSO. In addition, the Eddy LSR is considered as NSO designated critical habitat.

Forest Service Sensitive Species. Habitat exist for a number of Forest Service sensitive animal species to include fisher, marten, northern goshawk, and northern red-legged frog. Although no species plant species are known to occur, there are a number of sensitive plant species suspected of being within the Eddy LSR. Table 2.76 summarizes known and suspected plant species and their habitat.

Table 2.76. LSR RC-341 - Forest Service Sensitive Plants

Species Name	Known (K) or Suspected (S)	Habitat
Arctostaphylos klamathensis Klamath manzanita	S	Rocky ultramafic or gabbro soils in upper montane and subalpine conifer forests. 5700 - 6500 ft. elev.
Campanula wilkinsiana Wilkins' harebell	S	Streambanks and springs in red fir and subalpine forest; 5500-8600 ft. elev.
Cheanactis suffrutescens Shasta chaenactis	S	Rocky open slopes, cobbly river terraces; on ultramafic soils or glacial till w/ ultramafic included. 2600-6900 ft. elev.
Cordylanthus tenuis ssp. *pallescens* Pallid bird's-beak	S	Lightly disturbed openings in ponderosa pine forest; gravelly volcanic or ultramafic soils. 3600-5200 ft. elev.
Epilobium oreganum Oregon willow herb	S	Wet, gently sloping stream banks, meadows, & bogs, generally on ultramafic soils 500-7800 ft. elev.

Table 2.76. LSR RC-341 - Forest Service Sensitive Plants

Species Name	Known (K) or Suspected (S)	Habitat
Epilobium siskiyouense Siskiyou fireweed	S	Exposed, rocky serpentine ridges and slopes. 5000-8000 ft. elev.
Eriogonum umbellatum ssp. *humistratum* Mt. Eddy Buckwheat	S	Serpentine slopes and outcrops, mixed conifer to subalpine forest. 5700-9000 ft. elev.
Erythronium ctirinum var. *roderickii* Scott Mt. fawn lily	S	Mixed conifer forest on ultramafic or granitic soils 900-4000 ft. elev.
Galium serpenticum ssp. *scotticum* Scott Mt. bedstraw	S	Talus slopes and rock outcrops of ultramafic rock. 5100-7600 ft. elev.
Ivesia pickeringii Pickering's ivesia	S	Ephemeral drainages and seasonally wet grassy slopes in mixed conifer forest, on ultramafic soils. 2500-4500 ft. elev.
Minuartia stolonifera Scott Mt. sandwort	S	Rocky slopes on ultramafic soils; montane mixed conifer forest 4100-5300 ft. elev.
Phacelia dalesiana Scott Mt. phacelia	S	Ultramafic soils in upper montane mixed conifer forest 5300-7000 ft. elev.
Phacelia greenei Scott Valley phacelia	S	Gravelly serpentinized slopes and forest openings 5000-7000 ft. elev.
Phacelia leonis Siskiyou phacelia	S	Rocky to sandy openings in montane mixed conifer forest often on ultramafics 3900-6500 ft. elev.
Raillardella pringlei Showy raillardella	S	Wet ultramafic meadows, seeps, & streambanks. 4000-7500 ft. elev.
Smilax jamesii English Peak greenbriar	S	Shaded riparian habitat above 4000 ft. elev.
Trillium ovatum ssp. *oettingeri* Salmon Mountains wakerobin	S	Shaded riparian forest with white fir or red fir. 4000-6000 ft. elev.

Survey and Manage Species. There are no "known sites" within LSR RC-341. There have been no surveys within the Eddy LSR for this category of species.

Northern Spotted Owl

Eddy provides approximately 245 acres of nesting/roosting habitat and 2,165 acres of foraging habitat, all of which is typed with a size class and density of 3G or 3N. An additional 184 acres could potentially provide suitable spotted owl habitat. Based on elevation and soils, this LSR has a high likelihood at being it's expected capability of providing owl habitat.

Nearly all of Eddy LSR has been survey for spotted owl. One spotted owl activity center has been located with the boundary of the LSR. Table 2.77 summarizes acres of suitable habitat within a 0.7 and 1.3 mile home range.

Table 2.77. LSR RC-341 - Acres of suitable Spotted Owl habitat within 0.7 and 1.3 mile home ranges						
Activity Center	**Habitat within 0.7 mile**			**Habitat within 1.3 mile**		
	N/R	**F**	**Total**	**N/R**	**F**	**Total**
SK464	9	614	623	191	1674	1865

Note: Approximately 40% of this Activity Center lies outside of the LSR.

This LSR lies in the East Klamath Zone. RC-341 supports 1 activity center for the NSO. There are no activity centers outside the LSR having any portion of their 1.3 mile radius circle home range within the LSR. This pair was last inventoried in 1992 and was reproductively successful in that year. Of the 2,723 acres of National Forest System lands, 245 acres appear to be providing the requisites for nesting and roosting habitat with an additional 1,358 acres serving as foraging habitat. The total amount of NRF is 1,603 acres. There are only an additional 184 acres potentially capable of becoming suitable NRF habitat not withstanding a catastrophic event.

Estimated Owls. There are no additional spotted owl pairs known to exist in Eddy LSR.

Northern Spotted Owl Critical Habitat. The Eddy LSR originated as an part of the ISCs spotted owl conservation strategy as Habitat Conservation Area C-36. This HCA was combined with HCA C-35 to form CHU CA-8. The objectives for CA-8 were to tie together two single pair HCAs and incorporate an additional spotted owl site. The pair objective was to support 4-5 pairs in the future. The area was considered important in maintaining habitat/owl distribution. Table 2.78 summarizes the distribution of acres of CA-8 by land allocation.

Table 2.78. LSR RC-341 - Acres of NSO critical habitat that overlaps with LSR RC-341 Eddy and other land allocations				
CHU #	**Acres of overlap with LSR/reserved**	**Acres of overlap with Matrix**	**Other Reserves**	**Total**
CA-8	11,609	3,370	579	15,558

All of the Eddy LSR overlaps critical habitat.

Table 2.79 summarizes the acres of spotted owl habitat within CA-8 overlaid with LSR and other Forest land allocations. "Other Reserves" refers to land allocations such as wilderness or Riparian Reserves, from which no scheduled timber harvest is planned. "Matrix" refers to land allocations from which scheduled timber harvest is planned.

Table 2.79. LSR RC-341 - Acres of Spotted Owl habitat within CA-8 overlaid with LSR and other Forest land allocations				
Land Allocation	**Nesting/Roosting Habitat Acres**	**Foraging Habitat Acres**	**Other Reserves**	**Total**
LSR	1,240	7,951	2,296	11,489
Other Reserves	141	369	68	578
Matrix	197	2,854	523	3,574

The "matrix-portion" of CA-21 does not include any known owl pairs. However, part of the home range of the activity center SK-464 lies outside of the LSR and in the matrix land allocation

In conclusion, CA-8 was divided to form two LSRs, Scott Mountain and Eddy. The amount of Federal land and total number of activity centers within these two LSRs exceeds that of CA-8. This permutation of allocations performs all the intended functions of CA-8.

General Assessment of Habitat for Late-successional-associated Species

Approximately 2,701 acres of this LSR are capable of producing late-successional habitat. Currently, there are no late-successional acres. The combined acres vegetated by late-successional and mid-successional forest is 2,517 acres or 93% of the capable land base. Relative to other LSRs, Eddy would rank low in terms of the amount of existing late-successional and would rank as high in terms of the combine late-successional and mid-successional forested habitat.

Distribution and Connectivity of Habitat

There is no late-successional in the Eddy LSR. The mid-successional stands in the Eddy LSR are well distributed. Areas of serpentine soils limit the establishment of dense stands of forest. Connectivity through the LSR is adequate consisting of an abundance mid-successional forests, which are well distributed.

Other Resources

Livestock grazing occurred in this area as early as the mid to late 1800s. As with most of the Forest, permitted sheep grazing was terminated in this area in the early 1900s. This area receives a moderate amount of recreational use in the summer months and relatively high use in the winter months. Winter use is snowmobiles and cross country skiers.

Late-Successional Reserve RC-342 Deer

Introduction

An Interim LSR Assessment was completed for the Deer LSR in 1996. A Letter concluding "that the Interim LSRA provides sufficient context and framework for decisions on projects and activities detailed in LSRA. In addition, silvicultural and fire activities described in the LSRA and which are consistent with S&Gs and the above assumptions are exempted from further REO review", was issued on July 9, 1996. The analysis being conducted on this LSR as part of the Forest-wide assessment will provide a comprehensive appraisal of conditions and opportunities.

The Deer LSR is entirely within the boundaries of the Shasta-Trinity National Forests. It is another small, 5,932 acres, LSR lying about 1 mile east of the city of Mt. Shasta. It is surrounded by private land on three sides. The Upper Sacramento River lies to the south, the I-5 corridor to the east, Siskiyou Lake to the southeast, Morgan Meadows to the northwest and, Wagon Creek to

the north. It is approximately 3 miles long and 3 miles wide. Adjacent LSRs include Eddy (RC-341) 4 miles to the northwest, Wagon (RC-362) 4 mile to the east, Castle Lake (DD-67) 1 mile to the south. Elevation varies from 4,200 feet along the North Fork of the Sacramento River to 6,000 feet around Morgan Meadows.

This LSR was part of the original Habitat Conservation Strategy. It was later designated during the late-successional mapping effort after being identified as an important area for late-successional habitat. Table 2.80 summarizes the current condition by acreage within the LSR.

Table 2.80. LSR RC-342 Deer - General Status	
Total Acres (Shasta-Trinity NF)	5,932
Acres Capable of Supporting Late-Successional Habitat	4,886
Acres Currently Supporting Late-Successional Habitat	114
Percent of LSR Subject to Lethal Affects	83.3%
Acres of Early-Successional Habitat	631
Acres of Riparian Reserves	1,114
Suitable Owl Habitat as a Percent of Capable Habitat	86%
Miles of Road	32.4
Road Density	3.5
Private Land	0

Vegetative Condition

Table 2.81 highlights the general vegetative condition for the Deer LSR. Late-successional and mid-successional conditions account for 87% of the capable land base. Early-successional stands account for approximately 13% of the capable land base (3% >20 years and 10%< 20 years).

Table 2.81. LSR RC-342 - Vegetative Condition	
Vegetative Condition	**Acres**
Late-Successional/Open	0
Late-Successional/Dense	114
Mid-Successional/Open	1,428
Mid-Successional/Dense	2,714
Early-Successional/Pole	154
Early-Successional/Sapling, seedling	477
Other	1,045
Total	**5,931**

This LSR consists of mixed conifer, Douglas-fir, ponderosa pine and a significant acreage of non-forested area. Mixed conifer accounts for 1,960 acres or 40% of the coniferous vegetation followed by Douglas fir (27%) and ponderosa pine (21%). Non-forested areas account for approximately 18% of the total LSR. There are very minor amounts of white fir, less than 1%.

Vegetative Sustainability Discussion

Late-successional habitat within this LSR is modest portion of the capable land base, 2.3%. Another 84.8% of the capable land base is currently in mid-successional condition. It is important to protect the current late and mid-successional habitat from large disturbances. Both the mid and early successional vegetation was assessed in the Interim assessment. Stand density and fuel hazards were the key elements addressed to enhance progress toward later successional conditions.

Fire and Fuels

Records dating back to 1910 show that there have been 38 fire starts within the boundary of the Deer LSR, 66% of them by lightning and 34 human caused. The Interim Assessment points out that the pre-settlement fire interval was 8-30 years with an average of 18 years. With the present fire suppression policy fire intervals range from 17-36 years with an average of 27 years. The Headwaters Watershed Analysis has identified broad scale hazard and risk ratings that cover the Deer LSR. On a broad scale the entire LSR lies within a Moderate Hazard/High Risk. One can expect approximately 2.9 fires starts per decade for every 1000 acres within the LSR or about 7 starts per year occurring randomly within it.

Table 2.82 illustrates the FOFEM projected mortality in terms of high (>70%), medium (25% to 70%) and low (<25%).

Table 2.82. LSR RC-342 - Percent mortality by mortality rating (Percent of LSR)		
Mortality Rating		
High	**Medium**	**Low**
83%	16%	<1%

The Deer LSR is dominated by two Fuel Models, FM-6 and FM-9. Fuel Model 6 is characterized by sparsely stocked conifer stands containing large amounts of low level shrubs (less than 6 feet). These stands are a concern if the brush is old and decadent resulting in high dead to live ratios. Fire intensities are high in these situations. Fuel Model 9 is characterized by closed canopy conifer stands with densely stocked pole size trees in the understory. Typically these stands contain pockets of dead and down woody fuels. These fuels create high fire intensities during ground fires that can easily spread through the understory to the crowns of the dominant conifers.

Terrestrial Species Status

Federally Listed Endangered or Threatened and Proposed Species. Three Federally listed species occur within or immediately adjacent to the Deer LSR, American peregrine falcon (Endangered), bald eagle and, northern spotted owl (both Threatened). An American peregrine falcon eerie is located just outside the boundaries of the LSR. Bald eagles have been nesting in the vicinity of Lake Siskiyou for many years. The pair utilize the Lake have historically nested up to a mile from the water.

Forest Service Sensitive Species. There is habitat present for a number of Forest Service animal species to include American marten, Pacific fisher, northern goshawk, pallid bat, Townsend' bat, northern red-legged frog, cascade frog, and northwestern pond turtle. An activity goshawk territory and nest site lies within the LSR.

There are a number of known or suspected Forest Service sensitive plants that potentially occur within the Deer LSR. Table 2.83 summarizes the species known or suspected of occurring along with their habitat requisites.

Table 2.83. LSR RC-342 - Forest Service Sensitive Plants

Species	Known (K) or Suspected (S)	Habitat
Artostaphylos klamathensis Klamath manzanita	S	Rocky ultramafic or gabbro soils in upper montane & subalpine conifer forest 5700-6500 ft. elev.
Cordylanthus tenuis spp. *pallescens* Pallid bird's-beak	K	Lightly disturbed openings in ponderosa pine forest; gravelly volcanic or ultramafic soils 3600-5200 ft. elev.
Epilobium siskiyouense Siskiyou fireweed	S	Exposed, rocky serpentine ridges & slopes; 5000-8000 ft. elev.
Eriogonum alpinum Trinity buckwheat	S	Exposed, rocky serpentine ridges & slopes 6700-9000 ft. elev.
Phacelia dalesiana Scott Mountain phacelia	S	Ultramafic soils in upper montane mixed conifer forest 5300-7000 ft. elev.
Potentilla cristae Klamath potentilla	S	Rocky slopes & basins; ultramafic or basic substrate. 7000-9000 ft. elev.
Raillardella pringlei Showy raillardella	S	Wet ultramafic meadows, seeps & streambanks 4000 to 7500 ft. elev.

Survey and Manage Species. Botanical surveys over the past several years have confirmed the presence of 1 Survey and Manage Species adjacent to the LSR while two other vascular plant species (Allotropa virgata and Botrychium montanum) are suspected within the LSR boundaries. One bat species has been identified within the LSR; Townsends big-eared bat.

Other Late-successional Species. Five late-successional-associated species have been identified within the LSR. White-headed woodpecker, pygmy nuthatch and flammulated owls have been documented. A known goshawk nesting territory is located within the LSR boundaries. Both marten and fisher have been monitored via track plates and live traps within and immediate adjacent to the LSR. Monitoring of both marten and fisher were conducted via cooperative agreement with Sierra Pacific Industries, Inc.

Northern Spotted Owl

Deer LSR provides approximately 597 acres of nesting/roosting habitat and 3,259 acres of foraging habitat, for a total of 3,856 acres of suitable spotted owl habitat. An additional 631 acres could potentially provide suitable habitat. The LSR is presently at 86% of capable.

Most of the Deer LSR has been surveyed for spotted owls. An estimated 10% of the LSR has not been surveyed to protocol. There is only 1 activity center known to occur within the boundary of the LSR. This pair was first identified in 1976 and has been monitored for 15 years since it's

original discovery. Records show that it has produced young for 9 of the 15 monitored years. Table 2.84 summarizes habitat within 0.7 and 1.3 mile home ranges. Nesting/roosting (N/R) habitat is distinguished from foraging (F) habitat. Suitable habitat within the home range of activity center SK-010 lies mostly within the LSR. However, a good portion of the home range lies on private land.

Table 2.84. LSR RC-342 - Acres of suitable Spotted Owl habitat within 0.7 and 1.3 mile home ranges

Activity Center	Habitat within 0.7 miles			Habitat within 1.3 miles		
	N/R	F	Total	N/R	F	Total
SK-010	241	398	639	491	1260	1751

Estimated Owls. There are no additional spotted owl territories estimated in Deer LSR. There are no owl territories within 1.3 miles which overlap with this LSR.

Northern Spotted Owl Critical Habitat. The Deer LSR was part of the original Habitat Conservation Strategy's HCA - 37. It was expanded to the south to form Critical Habitat Unit CA-7. All of the acres of RC-342 overlap with CHU CA-7. The establishment of the present LSR system lead to the split of CA-7 forming not only RC-342 but Managed Late-successional Area (MLSA) DD-67 to the south. The intent of establishing this area as critical habitat was to increase the amount of habitat and protection of additional owls. "The original HCA was expected to support 2 pairs over time, so the area was approximately doubled in size in order to protect 3 additional owl sites. The area should support up to 5 owl pairs eventually. The added acreage is particularly important because much of HCA C-38 and CHU CA-5 is no longer in federal ownership, bringing into question the ability to that unit to function as the ISC intended."

Critical habitat unit CA-7 is about 16,478 acres in size. Table 2.85 summarizes overlap of CA-7 with Deer LSR and other land allocations. Included in the overlap assessment is the amount of spotted owl nesting/roosting (N/R) and foraging (F) habitat. Approximately 52% of the critical habitat units overlaps with the LSR and other "reserved" land allocations.

Table 2.85 lists the acres of spotted owl habitat within CA-7, overlaid with LSR and other Forest land allocations. "Other Reserves" refers to land allocations, such as wilderness or Riparian Reserves", from which no scheduled timber harvest is planned. "Matrix" refers to land allocation from which scheduled timber harvest is planned.

Table 2.85. LSR RC-342 - Acres of spotted owl habitat within CA-7, overlaid with LSR and other Forest land allocations

Land Allocations	Nesting/roosting Habitat Acres	Foraging Habitat Acres	Other	Total
LSR	685	4,510	2,299	7,494
Other Reserves	0	311	681	992
Matrix	294	3,240	2,176	5,710

MSLA DD-67 lies approximately 1 mile to the south of the Deer LSR and abuts the Castle Crags Wilderness. Much of the gap between the LSR and MSLA is in private ownership. Each of these

units maintains one owl each. Table 2.86 list the Spotted owl pair goals in Critical Habitat compared with activity centers in Late-Successional Reserves.

Table 2.86. LSR RC-342 - Spotted owl pair goals in Critical Habitat (CHU) compared with activity center in LSR

CHU	Spotted Owl Pair Goal	Corresponding LSR or MLSA	Know Activity Centers in Corresponding LSR and MLSA
CA-7	5 pairs	RC-342 & DD-67	SK010 (RC-342) SK268 (DD-67) SK*

* Has no Master Owl Number, but is Forest #14023

The "matrix-portion" of CA-7 includes one additional pair (Forest #14023) which has a portion of it's home range overlapping into DD-67.

In conclusion, the Deer LSR and other adjacent "reserved" land allocation are not performing all the intended functions of CA-7. It is important, however, to continue to manage the "matrix-portion" of CA-7 to provide habitat for spotted owl activity center 14023.

General Assessment of Habitat for Late-successional-associated Species

Approximately 4,886 acres of this LSR are capable of producing late-successional habitat. Currently, 114 acres or 2% of capable, are vegetated in late-successional habitat. The combined acres vegetate by late-successional and mid-successional forest are 4,255 acres or 87% of capable. Relative to other LSRs, Deer ranks low in the proportion of late-successional but high in the combined late-successional and mid-successional forested habitat.

Distribution and Connectivity of Habitat

Deer LSR has only one moderate size contiguous patch (114 acres) of late-successional habitat. A preponderance of the LSR is mid-successional which is presently providing for connectivity throughout much of the LSR. Mid-successional habitat is well distributed in the lower 2/3s of the LSR. The northern 1/3 consist of early successional and non-forests stands of vegetation. Connectivity to surrounding LSRs is generally adequate due to the quantity of mid-successional stands.

Managed Late-Successional Area DD-67 Castle Lake

Introduction

This is the first of six Managed Late-Successional Areas (MLSA) when moving from west to east into the McCloud area. The management of and objectives for MLSAs are different than those of LSRs. Castle Lake MLSA is entirely within the boundaries of the Shasta-Trinity National Forests. It is only 1,910 acres which is smaller than what is considered a normal home range for NSO. It is located on Scott Camp Ridge between the Sacramento River and Scott Camp Creek. It is approximately 2 miles wide and 2 miles long. Adjacent LSR and/or MLSA includes Deer (RC-342) 1 mile to the north, Wagon (RC-362) approximately 8 miles to the

northeast, Iron Canyon (RC-335) 10 miles to the southeast and, Clear Creek (RC-334) 14 miles to the south and Graves (RC-339) 10 miles to the west. Elevations varies from 4,400 to 4,700 feet. There are no private inholdings in this unit. It lies just to the north of the Castle Crags Wilderness Area

Table 2.87. MLSA DD-67 Castle Lake - General Status	
Total Acres (Shasta-Trinity NF)	1,910
Acres Capable of Supporting Late-Successional Habitat	1,877
Acres Currently Supporting Late-Successional Habitat	0
Percent of LSR Subject to Lethal Affects	89.5%
Acres of Early-Successional Habitat	257
Acres of Riparian Reserves	184
Suitable Owl Habitat as a Percent of Capable Owl Habitat	86%
Miles of Road	8.9
Road Density	3.0
Private Land	0

Vegetation Condition

Table 2.88 highlights the general vegetative condition for the Castle Lake MLSA. By definition, there is no late-successional habitat. Mid-successional conditions account for 86% of the capable land base. There are 257 acres of pole size stands established by conversion from shrub stands. They account for 14% of the capable land base. These stands are comprised of a mixture of mixed conifer (Douglas fir, ponderosa pine, cedar) and white fir and considered under stocked (canopy closure <40%).

Table 2.88. MLSA DD-67 - Vegetative Condition	
Vegetative Condition	**Acres**
Late-successional/Open	0
Late-successional/Dense	0
Mid-successional/Open	796
Mid-successional/Dense	824
Early-successional/Pole	257
Early-successional/Sapling, seedling	0
Other	33
Total	**1,910**

This MSLA contains a combination of mixed conifer, white fir and Douglas fir. Mixed conifer accounts for 43% of the coniferous vegetation while white fir accounts for 40% and Douglas fir 16%. Ponderosa pine accounts for less than 1%. Other-noncommercial accounts for a minor portion of this MLSA.

Vegetative Sustainability Discussion

There is currently no late-successional in this MLSA. Vegetation management in the Castle Lake MLSA has consisted of some amount of partial harvest including selection and forest protection measures, such as fire suppression. Much of this MLSA is in Mid-successional stands that are important for the development of late-successional habitat in the future. Management of stocking levels in the both the mid-successional and early-pole stands will be important if the area is to develop the sustainable level of Late-successional forest in the future.

Fire and Fuels

The Castle Crags Wilderness Area lies approximately one-half mile to the south of this MLSA. Mixed conifer and white fire are the dominant stands. The dominant fuel models in fuel models 6 and 9 with lesser acreages in fuel model 2. Forty-three percent lies in FM-9, 42% in FM-6 and, 12% in FM-2. Fuel model 2 is characterized by poorer timbered sites and early-successional areas of grass and brush. Surface fires can spread easily with pockets of fuels generating high hear intensities. This model is a concern on steep slopes or hotter aspects. Fuel model 6 is characterized by sparsely stocked conifer stands containing large amounts of low level shrubs (less than 6 feet high). These stands are a concern if the brush is old and decadent resulting in high dead to live ratios. Fire intensities are high in these situations. Fuel model 9 is characterized by closed canopy conifer stands with densely stocked pole size trees in the understory. Typically these stands contain pockets of dead and down woody fuels. These fuels create high fire intensities during ground fires that can easily spread through the understory to the crowns of the dominant conifers. The southern half of the MLSA is unroaded and relatively rugged in nature which could pose containment and initial attack problems. Very little of this MLSA has burned historically.

The fire hazard/risk rating has been determined to be Moderate/Low. There have been only 6 recorded starts since 1910, 67% lightning and 33% human caused.

Table 2.89 illustrates the FOFEM projected mortality in terms of high (>70%), medium (25% to 70%) and low (<25%).

Table 2.89 MLSA DD-67 - Percent mortality by mortality rating (Percent of LSR)

Mortality Rating		
High	**Medium**	**Low**
>89%	>10%	<1%

Terrestrial Species Status

Federally Listed Endangered, Threatened or Proposed Species. There is only one known or suspected Federally listed or proposed species, NSO.

Forest Service Sensitive Species. Habitat exists for Forest Service sensitive species to include northern goshawk (primarily foraging), marten, Townsend's big-eared bat, Western red bat, and

Cascade frog. The Forest, in conjunction with Sierra Pacific Industries, Inc. had in the past monitored this area for marten.

Botanical surveys of the past several years have confirmed one sensitive plant species with a number of plant species suspected of being present. Table 2.90 highlights the sensitive plant species known to occur or are suspected to occur within DD-67.

Table 2.90 MLSA DD-67 - Forest Service Sensitive Plants

Species	Known (K) or Suspects (S)	Habitat
Campanula shetleri Castle Crags harebell	S	Granite and diorite cliffs; north and northeast exposure, 3600-6000 ft. elev.
Cordylanthus tenuis spp. *pallescens* Pallid bird's-beak	K	Lightly disturbed openings in ponderosa pine forest; gravelly volcanic soils 3600-5200 ft elev.
Epilobium oreganum Oregon willow herb	S	Wet, gently sloping stream banks, meadow, & bogs, generally on ultramafic soil 500-7800 ft. elev.
Erythronium citrinum var *roderickii* Scott Mt. fawn lilly	S	Mixed conifer forest on ultramafic or granitic soils. 900-4000 ft. elev.
Ivesia longibracteata Castle Crags ivesia	S	Granite & diorite outcrops near and above timberline; Castle Crags endemic; 4400-4800 ft. elev.

Survey and Manage Species. No surveys for survey and manage species have occurred in Castle Lake MLSA. Survey will take place prior to any potential management activities within the MLSA or surrounding landscape.

Northern Spotted Owl

Castle Lake is one of six MLSAs found on the east side of the Forest. It provides for approximately 94 acres of nesting/roosting habitat and 1,494 acres of foraging habitat, for a total of 1,588 acres of suitable spotted owl habitat. An additional 257 acres could potentially provide suitable spotted owl habitat in the future. All of Castle Lake has been surveyed for spotted owls. MLSAs were established around individual pairs in areas requiring special management consideration relative to forest health and/or potential wildfire. One spotted owl pair (SK268) is located within the boundaries of this MLSA. An additional pair (SK) is located out side of the MLSA but has approximately 40% of its home range inside the MLSA. Table 2.91 summarizes acres of suitable habitat within a 0.7 and 1.3 mile home range.

Table 2.91. MLSA DD-67 - Acres of suitable Spotted Owl habitat within 0.7 and 1.3 home ranges

Activity Center	Habitat within 0.7 mile			Habitat within 1.3 miles		
	N/R	F	Total	N/R	F	Total
SK268	64	314	378	107	1124	1231

* Part of SK268 home range lies outside of the MLSA

Estimated Owls. There are no estimated additional spotted owl pairs in Castle Lake MLSA.

Northern Spotted Owl Critical Habitat. Castle Lake MLSA overlaps entirely with critical habitat unit CA-7. It was part of the original, and much larger, CA-7 which encompassed both RC-342 and all intervening land to the north. The area was identified as supporting up to 5 owl pairs eventually. The present NFP system divide CA-7 to form RC-342 and DD-67 with approximately 1 mile between the two units. Much of the intervening 1 mile is in other reserves, 1,039. Approximately 7,847 acres is considered as matrix.

Given the extensive amount of non-reserved acres of CA-23, the intent of critical habitat is not being met.

General Assessment of Habitat for Late-successional-associated Species

The intent of the Managed Late-successional Areas is to provide managed late-successional habitat within areas of high and severe fire disturbance. There is no late-successional at this time primarily due to past wildfire disturbance. Approximately 1,877 acres are capable of producing late-successional conditions. Currently, none exist. The total acres of mid-successional forest are 1,620 acres or 86.3% of capable.

Distribution and Connectivity of Habitat

Stands of late-successional are lacking in this MLSA. Stands of late-successional are located approximately one mile to the north and south of Castle Lake MLSA. Generally speaking, the distribution of late-successional is low over a broad portion of this larger landscape resulting from old mid-1800 fires and turn of the century railroad logging. Dispersal habitat or connectivity is being provided by mid-successional conifer stands.

Managed Late-Successional Area DD-83 Madrone

Introduction

The Madrone MLSA is one of six scattered across the eastern portion of the Shasta-Trinity National Forest. This MLSA is approximately 1,796 acres in size and lies within the Squaw Creek drainage on the southeastern part of the Forest. It lies in an area of checkerboard ownership, with the adjacent landowner being Sierra Pacific Industries, Inc. Elevation varies from 1,395 ft. along Hoffmeister Creek to 2,831 ft. along the eastern ridgeline. The terrain is steep and is bisected by two small drainages, Ash Creek and Hoffmeister Creek.

Table 2.92. MLSA DD-83 Madrone - General Status	
Total Acres (Shasta-Trinity NF)	1,796
Acres Capable of Supporting Late-successional Habitat	539
Acres Currently Supporting Late-successional Habitat	359
Percent of MLSA Subject to Lethal Affects	86.8%
Acres of Early-Successional Habitat	10
Acres of Riparian Reserve	369
Suitable Owl Habitat as a Percent of Capable Habitat	98%
Miles of Road	3.9
Road Density	1.4

Vegetative Condition

Table 2.93 highlights the general vegetative condition for the Madrone MLSA. Late-successional conditions account for 67% of the capable conifer lands. Late-successional and mid-successional conditions account for 98% of the capable conifer land base. Pure stands of black oak and live oak account for 70% of the total land base. There is an estimated additional 499 acres of lands currently dominated by Black Oak that are capable of developing in to late-successional forest dominated by conifers.

Table 2.93. MLSA DD-83 - Vegetative Condition	
Vegetative Condition	**Acres**
Late-successional/Open	114
Late-successional/Dense	245
Mid-successional/Open	115
Mid-successional/Dense	55
Early-successional/Pole	10
Early-successional/Sapling, seedling	0
Other	1,257
Total	1,796

The dominant vegetation type in the MLSA is black oak. If accounts for approximately 56% of the land base, 25% of which is capable of developing into late-successional if converted to conifers. The remainder of the land base is comprised of Douglas-fir (28%), live oak (14%), and ponderosa pine (2%).

Vegetative Sustainability Discussion

Late-successional forest is at 67% of the capable land and over 130% of the sustainable level for areas dominated by conifers. This MSLA has had little past management. There is a relatively large proportion of the MSLA in mid-successional habitat, 31% of the capable lands.

Fire and Fuels

Oak (black and live) represents the majority of the area with Douglas-fir being the dominant conifer species. The MLSA is dominated by fuel model 9 followed by fuel models 6 and 10. FM-9, much like conifer stands, is characterized by closed canopy with densely understory. Typically, these stands contain pockets of dead and down woody fuels. These fuels create high fire intensities ground fires that can easily spread through the understory to the crowns. FM-6 is characterized by sparsely stocked stands containing large amounts of low level shrubs (less than 6 feet high). These stands are a concern because old decadent shrubs have a high dead to live ratio resulting in high fire intensities. FM-10 is typically dense late-successional conifer stands with heavy amounts of dead and down woody fuels. Typically the understory is densely populated with intermediate size conifers. A wildfire carried by these fuels would be intense enough to cause crowning, spotting and rapid rates of spread on steep slopes or high winds. Large stand replacing fires can be expected.

Historic fire information shows that DD-83 has had a total of 5 starts since record keeping began around 1910. Sixty percent of these were lightning caused while the remainder were human caused. The Hazard/Risk for this MLSA is considered as Moderate/Moderate. Fire occurrence is light with the MLSA, however, several large fires have threatened it from the west.

This MLSA is relatively remote with only limited access via Forest Service roads making initial attack and suppression actions difficult. Fire effects analysis shows 86.8% of the area would have mixed levels of mortality which would result in a mosaic pattern. Some of the high mortality areas would require reforestation.

Table 2.94 illustrates the FOFEM projected mortality in terms of high (>70%), medium (25% to 70%) and low (<25%).

Table 2.94. MSLA DD-83 - Percent mortality by mortality rating (Percent of LSR)		
Mortality Rating		
High	**Medium**	**Low**
86.8%	9.2%	0.0%

Terrestrial Species Status

Federally Listed Endangered, Threatened or Proposed Species. There is only one Federally listed or proposed species in Madrone MSLA, the NSO.

Forest Service Sensitive Species. Few surveys have taken place for Forest Service sensitive species in this area. However, habitat exists for fisher, goshawk, pallid bat, Townsend's big-eared bat, Western red bat, cascade frog, and hardhead.

Botanical surveys have been limited in this area. Based on habitat characteristics, there are a number of suspected Forest Service sensitive plant species. Table 2.95 summarizes those sensitive plant species known of suspected of occurring within the boundary to MLSA or immediately adjacent to it.

Table 2.95. MSLA DD-83 - Forest Service Sensitive Plants

Species	Known (K) or Suspected (S)	Habitat
Botrychium subenus *Botrychium* (incl. *B. crenulatum* et. al.)	S	Meadows, marshes, & moist forests, often riparian; foothills to montane. Widespread but sporadic.
Cordylanthus tenuis ssp. *pallescens* Pallid bird's-beak	S	Lightly disturbed openings in ponderosa pine forest; gravelly volcanic or ultramafic soils 3600-5200 ft. elev.
Cypripedium fasciculatum Brownie lady's slipper	S	Mixed conifer or oak forest on a variety of soil types, often but not always associated with streams; 1300-6000 ft. elev.
Cypripedium montanum Mountain lady's slipper	S	Mixed conifer or oak forests on a variety of soil types; often but not always associated with streams; 1300-6000 ft. elev.
Fritllaria eastwoodiae Butte County fritillary	S	Dry benches & slopes, mixed conifer, with hardwood understory, volcanic soils, elevation 1500-4500 ft. elev.
Lewisia cantelovii Cantelow's lewisia	S	Moist rock outcrops in broad-leaf and conifer forests. 500-3000 ft. elev.
Neviusia cliftonii Shasta snow-wreath	S	North-facing slopes on limestone-derived soils, within riparian zone; 2400-3000 ft. elevation

Survey and Manage Species. Few surveys for Survey and manage species have occurred in the MSLA. Madrone is in the Range of the Shasta salamander. There are numerous sightings of this species within the Squaw Creek drainage and immediately adjacent to the MLSA. There are no recorded sighting within the boundary of the MLSA.

Northern Spotted Owl

Madrone MLSA provides approximately 245 acres of nesting/roosting habitat and 196 acres of foraging habitat, for a total of 441 acres of suitable spotted owl habitat. There is only an additional 10 acres of potentially suitable habitat.

All of Madrone has been surveyed for spotted owls. A total of one activity center is known to occur. This was the objective for the establishment of the MLSA. Table 2.96 summarizes habitat within 0.7 and 1.3 mile home ranges. Nesting/roosting (N/R) habitat is distinguished from foraging (F) habitat. Suitable habitat within the home range of activity center SH076 is contained within the MLSA. There is additional habitat within the MLSA but outside of the home. Parts of the home range lie outside the MLSA.

Table 2.96. MSLA DD-83 - Acres of suitable Spotted Owl habitat within 0.7 and 1.3 mile home ranges

Activity Center	Habitat within 0.7 mile			Habitat within 1.3 mile		
	N/R	F	Total	N/R	F	Total
SH076	241	146	387	262	424	686

Estimated Owls. There are no additional spotted owl territories known to exist in Madrone MLSA. The closest known owl is approximately 2 miles to the southwest. There is no home range overlap into the MLSA from owls outside of the MLSA.

Northern Spotted Owl Critical Habitat. There is no overlap between the Madrone MLSA and northern spotted owl critical habitat.

General Assessment of Habitat for Late-successional-associated Species

Approximately 539 acres or 30% of this MLSA that is dominated by conifers is capable of producing late-successional habitat. Another 25% of this MLSA dominated by black oak is capable. Currently, 359 acres or 66.6 of conifer dominated capable are vegetated in late-successional. The combined acres vegetated in late-successional and mid-successional forest totals 529 acres, or 98.1%. Seventy percent of the MLSA is classified as hardwood. Hardwoods stands should be considered for management actions aimed a reducing fuel hazards and improved their capacity to function as habitat for those groups of species associated with hardwood forests rather than conversion to conifer forests to develop late-successional conifer habitat typical of northern spotted owl and associated species.

Distribution and Connectivity of Habitat

The parcels of late-successional habitat are relatively small and are scattered throughout the MLSA, primarily along the riparian areas. The largest and most continuous stand of late-successional habitat occurs in Bills Creek. Connectivity between late-successional stands is provide by either open mid-successional or relatively dense oak stands. Overall, distribution and connectivity of late-successional patches within the LSR is limited.

Connectivity to adjacent LSRs is low and probably limited to riparian reserves. The Squaw Creek drainage is one of checkerboard ownership, natural fragmentation and, human fragmentation. In addition, this entire area has a complex fire history.

Late-Successional Reserve RC-335 Iron Canyon

Introduction

A Watershed Assessment was completed in January, 1996 on approximately 17,000 acres of this LSR. An Interim LSR Assessment was completed and submitted to the REO in August of 1996. A letter from the REO regarding their findings states "that the Iron Canyon projects are consistent with standards and guidelines for the silvicultural and salvage activities in this LSR. This document provides a comprehensive assessment of conditions and opportunities for the Iron Canyon LSR.

The Iron Canyon LSR is approximately 102,924 total acres in size (including private land), making it the largest LSR on the Forest. It is located on the Mt. Shasta/McCloud Management Unit, Shasta-Trinity National Forest. Major drainages include: Squaw Valley Creek, McCloud River, Trough Creek, Claiborne Creek, Squaw Creek, Hawkins Creek, Kosk Creek and Tom Neal Creek, plus numerous smaller drainages. Prominent points include, Yellowjack Mountain, Tombstone Mountain, Bald Mountain, Tamarac Mountain, Dutchman Peak, Stump Creek Butt and Grizzly Peak. Iron Canyon Reservoir is a Pacific Gas and Electric power generating unit which also serves as high use recreational area. The Pacific Crest Trail bisects the LSR. The

terrain is steep, rugged with the western half in unroad condition. It is bisected by numerous sharp ridges and streams. Elevation varies from 2,000 at Squaw Creek to 6,252 ft. at Grizzly Peak Lookout. Much of the central and southern portion of the LSR lies in checkerboard ownership with Sierra Pacific Industries, Inc. being the other major land owner.

This LSR has its origins as an HCA under the ISCs strategy. The HCA was later identified as northern spotted owl critical habitat with some boundary adjustments. Table 2.97 summarizes the current condition by acreage within the LSR.

Table 2.97 LSR RC-335 Iron Canyon - General Status	
Total Acres (Shasta-Trinity NF)	89,141
Acres Capable of Supporting Late-Successional Habitat	76,409
Acres Currently Supporting Late-Successional Habitat	25,010
Percent of LSR Subject to Lethal Affects	77.3%
Acres of Early-Successional Habitat	3,853
Acres of Riparian Reserve	12,312
Suitable Owl Habitat as a Percent of Capable Owl Habitat	94%
Miles of Road	319
Road Density	1.9
Private Land	13,783

Vegetative Condition

Table 2.98 highlights the general vegetative condition for the Iron Canyon LSR. Late-successional and mid-successional conditions accounts for 95% of the capable land base. Plantations account for 4% of the current capable land base (.01% > 20 years and 4% < 20 years).

Table 2.98. LSR RC-335 - Vegetative Condition	
Vegetative Condition	**Acres**
Late-successional/Open	2,758
Late-successional/Dense	22,252
Mid-successional/Open	25,113
Mid-successional/Dense	22,434
Early-successional/Pole	700
Early-successional/Sapling, seedling	3,153
Other	12,732
Total	**89,141**

The dominant vegetation type in the LSR is Douglas-fir which account for approximately 42% of the land base. This is followed closely by Mixed conifer, accounting for 34% of the land base. There are minor amounts of white fir and ponderosa pine, 2% and 4% respectively. Other non-commercial, primarily hardwoods, accounts for approximately 14% of the NFS land base.

Insects and Disease

Since 1993, observation flights have observed minor amounts of mortality within the LSR. Except for isolated 1 to 5 acres pockets, mortality within the LSR has remained at endemic levels.

Vegetative Sustainability Discussion

Forest conditions within this LSR have been shaped primarily by some large wildfires during the turn of the 19th Century and management actions on the landscape since that time. Late-successional habitat currently occupies 33% of the capable land base. Mid-successional stands occupy an additional 62% of the capable land base. Early successional stands are also important for developing into future late-successional characteristics as they make up only 5% of the capable land base. Stand densities in the mid and early successional component are important if more late-successional habitat is desired in the future. Stand density has been shown to be an important factor in this LSR in order to continue maintaining stand health and vigor.

Fire and Fuels

Over three-quarters of the LSR consist of mixed-conifer and Douglas-fir at the lower to mid-elevations. These areas fall into three different Fuel Models, FM-6, FM-9, and FM-10. A smaller amount of acreage falls into Fuel Model FM-2. White fir and ponderosa pine tend to be located at higher elevations but still tend to fall in the same three Fuel Models above. FM-6 accounts for 31%, FM-9 accounts for 25%, and FM-10 accounts for 25% of the land base. FM-2 accounts for only 8% but in conjunction with the other fuel models, could potentially pose serious problems. FM-2 is characteristic of poorer timber sites and young plantations with grass and brush. Surface fires can spread easily with pockets of fuels generating high heat intensities. This fuel model is a concern on steep slopes and hotter aspects. FM-6 is characteristic of sparsely stocked conifers containing large amounts of low level shrubs. These stands are a concern if the brush is old and decadent resulting in high dead to live ratios. Fire intensities are high in these situations. FM-9 is characterized by closed canopy conifer stands with densely stocked pole size trees in the understory. Typically these stands contain pockets of dead and down woody fuels. These fuels create high fire intensities during ground fires that can easily spread through the understory to the crowns of the dominant conifers. FM-10 is characterized by dense late-successional conifer stands with heavy amounts of dead down woody fuels. Typically the understory is densely populated with intermediate size conifers. A wildfire carried by these fuels would be intense enough to cause crowning, spotting and rapid rates of spread on steep slopes or during high winds. Large stand replacing fires can be expected.

Historically, 39% of the LSR has burned. The fire Hazard/Risk has been determined to have a rating of moderate/high. Large pockets of High/High exist on west/southwest facing slopes. This LSR has a high occurrence of lightning fires (77%). This LSR can expect an increase in human caused fire as recreational use increases. Records dating back to 1910 show that the Iron Canyon LSR has experienced 256 known fire starts.

Three opportunity conditions in this LSR are, extensive stands of brush in the western portion, relative large amount of dense mid-successional stands scattered through the LSR and scattered plantations. Plantations occur on a small portion of the LSR. In addition, there has been extensive harvesting on private lands within and bordering the northern end of the LSR. Fuels build up on private land surrounding the LSR tend to be very high, and could pose a threat to the LSR. A high percentage of the plantation are scattered on the eastern portion of the LSR. The western portion of the LSR is roadless.

Table 2.99 illustrates the FOFEM projected mortality in terms of high (>70%), medium (25% to 70%) and low (<25%).

Table 2.99. LSR RC-335 - Percent mortality by mortality rating (Percent of LSR)		
Mortality Rating		
High	**Medium**	**Low**
77%	9%	<1%

Terrestrial Species Status

Federally Listed Endangered, Threatened and Proposed Species. There are two listed species known to occur within Iron Canyon LSR, bald eagle, and northern spotted owl. A third species is suspected of occurring with the LSR but, has not been verified, the American peregrine falcon. The peregrine falcon remains listed as endangered while both the bald eagle and spotted at listed as threatened. Two breeding pairs of bald eagle have nest sites located at Iron Canyon Reservoir. At least one pair as utilized this Reservoir for over 15 years. There are numerous limestone outcroppings in the western portion of the LSR which are typically used as eyries in other portions of the Forests. These cliffs have not been inventoried recently.

Forest Service Sensitive Species. Habitat exist for a number of Forest Service sensitive animal and plant species. Sensitive animal species include marten, fisher, Townsend's big-eared bat, Western red bat, northwestern pond turtle, northern red-legged frog, and hardhead. Most of these species have been confirmed during the past several years.

Forest Service sensitive plant species are displayed in Table 2.100 along with general habitat description and whether the species is known or suspects of occurring in the LSR.

Table 2.100. LSR RC-335 - Forest Service Sensitive Plants

Species	Known (K) or Suspect (S)	Habitat
Botrychium crenulatum et. al.	S	Meadows, marshes, & moist forests, often riparian; foothills to montane. Widespread but sporadic.
Cordylanthus tenuis ssp. *pallescens* Pallid bird's beak	S	Lightly disturbed openings in ponderosa pine forest; gravelly volcanic and ultramafic soils 3600-5200 ft. elev.
Cypripedium fasciculatum Brownie lady's slipper	S	Mixed conifer or oak forests on a variety of soil types, often but not always associated with streams; 1300-6000 ft. elev.
Cypripedium montanum Mountain lady's slipper	S	Mixed conifer or oak forest on a variety of soil types, often but not always associated with streams; 1300-6000 ft. elev.
Fritillaria eastwoodiae	K	Dry benches & slopes, mixed conifer with hardwood understory,

Table 2.100. LSR RC-335 - Forest Service Sensitive Plants

Species	Known (K) or Suspect (S)	Habitat
Butte County fritillary		volcanic soils. 1500-4500 ft elev.
Lliamna bakeri Baker's globe mallow	S	Chaparral, pine or mixed conifer/oak forest, juniper woodland; on rocky soil, 3800-6800 ft. elev.
Lewisia cantelovii Cantelow's lewisia	S	Moist rock outcrops in broad-leaf & conifer forest; 500-3000 ft. elev.
Raillardiopsis scabrida Rough raillardella	K	Rocky, open subalpine slopes. 5500-7500 ft. elev.
Smilax jamesii English Peak greenbriar	K	Shaded riparian habitat above 4000 ft.
Neviusia cliftonii Shasta snow-wreath	S	North-facing slopes on limestone-derived soils, within riparian zone; 2400-3000 ft. elev.

Survey and Manage Species. Botanical surveys over the past several years have not confirm the presence of any survey and manage plant species. Not surveys have be done for animal species nor are they any "known sites"

Other late-successional-associated Species. Concentrated areas of goshawk use have been observed in the LSR, however, no nest site has yet to be located.

Northern Spotted Owl

The Iron Canyon LSR provides approximately 28,171 acres of nesting/roosting habitat and approximately 35,707 acres of foraging habitat for a total of 63,578 acres. An additional 3,853 acres have the potential of providing suitable owl habitat. This LSR is at 94% of capable.

This LSR borders Hearst Corporation property at its northern boundary. The eastern boundary is contiguous with Roseburg Lumber Company and the western boundary with Sierra Pacific Industries, Inc. The southern portion of the LSR is in mixed land ownership. The closest adjacent LSR lies just 4 miles to the southeast, RC-336 Chalk Mountain.

Much of the Iron Canyon LSR has not been surveyed to protocol for northern spotted owls (approximately 50%) because few management actions have been planned or implemented in the reserve. There have been a total of 16 spotted owl activity centers that have been located within the boundaries of this LSR. Table 2.101 summarizes habitat within 0.7 and 1.3 mile home ranges. It lists the acres of suitable spotted owl habitat within 0.7 and 1.3 mile home ranges. Nesting/roosting (N/R) habitat is distinguished from foraging (F).

Table 2.101. LSR RC-335 - Acres of suitable Spotted Owl habitat within 0.7 and 1.3 mile home ranges

Activity Center	Habitat within 0.7 mile			Habitat within 1.3 mile		
	N/R	F	Total	N/R	F	Total
SH026	462	53	515	1166	350	1516
SH027	578	101	679	1788	604	2392
SH028	551	73	624	1006	141	1147
SH030	462	438	900	1360	1111	2471

Table 2.101. LSR RC-335 - Acres of suitable Spotted Owl habitat within 0.7 and 1.3 mile home ranges						
Activity Center	**Habitat within 0.7 mile**			**Habitat within 1.3 mile**		
	N/R	**F**	**Total**	**N/R**	**F**	**Total**
SH034	548	388	936	1311	1111	2422
SH036	726	143	869	1411	605	2016
SH042	361	504	865	1085	1506	2591
SH047	671	203	874	1518	646	2164
SH048	487	348	835	1255	1073	2328
SH060	164	457	621	360	948	1308
SH071	486	60	546	1293	336	1629
SH072	394	43	437	1463	197	1660
SH078	71	549	620	673	1286	1959
SH080	241	176	417	680	346	1026
SH091	455	20	475	1103	292	1295
SH092	299	78	377	648	205	853

Estimated Owls. There are an estimated two additional spotted owl territories thought to exist in Iron Canyon LSR. The probable locations are Salt Creek, a tributary to the Upper Sacramento River, and Kosk Creek.

Northern Spotted Owl Critical Habitat. Iron Canyon LSR overlaps with critical habitat unit CA-4 and increases it's size beyond the CHU borders. The ISC considered this area as the best opportunity to manage a large HCA (12 future expected pairs) in the Shasta-McCloud subprovince. A substantial amount of acreage was added to the HCA to improve the shape (edge/area ratio) and increase the potential of supporting pairs to about 15. This CHU is one of the keys to maintaining the viability of the subprovince and providing a source of population, and may be the most important area to protect in the subprovince. It is also a vital area for providing linkage and an opportunity for genetic interchange between the northern and California subspecies.

Critical habitat unit CA-4 is about 79,890 acres in size. Table2.102 summarizes overlap of CA-4 with Iron Canyon LSR and other land allocations. Included in the overlap assessment is the amount of spotted owl nesting/roosting (N/R) and foraging habitat. Approximately 98% of the critical habitat unit overlaps with the LSR and other "reserved" land allocations.

Table 2.102 lists the acres of spotted owl habitat within CA-4, overlaid with LSR and other land allocations. "Other Reserves" refers to land allocations such as riparian reserves. "Matrix" refers to land allocations from which scheduled timber harvest is planned.

Table 2.102. LSR RC-335 - Acres of spotted owl habitat within CA-4 overlaid with LSR and other Forest land allocations				
Land Allocation	**Nesting/Roosting Habitat Acreage**	**Forage habitat Acreage**	**Other**	**Total**
LSR	26,068	32,207	19,813	78,088
Other reserves	0	0	0	0
Matrix	133	431	1,236	1,800

Iron Canyon LSR includes 16 spotted owl known activity centers and 2 suspected activity centers bringing the total to 18 activity centers.

The "matrix-portion" of CA-21 does not include any additional activity centers. There are no activity centers outside the LSR which overlap into the LSR.

In conclusion, Iron Canyon LSR and other "reserved" land allocations exceed all the intended functions of CA-4.

General Assessment of Habitat for Late-successional-associated Species

Approximately 76,409 acres of this LSR are capable of producing late-successional habitat. Currently, 25,010 acres or 33% of capable, are vegetated in late-successional habitat. The combined acres vegetated by late-successional and mid-successional forest are 72,557 acres, or 95% of capable. Relative to other Forest LSRs, Iron Canyon ranks high. However, the risk of loss of existing and developing habitat is high due to the frequency of fires and the percent of area rated as high risk of stand replacement in the event of a fire.

Distribution and Connectivity of Habitat

Stands of late-successional are well distributed through the LSR. Stands of late-successional tend to be in relatively large parcels except in the Girard and Salt Creek drainages. Connectivity of late-successional habitat is fairly good. Where late-successional habitat is fragmented connectivity is provided by mid-successional stands.

This LSR provides for a relatively large area of late-successional habitat. Probably its most important value for late-successional species is its connectivity to the Cascades and Sierra Nevada Mountains. It is nearly surrounded by large blocks of private land and does exhibit checkerboard ownership in the southern half.

Late-Successional Reserve RC-357 Algoma and Managed Late-Successional Area DD-79 Bartle

Introduction

These two units share a common border and therefore will be assessed as a single unit. Bartle MLSA was formed to pick up a single pair to the north of Algoma. The southern boundary of Bartle abuts the northern border of Algoma.

This LSR/MSLA combination is approximately 26,891 acres in size. If encompasses the headwaters of the McCloud River and it's upper tributaries. Elevations very from 4,000 ft. to a approximately 5,600 ft. The LSR/MLSA is predominantly National Forest System lands wrapped around a large block of private land. In addition, it is nearly all surrounded by private land. The area tends to be relatively flat with ridges forming the valley edges. There are "upwelling" forming isolated butts.

This LSR/MLSA has its origins as an HCA under the ISC's strategy. Its primary intent was to provide connectivity from the west to the California subspecies of spotted owl in the Sierra Nevada Mountain to the east. Its future expected spotted owls pairs, adjusted for demographic and environmental uncertainty was 5 pairs (Thomas et. al. 1990). Table 2.103 lists the current condition by acreage within the LSR/MLSA.

Table 2.103. LSR RC-357 Algoma and MLSA DD-79 Bartle - General Status	
Total Acres (Shasta-Trinity NF)	26,891
Acres Capable of Supporting Late-successional Habitat	25,025
Acres Currently Supporting Late-successional Habitat	945
Percent of LSR/MLSA Subject to Lethal Affects	29.9%
Acres of Early-Successional Habitat	4,261
Acres of Riparian Reserve	2,814
Suitable Owl Habitat as a Percent of Owl Capable Habitat	76%
Miles of Road	168
Road Density	3.9
Private Land	2,777

Vegetative Condition

Table 2.104 highlights the general vegetative condition for the Algoma/Bartle LSR/MLSA. Late-successional and mid-successional conditions account for 82% of the capable land base. Early-successional stands account for 17% of the capable land base (11% <20 years and 6% >20 years).

Table 2.104. LSR RC-357 Algoma and MLSA DD-79 Bartle - Vegetation Condition	
Vegetative Condition	**Acres**
Late-successional/Open	70
Late-successional/Dense	875
Mid-successional/Open	5,077
Mid-successional/Dense	14,742
Early-successional/Pole	1,450
Early-successional/Sapling, seedling	2,811
Other	1,866
Total	**26,891**

The dominant vegetation type in the LSR/MLSA is white fir which accounts for approximately 35% of the landbase. Mixed conifer and ponderosa pine are significant vegetation types also and account for 28% and 17%, respectively. The non-commercial types and Douglas-fir comprise the remainder of the vegetation and account for 7% and 2%, respectively.

Insect and Disease

Since 1993, observation flights have observed mortality during years 1993-1997. Moderate levels of mortality were observed in 1994 and 1996 affecting approximately 100 acres and 400 acres, respectively. Affected acreage was isolated to the western portion of the LSR/MLSA.

Mortality appeared to be focused on ponderosa pine during both years of significant mortality. Mortality remained at endemic levels in the other surveyed years.

Vegetative Sustainability Discussion

Late-successional habitat is currently lacking within this LSR/MLSA; it is 4% of the capable ground. Presently, there are approximately 4,261 acres or 17% of the capable ground, in early-successional stands. Past management actions have helped shape the current nature of forest stands in this area, beginning with old railroad logging, intensive fire suppression starting in the mid 20th Century, and silvicultural practices beginning in the 1950s. Many early and mid-successional stands are overstocked, dense stands. Stands developed quickly on these productive sites The high rate of stand development on these productive sites coupled with intensive fire suppression has resulted in the dense condition of these stands today. Mortality rates are on the increase due to the increasing level of intertree competition and resulting lack of resources to support the current stocking levels. Mid-successional stands currently account for 79% of the capable land base and early seral pole and seedling/sapling account for an additional 17%. The protection and management of these stands is critical to the future development of late-successional habitat. Stocking control will be essential to the development of future late-successional habitat. Some stands may be beyond the point of responding to stocking control treatments and it may be necessary to convert them back to early-successional condition if late-successional habitat is eventually desired from these stands.

Fire and Fuels

This area is generally dominated by white fir and mixed conifer. The primary fuel models identified for this LSR/MLSA are FM-2, FM-6 and FM-9. FM-9 is the most prevalent and is characterized by closed canopy conifer stands with densely stocked pole size trees in the understory. Typically, these stands contain pockets of dead and down woody fuels. These fuels create high fire intensities during ground fires that can easily spread through the understory to the crowns of the dominant conifers. There are nearly equal amounts of FM-6 and FM-2. FM-6 is characterized by sparsely stocked conifers containing large amounts of low level shrubs (less than 6 feet high). These stands are a concern if the brush is old and decadent resulting in high dead to live ratio. Fire intensities are high in these situations. FM-2 is characterized by poorer timbered sites and young plantations with grass and brush. Surface fires can spread easily with pockets of fuels generating high hear intensities. This fuel model is a concern on steep slopes or hotter aspects (south and west).

The fire hazard/risk for this area varies from Moderate/Moderate to High/Moderate in the northern portion. Several large pockets of high hazard exit throughout this LSR/MLSA. Records maintained since 1910 show that there has been 134 record fire starts. Lightning fires account for approximately 46% of the recorded starts while human caused fires account for 56%.

A primary concern for potential effect and fire behavior that were not part of this analysis are the adjacent private lands. The areas is surrounded by private land with a large block in the middle forming a "donut-shaped" LSR/MLSA. This ownership pattern, with its high levels of harvest occurring over the past several years, has lead to large accumulations of fuels increasing the fire

hazard. When considering the surrounding areas of high fuel accumulation form the activity fuels, the fire behavior potential can change dramatically. Flame lengths would be at a point to where aircraft and equipment would be needed. This increase in fuels dramatically increases the probability of a stand replacing event.

Table 2.105 illustrates the FOFEM projected mortality in terms of high (>70%), medium (25% to 70%) and low (<25%).

Table 2.105. LSR RC-357 and DD-79 - Percent mortality by mortality rating (Percent of LSR)		
Mortality Rating		
High	**Medium**	**Low**
29.9%	56.2%	1.5%

An additional concern lies with the present rate of mortality. If the present mortality is indicative of stand condition, than it is assumed that mortality will significantly increase in the near future which will cause concern for future fire effects and behavior.

Terrestrial Species Status

Federally Listed Endangered, Threatened and Proposed Species. There is only one known Federally listed species within the LSR/MLSA and that is the northern spotted owl. The closest known bald eagle territory lies approximately 10 to the southeast. The closest known peregrine falcon is over 30 miles away.

Forest Service Sensitive Species. The Algoma/Bartle LSR/MLSA provides habitat for a number of Forest Service sensitive species to include northern goshawk, willow flycatcher, Pallid bat, Townsend's big-eared bat, Western red bat, marten, fisher, Cascade frog and McCloud River redband trout.

In the past, the Forest has worked with Sierra Pacific Industries, Inc. in inventorying and monitoring both marten and fisher in this general area. There are numerous sites scattered both within and adjacent to this unit. There are 6 known goshawk nesting territory within the Algoma/Bartle LSR/MSLA. Willow flycatcher habitat is present along McCloud river but the species has not been verified.

There are 4 known or suspected Forest Service sensitive plant species present in this unit. Table 2.106 summarizes the species occurrence and habitat.

Table 2.106. LSR RC-357 and MLSA DD-79 - Forest Service Sensitive Plants

Species	Known (K) or Suspected (S)	Habitat
Calochortus longebarbatus var. *longebarbatus* Long- bearded star tulip	S	Seasonally wet meadows within pine forest or sagebrush communities; 3000-4000 ft. elev.
Ophioglossum pusillum Northern adder; s-tongue fern	S	Meadows, marshes, moist forests. 1000 ft.

Table 2.106. LSR RC-357 and MLSA DD-79 - Forest Service Sensitive Plants

Species	Known (K) or Suspected (S)	Habitat
Smilax jamesii English greenbriar	S	Shaded riparian habitat above 4000 ft. elev.
Trillium ovatum ssp. *oettingeri* Salmon Mountains wakerobin	K	Moist, shady conifer forest, especially near streams; elev 4000-6400 ft. elev.

Survey and Manage Species. Botanical surveys over the past several years have not confirmed the presence of any Survey and Manage species. This is only one known site within this unit. This area has not been systematically surveyed for any of the species within this category.

Northern Spotted Owl

The Algoma/Bartle LSR/MLSA lies in the West Cascades Zone. It provides approximately 4,298 acres of nesting/roosting habitat and 10,246 acres of foraging habitat for a total of 15,544 acres. An additional 4,214 acres have the potential to provide spotted owl habitat. This LSR/MLSA is at 73% capability. All of Algoma/Bartle has been survey over the years. The entire area was surveyed during the period of 1990-1992. Since then only periodic surveying has taken place. A total of 7 spotted owl activity centers occur within the boundary of this LSR/MLSA. Table 2.107 summarizes suitable habitat with 0.7 and 1.3 mile home ranges. Nesting/roosting (N/R) habitat is distinguished from foraging (F) habitat.

Table 2.107. LSR RC-357 and MSLA DD-79 - Acres of suitable spotted owl habitat within 0.7 and 1.3 mile home ranges

Activity Center	Habitat within 0.7 mile			Habitat within 1.3 mile		
	N/R	F	Total	N/R	F	Total
SK016	310	453	763	466	1662	2128
SK232	250	35	285	452	232	684
SK249*	51	647	698	81	1695	1776
SK252	172	57	229	446	124	570
SK267	693	78	771	1251	191	1442
SK269	5	702	707	198	1840	2038
SK278	13	259	272	221	887	1098

*Activity center for DD-79

Most of the spotted owl activity centers have a significant portion of their 1.3 mile home range lying outside of the LSR/MLSA. There are no activity centers lying outside of the LSR/MLSA that have a portion of their 1.3 mile home range overlapping the LSR/MLSA.

Estimated Owls. There are no additional spotted owl territories estimated to occur in the Algoma/Bartle LSR/MLSA. Suitable nesting and roosting habitat has been and will continue to be a limiting factor for activity center density.

Northern Spotted Owl Critical Habitat. Critical Habitat Unit CA-2 is 76,463 acres unit. It was a consolidation of HCAs 40, 41, 43 and 44 and all intervening Federal lands. It lies in the Shasta-McCloud area has be repeatedly recognized as an area of concern. This is largely due to checkerboard land ownership, an extensive logging history, as well as a dry climate resulting in a dominance of ponderosa pine and relatively open canopies. The area supports low owl densities, resulting in concern over restricted genetic interchange with the California subspecies. This particular critical habitat unit has two primary objectives. The presence of owl sites between those HCAs indicated that there was an opportunity to designate an area that may eventually support contiguous nesting habitat for up to 15 owl pairs. The CHU will also maintain easterly distribution of the subspecies. Table 2.108 summarizes overlap of CA-2 with Algoma/Bartle and other land allocations. Included in the overlap assessment is the amount of spotted owl nesting/roosting and foraging habitat. Approximately 44% of the CHU remains as LSR or MSLA which includes 5 different units.

Table 2.108. LSR RC-357 and MSLA DD-79 - Acres of spotted owl habitat within CA-2 overlaid with Algoma/Bartle

Land Allocation	Nesting/Roosting Habitat Acres	Foraging Habitat Acres	Other	Total
LSR/MLSA	4664	15,216	15,090	34,969
Matrix	13	456	360	829
Other Reserve	2,435	10,501	27,732	40,668

Algoma/Bartle LSR/MLSA includes 7 spotted owl activity centers. This is approximately 50% of the spotted owl pair objective for the critical habitat unit. Algoma/Bartle is approximately 35% of the size of CA-2. The Algoma/Bartle LSR/MLSA overlaps entirely with the eastern portion of CA-2. Table 2.109 compares the spotted owl pair objectives for CA-2 with the total known activity centers in LSRs and MSLA.

Table 2.109. LSR RC-357 and MSLA DD-79 - Comparison of the spotted owl pair objectives in critical habitat unit CA-2 with total known activity centers in LSRs and MLSAs

CHU	Spotted Owl Pair Goal	LSR/MLSA	Known Activity Center in Corresponding Unit
CA-2	15 pairs	RC-357	6 Activity Centers
		RC-360	1 Activity Center
		DD-76	1 Activity Center
		DD-78	1 Activity Center
		DD-79	1 Activity Center

In conclusion, the Algoma/Bartle LSR/MLSA in conjunction with other LSRs or MLSAs is not meeting the intent of the original critical habitat unit. However, they are protecting all known pairs in the McCloud Flat area.

General Assessment of Habitat for Late-successional-associated Species

Approximately 950 acres or 4% of the capable acres in Algoma/Bartle LSR/MLSA are presently late-successional habitat. Approximately 25,000 acres are capable of producing late-successional habitat. This is one of the lowest proportions of capable ground in late-successional habitat of

any of the 24 units assessed in this document. A large proportion of the LSR/MLSA is vegetated in mid-successional habitat. The combined acres vegetated by late-successional and mid-successional forest is 20,800 acres or 83% of capable. Relative to other LSR/MLSAs Algoma/Bartle ranks low in existing late-successional but high in the combination of late-successional and mid-successional habitat.

Distribution and Connectivity of Habitat

There are few stands of late-successional habitat in the Algoma/Bartle LSR/MLSA. The few stands of late-successional habitat that occur are small, scattered parcels over the unit. Overall the distribution of late-successional habitat throughout the LSR/MLSA ranks low as compared to other units. Dense mid-successional stands and pole stands comprise most of the vegetation in the LSR/MLSA.

Stands of dense mid-successional habitat span sections of the LSR/MLSA and are well distribution over the entire unit. However, with a significant portion of the unit in pole size stands and plantations and the habitat conditions in adjacent private land connectivity to other unit is a concern. The large block of private land in the middle of the unit may always limit the amount of and quality of habitat available for spotted owls and late-successional-associated species. Overall, the distribution of late-successional is low, but, the connectivity, primarily in mid-successional stands is adequate.

Late-Successional Reserve RC-360 Elk Flat

Introduction

This LSR is approximately 3,056 acres in size. It lies within the Ash Creek drainage. Elevation is approximately 4,400 along Ash Creek and varies little on Elk Flat. The terrain within the LSR is relatively flat and is bisected by Ash Creek. There are two private parcel within the LSR. There are large blocks of private land to the north and west.

Elk Flat LSR has its origins as a Habitat Conservation Area under the ISC's spotted owl management strategy. It was identified as an area of important late-successional habitat during the late-successional mapping effort (Johnson et. al. 1991). Table 2.110 summarizes the current condition by acreage with the LSR.

Table 2.110. LSR RC-360 Elk Flat - General Status	
Total Acres (Shasta-Trinity NF)	3,056
Acres Capable of Supporting Late-successional Habitat	2,836
Acres Currently Supporting Late-successional Habitat	1,306
Percent of LSR Subject to Lethal Affects	2%
Acres of Early-Successional Habitat	681
Acres in Riparian Reserve	266
Suitable Owl Habitat as a Percent of Capable Owl Habitat	67%
Miles of Road	21.7
Road Density	3.9
Private Land	443

Vegetative Condition

Table 2.111 highlights the general vegetative condition for the Elk Flat LSR. Late-successional and mid-successional conditions account for 76% of the capable land base. Early-successional stands accounts for 24% of the capable land base (17% <20 years and 7% >20% years).

Table 2.111. LSR RC-360 - Vegetative Condition	
Vegetative Condition	**Acres**
Late-successional/Open	248
Late-successional/Dense	1,058
Mid-successional/Open	128
Mid-successional/Dense	721
Early-successional/Pole	190
Early-successional/Sapling, seedling	491
Other	220
Total	**3,056**

The dominant vegetation type in the Elk Flat LSR is ponderosa pine. It accounts for 72% of the land base. Minor amounts of white fir and red fir are present and account for 7% and <1%, respectively.

Insect and Disease

Since 1993, observation flights have monitored mortality yearly. Endemic levels of mortality were observed during 1993, 1995 and 1997. Light mortality was observed on approximately 40 acres in 1994 and moderate levels of moderately were observed on approximately 100 acres in 1996. This mortality was confined to the ponderosa pine in both years of elevated mortality.

Vegetative Sustainability Discussion

Late-successional habitat within this LSR currently comprises a relative large proportion of the capable land base, 46%. Another 30% of the capable land base is currently in mid-successional condition. It is important to protect the current late and mid-successional habitat for large

disturbances. The early-successional vegetation needs to be assessed for potential management since it does comprise 24% of the capable land base. Stocking should be the key element addressed for these stands so they can continue to progress towards later successional stages.

Fire and Fuels

Historically, Elk Flat LSR has had a very low occurrence of fire and very little of its area burned. Historic records dating back to 1910 show that only 24 fire starts have occurred of which 92% have been lightning.

Three fuel models account for approximately 85% of the land base, FM-10, FM-2 and FM-9. Fuel Model 10 can be characterized by dense late-successional conifer stands with heavy amounts of dead and down woody fuels. Typically the understory is densely populated with intermediate size conifers. A wild fire carried by these fuels would be intense enough to cause crowning, spotting and rapid rates of spread on steep slopes or during high winds. Large stand replacing fires can be expected. FM-2 is characterized by poorer timbered sites and young plantations with grass and brush. Surface fires can spread easily with pockets of fuels generating high heat intensities. This fuel model is a concern on steep slopes or hotter aspects (south or west). FM-9 is characterized by closed canopy conifer stands with densely stocked pole size trees in the understory. Typically these stands contain pockets of dead and down woody fuels. These fuels create high fire intensities during ground fires that can easily spread through the understory to the crowns of the dominant conifers.

Fire hazard/risk has been determined to be Moderate/Moderate. Several large pockets of high hazard do exist. Lightning caused fires are the primary risk.

Road accessibility and topography play an important role in the expected containment capabilities. The probability of loss will the greater where there are no roads and where the terrain is steep. There are no significant conditions outside that would threatened with LSR.

Table 2.112 illustrates the FOFEM projected mortality in terms of high (>70%), medium (25% to 70%) and low (<25%).

Table 2.112. LSR RC-360 - Percent mortality by mortality rating (Percent of LSR)		
Mortality Rating		
High	**Medium**	**Low**
2.0%	85.4%	0.0%

Terrestrial Species Status

Federally Listed Endangered, Threatened or Proposed Species. The northern spotted owl is the only known Federally listed species within LSR RC-360 Elk Flat. In addition, Elk Flat is northern spotted owl designated critical habitat.

Forest Service Sensitive Species. Elk Flat provides habitat for a number of Forest Service sensitive species to include northern goshawk, pallid bat, Townsend's big-eared bat, western red

bat, marten, and fisher. Only the marten and fisher have been validated as being present within the LSR.

Botanical surveys over the past several years have identified a number of Forest Service sensitive species as being present or suspected of being present in the Elk Flat LSR. Table 2.113 summarizes those species suspect and known plant species.

Table 2.113. LSR RC-360 - Forest Service Sensitive Plants

Species	Known (K) or Suspected (S)	Habitat
Calochortus longebarbatus var. *longebarbatus* Long- bearded star-tulip	S	Seasonally wet meadows within pine forest or sagebrush communities; 3000-4000 ft. elev.
Ophioglossum pusillum Northern adder's-tongue fern	S	Meadows, marshes, moist forests. 1000 ft. elev. and above.
Smilax jamesii English Peak greenbriar	S	Shaded riparian habitat above 4000 ft. elev.
Trillium ovatum ssp. *oettingeri* Salmon Mountains wakerobin	K	Moist, shady conifer forest, especially near streams 4000-6000 ft. elev.

Survey and Manage Species. Few surveys for Survey and Manage species have occurred in the LSR. There are no known site identified within Elk Flat.

Northern Spotted Owl

The Elk Flat LSR lies in the West Cascade Zone. Elk Flat LSR provides approximately 426 acres of nesting/roosting habitat and 927 acres of foraging habitat, for a total of 1,353 acres OG suitable spotted owl habitat. An additional 681 acres could potentially provide suitable habitat. The LSR is presently 67% of capable.

Table 2.114. LSR RC-360 - Acres of suitable habitat within 0.7 and 1.3 mile home ranges

Activity Center	Habitat Within 0.7 mile			Habitat Within 1.3 mile		
	N/R	F	Total	N/R	F	Total
SK319	430	21	451	802	43	845

All of Elk Flat LSR has been surveyed for spotted owls. Only one activity center occurs within the LSR boundary. Table 2.114 summarizes habitat within the 0.7 and 1.3 mile home range. Nesting/roosting (N/R) habitat is distinguished from foraging (F) habitat. Suitable habitat within the home range of activity center SK-319 lies partly outside the boundary of RC-360 in matrix lands.

Estimated Owls. There are no additional spotted owl territories estimated in Elk Flat LSR. There are no activity centers outside of the LSR having the home range overlap with the LSR.

Northern Spotted Owl Critical Habitat. Elk Flat LSR overlaps in its entirety with a portion of critical habitat unit (CHU) CA-2.

CHU CA-2 is 76,463 acre unit. It was a consolidation of HCAs 40, 41, 43 and 44 and all intervening Federal lands. It lies in the Shasta-McCloud area and has be repeatedly recognized as an area of concern. This is largely due to checkerboard land ownership, an extensive logging history, as well as a dry climate resulting in a dominance of ponderosa pine and relatively open canopies. The area supports low owl densities, resulting in concern over restricted genetic interchange with the California subspecies. This particular critical habitat unit has two primary objectives. The presence of owl sites between those HCAs indicated that there was an opportunity to designate an area that may eventually support contiguous nesting habitat for up to 15 owl pairs. The CHU will also maintain easterly distribution of the subspecies. Table 2.115 summarizes overlap of CA-2 with Elk Flat and other land allocations. Included in the overlap assessment is the amount of spotted owl nesting/roosting and foraging habitat. Approximately 44% of the CHU remains as LSR or MSLA which includes 5 different units.

Table 2.115. LSR RC-360 - Acres of spotted owl habitat within CA-2 overlaid with Elk Flat

Land Allocation	Nesting/Roosting Habitat Acres	Foraging Habitat Acres	Other	Total
LSR/MLSA	4,664	15,216	15,090	34.969
Matrix	13	456	360	829
Other Reserve	2,435	10,501	27,732	40,668

Elk Flat LSR includes only one spotted owl activity center of CA-2. Table 2.116 compares the spotted owl pair objectives for CA-2 with the total known activity centers in LSRs and MSLA.

Table 2.116. LSR RC-360 - Comparison of the Spotted Owl pair objectives in critical habitat unit CA-2 with total known activity centers in LSRs and MLSAs

CHU	Spotted Owl Pair Goal	LSR/MLSA	Known Activity Center in Corresponding Unit
CA-2	15 pairs	RC-357	6 Activity Centers
		RC-360	1 Activity Center
		RC-361	1 Activity Center
		DD-76	1 Activity Center
		DD-78	1 Activity Center
		DD-79	1 Activity Center

In conclusion, the Elk Flat LSR in conjunction with other LSRs or MLSAs is protecting all known pairs in the McCloud Flat area.

General Assessment of Habitat for Late-successional-associated Species

Approximately 2,800 acres of Elk Flat LSR are capable of producing late-successional forest habitat. Currently, 1,300 acres or 46% of capable are vegetated in late-successional habitat. The combined acres vegetated by late-successional and mid-successional forest total 2,155 acres or 76% of capable. Relative to other forest LSRs, Elk Flat LSR ranks relative high in combination and moderate in the amount of late-successional.

Distribution and Connectivity of Habitat

Most of the LSR has been managed intensively for many years. Fire has not played a major role in the vegetative mosaic within this LSR in this century but no doubt did in the previous century. This could explain why approximately 20% of this LSR is in mid-successional habitat. There are areas in the LSR which do provide relatively large blocks and/or contiguous blocks of late-successional habitat. Along with good late-successional distribution, the relative large proportion of mid-successional adds to the connectivity between and amongst the late-successional blocks. Overall, the distribution and connectivity of late-successional stands would rate moderate to high.

Managed Late-Successional Area DD-76 McCloud

Introduction

This LSR is approximately 2,596 acres in size. In lies 1.5 miles northeast of the town of McCloud. Elevation varies from 3,600 ft. to 3,900 ft. The terrain is relatively flat and is bisected by Mud Creek. There is one small parcel of private inholding within the MSLA.

Unlike many of the MSLA/LSRs, this MSLA was not part of the original Habitat Conservation Strategy. It was designated as part of the FEMAT effort to protect an additional pair of owls in this low density owl area. Table 2.117 summarizes the status of the McCloud MLSA.

Table 2.117. MLSA DD-76 McCloud - General Status	
Total Acres (Shasta-Trinity NF)	2,596
Acres Capable of Supporting Late-successional Habitat	2,565
Acres Currently Supporting Late-successional Habitat	0
Percent of LSR/MLSA Subject Lethal Affects	<1.0%
Acres of Early-Successional Habitat	673
Acres in Riparian Reserves	80
Suitable Owl Habitat as a Percent of Capable Habitat	71%
Mile of Road	9.2
Road Density	2.3
Private Land	81

Vegetative Condition

Table 2.118 highlights the general vegetative condition for the McCloud MLSA. Presently, there is no late-successional habitat. Mid-successional conditions account for 74% of the capable land base. Plantations account for 26% of the capable land base (1% < 20 years and 25% > 20 years).

Table 2.118. MLSA DD-76 McCloud - Vegetative Condition	
Vegetative Condition	**Acres**
Late-successional/Open	0
Late-successional/Dense	0
Mid-successional/Open	260

Table 2.118. MLSA DD-76 McCloud - Vegetative Condition	
Vegetative Condition	**Acres**
Mid-successional/Dense	1,631
Early-successional/Pole	636
Early-successional/Sapling, seedling	37
Other	31
Total	**2,596**

The dominant vegetation type in the MLSA is ponderosa pine. It accounts for 99% of the land base. The remaining 1% of the land base is considered non-commercial/other.

Vegetative Sustainability Discussion

Late-successional habitat within this MLSA is currently lacking. This is a result of the timber harvest practices carried out during the early and mid-portions of this century. All of the capable land base in the MLSA is currently mid-successional condition. The mid-successional/dense vegetation may have the structure features to serve as late-successional habitat in this MLSA. It is important to manage the current mid-successional habitat to reduce risks from large, uncontrolled disturbances. The early-successional vegetation needs to be assessed for potential management since it does comprise 26% of the capable land base. Stocking should be the key element addressed for these stands so they can continue to progress towards later successional stages.

Fire and Fuels

Records, dating back to 1910, show that very little of this MLSA has burned. This may have been due to be closeness of the area to the town of McCloud. There have been 16 recorded starts since 1910 of which 81% were derived from lightning with the remaining 19% human caused.

Most of the area (63%) with the MLSA has been identified as being in Fuel Model FM-9. The other significant Fuel Model is FM-4. FM-9 is characterized by closed canopy conifer stands with densely stocked pole size trees in the understory. Typically these stands contain pockets of dead and down woody fuels. These fuels create high fire intensities during ground fires that can easily spread through the understory to the crowns of the dominant conifers. FM-4 is characterized by older, unthinned plantations, stands of mature shrubs and conifers. Crown density in the plantations and shrub fields increases the likelihood of stand replacing events.

The fire Hazard/Risk rating has been determined to be High/High. There is a high occurrence of lightning caused fires. The proximity to the town of McCloud increases potential for human caused fires. However, current road access is good supplying fire access to most of the MLSA.

Table 2.119 illustrates the FOFEM projected mortality in terms of high (>70%), medium (25% to 70%) and low (<25%).

Table 2.119. MLSA DD-76 McCloud - Percent mortality by mortality rating (Percent of LSR)		
Mortality Rating		
High	**Medium**	**Low**
0.0%	95.9%	1.0%

The fire effects analysis indicates 1.0% of the MLSA would have "non-lethal" effects. Approximately 96% of the MLSA would have mixed levels of mortality which would result in a mosaic pattern. As fire intensity increases so will the lethal effects. The potential for lethal mortality have been approximated at 0.0% of the MLSA. This type of mortality would require intensive reforestation efforts. One particular area of concern for potential fire effects in this MLSA are the acres of plantations. Plantations account for 26% of this MLSA with most of them over twenty years of age.

Terrestrial Species Status

Federally Listed Endangered, Threatened, or Proposed Species. There is only one known Federally listed species occurring in this MLSA, the northern spotted owl. In addition, this MLSA is within designated northern spotted owl critical habitat.

Forest Service Sensitive Species. The McCloud MLSA provides habitat for a limited number of Forest Service sensitive species to include goshawk, marten, fisher, pallid bat, Townsend's bat, and western red bat. There is one known goshawk nest territory within the MLSA. Goshawk territories on the McCloud flat have been monitored yearly to determine reproductive success. There has been inventory or monitoring of other sensitive species in this area.

Four Forest Service sensitive plant species are suspected or are known to occur in the McCloud MLSA. Table 2.120 summarize the species, their occurrence, and habitats for each of the 4 species.

Table 2.120. MLSA DD-76 McCloud - Forest Service Sensitive Plants

Species	Known (K) or Suspected (S)	Habitat
Calochortus longebarbatus var. *longebarbatus* long- bearded star-tulip	S	Seasonally wet meadows within pine forest or sagebrush communities; 3000-4000 ft. elev.
Ophioglossum pusillum northern adder's-tongue fern	S	Meadows, marshes, moist forests; above 1000 ft. elev.
Smilax jamesii English Peak greenbriar	S	Shaded riparian habitat above 4000 ft. elev.
Trillium ovatum ssp. *oettingeri* Salmon Mountains wakerobin	K	Moist, shady conifer forest, especially near streams; elev 4000-6000 ft. elev.

Survey and Manage Species. Few surveys for Survey and Manage species have occurred in the MLSA. There are no known sites occurring and no species have been located via existing survey efforts.

Northern Spotted Owl

McCloud MLSA provides approximately 75 acres of nesting/roosting habitat and 1,556 acres of foraging habitat for a total of 1,631 acres of suitable spotted owl habitat. An additional 736 acres could potentially provide suitable habitat. This MLSA is presently at 71% of capable. It falls in the NSO West Cascade Zone.

The entire MLSA has been survey for spotted owls. Only one activity center is known to occur within the boundaries of the MLSA. Table 2.121 summarizes habitat within 0.7 and 1.3 mile home range. Nesting/roosting (N/R) habitat is distinguished from foraging (F) habitat. Suitable habitat within the home range of activity center SK270 lies partly outside of the MLSA. There are no activity center outside of DD-76 that have habitat within its boundaries.

Table 2.121. MLSA DD-76 McCloud - Acres of suitable habitat within 0.7 and 1.3 mile home ranges

Activity Center	Habitat Within 0.7 mile			Habitat Within 1.3 mile		
	N/R	F	Total	N/R	F	Total
SK270	18	629	647	28	1676	1704

Estimated Owls. There are no additional owl territories estimated in McCloud DD-76 MSLA.

Northern Spotted Owl Critical Habitat. McCloud MLSA overlaps in its entirety with a portion of critical habitat unit (CHU) CA-2.

CHU CA-2 is 76,463 acre unit. It was a consolidation of HCAs 40, 41, 43 and 44 and all intervening Federal lands. It lies in the Shasta-McCloud area and has be repeatedly recognized as an area of concern. This is largely due to checkerboard land ownership, an extensive logging history, as well as a dry climate resulting in a dominance of ponderosa pine and relatively open canopies. The area supports low owl densities, resulting in concern over restricted genetic interchange with the California subspecies. This particular critical habitat unit has two primary objectives. The presence of owl sites between those HCAs indicated that there was an opportunity to designate an area that may eventually support contiguous nesting habitat for up to 15 owl pairs. The CHU will also maintain easterly distribution of the subspecies. Table 2.122 summarizes overlap of CA-2 with McCloud and other land allocations. Included in the overlap assessment is the amount of spotted owl nesting/roosting and foraging habitat. Approximately 44% of the CHU remains as LSR or MSLA which includes 5 different units.

Table 2.122. MLSA DD-76 McCloud - Acres of spotted owl habitat within CA-2 overlaid with McCloud

Land Allocation	Nesting/Roosting Habitat Acres	Foraging Habitat Acres	Other	Total
LSR/MLSA	4,664	15,216	15,090	34,969
Matrix	13	456	360	829
Other Reserve	2,435	10,501	27,732	40,668

McCloud MLSA includes only one spotted owl activity center of CA-2. Table 2.123 compares the spotted owl pair objectives for CA-2 with the total known activity centers in LSRs and MSLA.

Table 2.123. MLSA DD-76 McCloud - Comparison of the spotted owl pair objectives in critical habitat unit CA-2 with total known activity centers in LSRs and MLSAs			
CHU	**Spotted Owl Pair Goal**	**LSR/MLSA**	**Known Activity Center in Corresponding Unit**
CA-2	15 pairs	RC-357	6 Activity Centers
		RC-360	1 Activity Center
		RC-361	1 Activity Center
		DD-76	1 Activity Center
		DD-78	1 Activity Center
		DD-79	1 Activity Center

In conclusion, the McCloud MLSA in conjunction with other LSRs or MLSAs are not performing the intent of the original critical habitat unit. However, they are protecting all known pairs in the McCloud Flat area.

General Assessment of Habitat for Late-successional-associated Species

Approximately 2,565 acres of this MLSA are capable of producing late-successional habitat. Currently there are no acres meeting the definition of late-successional habitat. There are approximately 1,891 acres of mid-successional or 74% of capable. Relative to other LSR/MLSAs McCloud MLSA ranks among the lowest on the Forest.

Distribution and Connectivity of Habitat

McCloud MLSA DD-76 is devoid of stands meeting the definition of late-successional habitat. There is very little late-successional outside of the MSLA. The closest late-successional is just over a mile to the north. Regeneration harvesting has occurred resulting in numerous patches of early successional vegetation throughout the MLSA. The distribution of mid-successional continuous habitat does provide for connectivity within the MLSA. McCloud MLSA is surrounded on three sides with private land which tends to isolate it from other late-successional and other LSR/MSLAs. Connectivity to other units tends to be poor because of the level of early-successional forests.

Late-Successional Reserve RC-361 Mt. Shasta

Introduction

The Mt. Shasta LSR is approximately 14,504 acres in size. This LSR contains a checkerboard ownership pattern, with private land totaling an additional 10,850 acres. It encompasses the lower eastern and southeastern slopes of Mt. Shasta. It includes the upper portions of Mud Creek, Pilgrim Creek, Fall Creek, Brewer Creek, Gravel Creek and Swamp Creek. It runs along the Klamath/Shasta divide from Military Passed to Stevens Butt. Elevation varies from 4,200 ft. along the flat in Panther Creek to 8,300 ft. at the Mt. Shasta Wilderness Boundary. The terrain tends to be steep and is bisected with sharp to rolling ridgelines. It is in an area of mixed ownership with every other section being private. This LSR covers a large amount of ground, but is not contained in a contiguous parcel of land.

Only a small portion of Mt. Shasta LSR originated as an HCA (5 sections). Unlike most of the LSRs or MLSAs on the Forest, a high percentage of the Mt. Shasta LSR did not originate as an HCA nor was it identified during the listing of northern spotted owl critical habitat. This area was identified and selected as part of the late-successional process. Its primary intent was to provide connectivity, in the form of a "stepping stone", to the north and to provide higher elevation late-successional. Mt. Shasta LSR is providing habitat for two pairs of owls. Table 2.124 lists the current status by acreage within the LSR.

Table 2.124. LSR RC-361 Mt. Shasta - General Status	
Total Acres (Shasta-Trinity NF)	14,504
Acres Capable of Supporting Late-successional Habitat	12,598
Acres Currently Supporting Late-successional Habitat	786
Percent of LSR Subject to Lethal Affects	27.4%
Acres of Early-Successional Habitat	5,267
Acres of Riparian Reserves	1,138
Suitable Owl Habitat as a Percent of Owl Capable Habitat	52%
Miles of Road	120
Road Density	3.1
Private Land	10,850

Vegetative Condition

Table 2.125 highlights the general vegetative condition for the Mt. Shasta LSR. Late-successional accounts for approximately 6% of the capable land base. The combination of late-successional and mid-successional conditions accounts for 53% of the capable land base. Early-successional stands account for 42% of the capable land base (16% <20 years and 26 >20 years).

Table 2.125. LSR RC-361 - Vegetative Condition	
Vegetative Condition	**Acres**
Late-successional/Open	239
Late-successional/Dense	573
Mid-successional/Open	1,347
Mid-successional/Dense	5,173
Early-successional/Pole	3,308
Early-successional/Sapling, seedling	1,959
Other	1,906
Total	**14,504**

The dominant vegetation types in the LSR include red fir (47%), white fir (17%), lodgepole pine (7%), and ponderosa pine (4%). The non-commercial/other vegetation types account for 13%. Other vegetation types account for only a minor portion of the LSR.

Insect and Disease

Observation flights have observed mortality during the years 1994-1997. Flights during all 4 years observed only endemic level of mortality for the most part. Flight during 1995 and 1997

observed areas of concentrated mortality but still at low levels and primarily in the true fir. The primary agents are the fir engraver beetle and western pine beetle.

Vegetative Sustainability Discussion

This LSR is doing poorly in terms of late-successional habitat, 6% of the capable land base. Protection of late-successional stands is important within this LSR. Management of early successional vegetation will be important for future development of late-successional habitat since it currently comprises 42% of the capable land base. Stand density is the primary component to be concerned with, especially in plantations and the high elevation zone.

Fire and Fuels

With younger, denser stands as the dominant vegetation type, fuel loads over much of the area fall in predominately Fuel Model FM-9 (36%) or FM-2 (27%). FM-9 is characterized by closed canopy conifer stands with densely stocked pole size trees in the understory. Typically these stands contain pockets of dead and down woody fuels. These fuels create high fire intensities during ground fires that can easily spread through the understory to the crowns of the dominant conifers. FM-2 is characterized by the poorer timbered sites and young plantations with grass and brush. Surface fires can spread easily with pockets of fuels generating high heat intensities. This fuel model is a concern on steep slopes or hotter aspects (south and west). Three other Fuel Models have been identified FM-4, FM-6 and FM-10 having 12%, 11%, and 4%, respectively.

The Hazard/Rating has been identified as Moderate/High. Large pockets of high hazard exist. The large of private lands can be considered at high hazard. Lightning fire occurrence is high in this LSR. There have been 60 fire starts recorded since 1910. Eighty-three percent of those fires have resulted from lightning strikes while the remaining 17% have been human caused. Only about 3% of the Mt. Shasta LSR has been influenced by fire this century.

Table 2.126 illustrates the FOFEM projected mortality in terms of high (>70%), medium (25% to 70%) and low (<25%).

Table 2.126. LSR RC-361 - Percent mortality by mortality rating (Percent of LSR)		
Mortality Rating		
High	**Medium**	**Low**
27.4%	28.8%	1.0%

Plantations are a major concern for fire effects due to the potential of loss. Most have not been thinned and tend to be over stocked, mixed with brush, and have limbs reaching the ground. This situation increases the likelihood for crown fires. Plantations are scattered throughout the LSR which makes it more difficult to isolated areas of concern.

The lower eastern slopes of Mt. Shasta have experienced low but significant levels of mortality. This area is of higher concern to fire behavior and effects. Fires that may start within this area of mortality will have a lower probability of controlling a fire quickly and increases the potential for a large catastrophic fire.

Terrestrial Species Status

Federally Listed Endangered, Threatened, or Proposed Species. There is only one Federally listed species known to occur in the Mt. Shasta LSR, the northern spotted owl (see below).

Forest Service Sensitive Species. The Mt. Shasta LSR is providing habitat for a number of Forest Service sensitive species which includes northern goshawk, Townsend's big-eared bat, marten, fisher, southern torrent salamander, and Cascade frog. There are 2 known goshawk territories occur southeastern portion of the LSR. There are anecdotal sighting of both marten and fisher. One of the original intents for the establishment of this LSR was to provide habitat and habitat connectivity to the north for marten.

Botanical surveys over the last several years have confirmed a number of species presently considered as sensitive plant species. Table 2.127 summarizes the list of species, their status, and their habitats.

Table 2.127 LSR RC-361 - Forest Service Sensitive Plants

Species	Known (K) or Suspected (S)	Habitat
Botrychium subgenus *Botrychium* (incl.) *B. crenulatum*	S	Meadows, marshes, & moist forests, often riparian; foothills to montane; widespread by sporadic.
Campanula wilkinsiana Wilken's harebell	K	Streambanks & springs in red fir and subalpine forests; 5,500-8,600 ft. elev.
Cypripedium fascisulatum Brownie lady's slipper	S	Mixed conifer or oak forests on a variety of soil types, often but not always associated with streams; 1,300-6,000 ft. elev.
Cypripedium montanum mountain lady's slipper	S	Mixed conifer or oak forests on a variety of soil types, often but not always associated with streams; 1,300-6,000 ft. elev.
Iliamna bakeri Baker's globe mallow	S	Chaparral, pine or mixed conifer/oak forest, juniper woodland; on rocky soil, 3800-6800 ft. elev.
Rorippa columbiae Columbia cress	S	Seasonal lakebeds & drainages east of Cascade crest; 500-4,500 ft. elev.
Smilax jamesii English Peak greenbriar	S	Shaded riparian habitat above 4,000ft

Survey and Manage Species. There are 2 species of vascular plants, *Cypripedium fasciculatm* and *C. montanum*, suspected of occurring in the Mt. Shasta LSR. There have been no systematic surveys for Survey and Manage species in this LSR.

Northern Spotted Owl

The Mt. Shasta LSR lies in the Modoc Zone. It is providing approximately 253 acres of nesting/roosting habitat and 5,493 acres of foraging habitat for a total of 5,746 acres of suitable spotted owl habitat. An additional 5,728 acres have the potential of providing suitable habitat. The Mt. Shasta LSR is presently at 52% of capable.

The western portion of the LSR abuts the Mt. Shasta Wilderness Area. This boundary lies above the upper limits of suitable habitat for the owl. Therefore, there is little suitable habitat occurring in the Mt. Shasta Wilderness that would add to the strength of the LSR for owls.

Approximately 60% of the LSR has been surveyed to protocol. Only 2 activity centers have been identified within the LSR boundaries. Table 2.128 summarizes habitat with 0.7 and 1.3 mile home ranges. Both home ranges extend beyond the borders of the LSR. Nesting/foraging (N/R) habitat is distinguished from foraging (F) habitat.

Table 2.128. LSR RC-361 - Acres of suitable Spotted Owl habitat within 0.7 and 1.3 mile home ranges

Activity Center	Habitat within 0.7 mile			Habitat within 1.3 mile		
	N/R	F	Total	N/R	F	Total
SK230	251	10	261	582	76	658
SK355	224	58	282	756	294	1050

Estimated Owls. There are no additional owls estimated to occur within the LSR. Most of the habitat to the north and the remainder of the LSR is above the elevational limit normally considered suitable owl habitat (approximately 6,000 ft.).

Northern Spotted Owl Critical Habitat. Approximately 2,000 acres of the Mt. Shasta LSR overlap with critical habitat unit CA-2.

CHU CA-2 is 76,463 acre unit. It was a consolidation of HCAs 40, 41, 43 and 44 and all intervening Federal lands. The original HCA-40 lies in the southern portion of the Mt. Shasta LSR. It lies in the Shasta-McCloud area and has be repeatedly recognized as an area of concern. This is largely due to checkerboard land ownership, an extensive logging history, as well as a dry climate resulting in a dominance of ponderosa pine and relatively open canopies. The area supports low owl densities, resulting in concern over restricted genetic interchange with the California subspecies. This particular critical habitat unit has two primary objectives. The presence of owl sites between those HCAs indicated that there was an opportunity to designate an area that may eventually support contiguous nesting habitat for up to 15 owl pairs. The CHU will also maintain easterly distribution of the subspecies. Table 2.129 summarizes overlap of CA-2 with McCloud and other land allocations. Included in the overlap assessment is the amount of spotted owl nesting/roosting and foraging habitat. Approximately 44% of the CHU remains as LSR or MSLA which includes 5 different units.

Table 2.129. LSR RC-361 - Acres of spotted owl habitat within CA-2 overlaid with Mt. Shasta

Land Allocation	Nesting/Roosting Habitat Acres	Foraging Habitat Acres	Other	Total
LSR/MLSA	4,664	15,216	15,090	34,969
Matrix	13	456	360	829
Other Reserve	2,435	10,501	27,732	40,668

Mt. Shasta LSR includes only two spotted owl activity centers of CA-2. Table 2.130 compares the spotted owl pair objectives for CA-2 with the total known activity centers in LSRs and MSLA.

Table 2.130. LSR RC-361 - Comparison of the spotted owl pair objectives in critical habitat unit CA-2 with total known activity centers in LSRs and MLSAs			
CHU	**Spotted Owl Pair Goal**	**LSR/MLSA**	**Known Activity Center in Corresponding Unit**
CA-2	15 pairs	RC-357	6 Activity Centers
		RC-360	1 Activity Center
		RC-361	1 Activity Center
		DD-76	1 Activity Center
		DD-78	1 Activity Center
		DD-79	1 Activity Center

In conclusion, the Mt. Shasta LSR, in conjunction with other LSRs or MLSAs, are not performing the intent of the original critical habitat unit. However, they are protecting all known pairs in the McCloud Flat area.

General Assessment of Habitat for late-successional-associated Species

Approximately 12,600 acres of this LSR are capable of producing late-successional habitat. Currently 786 acres or 6% of capable, are vegetated in late-successional habitat. The combined acres vegetated by late-successional and mid-successional habitat are 7,300 or 58% of capable. Relative to other LSRs, Mt. Shasta ranks as having a moderate amount of late-successional and a moderate amount of combined late-successional/mid-successional habitat.

Distribution and Connectivity of Habitat

Mt. Shasta LSR has many moderately sized (200-300 acres), continuous blocks of late-successional habitat. Mid-successional habitat forms most the connectivity between late-successional habitat patches both within the LSR and to patches adjacent to the LSR. The distribution of late-successional tend to be scattered. Mt. Shasta LSR does provide some of the largest most continuous stands of late-successional true fir on the Forest.

Late-Successional Reserve RC-362 Wagon

Introduction

The Wagon LSR is entirely within the boundaries of the Shasta-Trinity National Forest. This LSR is about 4,938 acres in size. The northern portion of the LSR lies adjacent to the Mt. Shasta Wilderness Area. There is a small parcel of private land within the boundaries. Elevation varies from 4,800 feet at the southern portion to 8,100 ft. at Gray Butte along the eastern boundary. It encompasses portions of Big Canyon Creek and Panther Creek. The terrain is steep and is dissected with steep ridgelines separating the drainages. There are major developments to the immediate west of the LSR. This area general receives a great deal of recreational use.

Most of the LSR originated as an Habitat Conservation Area under the ISC's spotted owl management strategy followed by it's designation as critical habitat. It was designated to provide

habitat for a single pair and as a "stepping stone" for dispersal. Table 2.131 displays the current condition of the LSR.

Table 2.131. LSR 362 Wagon - General Status	
Total Acres (Shasta-Trinity NF)	4,922
Acres Capable of Supporting Late-Successional Habitat	4,484
Acres Currently Supporting Late-Successional Habitat	989
Percent of LSR Subject to Lethal Affects	73.5%
Acres of Early-Successional Habitat	984
Acres of Riparian Reserve	40
Suitable Owl Habitat as a Percent of Capable Owl Habitat	74%
Miles of Road	20.4
Road Density	2.7
Private Land	16

Vegetation Condition

Table 2.132 highlights the general vegetative conditions for the Wagon LSR. Late-successional and mid-successional conditions account for 78% of the capable land base. Early-successional stands account for approximately 22% of the capable land base.

Wagon LSR is dominated by red fir which accounts for 42% of the total land base followed by white fir (30%) and ponderosa pine (6%). The major understory species include black oak, manzanita and snowbrush.

Table 2.132. LSR RC-362 - Vegetative Condition	
Vegetative Condition	**Acres**
Late-successional/Open	145
Late-successional/Dense	844
Mid-successional/Open	575
Mid-successional/Dense	1935
Early-successional/Pole	764
Early-successional/Sapling, Seedling	220
Other	438
Total	**4,922**

Insects and Disease

Since 1993, observation flights have observed mortality at normal endemic level during the years 1993-1996.

Vegetative Sustainability Discussion

Late-successional habitat is currently at a moderate level within this LSR, 22% of capable ground. It appears that natural establishment of late-successional habitat has been slow to develop within this LSR. Two factors have played a significant role in the successional

development of this area. This LSR lies at the Forest and urban interface. It lies immediately adjacent to the town of Mt. Shasta and has provided wood products to the community since the turn of the century. In addition, fire has played a major role since the mid to late 1880s. Past wildfires coupled with fire suppression and lack of stand management have resulted in many of the dense stand conditions that are observed today. This stand density may be a contributing factor to the slow development of late-successional habitat as there are numerous dense mid-successional and pole size stands. Mid-successional stands currently account for 56% of the capable land base and early-successional pole and seedling/sapling account for an additional 22%. The protection and management of these stands is critical to the future development of late-successional habitat. Stocking control will be essential to the development of future late-successional habitat.

Fire and Fuels

The is area is dominated by true fir (red and white) with minor amounts of ponderosa pine and mixed conifer. The primary fuel model identify for this LSR is Fuel Model 9 which accounts for approximately 39.3% of the total area. This is followed by Fuel Model 2, 10 and 6 having 18.1%, 17.1% and 14.6%, respectively. Other Fuel Model are represented but at less significant levels. Fuel Model 9 is characterized by closed canopy conifer stands with densely stocked pole size trees in the understory. Typically, these stands contain pockets of dead and down woody fuels. These fuels create high fire intensities during ground fires that can easily spread through the understory to the crowns of the dominant conifers. Fuel Model 2 is characterized by poorer timber sites and young plantations with grass and brush. Surfaces fires can spread easily with pockets of fuels generating high intensities. This fuel model is a concern on steep slopes or hotter aspects (south to west). Fuel Model 10 is characterized by dense late-successional conifer stands with heavy amounts of dead and down woody fuels. Typically, the understory is densely populated with intermediate size conifers. A wild fire carried by these fuels would be intense enough to cause crowning, spotting and rapid rates of spread on steep slopes or during high winds. Large stand replacing fires can be expected. Fuel Model 6 is characterized by sparsely stocked conifers containing large amounts of low level shrubs. These stands are a concern if the brush is old and decadent resulting in high dead to live ratios. Fire intensities are high in these situations.

The fire hazard/risk for the Wagon LSR has been rate as moderate/high. Pockets of high/high occur on southwest facing slopes. The major of the fires recorded were human caused. There have been 60 recorded fires since 1910. Fifty-seven percent of these have been human caused. With this LSRs location, these fires have been limited in nature, normally to less than 1 acre.

The primary concern for potential effect and fire behavior are the adjacent private lands and the extremely high level of recreational use of the area. The area abuts private inholdings to the east, south and west. Fuels have been allowed to accumulate on adjacent lands, increasing the fire hazard. When considering the surrounding area of high fuel accumulations from activity fuels, the fire behavior potential can change drastically. Flame lengths would be at a point to where aircraft and equipment would be needed. This increase in fuel and extremely high recreational us increases the probability of fire starts and resulting stand replacement fires.

Table 2.133 illustrates the FOFEM projected mortality in terms of high (>70%), medium (25% to 70%) and low (<25%).

Table 2.133. LSR RC-362 - Percent mortality by mortality rating (Percent of LSR)		
Mortality Rating		
High	**Medium**	**Low**
73.5%	23.9%	2.2%

Terrestrial Species Status

Federally Listed Endangered, Threatened, or Proposed Species. There are no Federally listed endangered, threatened or proposed species known to occur within this LSR.

Forest Service Sensitive Species. Habitat exist for a number of Forest Service Sensitive species including marten, goshawk and red-legged frog. However, none of the above species have been documented within the LSR.

There are a number of known and/or suspected Forest Service Sensitive plant species with the Wagon LSR. Table 2.134 summarizes the species occurrence and general habitat requisites.

Table 2.134. LSR RC-362 - Forest Service Sensitive Plants

Species	Known (K) or Suspected (S)	Habitat
Botrychium subgenus *Botrychium* (includes *B. crenulatum* et. al.)	S	Meadows, marshes, and moist forests, often riparian; foothills to montane
Campanula wilkinsiana Wilkins' harbell	S	Streambanks and springs in red fir and subalpine forest; 5500-8600 ft. elev. Old growth associated species
Cypripedium fasciculatum Brownie lady's slipper	S	Mixed conifer or oak forests on a variety of soil types, often but not always associated with streams; 1300-6000 ft. elev.
Cypripedium montanum Mountain lady's slipper	S	Mixed conifer or oak forests on a variety of soil types, often by not always associated with streams; 1300-6000 ft. elev. Widespread but sporadic
Iliamna bakeri Baker's globe mallow	S	Chaparral, pine or mixed conifer/oak forest, juniper woodland; on rocky soil; 3800-6800 ft. elev.
Rorippa columbiae Columbia cress	S	Seasonal lakebeds and drainages east of Cascade crest; 500-4500 ft. elev.
Smilax jamesii English Peak greenbriar	S	Shaded riparian habitat above 4000 ft.

Survey and Manage Species. Botanical surveyed over the past few years have confirmed two species of fungi (*Martelli monticola* and *Cortinarius verruccisporus*) at 7 different sites in the Sandflat area. The southern half of the LSR lies within the range of the Shasta salamander. This area has not been surveyed for the species and there are none scheduled for the near future.

Northern Spotted Owl

The Wagon LSR was originally established for dispersal and/or east-west movement of owls. The LSR lies in the Modoc Zone as identified in the on going interagency baseline assessment. It presently provides approximately 325 acres of nesting/roosting habitat and 2,454 acres of foraging habitat for a total of 2,779 acres of spotted owl habitat. There are an additional 984 acres capable of becoming suitable habitat.

The Wagon LSR has been surveyed numerous times for spotted owls. The entire LSR was surveyed during the period of 1989 to 1992. Since then, additional surveys have occurred but not on an annual basis. Northern spotted owl pairs have never been located in the LSR. Individuals have been heard during night time inventory but never relocated during day time follow-ups. No individuals have been heard in two consecutive years of inventorying to protocol.

Estimated Owls. It is estimated that this area could possibly contain a single pair in the future.

Northern Spotted Owl Critical Habitat. Wagon LSR overlaps almost entirely with critical habitat unit CA-6. The objectives of the CHU were two-fold. First, the area fills a gap and provide for connectivity between CHUs CA-7 (3-4 miles west) and CA-2 (3-4 miles east). The area was designated to act as a stepping stone. The second objective was that the area may support a single pair eventually.

Table 2.135. LSR RC-362 - Acres of spotted owl habitat within CA-6 overlaid with the Wagon LSR and other Forest land allocations

Land Allocation	Nest/Roosting Habitat Acres	Foraging Habitat Acres	Other	Total
LSR	323	2,112	1,185	3,620
Other Reserves	0	0	0	0
Matrix	1	89	715	805

Critical habitat unit CA-6 contained 4,422 acres. The present LSR contains 4,922 acres. Table 2.135 summarizes overlap of CA-6 and the Wagon LSR and other land allocation. Included in the overlap assessment is the amount of spotted owl nesting/roosting and foraging habitat. Approximately 85% of the critical habitat unit overlaps with the LSR. There are no other land allocations (i.e. other reserves) providing additional protection. Approximately 652 acres of the original CHU is now matrix.

The Wagon LSR has no activity centers. None were planned for. There are no spotted owl activity centers included in the matrix-portion of critical habitat.

In conclusion, Wagon LSR performs the intended function of CA-6. It functions in providing habitat and connectivity to and from the adjacent LSRs and may eventually have a nesting pair.

General Assessment of Habitat for Late-successional-associated Species

Approximately 4,484 acres of Wagon LSR are capable of producing late-successional. Currently, 989 acres or 22% of capable are vegetated in late-successional. This is representative of many of the smaller LSRs across the Forest. A large portion of the LSR is vegetated in mid-successional habitat, or 56% of capable. The combined acres vegetated in late-successional and mid-successional forest are 3,499 acres, or 78% of capable. Relative to other small LSR on the Forest, Wagon LSR, has a low amount of late-successional habitat and a high amount of combined mid-successional/late-successional habitat.

Distribution and Connectivity of Habitat

A high percentage of the late-successional is located in the center of the Wagon LSR. Distribution of late-successional is generally poor within the LSR. Dense mid-successional stands run along the west edge and in the southern portion of the LSR. Connectivity to adjacent LSRs or MSLAs is extremely poor and is in the form of isolated stands along the base of Mount Shasta. The City of Mt. Shasta lies to the west, Mt. Shasta lies to the north, a broad expanse of private land lies to the south and checkerboard ownership lies to the east.

Other Resources

Livestock grazing occurred in this area as early as the 1800s. The Mt. Shasta area has been noted as a recreational area since the early 1900s. Both alpine and nordic skiing has been a favorite winter past time in the area since the 1940s. Mountaineering, both during the summer and winter, has also occurred since the turn of the century. General recreational use of Mt. Shasta area has increased gradually for many years. Two high day use winter areas (Sand Flat and Bunny Flat) are located in the eastern portion of the LSR while McBride Campground lies in the western portion.

Managed Late-Successional Area DD-72 Fons

Introduction

The Fons MLSA is entirely within the boundaries of the Shasta-Trinity National Forest. It was established around a historic spotted owl pair. It is located in the Fons Butte area two miles south of the Shasta-Trinity/Klamath National Forest boundaries. It runs from Dry Creek Spring to the north to Fons Butte in the south. It lies in an areas of checkerboard ownership and consist of two sections. Adjacent LSRs include RC-361 one mile to the north, RC-360 3 miles to the south and RC-359 10 miles to the east. The MLSA contains 1,243 acres of NFS ownership. Elevation varies from 4920 feet at Swamp Creek to 5,660 feet in the northeastern corner.

Unlike most of the LSRs, this MLSA did not has its origins with the ISC strategy. Its primary intend is to provide habitat for a single owl pair in a known high fire regime environment. Table 2.136 lists the current condition by acres within the MLSA.

Table 2.136. MLSA DD-72 Fons - General Status	
Total Acres (Shasta-Trinity NF)	1,243
Acres Capable of Supporting Late-Successional Habitat	999
Acres Currently Supporting Late-Successional Habitat	479
Percent of MLSA subject to Lethal Affects	58.1%
Acres of Early-Successional Habitat	443
Acres of Riparian	30
Suitable Owl Habitat as a Percent of Owl Capable	50%
Miles of Road	6.9
Road Density	3.45
Private Land	58

Vegetative Condition

Table 2.137 highlights the general vegetative conditions for the Fons MLSA. Late-successional and mid-successional conditions accounts for 56% of the capable land base. Early-successional stands accounts for approximately 44% of the capable land base with 22% <20 years of age and 17% >20 years of age.

Table 2.137. MLSA DD-72 - Vegetative Condition	
Vegetative Condition	**Acres**
Late-successional/Open	57
Late-successional/Dense	422
Mid-successional/Open	48
Mid-successional/Dense	29
Early-Pole	173
Early-successional/Sapling, Seedling	270
Other	244
Total	**1,243**

Fons MLSA is dominated by ponderosa pine which accounts for 39% of the total NFS acres. The is followed by mixed conifer than white fir with 22 and 20%, respectively. Knobcone pine accounts for 18% of the NFS acres. The above acres tends to be skewed with ponderosa pine being primarily in the older age classes and mixed conifer and white fir in the younger age classes. Understory species include Mountain whitethorn and snowbrush.

Insects and Disease

Since 1993, observation flights have showed constant low mortality in the mixed conifer and moderate levels in ponderosa pine. Observed mortality in both species was primarily in 1996 and 1997.

Vegetative Sustainability Discussion

Late-successional habitat is currently at a relatively high level within this MLSA, 48% of capable. Thirty-six percent of the land base is in plantations. Many of the plantations are a result of reforestation measures taken to reforest old burned areas from shrub field back to conifer dominated forest. Approximately 8% of the area is in mid-successional. Much of the MLSA has high potential for the development of additional late-successional habitat. Records of more recent times indicate that fire has had only a minor role. There have been two human causes fires both of which were under 100 acres in size. In addition, there has been very little significant fire activity in the area surrounding the MLSA. The area has been grazed by livestock since the mid 1800s and continues to be grazed today. No doubt grazing has had some influence on the MLSA. At the present time, there is a disproportionate amount of early successional vegetation or plantations. These stands are normally dense which tends to slow the development of late-successional habitat. The protection and management of these stands is important to the future development of late-successional habitat. Stocking control will be essential to the develop of these stands.

Fire and Fuels

This MLSA generally has a good distribution of ponderosa pine, mixed conifer and white fir. The primary fuel model identified for this MLSA is Fuel Model 10, 36% of the area. This is followed by Fuel Model 4 and 6 having 9.7% and 8.4%, respectively. Fuel Model 10 is characterized by dense late-successional conifer stands with heavy amounts of dead and down woody fuels. Typically the understory is densely populated with intermediate size conifers. A wild fire carried by these fuels would be intense enough to cause crowning, spotting and rapid rates of spread on steep slopes or during high winds. Fuel Model 4 is characterized by older, unthinned plantations, stands of mature shrubs and conifer. Crown density in the plantations and shrub fields increases the likelihood of stand replacing events. Fuel Model 6 is characterized by sparsely stocked conifers containing large amounts of low level shrubs (less than 6 feet). These stands are a concern if the brush is old and decadent resulting in high dead to live ratios. Fire intensities are high in these situations.

The fire risk for the Fons MLSA has been rated as Moderate/High. Lightning caused fires are the main risk. Records show that this area has not experienced significant fire affect since 1910. There have been a number of fires less then 100 acres within and/or adjacent to the MLSA, all less than 100 acres.

The primary concern for potential effects and fire behavior are from the adjacent private lands. The area is checkerboard ownership with moderate to high levels of harvesting occurring, both in years past and currently. Fuels have been allowed to accumulate, increasing the fire hazard. When considering the surrounding area of high fuel accumulation from activity fuels, the fire behavior potential can change dramatically. Flame lengths would be at a point to where aircraft and equipment would be needed. This increase in fuels significantly increases the probability of a stand replacement fire.

Table 2.138 illustrates the FOFEM projected mortality in terms of high (>70%), medium (25% to 70%) and low (<25%).

Table 2.138. MLSA DD-72 - Percent mortality by mortality rating (Percent of LSR)		
Mortality Rating		
High	**Medium**	**Low**
58.1%	35.7%	0.0%

Terrestrial Species Status

Federally Listed Endangered, Threatened, or Proposed Species. The only Federally listed species know to occur within this LSR is the northern spotted owl (see below).

Forest Service Sensitive Species. Habitat exist for a number of Forest Service Sensitive species including the fisher, marten, goshawk, and northern red-legged frog. Marten and fisher were monitored in the area jointly be the Forest Service and Sierra Pacific Industries, Inc. for a number of year during the later part of the 1980s and early 1990s. Fons MLSA lies within a know goshawk territory and is within 2 miles of a second territory. Swamp Creek is providing habitat for northern red-legged frogs but has never been inventoried to protocol to determine presence.

There are a number of known or suspected Forest Service Sensitive plant species within the Fons MLSA. Table 2.139 summarizes the species occurrence and general habitat requisites.

Table 2.139. MLSA DD-72 - Forest Service Sensitive Plants		
Species	**Known (K) or Suspected (S)**	**Habitat**
Botrychium subgenus *Botrychium* (includes *B. crenulatum* et. al.)	S	Meadows, marshes, and moist forests, often riparian; foothills to montane
Campanula wilkinsiana Wilkins' harbell	S	Streambanks and springs in red fir and subalpine forest; 5500-8600 ft. elev. Old growth associated species
Cypripedium fasciculatum Brownie lady's slipper	S	Mixed conifer or oak forests on a variety of soil types, often but not always associated with streams; 1300-6000 ft. elev.
Cypripedium montanum Mountain lady's slipper	S	Mixed conifer or oak forests on a variety of soil types, often by not always associated with streams; 1300-6000 ft. elev. Widespread but sporadic
Iliamna bakeri Baker's globe mallow	S	Chaparral, pine or mixed conifer/oak forest, juniper woodland; on rocky soil; 3800-6800 ft. elev.
Rorippa columbiae Columbia cress	S	Seasonal lakebeds and drainages east of Cascade crest; 500-4500 ft. elev.
Smilax jamesii English Peak greenbriar	S	Shaded riparian habitat above 4000 ft.

Survey and Manage Species. The MLSA lies within the range of numerous survey and manage species. However, there have been no surveys conducted within the Fons units and there are no sites known to occur in this area.

Northern Spotted Owl

The Fons MLSA was developed to protect a known owl pair in an area where few owls occur and in an area having high fire potential. This MLSA lies in the Modoc Zone as defined by the Interagency Provincial Baseline Technical Committee. The MLSA provides approximately 253 acres of nesting/roosting habitat and 197 acres of foraging habitat for a total of 450 acres of spotted owl habitat. There is an additional 443 acres capable of becoming habitat. The LSR is presently at 50% of capable.

All of the Fons MLSA has been survey for spotted owl numerous times over the years and was last surveyed in 1991. One spotted owl activity center has been identified within the boundaries of the MLSA. Table 2.140 summarizes suitable habitat within 0.7 and 1.3 mile home ranges circles. Nesting/roosting (N/R) is distinguished from foraging (F) habitat.

Table 2.140. MLSA DD-72 - Acres of suitable Spotted Owl habitat within 0.7 and 1.3 mile home ranges

Activity Center	Habitat within 0.7 mile			Habitat within 1.3 mile		
	N/R	F	Total	N/R	F	Total
SK248	261	12	273	439	160	599

Estimated Owls. There are no additional spotted owl territories estimated to occur in the Fons MLSA.

Northern Spotted Owl Critical Habitat. Fons MLSA was not a part of the final listing for critical habitat for the northern spotted owl. Its purpose is identified as a Reserve for an owl pair in the drier provinces where regular and frequent fire is a natural part of the ecosystem.

General Assessment of Habitat for Late-successional-associated Species

Approximately 999 acres of the Fons MLSA are capable of producing late-successional habitat. Currently, 479 acres or 48% of capable are vegetated in late-successional habitat. This is relatively high as compared to other small LSRs or MLSAs. A minor portion of this MLSA is vegetated in mid-successional habitat, only 8% of capable. The combined acres vegetated in late-successional and mid-successional forest are 555 acres, or 56% of capable.

Distribution and Connectivity of Habitat

There is a good distribution of late-successional forest in the Fons MLSA. Although this MLSA is contain only two sections of NFS lands, there is good connectivity within its boundaries. Dense mid-successional habitat is limited but, it is also well distributed. The Fons MLSA is somewhat isolated from adjacent LSRs/MLSA. The area has checkerboard ownership and very little late-successional is present on either NFS or private lands.

Other Resources

The Fons MLSA lies adjacent to the Toad Mountain and Bartle Cattle Allotments. Dispersed recreations occurs during the summer months. Hunting occurs from late summer through the fall months.

Managed Late-Successional Area DD-78 Sheephaven

Introduction

The Sheephaven MLSA is entirely within the boundaries of the Shasta-Trinity National Forest. It is one of six MLSA scattered across the east side of the Forest. Sheephaven Butte lies to the northwest while Stillwater Butte lies in the southeastern corner. The boundaries encompass the best habitat around a know owl pair. It lies approximately 1 mile east of RC-357, two mile north of DD-79 and 7 miles south of RC-359. This MLSA contains 1,138 acres of land all of which is NFS land. There are 6.4 miles of road leading to a road density of 3.6 miles of road per section. Elevation varies from 4,640 feet along Stillwater Creek to 5,234 feet at Sheephaven Butte.

This MLSA had its origins with the Northwest Forest Plan and was not originally associated with the ISC strategy. Its primary intent was to provide habitat for an owl pair in the drier areas where regular and frequent fire is a natural part of the ecosystem. Table 2.141 lists the current condition by acres within the MLSA.

Table 2.141. MLSA DD-78 Sheephaven - General Status	
Total Acres (Shasta-Trinity NF)	1,138
Acres Capable of Supporting Late-Successional Habitat	1,138
Acres Currently Supporting Late-Successional Habitat	0
Percent of MLSA Subject to Lethal Affects	21.9%
Acres of Early-Successional Habitat	36
Acres of Riparian	0
Suitable Owl Habitat as a Percent of Owl Capable Habitat	93%
Miles of Road	6.4
Road Density	3.6
Private Land	0

Vegetative Condition

Table 2.142 highlights the general vegetative conditions for the Sheephaven MLSA. Late-successional and mid-successional conditions account for 97% of the capable land base. Early-successional stands accounts for approximately 3% of the capable land base with all of those acres less than 20 years of age.

Table 2.142. MLSA DD-78 - Vegetative Condition	
Vegetative Condition	**Acres**
Late-successional/Open	0
Late-successional/Dense	0
Mid-successional/Open	640
Mid-successional/Dense	462
Early-successional/ Pole	0
Early-successional/Sapling, Seedling	36
Other	0
Total	**1,138**

Sheephaven MLSA is dominated by white fir which accounts for 87% of the land base followed by ponderosa and mixed conifer with 6% and 4%, respectively. Understory species includes snowbush, mountain whitethorn and a variety of grass species.

Insects and Disease

Since 1993, observation flights have observed endemic levels of mortality within the MLSA. However, in 1995 approximately 3,000 acres of moderate to high mortality was observed in pine to the south of Sheephaven.

Vegetative Sustainability Discussion

Late-successional habitat is currently lacking within the Sheephaven MLSA. It appears that some of the 3G stands maybe providing structure emulating late-successional characteristics. Within recent history, fire has played only a minor role in the vegetative development of the area. Existing stands are a result of several factors, including fire in the later part of the 1800s, fire suppression, and lack treatments to manage stand density. Approximately 25% of the area is in dense stands of white fir. This stand density may be contributing to the slow development of late-successional habitat. Mid-successional stands currently account for 97% of the capable land base and early-successional stands account for the remainder. Protection and management of these stands is critical to the future development of late-successional habitat. Stocking control will be essential to the development of future late-successional habitat and reduction of fire hazard.

Fire and Fuels

The area consist primarily of white fir with small amounts of ponderosa pine and mixed conifer. The primary fuel models identified for this MLSA is Fuel Model are 6 and 9. Fuel Model 6 is characterized by sparsely stocked conifer stands containing large amounts of low level shrubs. These stands are a concern if the brush is old and decadent resulting in high dead to live ratios. Fire intensities are high in these situations. Fuel Model 9 is characterized by closed canopy conifer stands with densely stocked pole size trees in the understory. Typically, these stands contain pockets of dead and down woody fuels. These fuels create high fire intensities during ground fires that can easily spread through the understory to the crowns of the dominant conifers.

The fire risk for the Sheephaven MLSA has been rated as Moderate/Moderate. There are pockets of high hazard fuels within the MLSA to warrant a rating above moderate. There have been 9 fires recorded in DD-78 since 1910. All of these fires have been under 100 acres in size. Fire of the fire were lightning caused and 4 were human caused. There have been major fires in this area. Two large fires to the west and south were recorded in 1924 with a major conflagration occurring to the east in the 1960s.

The primary concern for potential effects and fire behavior are the adjacent lands to the west. Fuels have been allowed to accumulate, increasing the activity fuels accumulation and fire hazard. This increase in fuels significantly increases the probability of a stand replacement fire.

Table 2.143 illustrates the FOFEM projected mortality in terms of high (>70%), medium (25% to 70%) and low (<25%).

Table 2.143. MLSA DD-78 - Percent mortality by mortality rating (Percent of LSR)		
Mortality Rating		
High	**Medium**	**Low**
21.9%	78.1%	0.0%

Terrestrial Species Status

Federally Listed Endangered, Threatened or Proposed Species. The only Federally listed species known to occur within DD-78 is the northern spotted owl (see below).

Forest Service Sensitive Species. Habitat exist for a number of Forest Service Sensitive species to include the fisher, marten, and goshawk. Fisher and marten have been monitored in the area in the past by both the Forest Service and Sierra Pacific Industries, Inc. The southwestern portion of the MLSA lies within a known goshawk territory. The center of this territory is approximately one southwest.

Table 2.144. MLSA DD-78 - Forest Service Sensitive Plants		
Species	**Known (K) or Suspected (S)**	**Habitat**
Botrychium subgenus *Botrychium* (includes *B. crenulatum* et.al.)	S	Meadows, marshes, and moist forests, often riparian; foothills to montane
Campanula wilkinsiana Wilkins' harbell	S	Streambanks and springs in red fir and subalpine forest; 5500-8600 ft. elev. Old growth associated species
Cypripedium fasciculatum Brownie lady's slipper	S	Mixed conifer or oak forests on a variety of soil types, often but not always associated with streams; 1300-6000 ft. elev.
Cypripedium montanum Mountain lady's slipper	S	Mixed conifer or oak forests on a variety of soil types, often by not always associated with streams; 1300-6000 ft. elev. Widespread but sporadic
Lliamna bakeri Baker's globe mallow	S	Chaparral, pine or mixed conifer/oak forest, juniper woodland; on rocky soil; 3800-6800 ft. elev.
Rorippa columbiae Columbia cress	S	Seasonal lakebeds and drainages east of Cascade crest; 500-4500 ft. elev.
Smilax jamesii English Peak greenbriar	S	Shaded riparian habitat above 4000 ft.

There are a number of known and/or suspected Forest Service plant species within the Sheephaven MLSA. Table 2.144 summarizes the species occurrence and general habitat requisites.

Survey and Manage Species. Surveys have been limited in this area. There are no known survey or manage species in this MSLA. However, *Allotropa virgata* has been survey for and located in RD-361, two miles to the north.

Northern Spotted Owl

Sheephaven MLSA DD-78 is one of 6 such areas scattered across the east side of the Forest. Its primary purpose is similar to Late-successional Reserves but are identified for certain owl locations in the drier provinces where regular and frequent fire is a natural part of the ecosystem. Sheephaven lies in the Modic Zone as define by the Klamath Province interagency spotted owl baseline technical committee. By definition, it presently provides very little nesting/roosting habitat, zero acres. However, it does appear that a number of the stands does provide the characteristics of owl nesting/roosting habit at. It does provide 462 acres of foraging habitat. This area was first surveyed to protocol in 1989 with addition surveys the following 4 years. The last time it was surveyed to protocol was 1996. Reproduction has never been verified. There is one activity center. Table 2.145 summarizes suitable habitat within 0.7 and 1.3 mile home ranges. Nesting/roosting (N/R) is distinguished from foraging (F) habitat.

Table 2.145. MLSA DD-78 - Acres of suitable spotted owl habitat within 0.7 and 1.3 mile home ranges

Activity Center	Habitat within 0.7 mile			Habitat within 1.3 mile		
	N/R	F	Total	N/R	F	Total
Sk356	0	462	462	0	462	462

Estimated Owls. There are no additional spotted owl territories estimated to occur in the Sheephaven MLSA.

Northern Spotted Owl Critical Habitat. The Sheephaven MLSA DD-78 was a part of the large CHU CA-2. The entire 1,138 acres lies within the boundaries of CA-2 in the northeastern corner. CA-2 was originally 4 small HCAs designed by the ISC. The presence of owl sites between those HCAs indicated that there was an opportunity to designate an area that may eventually support contiguous nesting habitat for up to 15 owl pairs. The CHU will also maintain easterly distribution of the subspecies.

The Sheephaven MLSA functions by providing protected habitat for a single pair of owls and to a lesser extent for connectivity and dispersal as individuals pass through. Table 2.146 displays the overlap with other land allocations.

Table 2.146. MLSA DD-78 - Acres of spotted owl habitat within CA-2 overlaid with the Sheephaven MSLA and other Forest land allocations

Land Allocation	Nest/Roosting Habitat Acres	Foraging Habitat Acres	Other	Total
LSR	323	2,112	1,185	3,620
Other Reserves	0	0	0	0
Matrix	1	89	715	805

General Assessment of Habitat for Late-successional-associated Species

All of Sheephaven MLSA is capable of producing late-successional, 1,138 acres. Currently there doesn't appear to be well developed late-successional habitat. This is not representative of other adjacent smaller units. The majority of the MLSA is vegetated in mid-successional habitat, 97%. When looking at potential for future late-successional, DD-78 has a high potential for a relatively large contiguous block of late-successional habitat.

Distribution and Connectivity of Habitat

As stated above, there appears to be no functioning late-successional habitat present. However, there is an excellent distribution of mid-successional habitat within the MLSA. There is one large contiguous mid-successional stand providing excellent connectivity within the MLSA. Connectivity to adjacent LSRs and MLSAs is also in good condition. Much like MLSA, connectivity throughout this area leans heavily to mid-successional stands.

Other Resources

Sheephaven MLSA lies in the Toad Mountain Cattle Allotment. Approximately 115 cow/calf pairs graze the allotment through most of the summer months. Dispersed recreation is the primary use by the general public.

Late-Successional Reserve RC-359 Harris Mountain

Introduction

The Harris Mountain LSR lies entirely within the boundaries of the Shasta-Trinity National Forest. It is basically a stepping stone for east-west and/or north-south dispersal. It is centered around Harris Mountain. It is approximately 3 miles in length and 2 miles in within. It is adjacent to private land along its eastern border. Adjacent LSRs include Porcupine, RC-360, approximately 6 miles to the east, Mt. Shasta, RC-361, 6 miles to the west and Sheephaven, DD-78, approximately 8 miles to the south. This small LSR contains 2,224 acres all of which is NFS lands. There are 9 miles of roads leading to a road density of 2.6 miles per square mile of LSR. Elevation varies from 4,800 feet in the flats to 5,788 at Harris Mountain.

This LSR had its original with the "Presidents Forest Plan" and not the ISC strategy. It was developed to provide for east/west connectivity for late-successional-associated species. It was

centered on a single owl pair and lies within the Modoc Zone. Table 2.147 lists the current condition by acres within the LSR

Table 2.147. LSR RC-359 Harris Mountain - General Status	
Total Acres (Shasta-Trinity NF)	2,224
Acres Capable of Supporting Late-Successional Habitat	2,196
Acres Currently Supporting Late-Successional Habitat	20
Percent of LSR subject to Lethal Affects	24.8%
Acres of Early-Successional Habitat	748
Acres in Riparian	0
Suitable Owl Habitat as a Percent of Owl Capable Habitat	58%
Mile of Road	9
Road Density	2.6
Private Land	0

Vegetative Condition

Table 2.148 highlights the general vegetative conditions for the Harris Mountain LSR. Late-successional and mid-successional conditions account for 66% of the capable land base. Early-successional stands accounts for approximately 34% (14% <20 years of age and 20% >20 years of age) of the capable land base.

Table 2.148. LSR RC-359 - Vegetative Condition	
Vegetative Condition	**Acres**
Late-successional/Open	0
Late-successional/Dense	20
Mid-successional/Open	416
Mid-successional/Dense	1,012
Early-successional/Pole	426
Early-successional/Sapling, Seedling	322
Other	28
Total	**2,224**

The Harris Mountain LSR is dominated by white fir which accounts for 33% for the total land base followed by lodgepole pine (22.5%), mixed conifer (14.9%) and ponderosa pine (13.6%).

Insects and Disease

Since 1993, observation flights have observed range of constant mortality within and adjacent to the Harris Mountain area. In 1994 there was approximately 8,000 acres of moderate levels of mortality in pine. There was a low level of mortality in true fir observed in 1996. In 1997 there was a moderate amount of mortality on 6,549 acres of pine. As observed over the past 5 years, this general area has experienced a low to moderate amount of mortality primarily in the younger overstocked stands of true fir (white fir), lodgepole pine and ponderosa pine.

Vegetative Sustainability Discussion

Late-successional habitat is currently at low levels within this LSR, 1% of the capable land base. Early-successional stands account for 34% of the capable land base. Late-successional habitat has been slow to develop within this LSR. Records show that fire has had little influence on the vegetative matrix in RC-359 during this century. Stand management, fire suppression, and lack of treatment to control stand density have had a primary role in shaping the development of current forests conditions. Stand density is a contributing factor to the slow development of late-successional habitat as there are numerous dense mid-successional and pole size stands. Mid-successional stand currently account for 65% of the capable land base with early-successional pole and sapling/seedling accounting for an additional 34%.

Forest protection and management of these stands is critical to the future development of late-successional habitat. Stocking control will be essential to the development of future late-successional habitat.

Fire and Fuels

The area generally has a good distribution of mixed conifer, lodgepole pine, white fir and ponderosa pine. The primary fuel models identified for this LSR include Fuel Models 9, 2, and 6. Fuel Model 9 accounts for approximately 45.5% of the land base while Fuel Models 2 and 6 account for 19.5% and 18.7%, respectively. Fuel Model 9 is characterized by closed canopy conifer stands with densely stocked pole size trees in the understory. Typically, these stands contain pockets of dead and down woody fuels. These fuels create high fire intensities during ground fires that can easily spread through the understory to the crowns of the dominant conifers. Fuel Model 2 is characterized by poorer timber sites and young plantations with grass and brush. Surface fires can spread easily with pockets of fuels generating high heat intensities. This fuel model is a concern on steep slopes or hotter aspects (south to west). Fuel Model 6 is characterized by Sparsely stocked conifers containing large amounts of low level shrubs (less than 6 feet). These stands are a concern if the brush is old and decadent resulting in high dead to live ratios. Fire intensities are high in these situations.

The fire risk for the Harris Mountain LSR has been rated as Moderate/High. There are some large pockets of high hazard conditions within the LSR. Lightning caused fire is the main risk involved. There have been 9 fires recorded within the LSR, all less than 100 acres and primarily lightning caused. Two of the nine fire occurrences have been human caused. Records show no indication of large fires occurring adjacent to Harris Mountain within this century.

The primary concern for potential fire effects and fire behavior are from the adjacent lands to the east. There are several thousands of acres in private ownership with moderate levels of harvesting occurring over the past several years. Fuels have been allowed to accumulate, increasing the fire hazard. When considering the adjacent area of high fuel accumulation from activity fuels, the fire behavior potential can change dramatically.

Table 2.149 illustrates the FOFEM projected mortality in terms of high (>70%), medium (25% to 70%) and low (<25%).

Table 2.149. LSR RC-359 - Percent mortality by mortality rating (Percent of LSR)		
Mortality Rating		
High	**Medium**	**Low**
24.8%	74.8%	0.0%

Terrestrial Species Status

Federally Listed Endangered, Threatened, or Proposed Species. There is only one known Federally listed species occurring within this LSR, the northern spotted owl (see below).

Forest Service Sensitive Species. Habitat exist for a number of Forest Service Sensitive species to include the fisher, marten, and goshawk. In past year, both the fisher and marten were monitored under agreement between Sierra Pacific Industries, Inc. and the Forest Service. There is known goshawk nesting territory within RC-359. In addition, there are two territories adjacent to the LSR, one approximately two miles to the south and one approximately three miles to the west.

There are a number of known or suspected Forest Service Sensitive plant species with the Harris Mountain LSR. Table 2.150 summarizes the species occurrence and general habitat requisites.

Table 2.150. LSR RC-359 - Forest Service Sensitive Plants		
Species	**Known (K) or Suspected (S)**	**Habitat**
Botrychium subgenus *Botrychium* (incl. *B. crenulatum* et.al.)	S	Meadows, marshes, and moist forests, often riparian; foothill to montane .
Cypripedium fasciculatum Brownie lady's slipper	S	Mixed conifer or oak forest on a variety of soil types; often but not always associated with streams; 1,300-6,000 feet elev.
Cypripedium montanum Mountain lady's slipper	S	Mixed conifer or oak forests on a variety of soil types, often but not always associated with streams; 1,300-6,000 feet elev.
Lliamna bakeri Baker's globe mallow	S	Chaparral, pine or mixed conifer/oak forest, juniper woodland, on rocky soil; 3,800-6,800 feet elev.
Orcuttia tenuis Slender Orcutt grass	S	Vernal pools, floodplains, reservoir edges on clay soils; 110-4,500 feet elev.
Rorippa columbiae Columbia cress	S	Seasonal lakebeds and drainages east of Cascade crest; 500-4,500 feet elev.
Smilax jamesii English Peak greenbriar	S	Lakesides, streambanks, riparian areas in montane coniferous forest; 2,900-7,500 feet elev.

Survey and Manage Species. Botanical surveys over the past few years have not confirmed any of the survey or manage plant species. No surveys of occurred for fungi, lichens, or bryophytes have taken place to date. There are no known sites.

Northern Spotted Owl

The Harris Mountain LSR was established for a number of reasons, one of which was to protect a know reproductively successful pairs of owls. This LSR provides 20 acres of good quality nesting/roosting habitat and approximately 1,013 acres of foraging habitat for a total of 1,033 acres of spotted owl habitat. An additional, 748 acres have the potential to provide spotted owl habitat in the future. This LSR is presently 58.0% of capable.

All of the Harris Mountain LSR has been surveyed to protocol for spotted owls over the years. The entire LSR was first surveyed in 1989 with 5 years of additional survey since then. The last year of survey was 1996. The only year of successful reproduction was in 1991. There is only one known activity center within the LSR boundaries. Table 2.151 summarizes suitable habitat within the 0.7 and 1.3 mile home ranges. Nesting/roosting (N/R) is distinguished from foraging (F) habitat.

Table 2.151. LSR RC-359 - Acres of suitable Spotted Owl habitat within 0.7 and 1.3 mile home ranges

Activity Center	Habitat within 0.7 mile			Habitat within 1.3 mile		
	N/R	F	Total	N/R	F	Total
SK354	181	253	434	443	674	1117

Estimated Owls. There are no additional spotted owl territories estimated to occur in the Harris Mountain LSR.

Northern Spotted Owl Critical Habitat. The Harris Mountain LSR was never part of the Final Designated Critical Habitat. The closes CHU is CA-2 six miles to the west and south.

General Assessment of Habitat for Late-successional-associated Species

Approximately 2,196 acres of the Harris Mountain LSR are capable of producing late-successional habitat. Currently, on 20 acres or 1.0% of capable have been identified as late-successional habitat. Some of the mid-successional habitat may have the structural characteristic of late-successional. This is representative of many of the smaller LSRs/MLSAs in this eastern portion of the Forest. A large portion of the LSR is vegetated in mid-successional habitat, 65% of capable. Combining the late-successional and mid-successional only provide a small addition or 65.9%. Harris Mountain has a low amount of late-successional but a relatively high amount of combined late-successional/mid-successional habitat.

Distribution and Connectivity of Habitat

There are few stands of late-successional forest in the Harris Mountain LSR. The only late-successional is located in the south central portion of the LSR. Mid-successional stands may be providing the same structure as late-successional. Both open and dense mid-successional habitat is well distributed through the 2,224 LSR. It is also well connected. However, there are large gaps in the distribution of both late-successional and mid-successional habitat adjacent to Harris Mountain. This area tends to have a great deal of inherent fragmentation. This coupled with past

management activities has lead to a highly fragmented environment having a poor distribution of late-successional habitat.

Other Resources

The Harris Mountain LSR lies within the Toad Mountain Cattle Allotment. The are 200 cow/calf pairs having a grazing season running from June 16th through September 30th . The Harris Mountain Guard Station is located in the western portion of the LSR. Dispersed recreation is primarily limited to the fall hunting season running from around the end of August through October.

Late-Successional Reserve RC-358 Porcupine

Introduction

The Porcupine LSR lies entirely within the boundaries of the Shasta-Trinity National Forest. The intent of the LSR was to establish and maintain the last few remaining late-successional stands on the far eastern side of the Forest and thus maintain and/or provide connectivity for late-successional-associated species. It is a relatively long narrow LSR run north/south. It is approximately 6 miles long and 1 mile wide. It runs from Six Shooter Butte in the north to Porcupine Butte to the south. Adjacent LSR include RC-259 seven miles to the west, and DD-78 approximately 11 miles to the south west. This linear LSR contains 1,070 acres of NFS lands and 19 acres of private. The main road bisecting this LSR is one of the few routes accessing the Medicine Lake area. Elevations vary from 4,600 feet east of Porcupine Butte to 6,120 feet at Six Shooter Butte in the north end.

This LSR originated with the Northwest Plan and did not originate as part of the ISC strategy. Its primary intent was to provide connectivity in a east/west direction. The are no owls present nor was there an intent to provide for spotted owls with this LSR. Table 2.152 displays the LSR's current status.

Table 2.152. LSR RC-358 Porcupine - General Status

Total Acres (Shasta-Trinity NF)	1,070
Acres Capable of Supporting Late-Successional Habitat	878
Acres Currently Supporting Late-Successional Habitat	163
Percent of LSR subject to Lethal Affects	12%
Acres of Early-Successional Habitat	202
Acres in Riparian	0
Suitable Owl Habitat as a Percent of Owl Capable Habitat	N/A
Miles of Road	16.3
Road Density	2.3
Private Land	19

Vegetative Condition

Table 2.153 highlights the general vegetative condition for the Porcupine LSR. Late-successional and mid-successional conditions account for 77.0% of the capable land base. Plantations account for approximately 23.0% of the capable land base (5.7% <20 years of age and 9.3% >20 years of age).

Table 2.153. LSR RC-358 - Vegetative Condition

Vegetative Condition	Acres
Late-successional/Open	0
Late-successional/Dense	163
Mid-successional/Open	430
Mid-successional/Dense	83
Early-successional/Pole	164
Early-successional/Sapling, Seedling	38
Other	192
Total	1,070

Porcupine LSR is dominated by ponderosa pine which accounts for 53.2% of the total land base followed by mixed conifer, white fir and red fir with 10.5%, 6.7% and, 4.2%, respectively. Understory consist of oak species, snowbrush, mountain whitethorn, bitterbrush.

Insects and Disease

Since 1993, observation flights have observed endemic levels of mortality with and adjacent to the Porcupine LSR. However, there was a moderate level of mortality in ponderosa pine observed in 1994.

Vegetative Sustainability Discussion

Late-successional habitat is currently at a low level with this LSR, 19% of capable land base. Past fire history has had a major role in the current condition of this area. There is 23% of the capable land base in early-successional stands. Most plantations were established to reforest shrub field dominated areas that became established after wildfires back to conifer forest. A high percentage of this LSR consist of soils having low site potential. The natural establishment of dense stands of late-successional is limited due to site capability or potential. Open stands of late-successional will probably continue to dominate this LSR. Mid-successional stands account for 58% of the capable land base. Of that capable land base, 49% fall into the mid-successional/Open category. Protection of the denser late-successional stands is critical to maintain or enhance the late-successional condition within the LSR.

Fire and Fuels

This area tends to be heavy to younger more open pine stands with lesser amounts of mixed conifer and true firs. The primary fuel model identified for this LSR is Fuel Model 6, 52.8% of the area. This is followed by Fuel Models 2 and 10 with 13.7% and 8.7% of the area,

respectively. Fuel Model 6 is characterized by sparsely stocked conifer stands containing large amounts of low level shrubs. These stands are a concern if the brush is old and decadent resulting in high dead to live ratios. Fire intensities are high in these situations. Fuel Model 2 is characterized by poorer timbered sites and young plantations with grass and brush. Surface fires can spread easily with pockets of fuels generating high heat intensities. This fuel model is a concern on steep slopes or hotter aspects (south or west). Fuel model 10 is characterized by dense late-successional conifer stands with heavy amounts of dead and down woody fuels. Typically the understory is densely populated with intermediate size conifers. A wild fire carried by these fuels would be intense enough to cause crowning, spotting and rapid rates of spread on steep slopes or during high winds. Large stand replacing fires can be expected.

The fire risk for the Porcupine LSR has been rate as Moderate/High. There are many large pockets of high hazard within the LSR. There have been 35 fires recorded in the LSR since 1910. None of these have exceeded 100 acres in size. Seventy-seven percent of the recorded fires have been a result of lightning. The remaining 23% resulted by human activities. The LSR is surrounded by NFS lands so fuels accumulation resulting from activities on adjacent private lands is not a factor.

Table 2.154 illustrates the FOFEM projected mortality in terms of high (>70%), medium (25% to 70%) and low (<25%).

Table 2.154. LSR RC-358 - Percent mortality by mortality rating (Percent of LSR)

Mortality Rating		
High	**Medium**	**Low**
12.3%	77.2%	10.3%

Terrestrial Species Status

Federally Listed Endangered, Threatened or Proposed Species. There are no known Federally listed or proposed species within the Porcupine LSR.

Forest Service Sensitive Species. Habitat exist for a number of Forest Service Sensitive Species including fisher, marten and goshawk. Very little work has been done in this general are. Information available tends to be antidotal in nature. There are 3 goshawk territories surrounding the LSR, none of which overlap into the LSR.

There are a number of suspected Forest Service Sensitive plant species potentially within the Porcupine LSR. Table 2.155 summarizes the species occurrence and general habitat requisites.

Table 2.155. LSR RC-358 - Forest Service Sensitive Plants

Species	Known (K) or Suspected (S)	Habitat
Botrychium subgenus *Botrychium* (incl. *B. crenulatum* et.al.)	S	Meadows, marshes, and moist forests, often riparian; foothill to montane .
Cypripedium fasciculatum Brownie lady's slipper	S	Mixed conifer or oak forest on a variety of soil types; often but not always associated with streams; 1,300-6,000 feet elev.
Cypripedium montanum mountain lady's slipper	S	Mixed conifer or oak forests on a variety of soil types, often but not always associated with streams; 1,300-6,000 feet elev.
Iliamna bakeri Baker's globe mallow	S	Chaparral, pine or mixed conifer/oak forest, juniper woodland, on rocky soil; 3,800-6,800 feet elev.
Orcuttia tenuis Slender Orcutt grass	S	Vernal pools, floodplains, reservoir edges on clay soils; 110-4,500 feet elev.
Rorippa columbiae Columbia cress	S	Seasonal lakebeds and drainages east of Cascade crest; 500-4,500 feet elev.
Smilax jamesii English Peak greenbriar	S	Lakesides, streambanks, riparian areas in montane coniferous forest; 2,900-7,500 feet elev.

Survey and Manage. Botanical surveys in this general area over the past few years have not confirmed any of the survey and manage species. No surveys have been complete for fungi, lichens, or bryophytes.

Northern Spotted Owl

The Porcupine LSR was not established for this species. It has been surveyed numerous time to protocol without verifying presence. This area is the outer ranger for northern spotted owl distribution.

Estimated Owls. Porcupine LSR has a very low probably of ever being occupied by spotted owls. Occasional floaters may show up and temporarily occupy RC-358.

Northern Spotted Owl Critical Habitat. Porcupine LSR was not a part of Designated Critical Habitat.

General Assessment of Habitat for Late-successional-associated Species

This LSR is unique in its geologic history and resulting vegetative matrix. Approximately 878 acres of the Porcupine LSR are capable of producing late-successional habitat, primarily late-successional/open. A high percentage of the LSR has very low site capability. Currently, 19% of capable are vegetated in late-successional habitat. However, because of the areas low site capability, acres defined as mid-successional may indeed be serving as late-successional. A large portion of the LSR is in mid-successional habitat, 58% of capable. The combined acres vegetated in late-successional and mid-successional forest accounts for 676 acres or 77% of the capable land base. Like many of the small to moderate size LSRs on the Forest, Porcupine LSR has low amount of late-successional habitat and a relatively high amount of combined mid-successional/late-successional.

Distribution and Connectivity of Habitat

The are few stands of late-successional habitat in the Porcupine LSR. The few stands that do occur are scattered across the LSR. Overall the distribution of late-successional within the LSR is poor. Open mid-successional habitat is well distributed is providing the only available connectivity both within the LSR and to areas adjacent to the LSR.

Other Resources

The Porcupine LSR receives light dispersed recreational use. Forest Services roads running through the LSR provide access to the Medicine Lake Highlands and Lava Flow Virgin Area.

Chapter 3
Desired Conditions

Desired practices and processes

The desired condition within LSRs/MLSAs is to provide late-successional and old-growth forest in which structure and composition is consistent with site conditions and ecological processes. Important structural attributes include live old growth trees, standing dead trees, fallen trees or logs on the forest floor, logs in streams, multiple canopy layers, smaller understory trees, canopy gaps, and patchy understory. These conditions can begin to appear when forest stands are between 80 and 140 years in age, depending on site conditions, species composition, and site history.

A generalized desired condition for the LSRs/MLSAs is to promote and maintain late successional conditions in the maximum amounts sustainable through time. Differences in late successional forest structure and process exist between forest community types within the LSRs/MLSAs, and no single desired condition is appropriate for the entire landscape. It is desirable to have amounts of late-successional habitats which are at or beyond the high end of the identified sustainable levels (The development of "sustainable levels" is described in appendix I). It must be remembered that the sustainable levels were based on a realistic look and analysis of the many factors that will influence LSR vegetation over time).

Processes that historically have created late-successional and old-growth ecosystems include: tree growth and maturation; death and decay of large trees; low to moderate intensity disturbances (such as fire, wind, insects and disease) that create canopy openings and gaps in various strata of vegetation; establishment of trees beneath the maturing overstory trees either in gaps or under the canopy; and closing of canopy gaps by lateral growth or growth of understory trees. These processes result in forests moving through different stages of late successional and old-growth conditions that may span several hundred years.

It is desirable to have variability in late successional vegetative characteristics. It is neither desirable nor possible to have entire landscapes containing the same vegetative characteristics, stocking levels, tree sizes, understory component. Within each vegetation community, desired condition will vary in accordance with site capability, which is influenced by elevation, slope, aspect, soil conditions, and climatic influences. Multistoried conditions will be scattered throughout the landscape, but will be more prevalent on the lower half of the more mesic north and east aspects, and in riparian areas. South and west facing slopes will generally have more open conditions including more intolerant and pioneer species. Canopy closure will vary across the landscape, generally tending towards more open on south and west slopes to more closed on north and east slopes and riparian areas.

In existing plantations residual snags, hardwoods, and down logs are a desired components to retain. Hardwood groups and individuals should be managed and retained as a stand component at density levels commensurate with the development of late-successional stands. To move young plantations towards mature and late successional forest conditions, it is imperative that

stands be maintained as healthy, fast growing with stocking levels and fuel accumulations at levels that reduce the likelihood of loss to catastrophic fire and encourage the growth of large trees.

The introduction of prescribed fire to the LSRs/MLSAs will help encourage the processes and attributes that define late-successional and old-growth ecosystems. It is desirable to have low to moderate intensity fires burn in LSRs/MLSAs. Low intensity fires can reduce fine fuels and ladder fuels, create a seedbed for a diversity of herbaceous plants, and create a patchy understory open enough for spotted owl movements. Moderate intensity fires are desirable if they create small openings in the canopy of a less than one to five acres in size. This allows for ingrowth of tree seedlings and other early successional plants, and creates snag patches and concentrations of down woody debris which are important prey base habitats. Burn openings are most desirable if they occupy only a small percentage (5-10%) of the stands providing habitat.

In addition, the introduction of a fire cycle more similar to that which occurred in pre-suppression times, will reduce the risk of catastrophic, fires. Large stand replacing, high intensity fires are not desirable within LSRs/MLSAs. Throughout the LSRs/MLSAs, fuel conditions should generally range from low to moderate Fire Behavior. Variability of fuel conditions across the landscape is desired, with some high concentrations of fuel intermixed with areas of low fuel accumulations. It is reasonable to expect that heavier scattered pockets of fuels will occur on relatively cool, moist sites, such as those found on north and east tending slopes, or low on the slope adjacent to perennial riparian areas. South and west tending aspects and upper slope positions, which are typically drier and harsher, will generally contain lighter fuel loadings, with fewer scattered pockets of heavy fuel. Site capability will also influence fuel loadings.

It is desirable to continue to have insect and disease populations within the LSRs/MLSAs and that they are generally maintained at endemic levels. Insects and diseases create gaps and are important for creating many of the decadence attributes desired in old growth stands. It is important that they don't reach levels that will create situations that will prevent the long term sustainability of late-successional habitats.

Mistletoe is a parasitic plant that will have to be closely monitored. While it is desirable to have levels of mistletoe in late-successional stands, high levels of the parasite can result in unacceptable levels of mortality and problems reestablishing young stands and understory trees. Historically, fire may have kept mistletoe at lower levels than what is observed in some areas today. Managers will have to be aware of some of the potential problems that may be encountered by allowing mistletoe levels to continue to increase in the coniferous vegetative types. Potential problems include; increased tree mortality that may alter the pattern of forest succession, increased fuel loads, and increased likelihood of a stand replacing event.

It is desirable to keep insects and related mortality at levels more closely associated with historic levels. This would fall into the range of no more than 0.2-0.5% of standing live biomass mortality/acre/year with occasional spikes of 1-1.5% during drought periods (Schultz, 1996).

It is desirable to provide habitat which contributes towards the recovery of the northern spotted owl. Variability in habitat attributes will be consistent with that described for late-successional habitats.

On the Shasta-Trinity National Forests, the more structurally complex late-successional conditions generally occur on north and east facing slopes in the mixed conifer, white fir, red fir , Douglas-fir. South and west facing slopes tend to be drier and less dense. The following is a description of desired conditions for the LSRs/MLSAs using specific stand and habitat characteristics. Aspect and site capability were focused on as being two primary influences on stand characteristics. Desired condition statements were developed for those two influences.

Aspect and Site Capability Based Desired Condition

Desired future condition for LSRs/MLSAs will vary according to the primary vegetative species, site class, topography and other site factors. The following sections will present descriptions of how desired conditions may vary, given different site class and environmental factors. **The identified desired conditions describe conditions for late-successional stands. These aspect and site based desired conditions are intended to be employed once it has been determined that a treatment (thinning, prescribed fire, etc.) is warranted within an LSR/MLSA. The descriptions are to be used to guide the development of the prescriptions, with development and maintenance of late-successional habitat as the ultimate objective of the treatment.** The levels and ranges of various attributes should allow for long term viability of late-successional characteristics.

The desired amounts of snags and down logs are shown each vegetation type and reflect Forest data obtained from the 1992 old growth inventory (OGI). Snags are to be in a variety of sizes and decay classes. Snags larger then 15 inches dbh should count toward meeting the guideline in late-successional stands. Logs are to be in a variety of decay classes; logs 15" in diameter and 10 feet in length count towards meeting the guideline for late-successional stands, but larger down logs (i.e.,>20") are preferable. The desired levels identified in the vegetative descriptions (tables 3-1 through 3-4) represent an average for a landscape or treatment area; i.e., 100 acres. Numbers of snags and down logs can vary on any particular acre.

It is desired to have scattered individual snags and down logs as well as larger aggregations. Aggregations will result from natural events such as wildfire, insect outbreaks, and wind storms. Aggregations perform important functions in both terrestrial and riparian habitat. Larger aggregations are desired as long as they do not put other important late-successional characteristics at risk to large scale disturbances. The degree to which aggregations might be left untreated will vary given aspect, steepness of slope, fire behavior potential of the site, and potential size of the resulting opening given the eventual occurrence of wildland fire. Generally, fewer and smaller aggregations would be located on south and west tending slopes, because of fire behavior typically associated with these areas. Aggregations that might result in openings greater than 10 acres, within late-successional stands should be treated to reduce fuels.

The desired flame length and rate of spread describe conditions at which overstory trees are not likely to be killed. Therefore, in order to perpetuate forested stands which have a high likelihood

of being resilient to fire events, fuel loadings should generally meet the described conditions. This is best achieved when duff and litter layers are kept to a minimum and larger fuels are scattered, rather than clumped or continuous.

Common Attributes

Late-successional conditions will be structurally diverse. It is desirable to have dense stands with total canopy closure >50% and more open areas on north and east aspects and between approximately >40 on south and west aspects and the McCloud Flats area. Conditions should not be uniform across the landscape. Due to the nature of the steep slopes, associated fire behavior, site capability and species canopy closure may be less in many areas including the upper portions of the slopes. Patches of denser stands should still be intermixed with the more open areas. Decadence should be present or even obvious in the stand; snags and coarse woody material would be common, although in varying concentrations throughout the stand. Deformed, broken and diseased trees would also be common enough to provide nesting and roosting opportunities for wildlife. There will be gaps created by natural mortality where early seral vegetation is present.

Generally, average fuel conditions will be such that flame lengths would be <4 feet and rate of spread <20 chains per hour (1 chain = 66 feet). Due to the nature of the aspects, fuel accumulations may be higher than those found on the south and west slopes. Pockets of higher fuel concentrations may be more frequent.

Attributes Specific to Vegetative Series

(references: Beardsley and Warbington 1996; Old Growth in Northwestern California National Forests)

Mixed Conifer

The more structurally complex late seral stage conditions will occur on the north and east slopes within the mixed conifer zone. Conifer species should contain a mixture of Douglas fir, ponderosa pine, sugar pine, and incense cedar. Dominant hardwoods should be black oak and madrone. It is desirable to have multilayered stands scattered throughout the north and east facing aspects, especially on moist sites or lower on the slopes.

On south and west aspects and the McCloud Flats sites will be dominated by conifers. Due to fire behavior some locations may have canopy closures averaging 25%, especially on the upper locations of steep slopes. Stands will generally be single layered with some hardwood present in the understory. Multilayered patches will be scattered, but stands will tend to be more single storied with mature to old growth characteristics. Ponderosa pine will be the dominant conifer species, intermixed with Douglas-fir, white fir, sugar pine, and incense cedar. Hardwood species will often consist of black oak, madrone, live oak, or aspen.

On capable lands, there are on the average 12 trees per acre at least > 30 inches in diameter, and 12 trees per acre between 20 inches and 28 inches diameter. The density of understory trees <20

inches diameter will be greatest on cooler north and east aspects. Overstory percent cover averages 49 percent. The average number of snags at least 20 inches in diameter is 2-4, per acre and 6-7, 20+ inch diameter down logs on north and east aspects and less on south and west aspects and the McCloud Flats. On the average there are three trees per acre with some form of decay.

Douglas fir

(Douglas fir - tanoak and Douglas fir - white fir): Most stands should be multilayered stands with conifers occupying the overstory and hardwoods/conifers occupying the understory, depending on associated vegetation series. Overstory conifer species should be dominated by Douglas fir and sugar pine in the Douglas fir - tanoak series. White fir should be an added component in the Douglas fir - white fir series. Dominant understory hardwoods should be tanoak, with minor amounts of pacific madrone and black oak. Dominant understory vegetation in the Douglas fir - white fir series should be white fir with a mixture of Douglas fir. It is desirable to have multilayered stands on north and east aspects, especially on moist sites or lower on the slopes.

On south and west aspects and the upper portions of some locations are more open with small patches of denser vegetation scattered. Overstory conifer species are dominated by Douglas-fir, sugar pine, and white fir where applicable. Dominant understory hardwoods include tanoak, pacific madrone, live oak, and big leaf maple.

On capable lands, there are on the average 13 trees per acre at least 30 inches diameter, and 12 trees per acre between 20 inches and 28 inches diameter. The density of lower crown class and understory trees <20 inches diameter will be greatest on cooler north and east facing aspects and on the lower portions of slopes adjacent to riparian areas. Overstory percent cover averages 75 percent. The average number of snags at least 20 inches in diameter is 2-3 per acre and 5-8, 20+ inch diameter down logs.

Desired basal area for most of the late seral and old growth stands on north and east aspects will generally be in the range of 60-80% of normal (Dunning & Reineke, 1933) and should apply to stands generally in the range of 150 - 200 years. This is done in order to allow these stands to maintain desired characteristics for a longer time period without an imminent threat to high levels of mortality (Personal discussion with Forest Pest Management Personnel). After the 200 year time frame, basal area should not be a concern in order to allow decadence and increased mortality processes to naturally occur. Table 3-1 summarizes these conditions.

Table 3-1. Expected Attributes for North and East Aspects (per acre) Shasta-Trinity National Forest LSRs/MLSAs

Vegetation Type	Snags Ñ	CWD Ñ	Basal Area Conifers (sq. ft.)	Basal Area Hardwoods (sq. ft.)	# Trees >20"	# Hardwoods
Douglas fir	4	12	185-220 H 140-170 L	35-50 H 25-40 L	25	25-55
Mixed Conifer	6	10	245-280 H 200-225 L	N/A	24	5-10

H Forest Survey Site Class 3-5
L Forest Service Site Class 6

Denser stands should be intermixed with these desired ranges with 10-20% of the landscape area in conditions that are closer to 90-100% of normal. This will allow for areas of higher stocking levels, higher levels of mortality, undisturbed debris, and size differentiation. Numbers of trees per acre will vary depending on the size of the trees within individual stands.

Desired basal area for most of the late seral and old growth stands on south and west aspects, and and the McCloud Flats will generally be in the range of 50-70% of normal (Dunning & Reineke, 1933) and should apply to stands generally in the range of 150 - 200 years. This is done in order to allow these stands to maintain desired characteristics for a longer time period without an imminent threat to high levels of mortality (Personal discussion with Forest Pest Management Personnel). After the 200 year time frame, basal area should not be as much of a concern in order to allow decadence and increased mortality processes to naturally occur. Table 3-2 summarizes these characteristics.

Table 3-2. Expected Attributes for South and West Aspects (per acre) Shasta-Trinity National Forest LSRs/MLSAs

Vegetation Type	Snags Ñ	CWD Ñ	Basal Area Conifers (sq. ft.)	Basal Area Hardwoods (sq. ft.)	# Trees >20"	# Hardwoods
Douglas fir	2-3	5-8	160-195 H 120-150 L	30-45H 35L	25	20-50
Mixed Conifer	2-4	6-7	210-245 H 170-200 L	N/A	24	5-10

H Forest Survey Site Class 3-5
L Forest Service Site Class 6

Denser stands should be intermixed with these desired ranges with 10-20% of the landscape area in conditions that are closer to 90-100% of normal. This will allow for areas of higher stocking levels, higher levels of mortality, undisturbed debris, and size differentiation. Numbers of trees per acre will vary depending on the size of the trees within individual stands.

True Fir

At elevations generally above 4,500 feet, the true fir types are found. Species will be dominated by white fir, and by red fir at higher elevations, above 5,500 feet. Stands will be dense with crown closures often > 60% on all aspects and positions on slope. Stands will generally be single layered stands with very little understory present to multilayered red fir stands of numerous ages and size classes. Decadence will be present in most of the stands. Snags and down logs will occur scattered and/or concentrated in clumps.

On capable lands, white fir stands on the average have 12 trees per acre at least 30 inches diameter, and 21 trees per acre between 20 inches and 28 inches diameter. There averages approximately 7 snags per acre at least 20 inches in diameter, and 8 down logs per acre at least 20 inches in diameter.

Red fir stands on the average have 19 trees per acre at least 30 inches in diameter, and 27 trees per acre between 20 and 28 inches in diameter. There averages approximately 6 snags per acre at least 20 inches in diameter, and 9 down logs per acre at least 20 inches in diameter.

Generally, average fuel conditions will be such that flame lengths will be <3 feet and rate of spread <20 chains per hour. Pockets of high fuel concentrations will be scattered across the landscape. Variability in fuel levels is acceptable for this vegetative type.

Desired basal area for most of the late seral and old growth stands in the true fir series should average approximately 70% of normal, for red fir (Schumacher, 1928), for white fir (Schumacher 1926), and should apply to stands generally in the range of 150 - 250 years. This is done in order to allow these stands to maintain desired characteristics for a longer time period without an imminent threat to high levels of mortality (Personal discussion with Forest Pest Management Personnel). After the 250 year time frame, basal area should not be as much of a concern in order to allow decadence and increased mortality processes to naturally occur.

In order to provide for diversity, 10-20% of the landscape within this vegetative component should have denser stocking levels, approaching 90-100% of normal. Numbers of trees per acre will vary depending on the size of the overstory trees. Table 3-3 summarizes these conditions.

Table 3-3. Expected Attributes all Aspects (per acre), Shasta-Trinity National Forests LSRs/MLSAs

Vegetation Type	Snags Ñ	CWD Ñ	Basal Area Conifers (sq. ft.)	Basal Area Hardwoods (sq. ft.)	# Trees >20"	# Hardwoods
Red Fir	6	9	300H 210 L	N/A	45	N/A
White Fir	7	8	315 H 175 L	N/A	30	N/A

H Forest Survey Site Class 3-5
L Forest Service Site Class 6

Lodgepole Pine

On the Shasta-Trinity National Forests lodgepole pine is found in association with Jeffrey pine, ponderosa pine, western white pine, red fir, white fir, mountain hemlock, and in more pure stands. Although lodgepole pine makes up the plurality of stocking, the largest trees in this type are most often not lodgepole pine. Beardsley and Warbington (1996) found that over 70 percent of the trees at least 30 inches in diameter in old-growth lodgepole pine were red fir, 15 percent were western white pine, 9 percent were white fir, 3 percent were mountain hemlock; none were lodgepole pine.

Lodgepole pine stands will be dense in pockets to open with crown closures generally > 40%. Stands can have scattered overstory trees, generally of species other than lodgepole pine with often dense understory of small sized trees. The cover of the shrub layer is often denser than the cover of the tree canopy.

On capable lands where sufficient other species are present, stands can average up to 4 trees per acre at least 30 inches diameter, and 22 trees per acre between 20 inches and 28 inches diameter. There averages approximately 4 snags per acre at least 20 inches in diameter, and 5 down logs per acre at least 20 inches in diameter.

The desired fuel condition for this type is to move the average flame lengths from a range of 4-5 feet down to 1 to <3 feet, and rate of spread from 7 to 8 chains per hour to <4 chains per hour. Pockets of high fuel concentrations will be scattered across the landscape. Some variability in fuel levels is acceptable for this vegetative type.

Table 3-4. Expected Attributes (per acre), Shasta-Trinity National Forest LSRs/MLSAs

Vegetation Type	Snags Ñ	CWD Ñ	Basal Area Conifers (sq. ft.)	Basal Area Hardwoods (sq. ft.)	# Trees >20"	# Hardwoods
Lodgepole	4	5	153H 70L	N/A	26	N/A

Desired basal area of old growth lodgepole pine series, generally in the range of 70-120 years, should average approximately 60-80% of normal, (Dahms, 1964). This is done to maintain desired characteristics for a longer time period and reduce the threat to high levels of mortality from insects, disease, and wildfire.

Young Plantations.

Regenerated areas will contain species, including hardwoods, that are representative of the site. Tree density will be variable with at least 75-85% of the area containing stocking levels that will allow the area to minimize the time to attain habitat characteristics suitable for dispersal and foraging and eventually reaching the desired late-successional characteristics. The remainder of the area will consist of denser or more open conditions. The recommended stocking should be 100 trees per acre with a minimum stocking level at the time of certification set at 50 trees per acre. Plantations with less than minimum stocking should be considered for additional reforestation efforts. At least 75-85% of the plantation area should meet minimum stocking levels. All appropriate treatments should be done to insure that minimum stocking levels are met. This includes release from competing vegetation to insure survival, animal control/protection efforts, including gopher control, and precommercial thinning.

Other Sites Not Capable of Growing Dense Mixed Conifer Stands

("low" sites, Forest Survey Site Class 6 and higher)

These stands will be open with 10-50% total crown closure. Most of the stands will be dominated by canyon live oak, Oregon white oak, and/or knobcone pine with scattered madrone and conifers. Overstory conifers will be Douglas fir, gray pine, and ponderosa pine. Conifer density will range from 1-10 per acre. Snag levels will generally be between 1-2 per acre and down woody debris averaging <5 per acre. Fuel conditions are such that the average desired flame length <4 feet and desired rate of spread <20 chairs per hour.

Areas of knobcone pine will be present. Patch ages will be variable depending upon timing of the last stand replacing event.

This category also includes those true fir stands that are naturally open. These stands will continue to be open with crown closures of less than 40%. Some of these stands will contain high levels of shrub, including snowbrush and manzanita in the understory. Conifers will be scattered or confined to small groups on these sites. Those areas associated with meadow complexes will contain scattered conifers or small groups of conifers with grass and herbaceous material as the dominant understory vegetation. Conifers will generally range from 5 to 20 trees per acre.

Areas of montane shrub will be maintained. Fire will be allowed to play a more natural role, which will create more healthy vigorous shrub stands. Large amounts of decadence and dead material will not be present in most of the montane shrub areas.

Aquatics Desired Condition

Watershed Restoration

It is desirable to minimize the negative effects of roading within the LSRs/MLSAs, including a reduction in the amount of road related sediment within the watershed. Standards and guidelines for LSRs/MLSAs state that road construction is generally not recommended unless potential benefits exceed the cost of habitat impairment.

Wherever feasible, restoration activities should be based on a watershed scale. Priorities should be based on protecting and restoring the highest quality aquatic habitats first. Restoring areas with greater likelihood of success may result in deferring areas that are heavily impacted from past activities.

Riparian Reserves

No recommendations are made at this time to change interim Riparian Reserve widths. The scope of this analysis limits the ability to use site specific information to determine if Riparian Reserve widths should be modified. According to the Forest Plan, the Late Successional Reserve land allocation takes precedence over the Riparian Reserve land allocation. Any projects will be developed to insure consistency with the Aquatic Conservation Strategy (ACS).

Any actions concerning roads will consider impacts to Riparian Reserves and aquatic resources, and be consistent with the standards and guidelines at NWROD, especially pages C-32 and C-33.

Restoration activities will be based upon a watershed scale. Priorities will be based upon protecting systems with the highest quality aquatic habitats first. Restoring areas with greater likelihood of success may result in deferring areas heavily impacted by past activities.

Roads

Roads impact watershed processes differently depending upon design, soil stability, proximity to streams, maintenance levels, and use. It is unreasonable to assume that a target road density would apply to all land forms, across all watersheds. Road densities within the LSRs/MLSAs are currently being assessed on a Forest level scale under a Access Travel Management Strategy. However, as a general rule, road densities below three miles per square mile are usually considered acceptable levels of risk.

Road crossings will be modified when feasible to enhance connectivity of the aquatic environment. Where culverts are required, they should be sized to pass expected quantities of watershed products. Assessment of road crossings should include sediment budgets for streams above culverts. In systems with high sediment loads, culverts may need to be larger than the 100 year return interval. Crossings should be designed to prevent stream capture by the road in the event of a failure. Adequate relief culverts should be provided where road grades may result in the stream being captured by the road. Fords are preferred to culverts in instances where water quality can be protected.

The roads providing access to private lands should be maintained in a condition that minimizes aquatic resource damage. Where road impacts are a concern actions should be considered, such as, redesign, reconstruction, and maintenance, or decommissioning to minimize resource affects, while meeting the land management objectives.

Sustainability of Late-Successional Habitat

This section of the assessment summarizes key factors is analyzing the levels of sustainability for each LSR/MLSA.

Table 3-5 summarizes the key factors concerning sustainability levels (also see Appendix I).

Table 3.5. Shasta-Trinity National Forests LSRA Sustainability factors

LSR/MLSA	Late- Successional %	Mid- Successional %	% Sustainable level	% High Mortality	Plantation %
Yolla Bolla RC328	54	40	108	68	6
South Fork RC330	54	30	90	44	13
Chanchellula RC331	22	60	44	33	9
Corral RC332	15	68	30	56	11
Canyon Creek RC333	20	72	40	69	7
Iron Canyon RC335	33	62	66	77	4
Buckeye RC337	30	63	60	31	9
Eagle RC338	19	75	38	42	1
Graves RC339	0	91	0	44	8
Scott Mtn RC340	2	92	4	53	1
Eddy RC341	0	93	0	96	0
Deer RC342	2	85	4	83	1
Algoma RC357	4	78	8	29	11
Porcupine RC358	12	73	24	12	8

Table 3.5. Shasta-Trinity National Forests LSRA Sustainability factors					
LSR/MLSA	**Late- Successional %**	**Mid- Successional %**	**% Sustainable level**	**% High Mortality**	**Plantation %**
Harris Mtn RC359	1	65	2	25	14
Elk Flat RC360	46	30	92	2	14
Mt. Shasta RC361	6	52	12	27	15
Wagon RC362	22	56	44	73	13
Castle Lake DD67	0	87	0	89	0
Fons DD72	48	8	96	58	30
McCloud DD76	0	74	0	1	2
Sheepheaven DD78	0	97	0	22	4
Bartle DD79	0	97	0	46	4
Madrone DD83	67	31	134	87	11

An analysis to assess the amount of late-successional habitat that can be sustained at any one point in time considered a number of key factors. Based on current forest stand conditions, site capability, likelihood of lethal affects of fire, and disturbance regimes amounts of late-successional forest will vary both temporally and spacially among and within LSRs/MLSAs. The western most LSR, South Fork RC330, is slightly influenced by coastal climate patterns, generally a wetter area with less frequent fire events, while the other LSRs/MLSAs are typical of the drier eastern California Cascades and Klamath Provinces. The South Fork LSR should be able to maintain a slightly higher level of late-successional forest about 60 percent of capable, while the other LSRs/MLSAs at about 50 percent of capable (See Appendix I). The sustainable levels should not be considered an objective, but rather a realistic picture of future conditions given key factors considered.

Five LSRs/MLSAs, Yolla Bolla, South Fork, Elk Flat, Fons, and Madrone, are at or close to the expected sustainable levels. Five LSRs/MLSAs, Chanchellula, Canyon Creek, Iron Canyon, Buckeye, and Wagon, are close to half of the expected sustainable level. The other LSRs/MLSAs are below half of the expected sustainable levels. Six LSRs/MLSAs, Graves, Eddy, Castle Lake, McCloud, Sheepheaven, and Bartle, have no mapped late-successional forest. Currently, half of the expected sustainable level of all LSRs/MLSAs is in late-successional forest.

Mid-successional forest accounts for about 60 percent of the all LSR/MLSAs. These mid-successional stands are an important component of the LSRs/MLSAs because they are closest to developing into late-successional habitat. Some of the mid-successional forest is already providing components of late-successional forests, while most of it provides habitat that is utilized by a variety of late-successional associated species.

Plantations are important in the development and sustenance of late-successional habitat and associated species. These areas are capable of supporting late-successional forest conditions and will succeed and replace failed stands in the future. Approximately nine percent of the capable area in all LSRs/MLSAs is plantation (ranging from 0 to 30% between individual LSR/MLSAs). Fourteen LSRs/MLSAs have less than 10% plantation. Twenty-three LSRs/MLSAs have less than 15% plantation. One MLSA, Fons DD72 has 30% plantation. Two LSRs/MLSAs, Eddy RC341 and Castle Lake DD67, have no acres of plantation. Emphasis should be placed on

ensuring that early successional forests, particularly plantations, move quickly towards late-successional conditions, especially in LSRs/MLSAs with larger amounts of plantation.

Fire/Fuels

The potential of a wildfire destroying late-successional forest within LSRs/MLSAs is a major issue for the areas in this analysis. The lack of periodic low intensity fires coupled with the lack of stocking control (thinning) of early and mid-successional habitats have resulted in over dense stand conditions with a higher likelihood of loss to disturbance events. Stands contain denser understories and higher levels of ground fuel which have greatly increased the risk of crown fires compared with conditions of presuppression forests.

An analysis of wildfire effects was a key factor in establishing the sustainable levels of late-successional habitat. More than two-thirds of the area of Yolla Bolla, Canyon Creek, Iron Canyon, Eddy, Deer, Wagon, Castle Lake, and Madrone LSRs/MLSAs have the potential of high lethal effects (>70% mortality) from a wildfire (see Appendix I). Early/mid-successional stands should be considered as highest priority for treatment because they present the highest hazard.

Chapter 4
Management Recommendations

Introduction

Management activities within LSR/MLSAs must be consistent with the objectives, policies, standards and guidelines set for these lands. LSR/MLSAs have been established by the ROD for the Northwest Forest Plan, Shasta-Trinity, Klamath, Six Rivers National Forest Land and Resources Management Plans, and the Bureau of Land Management Redding Resource Management Plan. Accomplishing the objectives will move the forest towards the desired condition for the LSR/MLSAs.

The overriding goal of management in LSR/MLSAs is to maintain, protect, and restore conditions of late-successional forest ecosystems, which serve as habitat for late-successional associated species. Inherent in meeting this goal is the contribution towards the recovery of listed and petitioned late-successional associated species. Treatments designed to provide these habitat conditions through time support the objectives for LSR/MLSAs.

In provinces which are in a condition of elevated risk to large-scale disturbance, management which goes beyond the guidelines contained in the ROD may be considered.

"Levels of risk in those LSRs are particularly high and may require additional measures. Consequently, management activities designed to reduce risk levels are encouraged in those LSRs even if a portion of the activities must take place in currently late-successional habitat. While risk reduction efforts should generally be focused on young stands, activities in older stands may be appropriate if: (1) the proposed management activities will clearly result in greater assurance of long-term maintenance of habitat, (2) the activities are clearly needed to reduce risks, and (3) the activities will not prevent the LSR from playing an effective role in the objectives for which they were established." (USDA, USDI 1994b)

Within the California Klamath and California Cascades Provinces, the greatest threat to further loss and degradation of habitat for late-successional associated species is catastrophic wildfire. The Shasta-Trinity Forest-wide fuels reduction strategy (in preparation) will consider purpose and need for actions in a comprehensive approach across the Forest, including the analysis and recommendations of this LSRA. Fuel reduction treatments within LSR/MLSAs will be necessary given the extent of LSRs on the Forest landscape. Furthermore, fuel reduction activities within stands of late-successional and old-growth forest habitat will be essential to maintaining and protecting them. Low and moderate intensity fire is one of the important ecological processes that is essential for the development and maintenance of late-successional and old-growth forest ecosystems (USDA, USDI 1994a).

The following are objectives which will guide the development and application of treatments within LSR/MLSAs:

I. Protect existing late-successional habitat from threats (of habitat loss) that occur inside and outside LSRs.
II. Promote the continued development of late-successional characteristics.
III. Protect mid and early-successional vegetation from loss to large-scale disturbance events
IV. Promote connectivity of late-successional habitat within LSRs.

The following are criteria, relative to each objective, to be used in setting priorities for treatments in LSR/MLSAs. The criteria are identified at two levels. The first level of criteria establishes priorities for treatment for the LSR network as a whole. The second set of criteria are developed to more specifically guide the placement of management activities within an LSR. They should be used at the project level to identify treatment areas within and adjacent to the LSR. Tables are included that identify specific treatments that may be applicable for each criterion. The objectives, criteria, and potential treatments are intended to identify situations triggering further analysis, planning and implementation. A more detailed description of the specific potential projects is included at the end of this section.

This document will not set proposed treatment priorities for 100-acre LSRs. Proposed treatments will be identified during watershed analysis or project level analysis. The Forest anticipates, and proposes, that fuel reduction activities be the primary type of treatment proposed within 100-acre LSRs.

Objectives, Criteria, and Potential Treatments

I. **Protect existing late-successional forest from threats (of habitat loss) that occur outside and inside LSRs**

Criteria: for prioritizing LSR/MLSA network as a whole

LSRs that currently are at a high percent of the expected late-successional sustainable level and are at a high risk to loss by large-scale disturbance.

Table 4-a was used to identify LSRs which are currently within or near expected late-successional sustainable level. Table 4-b was used to identify LSRs which are currently most at risk of stand replacement from a large-scale disturbance from internal influences.

LSRs/MLSAs with the greatest sustainable level of late-successional forest that also have the highest risk are: Yolla Bolla (RC-328), Fons (DD-72), Iron Canyon (RC-335), and Wagon (RC-362).

Table 4.a. LSR % Existing Sustaining Acres

LSR	% Sustain.	Acres 4+*
Madrone DD83	134	361
Yolla Bolla RC328	108	843
South Fork RC330	90	42,029
Fons DD72	96	477
Elk Flat RC360	92	1,307

Table 4.a. LSR % Existing Sustaining Acres		
LSR	**% Sustain.**	**Acres 4+***
Iron Canyon RC335	66	25,298
Buckeye RC337	60	1,884
Chanchellula RC331	44	4,510
Wagon RC362	44	985
Canyon Creek RC333	40	1,395
Eagle RC338	38	697
Corral RC332	30	10,851
Porcupine RC358	24	51
Mt Shasta RC 361	12	757
Algoma RC357	8	949
Scott Mtn RC340	4	400
Deer RC342	4	97
Harris Mtn RC359	2	22
Castle Lake DD67	0	0
McCloud DD76	0	0
Sheepheaven DD78	0	0
Bartle DD79	0	0
Graves RC339	0	0
Eddy RC341	0	0
Total		**92,914**

Acres 4+ : Existing acres of size class 4+
Table 4-a identifies LSR/MLSAs by late-successional sustainable level.

Table 4.b. LSR % Predicted Mortality		
LSR	**Mortality**	**Acres High Mortality**
Eddy RC341	0.96	2,619
Castle Lake DD67	0.89	1,700
Madrone DD83	0.87	1,563
Deer RC342	0.83	4,924
Iron Canyon RC335	0.77	68,639
Wagon RC362	0.73	3,593
Canyon Creek RC333	0.69	5,851
Yolla Bolla RC328	0.68	1,118
Fons DD72	0.58	721
Corral RC332	0.56	44,035
Scott Mtn. RC340	0.53	11,672
Bartle DD79	0.46	641
South Fork RC330	0.44	34,746
Graves RC339	0.44	1,139
Eagle RC338	0.42	1,609
Chanchellula RC331	0.33	7,434
Buckeye RE337	0.31	2,184

Table 4.b. LSR % Predicted Mortality		
LSR	**Mortality**	**Acres High Mortality**
Algoma RC357	0.29	7,394
Mt. Shasta RC361	0.27	3,916
Harris Mtn. RC359	0.25	556
Sheepheaven DD78	0.22	250
Porcupine RC358	0.12	128
Elk Flat RC360	0.02	61
McCloud DD76	0.01	26
Total	**0.54**	**206,512**

Table 4-b identifies LSR/MLSAs by predicted high mortality levels (stand replacement)

Criteria: for selecting treatment areas within LSRs. Maps included in the appendix show areas of late- ,mid-, and early-successional forest and fire caused mortality projections for each LSR/MLSA.

a. Where late-successional forest lies adjacent to, or is included in, relatively large areas rated "lethal fire effects." Prioritize areas for treatment using the following criteria (listed in highest to lowest priority): 1) located at the upper third of south- and west-facing slopes; 2) located on south- and west-facing slopes; 3) located on the upper third of slopes.
b. Areas of late-successional forest that are at high risk to loss by large-scale disturbance due to adjacent areas of extreme hazard: identified as having two or more years of moderate or high levels of insect and disease-related mortality OR areas in which past large-scale disturbances have resulted in large accumulations of fuels.
c. Areas of late-successional forest which are not currently at high risk to loss by large-scale disturbance; especially those that occur on south- and west-tending slopes.
d. Areas of late-successional forest that are isolated and may be an important remenant habitat.

Potential Treatments

Table 4.1 lists the types of treatments that would be appropriate to apply in order to meet the objective, given the criteria described above (a through c). The "Notes" section gives further explanation about the treatments, where necessary, relative to the criteria.

Table 4.1. Potential treatments to protect existing late-successional habitat from threats of habitat loss		
Treatment	**In Response to Criteria**	**Notes per Criteria**
Prescribed fire (hazard reduction)	a ,b	(b) Generally, begin by applying prescribed fire inside late-successional stand first to protect from outside threats. Once fuels are reduced within the late-successional stand, then treat adjacent area.
Hand-piling (hazard reduction)	a, b	(a) It may be necessary to apply hand-piling prior to prescribed burning within late-successional stands. (b) Hand-piling would be appropriate in early and mid-seral stands that occur adjacent to late-successional.

Table 4.1. Potential treatments to protect existing late-successional habitat from threats of habitat loss		
Treatment	**In Response to Criteria**	**Notes per Criteria**
Mechanical treatment (hazard reduction)	a, b, c	(a) Mechanical treatment in late-successional stands to reduce extreme fuel loadings. (b) Apply in adjacent areas (non-late-successional) of high-fire effects.
Thinning (hazard reduction & improvement)	a, b, c	(a) Thinning to reduce risk is appropriate in adjacent, non-late-successional stands and most often is needed prior to using other fuel reduction techniques, such as prescribed fire.
Managed Wildland Fire	a, c	Apply where fuel conditions are at levels conducive for MWF. (previously known as Prescribed Natural Fire)

* Percent of LSR acres that would have > 70% mortality/acre

This objective, #I, specifically targets late-successional stands for protection. Objective III specifically targets mid- and early-seral vegetation for treatment. In reality, most fuel reduction activities will be implemented at the landscape scale and will necessarily treat vegetation of all successional stages.

II. **Promote the continued development of late-successional forests**

Criteria: for prioritizing LSR/MLSA network as a whole

1. Those LSRs that are currently lacking late-successional habitat and have high amounts of mid-successional habitat.

Those LSRs highlighted as priority include: Graves (RC-339), Scott Mtn (RC-340), Eddy (RC-341), Deer (RC-342), Algoma (RC-357), Castle Lake (DD-67), Fons (DD-72), Sheepheaven (DD-78), and Bartle (DD-79). [Note: eight additional LSRs have a moderate to high proportion of their area in mid-successional to mature forest.]

2. Those LSRs that are currently lacking late-successional habitat and mid-successional habitat but have high proportions of early successional forest habitat.

Those LSRs highlighted as priority include: Harris Mtn (RC-359), Elk Flat (RC-360), Mt Shasta (RC361), and McCloud (DD-76). [Note: several additional LSRs have greater than 10 percent area in plantations.]

Criteria: for selecting treatment areas within LSR/MLSAs

a. Where a stand-replacing event has occurred, and it has been determined that some treatment is needed to help re-establish trees.
b. Within areas of the LSR/MLSA that are not currently late-successional and may not respond to treatment for accelerated growth, but have a need to treat in order to reduce future hazards from expected natural mortality and increased fuel loadings. Older mid-successional stands would be the higher priority as modeling has indicated future high fuel loadings, associated with mortality, will occur as dense stands experience site occupancy (Appendix J).

c. Within stands of the LSR that are generally lacking in late-successional habitat, those stands that would respond to treatment by accelerated development into late-successional habitat. Younger stands are generally more responsive to treatment, and should be considered higher priority than older mid-successional stands, relative to this objective.
d. Where mid and early-successional forest is adjacent to (generally within 1/4 mile) existing late-successional, such that treating it would lead to development of larger blocks of late-successional habitat.

Potential Treatments

Table 4.2 lists the types of treatments that would be appropriate to apply in order to meet the objective, given the criteria described above (a through d). The "Notes" section gives further explanation about the treatments, where necessary, relative to the criteria.

Table 4.2. Potential treatments to allow for continued development of late-successional habitat

Treatment	In Response to Criteria	Notes per Criteria
Thinning	b, c, d	(c, d) Those stands that will accelerate in growth following treatment, generally younger mid-successional and early successional.
Mechanical hazard reduction	b, c	(b) Older mid-successional stands where fuel conditions prevent a successful Rx fire or other reasons prevent the use of fire. (c) Growth response treatments need to reduce hazard by treating activity created fuels.
Prescribed fire	b, c, d	(b) May require two successive burns to adequately reduce future hazard - applies to older mid-successional stands. (c) Thinning with prescribed fire is not appropriate in plantations in seedling/sapling stage/and many pole sized stands.
Reforestation	a	(a) This includes all associated reforestation activities; site prep, planting, release, and animal control.
Regenerate and reforest	d	(d) This type of treatment would be applicable in situations where early or mid-successional stands are so dense and stagnant that they would not respond to thinning.

III. **Protect mid- and early-successional forest from loss to large-scale disturbance event**

Criteria: for LSR/MLSA network as a whole

1. Those LSR/MLSAs that currently have a high proportion of early-/mid-successional forest and contain a high likelihood of a large-scale disturbance.

Those LSR/MLSAs highlighted as priority include: Canyon Creek (RC-333), Iron Canyon (RC-335), Eddy (RC-341), Deer (RC-342), Wagon (RC-362), and Castle Lake (DD-67).

Criteria: for selecting treatment areas within LSRs.

a. Stands of mid-successional forest that are close to providing late-successional characteristics (within 30-40 years, for example).
b. Stands of mid and early-successional forest that are adjacent to or occur within areas rated "lethal fire effects".

c. Where mid- and early-successional forest is adjacent to or within, areas of past large-scale disturbance that have resulted in hazardous fuel conditions or areas of two or more years of moderate to high levels of insect and disease-related mortality.
d. Where mid- and early-successional forests contain high stocking levels conducive to future insect infestations and/or stand-replacing events (i.e., fuel loading increases associated with insect/stress-related mortality, crown fire risk).

Maps in the appendix show areas of mid- and early-successional forest that fit many of the criteria described above.

Potential Treatments

Table 4-3 lists the types of treatments that would be appropriate to apply in order to meet the objective, given the criteria described above (a through d). The "Notes" section gives further explanation about the treatments, where necessary, relative to the criteria.

Table 4-3. Potential treatments to protect mid and early-successional forest from loss to large-scale disturbance events

Treatment	In Response to Criteria	Notes per Criteria
Prescribed fire (hazard reduction)	a, b, c, d	(a, b, c, d) prescribed fire can be applied to mid-successional and early successional pole areas only when stand structure and fuel conditions are such that fire could be used to meet objectives. 1/
Hand-piling (hazard reduction)	a, b, c, d	(a, b, c, d) needs to be applied in areas where fuel levels are high enough to make prescribed burning, unacceptable. Could be applied as a pretreatment.. Most often used in conjunction with thinning.
Mechanical treatment (hazard reduction)	a, b, c, d	(a, b, c, d) needs to be applied in areas where fuel levels are high enough to make prescribed burning unacceptable or where prescribed burning is not proposed.
Thinning (hazard reduction & improvement)	a, b, c, d	(a, b, c, d) thinning in stands that will accelerate in growth, reduce fuel ladders and excessive tree mortality, or where stand or site conditions will result in meeting objectives. To reduce future hazards and encourage areas to develop into late-successional forest. 1/ Thinning is usually needed prior to reintroducing prescribed fire.
Managed Wildland Fire	a, d	Apply where fuels and stand conditions are conducive for MWF.

IV. **Promote connectivity of late-successional forests within LSR/MLSAs**

Criteria: for prioritizing LSR/MLSA network as a whole

1. Those LSR/MLSAs that currently rank low in connectivity of late-successional forest.

Terrestrial connectivity ranking was assigned through a spacial analysis of patch size and juxtaposition. Those LSR/MLSAs highlighted as priority include: Chanchellula (RC-331), Corral (RC-332), Canyon Creek (RC-333), and Iron Canyon (RC-335).

Criteria: for selecting treatment areas within LSR/MLSAs

a. Areas of early- and mid- successional forest adjacent to "isolated" stands of late-successional habitat that will respond to treatment in order to promote greater connectivity and reduce fire hazards throughout LSR.
b. Areas of early- and mid-successional forest that coincide with landscape features that may be important to dispersing animals (along riparian areas, within saddles, for example).

Potential Treatments

Table 4-4 lists the types of treatments that would be appropriate to apply in order to meet the objective, given the criteria described above (a through b). The "Notes" section gives further explanation about the treatments, where necessary, relative to the criteria.

Table 4-4. Potential treatments to promote connectivity of late-successional habitat within LSRs

Treatment	In Response to Criteria	Notes per Criteria
Thinning & improvement	a, b	(a, b) Applied to stands that will accelerate growth following treatment, primarily younger mid-successional stands. Can be done in older mid-successional stands where burning is not proposed in order to reduce future hazards.
Thinning with prescribed fire	a, b	(a) Applied primarily to older mid-successional stands. (b) Thinning with prescribed fire is not appropriate in seedling/sapling stage.
Manual thinning (precommercial)	a, b	(b) Applicable to seedling, sapling, and pole-sized stands.

Table 4-5 summarizes the LSRs/MLSAs identified as being highest priority for each of the four treatment objectives.

Table 4-5. Shasta-Trinity National Forest LSRs identified as having highest priority for specific treatments objectives

LSR	I	II	III	IV
Yolla Bolla RC328	x			
South Fork RC330				
Chanchellula RC331				x
Corral RC332				x
Canyon Creek RC333			x	x
Iron Canyon RC335	x		x	x
Buckeye RC337				
Eagle RC338				
Graves RC339		x		
Scott Mountain RC340		x		
Eddy RC341		x	x	
Deer RC342		x	x	
Algoma RC357		x		
Porcupine RC358				
Harris Mountain RC359		x		
Elk Flat RC360				
Mt Shasta RC361		x		

Table 4-5. Shasta-Trinity National Forest LSRs identified as having highest priority for specific treatments objectives				
LSR	**I**	**II**	**III**	**IV**
Wagon RC362	x		x	
Yolla Bolla RC328				
Castle Lake DD67		x	x	
McCloud DD76		x		
Bartle DD79		x		
Madrone DD83				
Fons DD72	x	x		
Sheepheaven DD78		x		

Activity Design Criteria

The following discusses design criteria that need to be taken into account when developing future activities from the above criteria.

1. **Reforestation and revegetation, including site preparation, release for survival, and animal damage control measures: These treatments are consistent with the exemption letter that exempts specific silvicultural activities from REO review, dated April 20, 1995, except as noted.**

a. Appropriate site preparation measures are utilized. They may include hand scalping, tractor piling, burning, discing, etc. (*This is different from the exemption letter.)
b. Reforestation with the objective of reaching late-successional conditions, protect site quality, or achieve other ROD objectives.
c. Treatments promote a natural species diversity appropriate to meet late-successional objectives, including hardwoods, shrubs, forbs, etc.
d. Plant screened resistant sugar pine stock during appropriate regeneration opportunities. (*This is different from the exemption letter.)
e. Treatments, either through spacing, planting area designation, expected survival, release efforts, and animal control efforts, should result in substantially varied spacing in order to provide for some very large trees as quickly as possible. In addition, where compatible with site conditions, treatments should create areas of heavy canopy closure and decadence, and encourage the growth of a variety of species appropriate to the site and the late-successional objective. Generally, at least 100 trees per acre on 75-85% of the plantation area in recommended (or otherwise specified in a site specific stand prescription prepared by a Certified Silviculturist). A desired minimum stocking level is 75 trees per acre (or otherwise specified in a site specific stand prescription prepared by a Certified Silviculturist). Animal control efforts, primarily deer protection and gopher control, need to be implemented if a silviculturist determines the recommended levels are at risk without these efforts. (*This is different from the exemption letter.)
f. Treatments minimize, to the extent practicable, the need for future entries.

2. Release efforts, growth, in existing young plantations: These treatments are consistent with the exemption letter that exempts specific silvicultural activities from REO review, dated April 20, 1995, except as noted.

a. There is undesirable vegetation (competition) which delays attainment of the management objective of late-successional conditions, or desirable components of the stand may be eliminated, because of such competition. The prescriptions should be supported by empirical information or modeling indicating the development of late-successional conditions will be accelerated or enhanced.
b. Cut material is less than 8" dbh, and any sale is incidental to the primary objective.
c. A variety of release methods can be utilized, manual chainsaw, grubbing, tired harvesters or skidders, discs, etc. (*This is different from the exemption letter.)
d. Treatments promote a natural species diversity appropriate to meet late-successional objectives, including hardwoods, shrubs, forbs, etc.

3. Thinning in young plantations and young natural early successional (seedling/sapling) stands: These treatments are consistent with the exemption letter that exempts specific silvicultural activities from REO review, dated April 20, 1995, except as noted.

a. To be done where young stands are overstocked. Overstocked means that reaching the management objective of late-successional conditions will be delayed, or desirable components of the stand may be eliminated, because of stocking levels.
b. Cut trees will be those excess to stand management objectives, (*This is different from the exemption letter.)
c. A variety of harvest methods can be utilized, manual chainsaw, tracked, tired harvesters or skidders, manual cutters, etc. (*This is different from the exemption letter.)
d. Treatments will provide a natural species diversity appropriate to meet late-successional objectives; including hardwoods, shrubs, forbs, etc.
e. Plantations that have a high proportion of ponderosa pine in the Douglas-fir or True Fir vegetative types should favor species other than ponderosa pine in leave tree selection where appropriate and consistent with treatment objectives. (*This is different from the exemption letter.)
f. Treatments include substantially varied spacing in order to provide for some very large trees as quickly as possible, maintain areas of heavy canopy closure and decadence, and encourage the growth of a variety of species appropriate to the site and the late-successional objective.
g. Treatments minimize, to the extent practicable, the need for future entries.

4. Thinning in early successional pole and mid-successional stands - Hazard Related: These treatments are consistent with the exemption letters that exempt specific silvicultural activities from REO review, dated July 9, 1996 and updated on September 30, 1996, except as noted.

Objectives

a. The objective or purpose of the treatment is to reduce the likelihood of large-scale disturbance that would result in the loss of key late-successional structure. Most stands within the assessment area will fall into this category. Further, the specific treatment would result in the long-term development of vertical and horizontal diversity, snags, CWD, and other stand components benefiting late-successional forest-related species. The treatment will also, to the extent practicable, create or retain components that will benefit late-successional forest-related species in the short term.
b. Negative short-term effects to late-successional forest-related species are outweighed by the long-term benefits to such species and will not lessen short-term functionality of the LSRs as a whole.
c. The leave tree criteria provide for such things as culturing individual trees specifically for large crowns and limbs and for the retention of certain characteristics that induce disease, damage, and other mortality or habitat, consistent with LSR objectives. "Healthiest, best tree" criteria typical of matrix prescriptions may be modified to reflect LSR objectives.
d. Within the limits dictated by acceptable fire risk, CWD and snag objectives should be based on those identified with within the desired condition section of this document.

Stand Attributes

a. The stand is currently not a complex, diverse stand that will soon meet and retain late-successional conditions without treatment and has been identified as high risk to a catastrophic event.
b. Cutting large older trees, generally over 150 years for any purpose will be the exception, not the rule. Individual trees exceeding 150 years should not be harvested except for the purpose of creating openings, providing other habitat structure such as downed logs, elimination of a hazard from a standing danger tree, or cutting minimal yarding corridors. Where large old trees are cut, they will be left in place to contribute toward meeting the overall CWD objective. An exception will be in situations where leaving the material will exceed the prescribed large woody debris amounts necessary for the target fuel hazard level and putting portions of the LSR at risk to a catastrophic event. (* This is different from the exemption letter but was approved during the Regional Ecosystem Office Review of Proposed Silviculture and Salvage Treatments in the Iron Canyon Watershed, Shasta-Trinity National Forests, dated August 22, 1996.)
c. The stands are overstocked. Overstocked means that reaching late-successional conditions will be delayed or desirable components of the stand will likely be eliminated, because of stocking levels.

Treatment Standards

a. The treatment is primarily an improvement treatment designed to increase tree size, crown development, or other desirable characteristics; to maintain vigor for optimum late-successional development; to reduce large-scale loss of key late-successional structure; to increase diversity of stocking levels and size classes within the stand or

landscape; or to provide various stand components beneficial to late-successional forest-related species.

b. The treatment is primarily an improvement thinning. Release cutting for the purpose of regenerating a second canopy layer in existing stands is no more than an associated, limited objective as described below under opening and heavily thinned patches. Efforts need to be made to promote diversity of hardwood and conifer species. Most of the thinning in these types of stands will focus on removal of suppressed and intermediate trees. Occasional co-dominants will be removed in order to provide growing space for remaining trees. In some cases, smaller diameter trees may be favored over adjacent larger diameter trees in order to promote species diversity and/or structural diversity . (* This is different from the exemption letter.)
c. The treatment will increase diversity within relatively uniform stands by including areas of variable spacing as follows:

- Ten percent or more of the resultant area would be in unthinned patches to retain processes and conditions such as thermal and visual cover, natural suppression and mortality, small trees, natural size differentiation, and undisturbed debris.
- Up to 15 percent of the area would be in heavily thinned patches, or in openings up to 1/4 acre in size, to individual tree development, encourage some understory vegetation development, and encourage the initiation of structural diversity.
- The treatment does not inappropriately "simplify" stands by removing layers or structural components, creating uniform stocking levels, or removing broken and diseased trees important for snag recruitment, nesting habitat, and retention of insects and diseases important to late-successional development and processes.

d. Certain considerations need to be made for larger sugar pine existing in stands proposed for treatment. This is a valuable species for late-successional stands. As previously stated, it is currently being impacted by white pine blister rust and high stocking levels have made it very susceptible to mountain pine beetle attacks. Thinning operations should place special emphasis on existing sugar pine. The following considerations should be applied to the sugar pine component; 1) protect large trees by removing the second stand layer around each to the drip line plus 10 feet (this will allow some snag recruitment), 2) where maintaining individual large sugar pine is deemed particularly important, thin to the drip line plus 20 feet, 3) leave only healthy appearing young sugar pine on sites that are low risk for white pine blister rust, and only where consistent with the other treatment objectives. (*This is different from the exemption letter.)
e. To the extent practicable for the diameter and age of the stand being treated, the treatment includes falling green trees or leaving snags and existing debris to meet or make substantial progress toward meeting an overall CWD objective. An assessment should be made of the treatment and landscape area i.e., 100 acres, to determine if minimum desired condition snag and CWD levels will be met following treatment. It the determination is made that the landscape area will be less than minimum desired condition levels, additional measures may be taken to create additional snags and/or CWD.
f. Snag objectives have been identified as part of the desired condition. Prescriptions must be designed to make substantial progress toward the overall snag objective, including developing large trees for future snag recruitment and retaining agents of mortality or

damage. To the extent practicable for the diameter and age of the stand being treated, each treatment includes retention and creation of snags to meet the desired condition.

g. The project-related habitat improvements outweigh habitat losses due to road construction.
h. Overall, treatment prescriptions will strive towards minimizing the number of retreatments to meet long term objectives while retaining desirable habitat components in the short term. One example of this is the situation where desired leave trees have very small live crown ratios. These types of trees have poorly developed root systems and are vulnerable to windthrown if opened up to much during one treatment. These types of stands need to be opened up over time and through the course of a couple of entries in order to allow for better root and crown development. An initial light thinning of no more than 20% of the existing basal area might be preferable in order to allow the stand to develop better root and crown characteristics. A follow-up thinning approximately one to two decades later could then be achieved in order to assist with the development of late-successional characteristics. (*This is different from the exemption letter.)
i. Plantations that have a high proportion of ponderosa pine in the Douglas-fir or true fir vegetative types should favor species other than ponderosa pine in leave tree selection consistent with treatment objectives. (*This is different from the exemption letter.)

5. Thinning in early successional pole and mid-successional stands - Development of Late-Successional Habitat:

Background

Most dense early- and mid-successional forest need treatment to reduce the risk of loss to catastrophic fire. There are some stands, particularly on the far west side of the Forest, that may not be imminently threatened or have the potential for future loss, but have a need for treatment to more quickly develop late-successional characteristics. Not all areas in need of treatment are less than 80 years of age. Most of the assessment area is in the Klamath and California Cascade Provinces, and is considered a dry area in comparison to the other Northwest Forest Plan Forests. Vegetation grows more slowly here, with late-successional characteristics often taking a longer time to develop. Particular LSR/MLSAs, while not being at risk to a large-scale event, have many acres of vegetation considered early and mid-successional. In some areas large blocks of late-successional habitat are lacking, with a need to develop additional acreage. As shown in the data in the current condition section, mid-successional stands across the Forest average 80-180 years of age, but mean diameters range from 11-24 inches. Many of these stands do not have the desired structure and will have a difficult time reaching desired characteristics without some management intervention.

Objectives

a. The objective or purpose of the treatment is to develop late-successional conditions and increase patch size of current late-successional habitat. Further, the specific treatment would result in the long-term development of vertical and horizontal diversity, snags, CWD, and other stand components benefiting late-successional forest-related species.

The treatment will also, to the extent practicable, create components that will benefit late-successional forest-related species in the short term.

b. Negative short-term effects to late-successional forest-related species are outweighed by the long-term benefits to such species and will not lessen short-term functionality of the LSRs as a whole.
c. The leave tree criteria provide for such things as culturing individual trees specifically for large crowns and limbs and for the retention of certain characteristics that induce disease, damage, and other mortality or habitat, consistent with LSR objectives. "Healthiest, best tree" criteria typical of matrix prescriptions are modified as appropriate to reflect LSR objectives.
d. Within the limits dictated by acceptable fire risk, CWD and snag objectives should be based on those identified with within the desired condition section of this document.

Stand Attributes

a. Younger stands should receive priority for treatment over older stands. Younger age stands are more likely to respond in a quicker time frame to stocking control treatments. Only stands less than 150 years of age should be considered for treatment. Stands older than this will not respond much quicker than the no treatment alternative.
b. The stand is currently not a complex, diverse stand that will soon meet and retain late-successional conditions without treatment.
c. Cutting trees older than 150 years for any purpose will be the exception, not the rule. Individual trees exceeding 150 years should not be harvested except for the purpose of creating openings, providing other habitat structure such as downed logs, elimination of a hazard from a standing danger tree, or cutting minimal yarding corridors. Where older trees are cut, they will be left in place to contribute toward meeting the overall CWD objective. An exception will be in situations where leaving the material will exceed the prescribed large woody debris amounts necessary for the target fuel hazard level and putting portions of the LSR at risk to a catastrophic event. (Regional Ecosystem Office Review of Proposed Silviculture and Salvage Treatments in the Iron Canyon Watershed, Shasta-Trinity National Forests, dated August 22, 1996.)
d. The stands are overstocked. Overstocked means that reaching late-successional conditions will be substantially delayed, or desirable components of the stand will likely be eliminated, because of stocking levels.

Treatment Standards

a. The treatment is primarily an improvement treatment designed to increase tree size, crown development, or other desirable characteristics; to maintain vigor for optimum late-successional development; to reduce large-scale loss of key late-successional structure; to increase diversity of stocking levels and size classes within the stand or landscape; or to provide various stand components beneficial to late-successional forest-related species.
b. The treatment is primarily a thinning. Release cutting for the purpose of regenerating a second canopy layer in existing stands is no more than an associated, limited objective as described below under opening and heavily thinned patches. Overstory conifers will be

left. Treatment will be confined to the dense understory. Efforts need to be made to promote diversity of hardwood and conifer species. Most of the thinning in these types of stands will focus removal of suppressed and intermediate trees. Occasional co-dominants will be removed in order to provide growing space for remaining trees. In some cases, smaller diameter trees may be favored over adjacent larger diameter trees in order to promote species diversity, maintain structural diversity, or adequate horizontal stem juxtaposition.

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

- Ten percent or more of the area would be in unthinned patches to retain processes and conditions such as thermal and visual cover, natural suppression and mortality, small trees, natural size differentiation, and undisturbed debris.
- Up to 15 percent of the resultant stand could be in heavily thinned patches, or in opening up to 1/4 acre in size, to maximize individual tree development, encourage some understory vegetation development, and encourage the initiation of structural diversity.
- The treatment does not inappropriately "simplify" stands by removing layers or structural components, creating uniform stocking levels, or removing broken and diseased trees important for snag recruitment, nesting habitat, and retention of insects and diseases important to late-successional development and processes.

d. Certain considerations need to be made for larger sugar pine existing in stands proposed for treatment. This is a valuable species for late-successional stands. As previously stated, it is currently being impacted by white pine blister rust and high stocking levels have made it very susceptible to mountain pine beetle attacks. Thinning operations should place special emphasis on existing sugar pine. The following considerations should be applied to the sugar pine component; 1) protect large trees by removing the second stand layer around each to the drip line plus 10 feet (this will allow some snag recruitment), 2) where maintaining individual large sugar pine is deemed particularly important, thin to the drip line plus 20 feet, 3) leave healthy appearing young sugar pines, consistent with treatment objectives for LSRs, on sites that are low risk for white pine blister rust.

e. To the extent practicable for the diameter and age of the stand being treated, the treatment includes falling green trees or leaving snags and existing debris to meet or make substantial progress toward meeting an overall CWD objective. An assessment should be made of the treatment and landscape area i.e., 100 acres, to determine if minimum desired condition snag and CWD levels will be met following treatment. It the determination is made that the landscape area will be less than minimum desired condition levels, additional measures should be considered to create additional snags and/or CWD.

f. Snag objectives have been identified as part of the desired condition. Prescriptions must be designed to make substantial progress toward the overall snag objective, including developing large trees for future snag recruitment and retaining agents of mortality or damage. To the extent practicable for the diameter and age of the stand being treated, each treatment includes retention and creation of snags to meet the desired condition.

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

h. Overall, treatment prescriptions will strive towards minimizing the number of retreatments to meet long term objectives while retaining desirable habitat components in the short term. One example of this is the situation where desired leave trees have very small live crown ratios. These types of trees have poorly developed root systems and are vulnerable to windthrown if opened up to much during one treatment. These types of stands need to opened up over time and through the course of a couple of entries in order to allow for better root and crown development. An initial light thinning of no more than 20% of the existing basal area would be preferable in order to allow the stand to develop better root and crown characteristics. A follow-up thinning approximately one to two decades later could then be achieved in order to assist with the development of late-successional characteristics. (*This is different from the exemption letter.)
i. Plantations that have a high proportion of ponderosa pine in the Douglas-fir or true fir vegetative types should consider favoring species other than ponderosa pine in leave tree selection.

6. Hazard Reduction - Blowdown, Insect, and/or Wildfire Related:

Objectives

a. The objective or purpose of the treatment is to develop, restore or maintain late-successional conditions or to reduce the likelihood of stand replacing disturbances that would result in the loss of key late-successional structure. Further, the specific treatment would result in the long-term sustainability of vertical and horizontal diversity, snags, CWD (logs), and other stand components benefiting late-successional forest-related species. The treatments will also, to the extent practicable, create and/or maintain components that will benefit late-successional forest-related species in the short term.
b. Negative short-term effects to late-successional forest-related species are outweighed by the long-term benefits to such species and will not lessen short-term functionality of the LSR as a whole.
c. The leave material criteria provide for such things as species diversity, varying levels of decay, amount, arrangement, and size class of snags and CWD.
d. Within the limits dictated by acceptable hazards, CWD and snag objectives have been established in the desired condition section of this analysis.

Stand Attributes

a. The area impacted is less than 10 acres in size and may have crown closure greater than 40%.
b. The impacted area has more material than what is currently needed to meet CWD and snag requirements as identified in this Forest-wide LSR Assessment.
c. An adequate fire analysis and/or acceptable fire model, i.e., BEHAVE, or Forest Pest Management analysis has determined the area to have a high likelihood of a stand replacing event.

Treatment Standards

a. The treatment is intended to reduce the likelihood of a stand replacing event and provide for sustainable late-successional forest structure. The proposed management activities will clearly result in greater assurance of long-term maintenance of habitat; the activities are needed to reduce hazards, and; the activities will not prevent the LSRs from playing an effective role in the objectives for which they were established.
b. The prescription is supported by fire analysis and/or field review of the entomological and pathological conditions that indicate the need for treatment in order to reduce the likelihood of a stand replacing event. The analysis clearly indicates the need for treatment, and the treatment prescribed will reduce the severity of a fire event. Opportunities to reach hazard reduction objectives through treatment of post activity fuels are included as a required and integral part of the projects hazard reduction strategy. This includes fuels created from fire suppression activities, blowdown, insect, and wildfire.
c. The treatment will still meet or exceed LSR CWD and snag requirements without putting the habitat structure at risk to loss from fire or insects. The prescription must account for the full period of time before a stand will begin to contribute coarse woody debris and snags. The biomass left in snags can be credited toward the amount of coarse woody debris biomass needed to achieve management objectives. Except in these instances or as required to meet safety requirements during harvest, no standing trees or snags will be cut.
d. Removal of snags and logs may be necessary to reduce hazards to humans along roads and trails, and in or adjacent to campgrounds, administrative sites, and other developments. Where materials must be removed from the site, as in a campground or on a road, a salvage sale is appropriate. In other areas leaving material on site should be considered.
e. Logs present on the forest floor before a disturbance event provide habitat benefits that are likely to continue. It seldom will be appropriate to remove them, unless their presence creates the high risk situation described in Stand Attributes.
f. The coarse woody debris retained should approximate the species composition of the original stand, as practical, to help replicate preexisting suitable habitat conditions.

7. Fuel reduction (primarily dead and down)

Objectives

To remove dead and dying trees in order to protect the remaining existing and developing late-successional habitat and to facilitate the development of reforested areas toward late-successional conditions following a stand-replacing event. The short term impact on the LSR/MLSA must be neutral. Treatment should have a long- term positive effect on late-successional habitat and should not diminish habitat suitability now or in the future.

Treatment should focus on long-range objectives, which are based on desired future condition of the forest. Management following a stand-replacing event should be designed to accelerate or not impede the development of late-successional characteristics.

Stand Attributes

a. The area has received a stand-replacing event such as those caused by wind, fires, insect infestation, volcanic eruptions, or diseases. The area impacted is larger than 10 acres in size and has had crown closure reduced to less than 40% except in areas with heavy concentrations along roads that can pose a risk as a point of ignition.
b. The impacted area has more material than what is currently needed to meet desired CWD and snag requirements as identified in the Forest-wide LSR Assessment.

Treatment Standards

a. Areas considered for treatment contain areas larger than 10 acres in size and canopy closure has been reduced to less than 40%.
b. All standing live trees should be retained, including those injured (e.g., scorched) but likely to survive.
c. Following stand-replacing disturbance, management should focus on retaining snags that are likely to persist until late-successional conditions have developed and the new stand is again producing large snags. The biomass left in snags can be credited toward the amount of coarse woody debris biomass needed to achieve management objectives.
d. Following a stand-replacing disturbance, management should retain adequate coarse woody debris quantities in the new stand so that in the future it well still contain amounts similar to naturally regenerated stands. The analysis that determines the amount of coarse woody debris to leave must account for the full period of time before the new stand begins to contribute coarse woody debris. Desired levels found in this assessment should be used as a guide for determining adequate levels of snags and CWD.
e. Removal of snags and logs may be necessary to reduce hazards to humans along roads and trails, and in or adjacent to campgrounds. Where materials must be removed from the site, as in a campground or on a road, a salvage sale is appropriate. In other areas, such as along roads, leaving material on site may be considered.
f. The only exception to removing trees that would continue to live should be for incidental removal for safety reasons during the operation.
g. These basic guidelines may not be applicable after disturbances in younger stands because remnant coarse woody debris may be relatively small.
h. Logs present on the forest floor before a disturbance event provide habitat benefits that are likely to continue. It seldom will be appropriate to remove them. Where these logs are in an advanced state of decay, they will not be credited toward objectives for coarse woody debris retention developed after a disturbance event.
i. Some deviation from these general guidelines may be allowed to provide reasonable access to treatment sites and feasible logging operations. Such deviation should occur on as small a portion of the area as possible, and should not result in violation of the basic intent that late-successional forest habitat or the development of such habitat in the future should not be impaired through the area.

8. Firewood Cutting:

Objectives

a. Provide a public service by providing opportunities for cutting firewood.
b. Reducing fire potential and resistance to control.

Treatment Standards

a. NWROD C-16, allow fuelwood gathering from cull decks.
b. NWROD C-16 designate fuelwood to be removed to thin green trees, to remove blowdown blocking roads, and to meet project objectives in harvested areas.
c. Allow the cutting of dead and down material within 100 feet of an open designated forest system road, within LSR/MLSAs. Snag and CWD levels will be met across the entire LSR, even though this narrow section along the road systems will be in the low end of the desired range. (*Monitor and evaluate the program. Programatic fuel wood gathering within LSR/MLSAs may need additional evaluation and assessment.)

Analysis

Currently the Forest sells approximately 8,000 cords of fuelwood per year. Assuming cords removed has a linear relationship to percent land allocation, 2,000 cords could be removed from LSR/MLSAs or approximately 2 board feet per acre. However, since the most fuelwood will be gathered close to roads the affected area is probably less than 5 percent. Assuming fuelwood is gathered from no more than 5 percent of LSR/MLSAs an estimated 40 board feet per acre might be gathered from 5 percent of the LSR/MLSAs primarily along roads where fire risk is often of greatest concern.

9. Hazard Reduction - Prescribed Burning

Objectives

a. Reduce the likelihood of stand replacing disturbances that would result in the loss of existing and future late-successional forest.
b. Promote long term sustainability of late-successional habitat by mitigating fire effects. Activities will be designed to provide for stand components such as snags, CWD (logs), and other stand components benefiting late-successional forest-related species and their habitat.
c. Reduce future hazards in early (pole) and mid-successional stands in order to allow them to continue to develop into late-successional characteristics. Most often stand improvement cuttings (thinning) will need to proceed fire treatments-because of there present level of fuel buildup and dense live and dead fuel ladders many stands would be lost if fire is reintroduced prior to some improvement thinning.
d. Prescribed burning done in late-successional stands will be conducted in a manner that will mitigate fire effects and maintaining desired levels of late-successional characteristics; snags, CWD, decadence, etc.

e. Transition areas identified as a Fuel Model (FM) 10 to characteristics more representative of FM-8 or FM-9. Emphasis of activities should be placed on reducing flame lengths, rate of spread and crown fire potential.
f. Short-term impacts to late-successional forest-related species from fuels reduction treatments are outweighed by the long-term benefits to such species and will not lessen short-term functionality of the LSRs as a whole. There is a recognized trade-off between the loss of resources at the scale of an uncontrolled wildfire versus the loss of resources at a prescribed fire level.

Stand Attributes

a. Late-successional stands that have been identified as having the potential of lethal wildfire effects.
b. Mid-successional stands that have the potential for high levels of natural mortality prior to late-successional development and have conditions that allows reintroduction of fire, with low to zero risk of loss.
c. Those late-successional stands that are on south- and west-facing aspects or on the upper portions of slopes.

Treatment Standards

a. The treatment is intended to reduce the likelihood of a stand replacing event and provide for sustainable late-successional forest structure. The proposed management activities will clearly result in greater assurance of long-term maintenance of habitat; the activities are clearly needed to reduce present hazards or insure future hazards are low, and; the activities will not prevent the LSR from playing an effective role in the objectives for which they were established.
b. Prescribed burning "windows" are often constrained by fuel moisture levels and weather patterns. Burning should be implemented where fuel concentrations are at levels that will allow this activity to be conducted with a likelihood for success. If areas of high fuel loadings are not at a level conducive to conducting prescribed fire, manual or mechanical fuel treatment should be implemented in order to reduce fuels-this will often be the case.
c. Snag and CWD objectives have been identified as part of the desired condition. Prescriptions must be designed to insure sustaining the overall snag and CWD desired levels.
d. Mid-successional stands may require sequential entries with prescribed fire. A large portion of the smaller diameter live trees need to be reduced in order to lower future hazards created from natural mortality. A follow-up burn may be required to further reduce fuels as the remaining material begins to fall.
e. Uniformity across the treatment area is not desired. Patches of heavier fuels should be left scattered across the landscape, as long as the overall hazard to important late-successional attributes is adequately reduced.
f. Mortality caused by prescribed fire will not impact more than 10 to 15% of the overstory trees, maintain at least 50% soil cover retention* (Shasta-Trinity National Forest Land and Resource Management Plan). Soil cover consists of low growing live vegetation, rock fragments, and fine organic matter.

g. During burning operations, large diameter trees with high accumulations of duff around the base should maintain sufficient moisture reducing the residence time. This will prevent damage to cambium layer (and fine roots) of these large trees.
h. Areas should be more of a compact litter layer and represent a FM-8 for fine fuels containing little undergrowth. Dead and down material of 0 - 0.25 inch should be at a level of approximately 1.5 tons per acre and 0.26 - 3 inch material at 5 tons per acre. All burn prescriptions would be designed to maintain a cover of fine organic matter* on at least 50% of the treated area (Shasta-Trinity National Forest Land and Resource Plan - past monitoring of burns have observed a retention of 80% fine organic matter). *Fine organic matter refers to the duff, litter and twigs less than 3 inches in diameter.
i. Maximum flame lengths are generally three to six feet. Low intensity fire will be maintained in Riparian Reserves.
j. Constructed control lines will be kept to a minimum and existing boundaries will be utilized whenever possible as in roads, rock outcrops, ridge tops, and wet draws. Control lines generated will be rehabilitated when project is completed.

10. Hazard Reduction - Manual and Mechanical Fuel Reduction

Objectives

a. Reduce the likelihood of stand replacing disturbances that would result in the loss of existing and future late-successional vegetation. Promote long term sustainability of late-successional habitat. Activities will result in providing for long-term sustainability of vertical and horizontal diversity, snags, CWD (logs), and other stand components benefiting late-successional forest-related species and their habitat.
b. Reduce the future hazards in early and mid-successional stands in order to allow them to continue to develop into late-successional characteristics.
c. Manual and mechanical fuel reduction done in late-successional stands will be conducted in a manner that will insure minimizing the impact to and maintaining desired levels of late-successional characteristics; snags, CWD, decadence, etc.
d. Transition areas identified as a FM-10 or higher to characteristics more representative of FM-8 or FM-9. Emphasis of activities should be placed on reducing the amount of fine fuels, the associated rate of spread and flame length.
e. Negative short-term effects to late-successional forest-related species are outweighed by the long-term benefits to such species and will not lessen short-term functionality of the LSRs as a whole.

Stand Attributes

a. These treatments will be implemented in stands where fuel situations prevent successful prescribed fire treatments. Treatments would be done in order to get fuels to a level that would allow successful prescribed fire.

Treatment Standards

a. Manual fuel reduction will consist of handpiling heavy concentrations of fuel.

b. Mechanical fuel reduction can include dozer piling, chipping fuel accumulations, and cutting and crushing fuel (dozer, track-mac, hdyro-axe, etc.)
c. The treatment is intended to reduce the likelihood of a stand replacing event and provide for sustainable late-successional forest structure. The proposed management activities will clearly result in greater assurance of long-term maintenance of habitat; the activities are clearly needed to reduce hazards, and; the activities will not prevent the LSR from playing an effective role in the objectives for which they were established.
d. Uniformity across the treatment area is not desired. Patches of heavier fuels should be left scattered across the landscape, as long as the overall hazard to important late-successional attributes is adequately reduced.
e. Equipment operations retain at least 50% soil cover retention* (Shasta-Trinity National Forest Land and Resource Management Plan). Soil cover consists of low growing live vegetation, rock fragments, and fine organic matter.
f. Snag and CWD objectives have been identified as part of the desired condition. Prescriptions must be designed to insure sustaining the overall snag and CWD desired levels. *Fine organic matter refers to the duff, litter and twigs less than 3 inches in diameter.

Implementation Schedule

This chapter has discussed objectives, criteria, and treatment standards. The type of activity implemented in a given area is dependent upon site specific situations. This section will provide a more detailed discussion about specific actions that are recommended within the LSR/MLSAs. Approximate time frames will be attached to these projects.

Given the relationship between upslope processes and the aquatic environment, treatments must be designed and implemented in a manner which is consistent with Aquatic Conservation Strategy Objectives. Assurance of meeting ACS objectives is best achieved through resource specialist input at the project level and collaboration with other appropriate agencies and stakeholders.

Standards and Guides from the President's Forest Plan will be followed when actively managing an LSR/MLSA. These are found on pages C-11 through C-20 in the ROD and have been incorporated into the Forests LMPs and amend BLM Redding Areas Resource Plan. The Aquatic Conservation Strategy and the corresponding Riparian Reserve Standards and Guides also need to be followed when management activities are proposed; these are located on pages B-11 and C-31 through C-38.

Some additional recommendations have been identified or emphasized as a result of this assessment. They are presented below:

- Soil cover guidelines found within the Forests Land and Resource Management Plans and BLM, Redding Areas Resource Plans need to be met for all planned activities.
- Fuel treatment within thinning areas needs to be accomplished to the desired flame length and rate of spread levels.

- Sensitive plant species are known to occur within the LSRs. The effects of proposed management activities on this species will be considered during project-level planning and implementation.
- Activities which will occur within spotted owl NRF habitat should be designed and implemented in such a way that achieves the treatment objectives while maintaining habitat suitability. Habitat degradation will occur in some situations, and some amount of degradation may be an acceptable trade-off in return for the benefit of reducing threats to entire activity centers. The degree of acceptable trade-offs will be determined at the project level.

Promote the Development of Late-Successional Characteristics

Existing Situation: Nineteen LSR/MLSAs have been identified as having less than 75 percent of the sustainable level of late-successional forest (as defined in this LSRA) and 12 LSR/MLSAs have less than 30 percent of their sustainable level of late-successional. Thirteen LSRs and MLSAs have a high proportion, >70 percent, of mid-successional forest. The majority of the mid-successional forest consists of dense, overstocked stands. Many of these stands contain stocking levels that are near or exceed site capability. They are often slow growing and growth projections indicate the potential for high levels of mortality with associated fuel increases. In order for many of these stands to achieve late-successional characteristics, some type of management will be required. The other 11 LSRs/MLSAs contain a higher mix of early-successional habitat, including plantations. These stands will experience a reduction in growth and increased mortality without treatment.

Desired Condition: Within the LSRs/MLSAs, sustainable levels of late-successional habitat have been identified ranging between 50-60% (of capable ground). Vegetation is desired to be varied over the landscape, consisting of dense multi-layered stands, more open multi-layered stands, dense and open single storied stands, a variety of trees per acre with differing size classes, snags, down logs, etc. The desired character is to be in line with site capability, elevation, slope, aspect and soil conditions. Stand specific desired conditions should meet those identified in the desired condition section.

General Description of Treatments: Thinning, hazard reduction thinning, and prescribed burning are management activities that can assist the development of late-successional habitat on capable ground. Plantations and natural stands would be treated to provide for species diversity for both conifers and hardwoods.

LSRs that have been prioritized for treating mid-successional habitat to accelerate development of late-successional forest and protect existing habitat and developing habitat include: Yolla Bolla (RC-328), Canyon Creek (RC-333), Iron Canyon (RC-335), Graves (RC-339), Scott Mtn (RC-340), Eddy (RC-341), Deer (RC342), Algoma (RC-357), Wagon (RC-362), Castle (DD-67), Fons (DD-72), Sheepheaven (DD-78), Bartle (DD-79).

LSRs prioritized for plantation treatment to reduce hazards, and accelerate development of late-successional forest, include: South Fork (RC-330), Canyon Creek (RC-333), Iron Canyon (RC335), Eddy (RC-341), Deer (RC-342), conditions should meet those identified in the desired

condition section. Harris Mtn (RC-359), Elk Flat (RC-360), Mt. Shasta (RC-361), Wagon (RC-362), Castle Lake (DD-67), and McCloud (DD-76). These LSRs/MSLAs have large amounts of young plantations and early-successional vegetation.

The LSRA Team identified activities that would be implemented in order to develop late-successional characteristics considering the following from a the analysis.

Based on analysis, approximately 59% of the LSR/MLSA acreage is in mid-successional forest, and approximately 35% in mid-successional dense. It is assumed that opportunities exist in the mid-successional dense and some of the mid-successional open forest for improvement treatments to reduce hazards, and accelerate development towards late-successional forest conditions.

Approximately 50 percent of the mid-successional acres will respond to thinning with accelerated growth, thereby decreasing the amount of time needed for development into late-successional characteristics. This treatment will also reduce future hazards.

Priority will be for prescribed burning and/or improvement thinning the older mid-successional acres first, since they are closer to developing late-successional characteristics. Thinning to accelerate growth is a priority particularly in younger mid-successional stands-since LSRs currently are about 50% of the sustainable level. All treatments will be in mid-successional stands and will meet criteria and objectives stated for such activity.

Attempts should be made to treat as many acres as possible to move towards the late-successional sustainable levels. The actual acres treated will be dependent upon budgets and Forest priority.

Potential Treatment Locations: These locations are highlighted in Objective II, Criteria a, b, c, and d.

Effectiveness: There is an abundance of research which shows the effectiveness of thinning stands to promote stand and individual tree growth. (Oliver, 1988; Cochran and Oliver; Barrett, 1982; Barrett, 1983; Williamson, 1982, Tappeiner, Bell, & Brodie, 1982; Oliver, 1972; Oliver, 1979.)

Treatments and Trade-offs: Desired tree size characteristics can be achieved in a quicker time frame by treating over-stocked stands. Treating old plantations, early-successional, and mid-successional forest stands can accelerate meeting desired size characteristics. Table 4-10 summarizes the expected response to treatments by site class and age of stand at treatment (See Appendix J).

Table 4-10. Predicted response to treatments for stands modeled

Successional Stage at Treatment	Decades to late-successional
Mid-successional	3-5
Early successional	3-6

Treating these stands will allow for better control over species diversity and variable spacing across the landscape. Treatments of plantations would also break up the fuel continuity within the plantations by opening up the canopy layer of the trees.

These treatments will reduce the risk to insect outbreaks and reduce the likelihood of a large-scale disturbance by lowering the potential for a crown fire and the potential for increased fuel levels that would be created from insect/stress related mortality.

Some potential impacts to consider in design of proposed actions at the project level, depending on the character of the project can include: degradation of suitable habitat in terms of reduction in; crown cover, snags, and down logs; noise disturbance; and temporary displacement of individuals.

No Treatments: If left alone, some of the stands would begin to stagnate, predisposing them to insect attack and increased likelihood of a large-scale disturbance. Many of these stands will continue to have weakened and suppressed trees which are susceptible to mortality. There would still be the potential for significant loss to future late successional habitat with no treatment. In some cases no treatment may mean the non-attainment of desired characteristics.

Objectives Addressed: These types of activities will address several of the objectives. The primary objective addressed is promoting the continued development of late-successional habitat while reducing likelihood to loss from large-scale events. The areas identified as priority areas will assist with creating larger blocks over time. These treatments will also have benefits by providing additional resiliency to portions of the LSR/MLSA.

Time Frames: It is desirable to treat the areas to attain the desired conditions of late-successional habitat. Not all early- and mid-successional stands will require treatment. Field assessment will need to be completed in order to determine which stands will need treatment in order to progress, either to accelerate or maintain development or reduce future risk to large-scale events. Treating the older mid-successional stands would provide for late-successional habitat in a quicker time frame. It is be desirable to treat plantations and younger mid-successional stands with thinning. Older, mid-successional stands and not treated with prescribed fire will often need mechanical hazard reduction first, in order to minimize future loss and prepare them for prescribed fire treatments, while a few stands may be treated with prescribed fire without mechanical treatments.

Table 4-11 displays the ranges of acres needing treatment in each LSR in order to protect existing habitat and aid in the development of early- and mid-successional forest towards late-successional. The following highlights potential treatment acres that are treatments prioritized for mid-successional forest, burning is prioritized where stand conditions allow and desired conditions can be achieved. In the early successional forest treatment, plantations should be prioritized for treatment.

Table 4-11. Acres of LSR/MLSA needing treatment to continue development		
Treatment	**Needs (acres)**	**Accomplishments**
Yolla Bolla		
Risk Reduction -Rx Burning Mechanical, Thinning	500	
Growth Acceleration Thinning - Mid-successional	0	
Thinning - Plantations, Early-successional	80	
South Fork		
Risk Reduction -Rx Burning, Mechanical, Thinning	13,222	
Growth Acceleration Thinning - Mid-successional	2,900	
Thinning - Plantations, Early-successional	6,000	
Chanchellula		
Risk Reduction -Rx Burning, Mechanical, Thinning	6,543	
Growth Acceleration Thinning - Mid-successional	3,271	
Thinning - Plantations, Early-successional	1,500	
Corral		
Risk Reduction -Rx Burning, Mechanical, Thinning	25,270	
Growth Acceleration Thinning - Mid-successional	12,630	
Thinning - Plantations, Early-successional	3,500	
Canyon Creek		
Risk Reduction -Rx Burning, Mechanical, Thinning	2,231	
Growth Acceleration Thinning - Mid-successional	0	
Thinning - Plantations, Early-successional	120	
Iron Canyon		
Risk Reduction -Rx Burning, Mechanical, Thinning	16,915	750
Growth Acceleration Thinning - Mid-successional	7,980	
Thinning - Plantations, Early-successional	3,200	
Buckeye		
Risk Reduction -Rx Burning, Mechanical, Thinning	745	
Growth Acceleration Thinning - Mid-successional	1,115	
Thinning - Plantations, Early-successional	400	
Eagle		
Risk Reduction -Rx Burning, Mechanical, Thinning	855	
Growth Acceleration Thinning - Mid-successional	570	
Thinning - Plantations, Early-successional	40	
Graves		
Risk Reduction -Rx Burning, Mechanical, Thinning	370	
Growth Acceleration Thinning - Mid-successional	100	
Thinning - Plantations, Early-successional	200	
Scott Mountain		
Risk Reduction -Rx Burning, Mechanical, Thinning	5,650	
Growth Acceleration Thinning - Mid-successional	1,200	
Thinning - Plantations, Early-successional	210	

Table 4-11. Acres of LSR/MLSA needing treatment to continue development		
Treatment	**Needs (acres)**	**Accomplishments**
Eddy		
Risk Reduction -Rx Burning, Mechanical, Thinning	700	
Growth Acceleration Thinning - Mid-successional	505	
Thinning - Plantations, Early-successional	0	
Deer		
Risk Reduction -Rx Burning, Mechanical, Thinning	1,870	
Growth Acceleration Thinning - Mid-successional	720	
Thinning - Plantations, Early-successional	300	
Algoma		
Risk Reduction -Rx Burning, Mechanical, Thinning	2,160	
Growth Acceleration Thinning - Mid-successional	6,835	
Thinning - Plantations, Early-successional	2,000	
Porcupine		
Risk Reduction -Rx Burning, Mechanical, Thinning	200	
Growth Acceleration Thinning - Mid-successional	1,030	
Thinning - Plantations, Early-successional	100	
Harris Mountain		
Risk Reduction -Rx Burning, Mechanical, Thinning	245	
Growth Acceleration Thinning - Mid-successional	640	
Thinning - Plantations, Early-successional	210	
Elk Flat		
Risk Reduction -Rx Burning, Mechanical, Thinning	0	
Growth Acceleration Thinning - Mid-successional	755	
Thinning - Plantations, Early-successional	300	
Mt. Shasta		
Risk Reduction -Rx Burning, Mechanical, Thinning	1,100	
Growth Acceleration Thinning - Mid-successional	4,415	
Thinning - Plantations, Early-successional	1,600	
Wagon		
Risk Reduction -Rx Burning, Mechanical, Thinning	1,415	
Growth Acceleration Thinning - Mid-successional	100	
Thinning - Plantations, Early-successional	350	
Castle Lake		
Risk Reduction -Rx Burning, Mechanical, Thinning	920	
Growth Acceleration Thinning - Mid-successional	925	
Thinning - Plantations, Early-successional	0	
Fons		
Risk Reduction -Rx Burning, Mechanical, Thinning	100	
Growth Acceleration Thinning - Mid-successional	0	
Thinning - Plantations, Early-successional	200	

Table 4-11. Acres of LSR/MLSA needing treatment to continue development		
Treatment	**Needs (acres)**	**Accomplishments**
McCloud		
Risk Reduction -Rx Burning, Mechanical, Thinning	0	
Growth Acceleration Thinning - Mid-successional	1,440	
Thinning - Plantations, Early-successional	30	
Sheepheaven		
Risk Reduction -Rx Burning, Mechanical, Thinning	0	
Growth Acceleration Thinning - Mid-successional	810	
Thinning - Plantations, Early-successional	20	
Bartle		
Risk Reduction -Rx Burning, Mechanical, Thinning	335	
Growth Acceleration Thinning - Mid-successional	300	
Thinning - Plantations, Early-successional	20	
Madrone		
Risk Reduction -Rx Burning, Mechanical, Thinning	150	
Growth Acceleration Thinning - Mid-successional	0	
Thinning - Plantations, Early-successional	0	
Total		
Risk Reduction -Rx Burning, Mechanical, Thinning	81,496	
Growth Acceleration Thinning - Mid Successional	48,241	
Thinning - Plantations - Early-Successional	20,380	

Potential Funding: Projects can be potentially funded with wildlife habitat improvement, watershed restoration, fuel reduction, and/or KV dollars.

Hazard Reduction For Late-Successional Forest Habitat Maintenance, Protection of Early and Mid-Successional Habitat, Preventing Further Loss of Spotted Owl Habitat

Existing Condition: Lack of natural levels of fire occurrence over the last several decades, coupled with the lack of stand management to improve forest density levels has resulted in a landscape which is prone to catastrophic fire events. This condition threatens the ability to maintain late-successional, spotted owl within the LSRs. Key situations were identified that caused concern for some particular LSR/MLSAs.

The first concern was for those LSR/MLSAs that are within or near expected late-successional sustainable level and have been identified as currently at risk to loss, from large-scale wildfire event.

The second concern was for those LSR/MLSAs that have an abundance of early- and/or mid-successional habitat and have been identified as currently at risk to loss, from a large-scale event.

Desired Condition: The desired condition is to maintain the late successional forest and surrounding habitats, in a condition which is not greatly susceptible to stand replacing fire. Continuous, large parcels of high fire behavior condition should be disrupted. Scattered pockets

of fuel accumulations will still be present, more so on the north- and east-tending slopes than on the south- and west-tending slopes.

Forested habitat on the south and west-tending slopes is expected to be maintained in a relatively more open canopy closure, with fewer snags, fewer down logs, and less understory, than on the north and east-tending slopes.

General Description of Treatment: The determination of strategies to determine most appropriate places to burn for the highest amount of protection will occur at the project development stage. Appropriate proportions to be treated and the timing of treatments will likely be determined at project development through consultation with the Fish and Wildlife Service and National Marine Fisheries Service.

The proposed treatments would be aimed at reducing fuels and potential lethal effects through the use of prescribed fire. Prescribed fire would be used to maintain current late-successional conditions currently found in the priority LSR/MLSAs and would likewise be used to reduce lethal effect concerns for the younger age vegetation to allow for continued development.

Where fuel conditions are at levels that may preclude prescribed burning success, which is most often the case in dense mid-successional stands, other fuel reduction methods would be employed first. These include manual or mechanical fuel reduction. These treatments would concentrate on getting fuel conditions to a point that will warrant successful prescribed burning.

Potential Treatment Locations: The actual on the ground locations will be identified during project planning. This assessment has highlighted some specific criteria to use when selecting project areas in order to protect current and future late-successional habitat.

To protect existing late-successional habitat:

1. Treatment areas for protecting late-successional, spotted owl habitat that lies adjacent to or is included in relatively large areas identified as having "high lethal effects" should be prioritized by 1) those located at the upper third of south and west-facing slopes, 2) those located on south and west-facing slopes, and 3) those located on the upper third of slopes.
2. Those areas of late-successional, spotted owl habitat that are threatened by adjacent areas that have been identified as; 1) having more than two years of high or moderate insect mortality or 2) areas in which past large-scale disturbances have resulted in large accumulations of fuels.

Trade-offs and Effectiveness

Treatment: Although prescriptions would be targeted at consumption of ground fuels, treatments could result in some reduction in coarse woody material, snags, and some understory vegetation. Prescribed fire in these habitats could result in an estimated 10 to 15% stand mortality (i.e. white fir, especially small diameter white fir, is very susceptible to fire kill). The potential exists for some short term habitat degradation, as a result of treatment, but NRF habitat would not be rendered unsuitable.

No Treatment: Without stand improvement treatments, the high potential for the occurrence of stand-replacing events remains for these priority LSR/MLSAs. The loss of current late-successional and early/mid-successional forest would likely occur before these LSR/MLSAs reach expected sustainable levels.

Objectives addressed: These proposed treatments are in support of the objectives which address the protection and maintenance of late successional forest, spotted owl and resiliency of the LSR from large-scale disturbance. They also address the need to protect current early/mid-successional forest in order to allow it to continue to develop into late-successional habitat.

Time frames: The Shasta-Trinity National Forests Land and Resource Plan identifies projected fuel reduction treatment acreages for the preferred alternative. Within the next decade, years 2000 to 2010, a range of 8,000 to 30,000 acres could potentially be treated within LSRs to reduce risk to large-scale disturbances. This depends on funding, how much fuel reduction is planned in other land allocations, and other environmental and regulatory requirements.

Potential Funding: Projects can be potentially funded with wildlife habitat improvement, watershed restoration, fuel reduction, and/or trust fund dollars.

Miscellaneous Activities

The LSR/MLSAs land allocations overlay many established and historic facilities, and traditional activities. The following is a partial list of those activities.

1. Maintaining Existing Facilities including Resorts, campgrounds, administrative sites etc.

Existing Condition: Preexisting developed sites, Forest Plan Management Prescription IV lands, are located within many LSR/MLSAs. These facilities are in need of periodic maintenance and improvement to continue to provide safe service to the public. Example is developed campgrounds around the Iron Canyon Reservoir located in Iron Canyon LSR RC-335 will need period maintenance, hazard tree removal, fuel removal, campsite reconstruction, etc.

Desired Condition: Continued management of existing facilities.

Locations: Analysis area wide.

Trade-offs and Effectiveness: Neutral to objectives of LSR.

Consistency: Consistent at NWROD, Developments - C-17, and Recreational Uses - C-18.

2. Permitting and Managing Telecommunication Sites, Utility Rights-of-Way, etc.

Existing Condition: The Forest Plan established milti-user electronic sites for the Forests electronics site network. Utility Rights-of-Way periodically cross LSR/MLSAs. Existing

facilities are maintained including vegetation management. New proposals will be considered and evaluated.

Desired Condition: Manage and maintain designated electronic sites. Authorize maintain or improvement of R-O-W. Consideration of new proposals will include applicable mitigation measures and/or alternative routes to minimize impacts to Late-successional forest.

Locations: Analysis area wide.

Trade-offs and Effectiveness: Most often neutral to objectives of LSR, may require special provisions for future R-O-W.

Consistency: Consistent at NWROD, Developments - C-17, and Rights-of-Way - C-19.

3. Hydro electric facilities including dams .

Existing Condition: Hydro electric facilities nee to be maintained and relicensed.

Desired Condition: Continued management and licensing of existing facilities.

Locations: Iron Canyon RC-335.

Trade-offs and Effectiveness: Neutral to objectives of LSR.

Consistency: Consistent at NWROD, Lands C-36.

4. Special Forest Products including Christmas Trees.

Existing Condition: Approximately 5,500 Christmas tree permits are issued annually on the Shasta-Trinity National Forests. Approximately 25% of the Forest is LSR, so an estimated 1,375 Christmas trees might potentially be harvested from LSRs Forest Wide, or 1 tree per 220 acres. Other Forest products include such items as posts, poles rails, landscape transplants, yew bark, shakes, seed cones, boughs, mushrooms, fruits berries, hardwoods, forest greens (e.g., ferns, huckleberry, beargrass, and mosses), and medicinal forest products. The level of activity and number of permits issued is currently low.

Desired Condition: Continue to monitor and evaluate whether gathering of special products have adverse effects on late-successional forests and apply corrective action when appropriate.

Locations: Analysis area wide.

Trade-offs and Effectiveness: Neutral to objectives of LSR.

Consistency: Consistent at NWROD, Special Forest Products C-18.

5. Providing Access to Private Inholdings.

Existing Condition: The Forest includes within its boundaries many private inholdings.

Desired Condition: Continued to provide reasonable access to private inholdings, including appropriate mitigation measures or alternative routes when necessary to reduce impacts to LSR objectives.

Locations: Analysis area wide.

Trade-offs and Effectiveness: Neutral to objectives of LSR.

Consistency: Consistent at NWROD, C-19.

6. Managing and Burning Chaparral.

Existing Condition: LSRs include chaparral areas that periodically need treatment usually to improve browse contions for wildlife or to reduce fuel hazards.

Desired Condition: Improved conditions for chaparral dependent species.

Locations: Chaparral or shrub dominated areas not capable of attaining late-successional forest conditions.

Trade-offs and Effectiveness: Neutral to objectives of LSR.

Consistency: Consistent at NWROD, Habitat Improvement Projects - C-17.

7. Maintaining Hardwood Stands, forest openings, meadows, and glades

Existing Condition: Hardwood forest stands are included within some LSR/MLSAs. Madrone DD-83 is greater than 50% in black oak woodlands. Many black oak stands are overcrowded with poor mass area. Meadow and glades are being encroached by conifers

Desired Condition: Protect and improve forest woodlands, meadows and glades. Improve black oak stand health through thinning treatments and light burning.

Locations: Specific hardwood stands, meadows and glades analysis area wide. A large portion of Madrone DD-83 is black oak forest.

Trade-offs and Effectiveness: Neutral to objectives of LSR.

Consistency: Consistent at NWROD, Habitat Improvement Projects - C-17. Forest Plan land designation for Madrone DD-83 should be evaluated, with possible revision to a land allocation that emphasizes management of hardwood forests.

8. Noxious Weed Control.

Existing Condition: Several species of nonnative (noxious weeds) are wide spread through the analysis area.

Desired Condition: Implement practices to control or eradicate noxious weeds.

Locations: Analysis area wide.

Trade-offs and Effectiveness: Neutral or beneficial to objectives of LSR.

Consistency: Consistent at NWROD, Nonnative Species C-19.

9. Special uses events (e.g., organized camps, movie production crews, bicycle races, etc...)

Existing Condition: Occasional requests for permits. Most requested activities are neutral to the objectives of LSRs.

Desired Condition: Proposals will be evaluated at the project level for impacts on LSR objectives, and mitigation measures or alternatives considered.

Locations: Analysis area wide.

Trade-offs and Effectiveness: Usually neutral to objectives of LSR.

Consistency: Consistent at NWROD, Recreational Uses - C-18.

10. Maintaining, repairing, stabilizing road cuts and fills, and decommissioning roads.

Existing Condition: Roads impact watershed processes differently depending upon design, soil stability, proximity to streams, maintenance levels, and use. Currently the Forest is in the process evaluating its road system under a Access Travel Management Plan (ATM) that will consider a number of complex factors and make recommends.

Desired Condition: ATM plan completed - system roads maintained, excess roads removed from the system.

Locations: Analysis area wide.

Trade-offs and Effectiveness: Beneficial to objectives of LSR.

Consistency: Consistent at NWROD, Road Construction and Maintenance, C-16.

11. Managing dispersed recreation including, installing traffic control devices, seasonal closure gates and fences, constructing, reconstructing, re-routing, and maintaining trails, maintaining, improving, removing undeveloped camp sites, and installing signs.

Existing Condition: Because it is easily accessible from I-5 the Forest has a large recreation visitor use that ranks in the top ten in the the Nation. Seventy percent of the use is dispersed recreation. The public demand for dispersed recreation is expected to increase. The 1989 RPA document, "An Analysis of the Outdoor Recreation and Wilderness Situation in the United States: 1989-2040", lists activities with the greatest growth expectation including, pleasure walking, pleasure driving, picnicking, stream/lake/ocean swimming, family gatherings, pool swimming, wildlife observation and photography and other outdoor photography, motorboating, bicycle riding, and hiking.

Desired Condition: Continue to provide quality opportunities for dispersed recreation compatible with protection of resources.

Locations: Analysis area wide particularly along roads, trails, and bodies of water.

Trade-offs and Effectiveness: Neutral to objectives of LSR.

Consistency: Consistent at NWROD, Recreation Uses, C-18.

12. Managing Wildlife and Fish Habitat .

Existing Condition: Actions include, maintaining and constructing improvements, coordinating with California Department of Fish and Game in reintroduction of fish and wildlife species programs, removing log jams and fish barriers, restoring or creating pools in streams.

Desired Condition: Continue to consider opportunities to improve habitat.

Locations: Analysis area wide.

Trade-offs and Effectiveness: Beneficial to objectives of LSR.

Consistency: Consistent at NWROD, Habitat Improvement Projects - C-17.

13. Managing Livestock Grazing.

Existing Condition: For existing grazing allotments - see Chapter 2. Generally, grazing is neutral the objectives for LSRs.

Desired Condition: Continue monitoring and managing allotments. Implement practices to protect resources as appropriate. Where objectives cannot be met, relocate livestock management and/ of handling facilities.

Locations: LSR/MLSAs with range allotments

Trade-offs and Effectiveness: Usually neutral to objectives of LSR.

Consistency: Consistent at NWROD, Range Management, C-17.

14. Managing Existing Progeny Sites.

Existing Condition: A number of pre-existing progeny test sites are located within LSR/MLSAs. Management of these sites includes cultural practices (e.g., as weed control, thinning, planting), and administrative actions (e.g., building and repairing fences).

Desired Condition: Continued management of progeny sites.

Locations: At progeny sites.

Trade-offs and Effectiveness: Neutral to objectives of LSR.

Consistency: Consistent at NWROD, Research - C-18.

15. Identifying and Managing Rust Resistant Sugar Pine.

Existing Condition: Action includes collection of seed cones, tagging of trees, and protection measures around resistant trees (thinning, weeding etc.).

Desired Condition: Protection of rust resistant Sugar Pine.

Locations: Analysis area wide.

Trade-offs and Effectiveness: Neutral to objectives of LSR.

Consistency: Consistent at NWROD Research, C-18.

16. Mining.

Existing Condition: Various small mining claims primarily on the westside of the Forest.

Desired Condition: The impacts of ongoing and proposed mining actions are assessed, and mineral activity permits include appropriate stipulations related to the mineral activity. Mitigation measures are designed to minimize detrimental effects to late-successional habitat.

Locations: At mining claim analysis area wide.

Trade-offs and Effectiveness: Usually neutral to nonsignificant impacts to objectives of LSR.

Consistency: Consistent at NWROD, Mining - C-17.

Appendix A
References

Agee JK and RL Edmonds. 1992. Forest protection guidelines for the northern spotted owl. PP: 182-244 Appendices, Final Draft Recovery Plan for the Northern Spotted Owl. USDI.

Agee J.K. 1996. The Influence of Forest Structure on Fire Behavior

Atzet T, RE Martin. 1991. Natural disturbance regimes in the Klamath province. Proceedings of the symposium on biodiversity of northwestern California. Santa Rosa, CA 9p.

Beardsley D, R Warbington. 1996. Old growth in northwestern California National Forests. Res Pap PNW-RP-491. Portland, OR: USDA, Forest Service Pacific Northwest Research Station 47p.

Bjornn TC, DW Reiser. 1991. Habitat requirements of salmonids in streams. American Fisheries Society Special Publication 19: 83-138.

Brown GW. 1980. Forestry and water quality. Oregon State University Book Stores, Inc. Corvallis, OR.

Brown ER, editor. 1985. Management of wildlife and fish habitats in forests of Western Oregon and Washington. Part 1 - Chapter Narratives. 332 pp.

Clayton D. 1997. Personal communication. Wildlife Biologist, Rogue River National Forest, Oregon.

Creasy, M 1997. CALVEG Descriptions for the Six Rivers, Klamath, Shasta-Trinity, and Mendocino National Forests, unpublished report to Richard Svilich located at Klamath National Forest, Yreka, CA.

Crookston NL. 1990. User's guide to the event monitor: part of the prognosis model version 6. Gen Tech Report INT-133. Ogden, UT. US Forest Service Intermountain Forest and Range Experiment Station 112 p.

Dahms, Walter G. 1964. Gross and Net Yield Tables for Lodgepole Pine, Research Paper PNW-8, USDA, Forest Service, Pacific Northwest Forest and Range Experiment Station.

Dunning, and Reineke. 1933. Preliminary Yield Tables for Second Growth Stands in the California Pine Region, Technical Bulletin No. 354, USDA, Forest Service, California Forest and Range Experiment Station.

Elder Don. 1998. Personal communication. Geologist, Klamath National Forest, Yreka, CA.

Fischer WC. 1987. The fire effects information system. 128-135. Proceedings of the Symposium on Wildland Fire 2000 : April 27-30, 1987, South Lake Tahoe, CA. Berkeley, CA : USDA, Forest Service, Pacific Southwest Forest and Range Experiment Station, General technical report PSW101.

Freel M. 1991. A literature review for management of the marten and fisher on National forests in California. Unpublished report prepared for US Forest Service, Pacific Southwest Region. 24 p.

Hickman, JC, editor. 1993. The Jepson manual higher plants of California. University of California Press Berkeley, CA.

Huff M, J Henshaw, E Laws. 1997. Great gray owl survey status and evaluation of guidelines for the Northwest forest plan. Unpublished report. 47 p.

Hughes MK, PM Brown. 1991. "Drought Frequency in Central California Since 101 B.C. Recorded in Giant Sequoia Tree Rings." Climate Dynamics 6: 161-167.

Jimerson 1993. Draft North Coast and Klamath Ecological Province Vegetation Descriptions.

Johnson KN, JF Franklin, JW Thomas, J Gordon. 1991. Alternatives for management of late-successional forests of the Pacific Northwest. A report to the Agriculture Committee and the Merchant Marine Committee of the U.S. House of Representatives 59 p.

Karr JR. 1981. Assessment of biotic integrity using fish communities. Fisheries (Bethesda) 6(6):21-27

Keane RE, ED Reinhardt, JK Brown. 1994. FOFEM : a first order fire effects model for predicting the immediate consequences of wildland fire in the United States. p. 628-631. Proceedings of the 12th international conference on fire and forest meteorology : October 26-28, Jekyll Island, GA. Bethesda, MD: Society of American Foresters.

Knight RL, K Gutzwiller, editors. 1995. Wildlife and recreationists, coexistence through management and research. Island Press. 372 pp.

Meehan WR, editor. 1991. Influences of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Society Special Publication 19.

Nussbaum et. al. 1983

Perry DA, MP Amaranthus, JG Borchers, SL Borchers, RE Brainerd. 1989. Bootstrapping in ecosystems internal interactions largely determine productivity and stability in biological systems with strong positive feedback. Bioscience 39:4 230-237.

Ruggiero LF, KB Aubry, SW Buskirk, LJ Lyon and WJ Zielinski. 1994. The scientific basis for conserving forest carnivores; American marten, fisher, lynx, and wolverine in the Western United States. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. Gen Tech Report RM-254 184 p. States.

Sawyer JO, T Keeler-Wolf. 1995. A manual of California vegetation. California Native Plant Society, Sacramento, CA.

Scharpf, Robert F., tech. coord. 1993. Diseases of Pacific Coast Conifers. Agric. Handb. 521. Washington, DC: U.S. Department of Agriculture, Forest Service. 199p.

Schultz DE [personal communications]. Regarding stand gaps, and forest pest management. Located at Shasta-Trinity National Forest, Redding, CA.

Schumacher, Francis X. 1930. Yield stand and volume tables of Douglas-fir in California, Bulletin 491, University of Calif. College of Agriculture, Agricultural Experiment Station, Berkeley, CA.

Schumacher, Francis X. 1928. Yield, Stand and Volume Tables for Red Fir in California, Bulletin 456, University of Calif. College of Agriculture, Agricultural Experiment Station, Berkeley, CA.

Skinner CN. 1994. Fire return intervals in the Eastern Klamath Mountains, California, In: Abstracts from the Association of American Geographers 90th Annual Meeting, 29 March-2 April, 1994, association of American Geographers, Washington, DC, 352-353.

Skinner CN. 1995. Change in spatial characteristics of forest openings in the Klamath Mountains of northwestern California. Landscape Ecology 10:4 pp 219-228 1995 SPB Academic Publishing bv, Amsterdam.

Skinner CN. 1997. A preliminary investigation of fire history in riparian reserves of the Klamath Mountains. Presented at Fire in California Ecosystems: Integrating Ecology, Prevention, and Management, November 17-20, 1997. San Diego, CA.

Snyder JO. 1931. Salmon of the Klamath river California. Fish Bulletin No. 34 Division of Fish and Game of California 129 p.

STNF. 1994. Butter Creek Watershed Analysis and Interim LSR Assessment. US Forest Service. Shasta-Trinity National Forest.

STNF. 1995. Headwaters Sacramento River Watershed Analysis. US Forest Service. Shasta-Trinity National Forest.

STNF. 1995. McCloud Flat Ecosystem Analysis. US Forest Service. Shasta-Trinity National Forest.

STNF. 1995. Panther Creek and Upper Squaw Creek Watershed Analysis. US Forest Service. Shasta-Trinity National Forest.

STNF. 1995. Spanky Dee Watershed Analysis. US Forest Service. Shasta-Trinity National Forest.

STNF. 1996. Deer Creek Interim LSR Assessment. US Forest Service. Shasta-Trinity National Forest.

STNF. 1996. Iron Canyon Watershed Analysis. US Forest Service. Shasta-Trinity National Forest.

STNF. 1996. Iron Canyon Interim LSR Assessment US Forest Service. Shasta-Trinity National Forest.

STNF. 1996. Lower Hayfork Creek Watershed Analysis. US Forest Service. Shasta-Trinity National Forest.

STNF. 1996. Shotgun/Slate Watershed Analysis. US Forest Service. Shasta-Trinity National Forest.

STNF. 1996. Upper Sacramento River Watershed Analysis. US Forest Service. Shasta-Trinity National Forest.

STNF. 1997. Bartle Watershed Analysis. US Forest Service. Shasta-Trinity National Forest.

STNF. 1997. Beegum Watershed Analysis. US Forest Service. Shasta-Trinity National Forest.

STNF. 1997. Lower McCloud River Watershed Analysis. US Forest Service. Shasta-Trinity National Forest.

STNF. 1998. Clear Creek LSR Assessment. US Forest Service. Shasta-Trinity National Forest.

STNF. 1998. McCloud Arm Watershed Analysis. US Forest Service. Shasta-Trinity National Forest.

STNF. 1998. Upper Hayfork Watershed Analysis. US Forest Service. Shasta-Trinity National Forest.

Strahler AN. 1957. Quantitative analysis of watershed geomorphology. Transactions of the American Geophysical Union 38:913-920.

Taylor AH, CN Skinner. 1995. Fire regimes and management of old-growth Douglas-fir forests in the Klamath Mountains, northwestern California. Presented at the Conference on Fire and Threatened and Endangered Species Habitat.

Taylor A.H., and C.N. Skinner,. 1998. Fire history and landscape dynamics in a late-successional reserve, Klamath Mountains, California, USA. Forest Ecology and Management 111 (1998) 285-301.

Technical Report, USDA 1982; INT-122

Thomas JW, ED Forsman, JB Lint, EC Meslow, BR Noon, J Verner. 1990. A conservation strategy for the northern spotted owl. Interagency scientific committee to address the conservation of the northern spotted owl. USDA Forest Service, USDI Bureau of Land Management, Fish and Wildlife Service, and National Park Service. Portland, Oregon. U.S. Government Printing Office 791-171/20026. Washington D.C.

Thomas JW, MG Rapheal, RG Anthony, ED Forsman, AG Gunderson, RS Holthausen, BG Marcot, GH Reeves, JR Sedell, DM Solis. 1993. Viability assessments and management considerations for species associated with late-successional and old growth forests of the Pacific Northwest. Portland, Oregon USDA Forest Service 523 pp.

USDA. 1994. Ecological subregions of the United States: section descriptions, USDA, Forest Service, Ecosystem Management, Washington DC.

USDA. 1997. Ecological subregions of California, section and subsection descriptions, USDA, Forest Service, Pacific Southwest Region, R5-EM-TP-005.

USDA Forest Service. 1997. Forest insect and disease conditions in the United States 1996. USDA, Forest Service, Forest Health Protection Washington, DC 87 p.

USDA Forest Service and USDI Bureau of Land Management. 1994a. Final supplemental environmental impact statement on management of habitat for late successional and old-growth forest related species within the range of the northern spotted owl. Portland, Oregon: USDA Forest Service, USDI Bureau of Land Management. 2 vols. and appendices.

USDA Forest Service and USDI Bureau of Land Management. 1994b. Record of Decision for amendments to Forest Service and Bureau of Land Management planning documents within the range of the northern spotted owl; standards and guidelines for management of habitat for late-successional and old-growth forest related species within the range of the northern spotted owl. Portland, Oregon: USDA Forest Service, USDI Bureau of Land Management.

USDA Forest Service, USDI USFWS, USDC National Oceanic and Atmospheric Administration National Marine Fisheries Service, USDI National Park Service, USDI BLM, Environmental Protection Agency. 1993. Forest ecosystem management: an ecological, economic, and social assessment. Report of the ecosystem management assessment team. USDA Forest Service.

USDI Fish and Wildlife Service. 1992a. Draft description of critical habitat for the northern spotted owl in California.

USDI Fish and Wildlife Service. 1992b. Recovery plan for the Northern Spotted Owl, Draft 662 p.

USDI Fish and Wildlife Service, 1997. Recovery Plan for the Threatened Marbled Murrelet. 194 p. plus appendices.

Walstad JD, SR Radosevich, DV Sandberg, editors. 1990. Natural and Prescribed Fire in Pacific Northwest Forests. Oregon State University Press, Corvallis, OR.

Welsh, HH Jr, AJ Lind. 1995. Habitat correlates of the Del Norte salamander, Plethodon elongatus, in Northwestern California Journal of Herpetology 29: 198-210.

West JW, OJ Dix, AD Olson, MV Anderson, SA Fox, JH Power. 1989. Evaluation of fish habitat condition and utilization in Salmon, Scott, Shasta and mid-Klamath sub-basin tributaries. USDA Forest Service, Klamath National Forest. Annual Report for Interagency Agreement 14-16-0001-89508.

Wills, R.D. 1991

Wills, RD. 1994. Fire history and stand development of a Douglas fir/hardwood forest in northern California, Northwest Science, 68: 205-212.

Willis, R.D. and Struart.

Wykoff WR, NL Crookston AR Stage. 1982. Users guide to the stand prognosis model. Gen. Tech Report INT-133. Ogden UT. USDA Forest Service Intermountain Forest Range and Experiment Station 112p.

Appendix B
Fire/Fuels Modeling

The following is a description of the components and the process involved in determining fire hazard and risk for the Forest Wide LSRA.

Fuel Model Definitions

The prediction of fire behavior is valuable for assessing potential fire damage to resources. A quantitative basis for rating fire danger and predicting fire behavior is possible with the mathematical fire behavior fuel models. Fuels have been classified into four groups; **grasses, shrubs, timber,** and **slash**. The differences in these groups are related to the fuel load and distribution of fuel among fuel size classes.

The criteria for choosing a fuel model (Anderson 1982) includes the fact that fire burns in the fuel stratum best conditioned to support fire. Fuel models are simply tools to help the user realistically estimate fire behavior. Modifications to fuel models are possible by changes in the live/dead ratios, moisture contents, fuel loads, and drought influences. Thirteen fire behavior predictive fuel models are used during the severe period of fire season when wildfire pose greater control problems and impacts on land resources.

Following is a brief description of each of the 13 fire behavior fuel models:

Grass Group

Fire Behavior Fuel Model 1 - Fire spread is governed by the very fine, porous, and continuous herbaceous fuels that have cured or are nearly cured. Fires are surface fires that move rapidly through the cured grass. Very little timber or shrub is present.

Fire Behavior Fuel Model 2 - Fire spread is primarily through cured or nearly cured grass where timber or shrubs cover one to two-thirds of the open area. These are surface fires that may increase in intensity as they hit pockets of other litter.

Fire Behavior Fuel Model 3 - Fires in this grass group display the highest rates of spread and fire intensity under the influence of wind. Approximately one-third or more of the stand is dead or nearly dead.

Shrub Group

Fire Behavior Fuel Model 4 - Fire intensity and fast spreading fires involve the foliage and live and dead fine woody material in the crowns of a nearly continuous secondary overstory. Stands of mature shrubs, six feet tall or more are typical candidates. Besides flammable foliage, dead woody material in the stands contributes significantly to the fire intensity. A deep litter layer may also hamper suppression efforts.

Fire Behavior Fuel Model 5 - Fire is generally carried by surface fuels that are made up of litter cast by the shrubs and grasses or forbs in the understory. Fires are generally not very intense because the fuels are light and shrubs are young with little dead material. Young green stands with little dead wood would qualify.

Fire Behavior Fuel Model 6 - Fires carry through the shrub layer where the foliage is more flammable than fuel model 5, but requires moderate winds, greater than eight miles per hour.

Fire Behavior Fuel Model 7 - Fires burn through the surface and shrub strata with equal ease and can occur at higher dead fuel moistures because of the flammability of live foliage and other live material.

Timber Group

Fire Behavior Fuel Model 8 - Slow burning ground fuels with low flame lengths are generally the case, although the fire may encounter small "jackpots" of heavier concentrations of fuels that can flare up. Only under severe weather conditions do the fuels pose a threat. Closed canopy stands of short-needled conifers or hardwoods that have leafed out support fire in the compact litter layer. This layer is mostly twigs, needles, and leaves.

Fire Behavior Fuel Model 9 - Fires run through the surface faster than in fuel model 8 and have a longer flame length. Both long-needle pine and hardwood stands are typical. Concentrations of dead, down woody material will cause possible torching, spotting, and crowning of trees.

Fire Behavior Fuel Model 10 - Fires burn in the surface and ground fuels with greater intensity than the other timber litter types. A result of overmaturing and natural events creates a large load of heavy down, dead material on the forest floor. Crowning out, spotting, and torching of individual trees is more likely to occur, leading to potential fire control difficulties.

Slash Group

Fire Behavior Fuel Model 11 - Fires are fairly active in the slash and herbaceous material intermixed with the slash. Fuel loads are light and often shaded. Light partial cuts or thinning operations in conifer or hardwood stands. Clear-cut operations generally produce more slash than is typical of this fuel model.

Fire Behavior Fuel Model 12 - Rapidly spreading fires with high intensities capable of generating firebrands can occur. When fire starts it is generally sustained until a fuelbreak or change in conditions occur. Fuels generally total less than 35 tons per acre and are well distributed. Heavily thinned conifer stands, clear-cut, and medium to heavy partial cuts are of this model.

Fire Behavior Fuel Model 13 - Fire is generally carried by a continuous layer of slash. Large quantities of material three inches and greater is present. Fires spread quickly through the fine fuels and intensity builds up as the large fuels begin burning. Active flaming is present for a sustained period of time and firebrands may be generated. This contributes to spotting as weather

conditions become more severe. Clear-Cut are depicted where the slash load is dominated by the greater than three inch fuel size, but may also be represented by a "red slash" type where the needles are still attached because of high intensity of the fuel type.

Fire Risk

Historical records indicate lightning and human caused fires have been common in the LSRs. Little precipitation (May to September) and high summer temperatures allow fuels to dry, which allows for ease and spread of wildfire ignitions.

There are numerous fire risks within the LSRs. Many dispersed camp sites, recreational use, and travel corridors all contribute to the possibility of a wildfire occurrence from human causes.

The greatest risk of fire starts is from the occurrence of lightning. Thunder storms are common throughout the summer months in and near the LSRs. Lightning, erratic winds and usually precipitation accompany these storms, the latter which limits the actual number of ignitions.

It is important to realize that risk is not the probability of a fire occurring, but the probability of when a fire will occur. Fire will occur in the LSRs.

A mathematical formula is used to derive the risk value. Included in the formula are the number of starts, number of years of historical information, and number of acres involved. The values in the formula are:

x =Number of starts recorded for the area from the fire start data base.
y = Period of time covered by the data base
z = Number of acres analyzed (displayed in thousands).

The formula is as follows and was used for each LSR.

{(x/y)10}/z = Risk rating

The value derived corresponds to a likelihood of fire starts per 1,000 acres per decade. The following are the risk ratings and range of values used to determine the risk.

Low Risk = 0-0.49 - This projects one fire every 20 or more years per thousand acres.
Moderate Risk = 0.5-0.99 - This projects one fire every 11-20 years per thousand acres.
High Risk = > 1.0 - This level projects one fire every in 0-10 years per thousand acres.

Fire Hazard

To determine Fire Hazard Classes, each fuel model is run through the BEHAVE program. This program uses fuel model, slope, and weather parameters to predict fire behavior and resistance to control for fire suppression purposes. The 90th percentile weather from the most representative weather station was used to model late summer afternoons, typical of late July through early September.

Three slope classes are used, consistent with the slope classes used in the LMP geologic hazard classification (0-34%, 35-65%, and >65%). All fuel models were run through each of the three slope classes, to determine increases in fire behavior with increased steepness of terrain.

The output of this is a rating of Low, Moderate, or High fire behavior based on flame lengths, which are good indicators of fire line intensity and resistance to control, and/or rate of spread (ROS).

Fire hazard modeling is done in order to estimate the severity and resistance to control that can be expected, when a fire occurs during what is considered the worst case weather conditions. Late summer weather conditions are referred to as the 90th percentile weather data, which is a standard used when calculating fire behavior. The modeling incorporates fuel condition, slope class, and 90th percentile weather conditions in calculating projections on flame lengths and rates of spread. A low rating indicates that fires can be attacked and controlled directly by ground crews building fireline and will be limited to burning in understory vegetation. A moderate rating indicates that hand built firelines alone would not be sufficient in controlling fires and that heavy equipment and retardant drops would be more effective. Areas rated as high represent the most hazardous conditions in which serious control problems would occur i.e., torching, crowning, and spotting, control lines are established well in advance of flaming fronts and backfiring may be necessary to widen control lines.

Fire Caused Mortality Projections

First Order Fire Effects Model (FOFEM) (Keane and others 1994) was developed by the Intermountain Research Station. This program predicts the direct consequences of wildfire on vegetation in quantified measures of tree mortality. The driving variable for tree mortality computations is flame length.

To obtain a flame length for the FOFEM program, fuel model crosswalks were developed using current vegetation data and run through the BEHAVE model. This model is an interactive fire behavior program that has flame length as one of its many outputs. The flame length is the principle measurement of the three Hazard levels Low (0-4 foot flame lengths), Moderate (4-8 foot) and High (8+ foot). The flame length is a product of topography by slope class, vegetation by fuel model and weather at the 90th percentile. The FOFEM model does not predict the flame length but merely uses it as an input, the predicted flame length from BEHAVE was entered into the program.

The FOFEM outputs can be derived for either a single tree projection or a stand of trees. The stand option was used for this analysis. To accomplish this, a general stand description consisting of tree per acre by species by size class were developed for each cover type used as an input. These assumptions were constructed using similar stand structures that had been inventoried and cataloged in watershed analyzes on the Forest.

A Fire Caused Mortality Projection layer was developed for GIS. This layer displays the mortality that would occur within vegetative stands following a wildfire. Mortality is expressed

by the percent of kill. FOFEM does not predict any additional mortality resulting from stress, post fire insect infestation, or any other mortality that may be indirectly caused by fire.

	Mortality Classes:
Low	<25% mortality to the stand
Medium	25 to 70% mortality to the stand
High	>70% mortality to the stand

Appendix C
Fire Management Plan

The goal described in the Shasta-Trinity National Forest Land and Resource Management Plan (1994) is to protect and enhance conditions of late-successional and "old growth" forest ecosystems. Use of prescribed fire, either by itself or in conjunction with other fuels reduction methods, is considered an appropriate method in all management areas.

The Shasta-Trinity National Forest (SHF) has fire protection responsibilities for approximately 2.4 million acres of National Forest System (NFS) lands and 364,000 acres of private or State Responsibility Area (SRA). Late Successional Reserves (LSRs) consisting of approximately 624,000 acres, are designed to provide for the viability needs of all late-successional species in an ecosystem approach. When determining the Lethal Fire Effects in the LSRs, the analysis concluded that approximately 53% of the LSRs would have high lethal fire effects. With proper use of prescribed fire and other fuels reduction methods, areas of high lethal fire effects can be reduced, resulting in greater assurance of long-term maintenance of the desired conditions, increased safety to firefighters, and increased effectiveness of fire suppression efforts.

The Fire Management Plan Objectives

The objective of this plan is to provide guidelines to managers for fire suppression and fuels treatment activities in the LSRs. The goal is to protect and promote late successional habitat, while allowing important processes to continue (i.e., fire). The achievement of this goal will require management activities within and adjacent to the LSRs that will change and/or maintain current fuel characteristics to a desired or sustainable level over time.

The following four main objectives that will guide management activities within LSRs:

I. **Protect existing late successional habitat from threats (of habitat loss) that occur inside and outside LSRs.**
II. **Promote the continued development of late successional characteristics.**
III. **Protect mid and early-seral vegetation from loss to large-scale disturbance events**
IV. **Promote connectivity of late successional habitat within LSRs.**

Desired Condition

It is desired in LSRs to have well-dispersed and continuous areas of multi-layered forests with high quality habitat characteristics and attributes. The amount of acres burned in high intensity wildfires will have decreased significantly due to the large, aggressive fuel management program reducing fuel loading throughout the Forest. There will be more acres of lower intensity fires similar to conditions prior to 1900. These lower intensity fires will begin to create a more open forested condition in many areas. Managed Wildland Fire and management-lighted prescribed fire are desirable tools to be used for managing the Forest resources. Consider the long-term role of fire during all project planning phases.

Fuels Management

A primary objective of the Fuel Management Program is to allow fire to play its regulating role in the ecosystem. Prescribed fire will help in meeting this objective for the LSRs. Low intensity prescribed fires (underburning) should be planned and implemented over large areas to increase the effectiveness of the fuels treated. The development of the Forest-wide Fuels Management Strategy will assist Unit Managers in determining long term goals in fuel reduction projects.

Proposed new federal policies (U.S. Department of the Interior and U.S. Department of Agriculture 1995) would permit wildfires to be managed if they can meet resource objectives. Managed Wildland Fire (MWF) is a natural ignited fire (lightning) which is allowed to burn under specific prescriptive parameters to meet pre-determined resource objectives. MWF should be planned and implemented where fuel concentrations are at levels that will allow this activity to meet resource and management objectives.

Fire managers need to consider several factors and conditions during initial fire size-up in identifying a potential Managed Wildland Fire. Ignition starts should be in areas such as the upper third of the slope where the fire behavior will be at a low to moderate intensity level. These locations allow fires to make short uphill runs of moderate intensity while primarily being managed as downslope backing fires of low intensities and smaller flame lengths. Managed Wildland Fire is appropriate in high elevation areas where high severity fires are less of a concern. Constraints for the use of Managed Wildland Fire include risk of escapes, lack of adequate funding, air quality restrictions, and competition for contingency personnel during active wildfire seasons.

Fuels reduction plans should coordinate with fire pre-suppression planning in developing strategies for pre-existing containment lines or fuel buffer areas that can be utilized as indirect firelines to execute burnouts in the event of a large fire. Fuelbreak construction or fuel buffer zone plans for these need to be site specific. This may include removal of trees to reduce stand density; in turn reducing the crown fire potential.

Private lands should be considered when planning for fuel reduction projects. Much of the private lands within the LSRs are owned by timber companies where fuel reduction standards may not be compatible with LSR management objectives on NFS lands. Opportunities may exist to work with these companies to mitigate hazards on private lands that may effect NFS lands.

Wildfire Prevention

High public use areas within and adjacent to the LSRs should be a primary focus for Fire Prevention activities. High use recreation areas, including both developed campgrounds and dispersed sites, should be identified in Fire Prevention Planning to assess the human-caused risk of wildfire occurrence that may threaten the LSRs. Local communities inside the Forest boundary that are within or adjacent to LSRs should also be considered as location for potential human-caused fires that could threaten the LSRs.

Fire Suppression

Firefighter and public safety is and will continue to be the number one priority during fire suppression and actions will be tied directly to the Fire Orders and the Watch Out Situations. Fire suppression responses within the LSRs should be timely and appropriate for the situation and the resource. Plans for wildfire suppression will emphasize maintaining late-successional habitat. Minimum Impact Suppression Methods (MISM) will be considered in determining the appropriate response assuring that habitat damage is minimized. Resource Advisors and Resource Specialists will be utilized for establishing the appropriate response. Maps of Riparian Reserves, sensitive granitic lands, and location of spotted owl activity centers are available to Resource Advisors and Resource Specialists. MISM will be used near these locations.

The appropriate line officer shall review the Wildland Fire Situation Analysis for wildland fires that have exceeded the capabilities of the initial attack resources and are expected to burn into the next burning period. A "Maximum Manageable Area" should be determined during the initial phases of the preparation of the Wildland Fire Situation Analysis (WFSA).

Each of the T&E species requires different habitat. Report wildfires within LSRs or threatening LSRs to the appropriate District and/or Forest biologist. The biologist shall determine the need to contact the USFWS. Motorized and heavy equipment may be permitted by the Incident Commander to assure habitat protection.

Firelines

When constructing firelines, use minimum width and depth to check the fire spread. Minimize the use of dozers and consult with resource advisors when planning their use. Inside the fireline, cut and limb only those fuels which would spread fire across the fireline if ignited. Use cold-trail, wet line, or a combination of these when appropriate.

Use existing roads and trails to burn-out or backfire against to stop the fire spread. Use burning-out as a fire suppression tool. Use natural barriers such as ridges, meadows, rocky draws and outcrops. Allow fires to burn to natural barriers whenever possible. Backfires will be designed to minimize fire effects on LSR habitat.

Live trees will not be cut unless they pose a safety hazard or they will cause fire spread across the fireline. Consider allowing ignited trees or snags to burn out. Identify hazard trees with flagging and/or a lookout. If they are causing safety and/or control problems, felling is appropriate. On the burn-out side of the line, fall only those snags that would spread fire across the fireline if they should burn and fall over, or those that pose a high risk of spotting. Surviving trees that have defects caused by fire can provide valuable wildlife habitat. Consequently, trees that can be retained without jeopardizing crew safety, should be retained.

MOP-UP: Guidelines for mop-up of ground fuels include a minimum amount of spading of hot areas. When possible, utilize fold-a-tanks instead of pumping from creeks. If pumps are utilized, use absorbent pads underneath the pumps and tanks to absorb any spills. Heat detectors and backs of bare hands will aid in locating hot spots and will reduce the risk of the fire re-igniting and spreading. Rehabilitate firelines as appropriate and minimize bucking of logs. One hundred

percent mop-up may not be necessary. Managed Wildland Fire will require mop-up only when prescription parameters are being exceeded or expected to exceed.

LOGISTICS: Logistics in LSRs include incident bases, helispots, and helibases. An assessment should be made as to the impacts to these sites prior to using for base camps or Helibase operations.

Use of spike camps may be appropriate in some areas of the LSRs. Site locations should be on naturally draining areas, such as sites with rocky or sandy soils or in natural or created openings. Avoid locating camps in meadows. When laying out the camp, define cooking, sleeping, latrine, and water supply locations to minimize the number of trails in camp, thus reducing compaction to the site. Ensure that crews do not clear vegetation or dig trenches in sleeping areas. Use portable toilet facilities. Constantly evaluate the impacts, both short and long term of the camp. Be sure to include rehabilitation of campsites in the rehabilitation plan.

Logistical support for Managed Wildland Fire will be minimal. Generally spike camps and helispots will be used as needed and applying the same standards for rehabilitation.

AIR SUPPORT: Air support for the LSRs needs to be used appropriately. Use of helicopters will be appropriate much of the time and air tankers may be appropriate on large fires or on small fires with the potential to become large. Minimum disturbance of the LSRs by air operations should be considered by managers. Consultation with resource advisors, on the use of aircraft, should be done as part of the dispatch planning. Consultation should also occur during extended attack fires.

When possible utilize rappellers and longline sling operations, rather than constructing helispots. Do not construct helispots within Riparian Reserves. First priority of helispot locations should be areas that have been utilized in the past and/or are natural openings and existing areas that will not require maintenance to keep them open, such as landings from logging operations.

Use of retardant needs to be weighed against the probability of the initial attack crews being able to control or contain the fire. If a determination is made that use of retardant will prevent a larger and more damaging fire, then retardant should be used.

Reconnaissance flights for fire starts will enable fire managers to receive initial size up of the fire in determining the proper management strategy. Reconnaissance flights are the primary usage when monitoring Managed Wildland Fires. Air tankers will be used only if Managed Wildland Fire exceeds prescription and control efforts are hindered.

REHABILITATION GUIDELINES: Rehabilitation is critical to reduce the impacts associated with fire suppression and the logistics that support it. Constructing control lines, transporting personnel and materials, utilizing areas for feeding, sleeping, washing, latrines, and other suppression activities will significantly impact sensitive resources, regardless of the mitigating measures taken. During rehabilitation efforts, a resource advisor with expertise on the LSRs will be available.

Cover all lines with coarse woody material. This will also help to reduce erosion and sedimentation. Trails used as firelines in their natural condition will normally not require rehabilitation. Those that were cup trenched, widened, or otherwise modified should be restored and the tread should be returned to the original width.

Dispose of all trash appropriately and scatter slash, rake, etc. camp sites and sleeping areas so that the site will blend with natural surroundings. Cover, fill in latrine sites. Disguise landing pads so they appear as natural openings and could be used, if needed in the future. Discourage the use of firelines as trails, by covering with brush, limbs, small diameter poles, and rotten logs in a naturally-appearing arrangement. Replace dug-out soil and/or duff and obliterate any berms created during suppression efforts. If control lines have been constructed on slopes greater than 5%, build waterbars. The following is a guide to be used for constructing these waterbars:

Table 1. Waterbar Spacing

Fireline Percent Grade	Maximum Spacing in Ft.
6-15	150
16-25	100
26-65	50
65+	25

Waterbar locations and spacing should also consider soil types, broken terrain, length of line run, availability of coarse woody material, etc. Utilize the resource advisor for waterbar requirements in areas where use of this guide may not apply.

POST-FIRE EVALUATIONS: A post-fire evaluation is important for identifying areas that need improvement, formulating different strategies to add to the LSR fire plan, and assisting in producing quality work in the future. As part of this evaluation, resource advisors and Fire Managers will evaluate this plan to ensure that the intent of the Standards and Guidelines in the LMP have been met. The post-fire evaluation will consist of data collection, documentation, and making recommendations. The evaluation will occur prior to the departure of any fire overhead team, so that a copy can be placed in the final fire package. A copy of the evaluation will also be given directly to the line officer.

Smoke Management/Air Quality

Management activities also shall comply with the air quality standards established by the California Air Resources Board and the local Air Pollution Control Districts.

When applying prescribed fire, the primary smoke sensitive areas are the local communities within the Forest boundaries. Also, the Yolla-Bolla Middle Eel Wilderness is a Class I airshed that could also be affected by smoke and require particular consideration.

Public understanding of the prescribed fire program and smoke management will be important during implementation. Some measures that should be employed include:

1. Interact and exchange information with the public about the objectives of the prescribed fire and smoke management programs. Emphasize what role prescribed fire plays in the ecology of the area. Discuss what has occurred historically.
2. Inform the local public about planned fires before their ignition.

Minimize impacts to communities and Class 1 wilderness areas from prescribed burns. Implement prescribed burns when prevailing winds and smoke mixing heights permit smoke to be dispersed away from mountain communities. Impacts to communities from a single burn may be present for a day or two.

Fire Plan for Individual Late Successional Reserves:

The following highlights information about the individual LSRs informing Fire Management personnel and resource officers on issues or conditions that may need to be addressed during fire suppression activities or fuel reduction planning.

RC328 - Yolla Bolla

Late-successional/dense Douglas-fir is the dominant vegetation with more than 50% of this LSR in fuel model 10. The LSR has many acres of low hazard rating with several pockets of high hazard. Fire risk is low, with no human caused fires recorded. Several fires over 100 acres have occurred just outside the boundary of the LSR. Mortality rating is 68% high and 31% medium.

RC330 - South Fork

Late-successional Douglas-fir and mixed conifer are the dominant vegetation and fuel models 9 and 10 account for about 80% of the LSR. The hazard risk rating is Moderate/High. Pockets of High/High occur on intermingling private lands due to high down fuel loadings. Numerous large fires have occurred with the past 20 years, including about 40,000 acres during 1987. This LSR has a high occurrence of lightning fires (79%). Mortality rating is 44% high, 50% medium.

RC331 - Chanchellula

Mid-successional Douglas-fir is the dominant vegetation with fuel model 9 covering about 40% of the LSR and fuel models 10 and 6 covering the remaining. The hazard risk rating is moderate/moderate. Large pockets of high hazard occur on the south facing slopes. Fire occurrence is 54% lightning and 46% human-caused. Mortality rating is 33% high, 52% medium.

RC332 - Corral

Mid-successional Douglas-fir is the dominant vegetation. Most of the LSR is in either fuel model 9 or 10. Hazard risk rating is moderate/high but some high/high pockets occur on the steeper southwest facing slopes. Approximately 60% of the fires are lightning caused. The Mortality rating is 56% high and 33% medium.

RC333 - Canyon Creek

The dominant vegetation is mid-successional Douglas-fir. Most of the LSR is fuel model 9 with fuel model 4 covering the scattered brushfields. The hazard risk rating is moderate/high on the west side of the LSR and high/high on the east side. This LSR has the highest ratio of human caused fires of any LSR on the Forest (63%). This LSR was affected by the 1987 fires. Mortality rating is 69% high and 26% medium.

RC335 - Iron Canyon

Most of the LSR is dominated by mixed conifer and Douglas-fir. The higher elevations have white fir and ponderosa pine mixtures. Fuel models 9 and 10 dominate the LSR. The hazard risk rating is moderate/high. Large pockets of high/high occur on the west and southwest facing slopes. The LSR has a high lightning occurrence at 77%. The mortality rating is 77% high; 9% medium.

RC337 - Buckeye.

Douglas-fir, mixed conifer ponderosa pine and white fir are the dominant species of the LSR. About 33% is in fuel model 10; 26% in fuel model 6 and 24% in fuel model 10 making predictions difficult for this LSR. Lightning fires account for 59% of the fire starts. Hazard risk rating is moderate/moderate. Mortality rating is 31% high and 33% medium.

RC338 - Eagle

The vegetation is a mixture of mixed conifer, Douglas-fir and ponderosa pine. Most of the LSR is typical of fuel model 6. Hazard risk rating is moderate-high/moderate. There are enough pockets of high hazard to warrant a rating above moderate. The lightning and human caused fires are about 50%. Large fires of moderate to high intensity have occurred to the east of the LSR. Mortality rating is 42% high and 30% medium.

RC339 - Graves

Vegetation is generally ponderosa pine. Most of the area is fuel model 9. Hazard risk is moderate-high/high. There are many pockets of high hazard within the LSR. Lightning fires are 83% of the fire occurrence. Large amount of acres in private lands within and adjacent to the LSR. Mortality rating is 44% high and 24% medium.

RC340 - Scott Mountain

Sparsely stocked stands of white fir, red fir and ponderosa pine are characteristic of this LSR. Fuel model 6 with interspersed fuel model 9 can be found. Hazard risk rating is moderate/moderate. Lightning caused fires are 78% of the occurrence. Mortality rating is 53% high and 7% medium.

RC341 - Eddy

Vegetation types are split between white fir, red fir, mixed conifer and ponderosa/Jeffrey pine. Fuel models 6 and 9 can be used. Hazard risk rating is moderate/low. Only 5 fire starts have been recorded within the LSR however a large fire affected the east portion of the LSR. Eddy has the highest percentage of high mortality at 96%; 3% medium.

RC342 - Deer

The LSR is dominated by fuel models 6 and 9. Hazard risk rating is moderate/high. Lightning caused fires are 66%. This LSR was affected on the northern half by the same large fire that affected LSR RC341. Mortality rating in this LSR is also very high with 83% high; 16% is rated medium.

RC357 - Algoma and DD79 - Bartle

These areas are dominated by white fir and mixed conifer. Fuel model 9 is the most prevalent. Hazard risk rating is moderate/moderate with the northern portion being more high/moderate. Human caused fires dominate the area at 56% of the fire occurrence. The LSR is surrounded by private lands which is a concern with the human caused fire occurrence. The mortality rating is 31% high and 56% medium.

RC358 - Porcupine

This LSR has younger stands of ponderosa pine that are more open. Fuel model 6 is prevalent. Hazard risk is moderate/high with many pockets of high/high. Lightning fire occurrence is predominate at 77%. Mortality rating is 12% high and 77% medium.

RC359 - Harris Mountain

The LSR is a mixture of mixed conifer, lodgepole pine and white fir. Most of the LSR is fuel model 9. The hazard risk is moderate/high. Lightning caused fires predominate. The mortality rating is 25% high and 75% medium.

RC360 - Elk Flat

The dominant vegetation is ponderosa pine and white fire. The fire occurrence is very low with lightning caused fires accounting for 92% of the recorded occurrence. The hazard risk is moderate/moderate. The mortality rating is only 2% high and 85% medium.

RC361 - Mt. Shasta

This LSR has younger and denser stands so fuel model 9 is predominate. Lightning fire occurrence is high at 83%. The hazard risk rating is moderate/high though large pockets of high hazard exist. The mortality rating is 27% high and 29% medium.

RC362 - Wagon

Red and white fir dominate the area with some amounts of ponderosa pine. Fuel model 9 is prevalent. Human caused fire occurrence is at 57%. Hazard risk is moderate/high with high/high on the southwest facing slopes. Mortality rating is 74% high and 24% medium.

DD67 - Castle Lake

Mixed conifer and white fir are dominate vegetation. Fuel model 9 is prevalent. The hazard risk is moderate/low. There have only been 6 recorded fires within this small MLSA. However, due to fuel loading mortality rating is 89% high and 10% medium.

DD72 - Fons

There is a good distribution of ponderosa pine, mixed conifer and white fir. Fuel model 10 is prevalent. Lightning fires are the main risk. Hazard risk is moderate/high. Mortality rating is 58% high and 36% medium.

DD76 - McCloud

Fuel model 9 dominates this MLSA. Very few fires have been recorded within the area and of those 81% are lightning caused. The hazard risk rating is high/high and the mortality rating is 0% high and 96% medium.

DD78 - Sheephaven

White fir with small amounts of ponderosa pine and mixed conifer dominate the vegetation. Fuel mode 9 and 6 are prevalent. Hazard risk is moderate/moderate. There have only been 9 fires recorded within the MLSA, however there have been several large fires within the vicinity. Mortality rating is 22% high and 78% medium.

DD83 - Madrone

Both live oak and black oak are the predominate vegetation. Fuel model 9 can be used. Hazard risk is moderate/moderate. Fire occurrence within this small MLSA is low however several large fires have threatened it from the west. Mortality rating is 87% high and 9% medium.

Appendix D
Monitoring Plan

The following are monitoring items that are applicable to the Forest-wide LSR Assessment.

Implementation Monitoring

Implementation monitoring determines if the standards and guidelines were followed. It asks: Does the project and/or activity follow the direction in its Land and Resource Management Plan. Implementation monitoring answers this question by determining if the standards and guidelines were correctly applied and followed.

Implementation Monitoring for the Forest-wide LSR Assessment will include:

1. Monitor to assess whether proposed management activities are consistent with the standards and guidelines found in the Shasta-Trinity National Forests Land and Resource Management Plan.
2. Monitor to assess whether proposed management activities are consistent with the Forest-wide LSR Assessment.

Effectiveness Monitoring

Effectiveness monitoring evaluates projects and/or activities ability to meet their intended purpose and need and desired results.

Effectiveness monitoring for the Forest-wide LSR Assessment will include:

1. **Monitor a sample of projects and activities to assess effectiveness in meeting desired results and meeting the purpose and need for which they were established. Some specific projects include:**

A. Hazard Reduction Projects (includes prescribed burning, manual fuels treatment, and mechanical fuels treatment):

- Were fuels adequately reduced following hazard reduction activities?
- Complete a post burn evaluation to determine effectiveness of prescribed burn program in reducing wildfire effects and meeting the overall resource objectives.
- Did the project meet the desired results of generally reducing fuel conditions of flame length and rate of spread while still providing for variable fuel patterns across the landscape?
- Did the project keep within desired soil cover guidelines from the Forest Resource and Land Management Plan?
- Did burns limit large tree mortality to within project objectives?
- Over large areas, are snag and down woody requirements still being met following treatments?

- In areas meeting standards and guides for salvage, were dead trees harvested in a timely manner in order to capture utilizable wood products?

B. Reforestation:

- Do survival exams show that adequate stocking levels have been achieved to attain late-successional characteristics?
- Were appropriate species planted for the site and elevation?

C. Thinning:

- Did thinning activities provide for species diversity, including hardwoods?
- Were desired conditions achieved for fuel levels following the thinning operations?
- Are spacing requirements adequate and variable with the intent of achieving desired stand structures?
- Long term monitoring should include evaluating growth patterns, stand crown closure, and species diversity every 5-10 years to see if desired stand structure patterns are or will eventually be achieved.

Validation Monitoring

Validation Monitoring will occur to determine if a cause and effect relationship exists between management activities and the general objectives of the LSR. Need to assess if underlying management assumptions are correct. Also need to determine if maintained or restored habitat conditions support stable and well-distributed populations of late-successional associated species.

Due to the nature of questions that need to be answered, options to complete validation monitoring in other LSRs or areas with like habitat should be explored. If management activities similar to those proposed for this LSR have also been done elsewhere, opportunities to validate assumptions should occur there as well.

Some questions to explore are:

- Does demography data for habitats similar to those found with the Forest-wide LSR Assessment show links between dispersal success of owls and the level of habitat connectivity?
- Does demography data show favorable (or stable) Spotted Owl population growth in areas with habitat that has been improved to a condition similar to the desired condition expressed for the Forest-wide LSR Assessment?

Within the Forest-wide LSR Assessment validation monitoring will include assessing one or more of the functioning objectives established for the LSR and how well they are being met by all the management activities that have occurred.

This monitoring may to be coordinated with other LSRs that are also being assessed for various functioning elements.

Every ten years, monitoring and assessment of functioning objectives can:

- Determine the percent of capable ground currently in late and old growth habitat characteristics.
- Assess the risk to the LSR from a large scale disturbance.
- Assess connectivity between late successional and old growth stands within the LSR.
- Assess habitat characteristics and associated acreages within home ranges of known activity centers.
- Assess the effectiveness of the fuel management efforts and adjust priorities of these efforts based on this and future assessments.
- Assess the actual number of acres treated in LSRs as compared to those identified in the implementation schedule.
- Complete an analysis of existing vegetative conditions within LSRs.

Appendix E
Successional Stage Stratification

The Forest timber type data layer was used to categorize vegetation into successional classes. The following describes the sorting rules applied in this process.

Late-successional/Dense - Polygons having a commercial conifer as the primary component and of the following size and density classes: 4N, 4G, 5N, 5G. Stands labeled as 4P and 5P were added to this category if they included a commercial conifer as a primary component and a commercial conifer or black oak as a secondary component

Late-successional/Open - Polygons having a commercial conifer as the primary component and of the following size and density classes: 4S, 4P (except as noted above), 5S, 5P (except as noted above).

Mid-successional/Dense - Polygons having a commercial conifer as the primary component and of the following size and density classes: 3N, 3G, 6 stands, and 3P stands where a commercial conifer occurs as the primary component and a commercial conifer or black oak occurs as the secondary component.

Mid-successional/Open - Polygons having a commercial conifer as the primary component and of the following size and density classes: 3S and 3P (except as noted above).

Early-successional/poles and saplings - Polygons having a commercial conifer as the primary component and of the following size and density classes: 2N and 2G and plantations older than 20 years. 2S and 2P stands that had a conifer as the primary and secondary component.

Early-successional/seedlings - Polygons having a commercial conifer as the primary component and of the following size and density classes: 1N and 1G and plantations younger than 20 years. 1S and 1P stands that had a conifer as the primary and secondary component.

Other - This category includes hardwood stands (including hardwood stands which have a conifer secondary component), early successional S and P stands that had conifer as the primary component and hardwoods, shrubs, grasses, etc. as the secondary component, shrubs, grasses, barren ground, and non-commercial conifer stands (ie. knobcone pine, for instance.)

Size Class Definitions

1 = 1 to 5.9 inches dbh
2 = 6 to 12.9 inches dbh
3 = 13 to 24.9 inches dbh
4 = 25 to 40.0 inches dbh
5 = > 40 inches dbh

Density Class Definitions

S = 10 to 19% canopy closure
P = 20 to 39% canopy closure
N = 40 to 69% canopy closure
G = > or equal to 70% canopy closure
6 = two-storied stands

Appendix F
Ecological Subsections

Subsection Descriptions

Northern California Coast Range M261Ba plus Klamath Mountains M261As

Lithology and Stratigraphy. These subsections are dominated by clastic Jurassic marine sedimentary rocks of the Galice formation and Cretaceous Franciscan metaclastic rocks of the Eastern Belt. The marine sedimentary rocks have been slightly metamorphosed to form metagraywacke and phyllite. All rocks are intensely folded and faulted. Ultamafic rocks are minor components in these subsections. In addition, there are small areas of serpentinized peridotite and Mesozoic granitic rocks.

Geomorphology. These are subsections of mountains with rounded ridges, steep sides, and narrow canyons. Most of the mountains are elongated in north-northwest to northwest directions and have subequal summits with increasing elevation toward the interior. The elevation range is from about 1200 feet up to 8092 feet on Mt. Linn in the South Yolla Bolly Mountains. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Dystric Xerochrepts, Dystric Lithic Xerochrepts, Ultic Haploxeralfs, Typic Haploxerults, and Lithic Xerorthents. Shallow Dystric Xerochrepts on granitic rocks generally have paralithic contacts rather than lithic contacts. At higher elevations, Typic and Lithic Xerumbrepts are most common. The soils are leached free of carbonates. Few surfaces are old enough because of active erosion, to Alfisols or Ultisols. Some soil are well drained. Soil temperature regimes are predominantly mesic, some frigid, and minor cryic. Soil moisture regimes are almost exclusively xeric.

Potential Natural Vegetation. The predominant natural plant community of the subsections are Douglas-fir and Douglas-fir/tanoak series. Red fir series and White fir series are common in areas of frigid soil temperature regimes. Canyon live oak is common on very steep rocky slopes with stony soils. Oregon white oak series occurs on clayey soils and south-facing slopes at the lower elevations.

Characteristic series by lifeform include:

Grasslands: California annual grassland series, Introduced perennial grassland series, Montane meadow habitat, Rocky Mountains sedge series.

Shrublands: Brewer oak series, Bush chinquapin series, Chamise series, Chamise-wedgeleaf ceanothus series, Greenleaf manzanita series, Holodiscus series, Leather oak series, Huckleberry oak series, Interior oak shrub series, Low sagebrush series, Montane wetland shrub habitat, Mountain alder series, Mountain whitehorn series, Rubber rabbitbrush series, Sitka alder series, Tobacco brush series, Whiteleaf manzanita series.

Forests and woodlands: birchleaf mountain-mahogany series, California buckeye series, Black oak series, Canyon live oak series, Douglas-fir series, Douglas-fir/ponderosa pine series, Douglas-fir/tanoak series, ponderosa pine series, Foothill pine series, Foxtail pine series, Incense-cedar series, Knobcone pine series, Jeffrey pine series, Mixed conifer series, Red fie series, White fir series.

Climate. The mean annual precipitation is about 40 to 120 inches. Most of the precipitation is rain at lower and snow at higher elevations. Mean annual temperature is about 35 to 55 F. The mean freeze-free period is in the range from 100 days at higher elevation to 200 days at low elevations.

Surface Water. Runoff is rapid and all but the larger streams are dry through much of the summer. Run-off is primarily to the South Fork Trinity River. There are a few small lakes and wet meadows in glacial basin at higher elevations.

Disturbance Regimes:

Fire: Historic occurrence has changed from frequent, low, moderate and high intensity surface fires to infrequent, high intensity ground or stand replacing fires.

Seismic Activity: Seismically active area with strong shaking and ground rupture.

Climate: Wide fluctuations in precipitation and temperature for periods of years result in significant or catastrophic changes in the biological communities.

M261Au of the Klamath Mountain Section

This is an arcuate subsection aligned form north-northwest to east-southeast along the southwest edge of the Klamath Mountains. It is the Western Paleozoic and Triassic Belt, bound on the southwest by the South Fork Mountain and Bear Wallows faults and on the northeast by the Salt Creek fault.

Lithology and Stratigraphy. This subsection is dominated by Paleozoic to Jurassic metavolcanic and metesedimentary rocks and serpentinized peridotite of Rattlesnake Creek terrane. These rocks are intensely folded and faulted. There are small areas of Mesozoic granitic rocks in the subsection. There is a small area of Oligocene nonmarine sedimentary rocks of the Weaverville Formation in Hyampom Valley and Quaternary alluvium occurs there and elsewhere along the South Fork Trinity River.

Geomorphology. This is a subsection of mountains with rounded ridges, steep sides, and narrow canyons. Narrow floodplains occur along the South Fork Trinity and Trinity Rivers and are broader in Hyampom Valley. The elevation range is from about 400 feet up to 5881 feet on Dubakella Mountain. Mass wasting and fluvial erosion are the main geomorphic processes.

Soils. The soils are mostly Dystric, Dystric Lithic, Lithic, and Typic Xerochrepts and Ultic and Mollic Haploxeralfs. Soils on Lithic and Typic Xerochrepts and Mollic Haploxeralfs are on

serpentinized peridotite. Shallow Dystric Xerochrepts on granitic rocks generally have paralithic contacts, rather than lithic contacts. Soils on the Weaverville formation are mostly Argixerolls and those on floodplains are mostly Xerofluvents. The soils are well drained. Soil temperature regimes are mesic. Soil moisture regimes are xeric.

Potential Natural Vegetation. The predominate natural plant communities are Douglas-fir series, Mixed conifer series, Douglas-fir/ponderosa pine series. Jeffrey pine series occurs on serpentinized peridotite. Canyon live oak series is common on very steep rocky slopes with stony soils.

Characteristic series by lifeform include:

Grasslands: California annual grassland series, Montane meadow habitat.

Shrublands: Brewer oak series, Greenleaf manzanita series, Holodiscus series, Tobacco brush series, Wedgeleaf ceanothus series.

Forest and woodlands: Black oak series, Birchleaf mountain-mahogany series, Canyon live oak series, Douglas-fir series, Douglas-fir/ponderosa pine series, foothill pine series, Jeffrey Pine series, Knobcone pine series, Mixed conifer series, Oregon white oak series, Ponderosa pine series, White alder series, White fir series.

Climate. The mean annual precipitation is about 40 to 60 inches. Most of the precipitation is rain. Mean annual temperature is about 45 to 57 degrees. The mean freeze-free period is about 100 days at higher elevations to 225 days at lower elevations.

Surface Water. Runoff is rapid. It drains to the South Fork Trinity River, except at the southeast end of the subsection where runoff drains to tributaries of the Sacramento River. All but the larger streams are dry through most of summer. There are no natural lakes in the subsection.

M261Ar and M261Ac of the Klamath Mountain Section

These subsections are in the Western Paleozoic, Triassic, and Central Metamorphic Belts. They stretch from the Trinity Alps south-southeastward to southeastward between the Siskiyou and the Salt Creek faults to the Great Valley. The climate is temperate and humid.

Lithology and Stratigraphy. These subsections are dominated by Mesooic granitic rocks, Paleozoic metavolcanic rocks of the Salmon Hornblende Schist to Jurassic gabbro and metasedimentary rocks of the Abrams Mica Schistor Grouse Ridge Formation, including serpentinized peridotite, of the Sawyers Bar and Western Hayfork Terrance. It is between Siskiyou fault on the east and the Bully Choop on the west and southwest. The age of the metamorphism is Devonian, which is when the Bully Choop fault was active. Oregon Mountain is an outliner, or klippe, of the metamorphosed marine sedimentary rocks from the Eastern Klamath Belt. The granitic rocks are generally quartz diorite to soightly more silicic rocks. There are nonmarine sedimentary rocks of the Weaverville Formation in a graben occupied by Hayfork

Valley. Quaternary alluvium occurs in Hayfork Valley and along the Trinity River and its tributaries.

Geomorphology. These are subsections of mountains with rounded summits, steep sides, and narrow canyons. The mountains are generally aligned toward the north, although the Hayfork graben and Hayfork Divide are aligned toward the northeast. Slopes in the Hayfork graben are nearly level on flood plains to moderately steep on the Weaverville Formation. There are floodplains and terraces in Hayfork Valley and along the Trinity River and its tributaries. The elevation range is from about 1500 feet up to 6974 feet on Bully Choop. Mass wasting and fluvial erosion are the main geomorphic process.

Soils. The soils are mostly Dystric and Dystric Lithic Xerochrepts and Ultic Haploxeralfs, plus shallow Dystric Lithic Xerochrepts on granitic rocks and Mollic Haplozeralfs on serpentinized peridotite. Palezeralfs and Mollic Haploxeralfs predominate on the Weaverville Formation. Soils at higher elevations are mostly Typic and Lithic Xerumbrepts. Lithic Xerochrepts, Lithic Argixerolls, and Mollic Haploxeralfs occur at lower elevations, adjacent to the Central Valley. Soils on alluvium in Hayfork Valley are mostly Argixerolls and Auic Xerofluvents. The soils are well drained, except somewhat poorly drained soils in Hayfork Valley. Soil temperature regimes are mostly mesic, with some frigid or cryic at higher elevations and thermic at lower elevations. Soil moisture regimes are xeric.

Potential Natural Vegetation. The predominant natural plant communities are Douglas-fir series, Mixed conifer series, Douglas-fir/ponderosa pine series, and Ponderosa pine series. White fir series is predominant at higher elevations. Jeffrey pine series occurs on serpentinized peridotite. Oregon white oak is predominant in Hayfork Valley. Chamise chaparral series and Mixed chaparral communities occur at lower elevations.

Characteristic series by lifeform include:

Grassland: California annual grassland series, Montane meadow habitat.

Shrublands: Brewer oak series, Bush chinquapin series, Chamise series, Chamise-wedgeleaf ceanothus series , Greenleaf manzanita series, Holodiscus series, huckleberry oak series, Tobacco brush series, Wedgeleaf ceanothus series, Whiteleaf manzanita series.

Forests and woodlands: Black oak series, Birchleaf mountain-mahogany series, Canyon live oak series, Douglas-fir series, Douglas-fir/ponderosa pine series, Foothill pine series, Interior live oak series, Jeffrey pine series, Knobcone pine series, Mixed conifer series, Oregon white oak series, Ponderosa pine series, White alder series, White fir series.

Climate. The mean annual precipitation is about 30 to 70 inches. Most of the precipitation is rain; much of it is snow at higher elevations. Mean annual temperature is about 40 to 55 F. The mean freeze-free period is about 50 days at higher elevations to 200 days at low elevations.

Surface Water. Runoff is rapid. Most of it drains to the Trinity River and its tributaries. Runoff from the southeast end of the subsection drains into Cottonwood Creek, a tributary of the

Sacramento River. The streams are mostly perennial on the west, and many of the smaller ones are ephemeral on the east. There are no lakes in these subsections.

Disturbance Regimes:

Fire: At lower and mid-elevations, historic occurrence has changed from frequent, low intensity ground fires to infrequent, high intensity stand replacing fires. At higher elevations, historic occurrence has changed from infrequent, low and moderate intensity ground fires to infrequent, low, moderate, and high intensity surface or stand replacing fires.

Seismic Activity: Western part is seismically active area with strong shaking and ground rupture.

Climate: Wide Fluctuations is precipitation and temperature for periods of years result in significant or catastrophic changes in biological communities.

M261Ai of the Klamath Mountains Section

Lithology and Stratigraphy. This subsection contains a variety of Devonian through Jurassic metavolcanic and metasedimentary rocks, including metamorphosed andesite, rhyolite, pyroclastic rock, graywacke, shale, minor chert, and limestone. From oldest to youngest, they are designated Copley greenstone, Kennett Formation, Bragdon Formation, Baird Formation, McCloud Limestone, Bollibokka Group, Pit Formation, Modin Formation, Arvison Formation, Bagley Andesite, and Potem Formation. Non marine sedimentary rocks of the Weaverville Formation occur in a north-northeast aligned graben that is parallel to the Trinity River in the Musser Hill area.

Geomorphology. This is a subsection of mountains with rounded summits, steep sides, and narrow canyons. It is hilly with moderately steep slopes, rather than mountainous with steep slopes, in the trough that is occupied by the Weaverville Formation. The elevation range is from about 700 adjacent to the Great Valley up to 6252 feet on Grizzley Peak. Mass wasting and fluvial erosion are the main geomorphic process.

Soils. The soils are mostly Dystric, Dystric Lithic, and Lithic Xerochrpts, Ultic Haploxeralfs, and Typic Haploxerults. Xeric Haplohumults are common on older land surfaces. Soils on the Weaverville Formation are mostly Mollic Haploxeralfs. The soils are well drained. Soil temperature regimes are predominantly mesic, with some frigid at higher elevations and thermic adjacent to the Great Valley. Soil moisture regimes are xeric.

Potential Natural Vegetation. The predominant natural plant community are Mixed conifer series, Douglas-fir/ponderosa pine series, and ponderosa pine series. Blue oak series and mixed chaparral communities occur on south-facing slopes at lower elevations. Canyon live oak series is common on very steep rocky slopes with stony soils. White fir series occurs at higher elevations.

Characteristic series by lifeform include:

Grasslands: California annual grassland series.

Shrublands: Brewer oak series, Chamise series, Chamise-wedgeleaf ceanothus series, Greenleaf manzanita series, Tobacco brush series, Wedgeleaf ceanothus series, Whiteleaf manzanita series.

Forests and woodlands: Birchleaf mountain-mahogany series, Black oak series, Blue oak series, Canyon live oak series, Douglas-fir series, Douglas-fir/ponderosa pine series, Engelman spruce series, Foothill pine series, Jeffrey pine series, McNab cypresses series, Mixed conifer series, Oregon white oak series, Ponderosa pine series, Valley oak series, White alder series.

Climate. The mean annual precipitation is about 40 to 80 inches. Most of the precipitation is rain at lower elevations, but much of it is snow at higher elevations. Mean annual temperature is about 42 to 56 F. The mean freeze-free period is about 75 days at higher elevation to 200 days at lower elevations.

Surface Water. Runoff is rapid. It drains to the Trinity River on the west and to the Sacramento River and its tributaries in the eastern part of the subsection. All but the larger streams are dry throughout much or most of summer. There are no natural lakes, but there are some reservoirs in the subsection.

Disturbance Regimes: See M261Ai above

M261Ak and M261Aj of the Klamath Section

Lithology and Stratigraphy. These subsections are dominated by ultramafic rocks of the Trinity terrane, which is a complex polygenetic assemblage of disrupted Cambrian, Ordivician, Silurian, and Devonian ocean crust that has been intruded by Mesozoic granitic rocks. The terrane is represented by serpentinized peridotite, gabbro diabase, and minor volcanic rock. The granitic rocks are generally quartz diorite to slightly more silicic rocks. Quaternary glacial till and outwash occur in many areas.

Geomorphology. These are subsections of mountains with rounded summits, steep sides, and narrow canyons. Cirques and moraines are common in much of the subsection. The elevation range is from about 1500 feet up to 9025 feet on Mount Eddy. Mass wasting and fluvial erosion are the main geomorphic processes. Glacial processes have been active extensively during the Pleistocene and locally during the Holocene.

Soils. The soils are mostly Typic, Dystric, and Lithic Xerochrepts and Mollic and Ultic Haploxeralfs. Ultic Palexeralfs occur on old land surfaces. Soils on late Pleistocene moraines are mostly Typic Xerochrepts and those on Holocene moraines are mostly Xerothents and Xerochrepts. Soils on granitic rocks are mostly Entic, Typic and Lithic Xerumbrepts. Typic, Lithic, and Pachic Argixerolls are common in drier areas at the northern end of the subsection. Silica-cemented till is common and indurated till and alluvium are exposed in many stream beds. Soils at the higher elevation are mostly rocky Lithic and Typic Cryorthents. The soils are well

drained, except in small glacial basins. Soil temperature regimes are mostly frigid, with some cryic at higher elevation and mesic in the north. Soil moisture regimes are seric.

Potential Natural vegetation. The predominant natural plant communities are White fir series, Montane meadow habitats with Jeffrey pine series on ultramafic rocks, Douglas-fir/ponderosa pine series on gabbro and diabase, and Mixed conifer series on granitic rocks. Red fir, Mixed subalpine forest series and Alpine habitats are predominant at higher elevations, and Foxtail pine series is common. Port Orford-cedar series occurs in a few riparian areas and Canyon live oak series occurs on very steep rocky slopes with stoney soils.

Characteristic series by lifeform include:

Grasslands: Montane meadowland habitat, Subalpine meadow habitat at higher elevations with California annual grassland series and Purple needlegrass series at lower elevations.

Seeps: Darlingtonia series

Shrublands: Big sagebrush series, Greenleaf manzanita series, Whiteleaf manzanita series, Holodiscus series, Huckleberry oak series, low sagebrush series, Wedgeleaf ceanothus series, Montan wetland shrub habitat, Mountain heather-bilberry series, Subalpine upland shrub habitat, Brewer oak series, Subalpine wetland shrub habitat, Tobacco brush series.

Forest and woodlands: Black oak series, Canyon live oak series, Incense-cedar series, Curlleaf mountain-mahogany series, Douglas-fir series, Douglas-fir/ponderosa pine series, Foxtail pine series, Jeffrey pine series, Lodgepole pine series, Mixed conifer series, Mixed subalpine forest series, Mountain alder series, Mountain hemlock series, Ponderosa pine series, Port Orford-cedar series, Red fir series, Sitka alder series, Western white pine series, White fir series, Whitebark pine series, Knobcone pine series, Oregon white oak series.

Climate. The mean annual precipitation is about 30 to 70 inches. Much of the precipitation is snow at the higher elevations. Mean annual temperature is about 30 to 45 F at higher elevation and 45 to 55 F at lower elevations. The mean freeze-free period is from less than 25 days at higher elevations to 175 days at lower elevations.

Surface Water. Runoff is rapid. It drains to the Trinity River on the west, the Sacramento and Shasta Rivers on the east. Larger streams are perennial and most smaller streams are dry by the end of the summer. There are many small lakes, or ponds, in cirque and patermoster basin.

Disturbance Regimes: See M261Ai above.

M261Dj and M261Dg of the Southern Cascades

Lithology and Stratigraphy. Miocen, Pliocene, and Pleistocene basalt and andesite lava flows dominate these subsections. The western to northwestern part of the subsections are dominated by Quaternary alluvium, colluvium, and lucustrine basin-fill has accumulated in some valleys.

Weakly consolidated Pliocene and Quaternary sedimentary deposits, including diatomite, occur along the Pit river in the vicinity of Lake Britton.

Geomorphology. The dominant landform is an undulating basalt flows, which have been faulted to form many horsts and grabens. Alluvium occurs in small depressions, or sinks, in the grabens. Moderately steep to very gently sloping mud flow deposits, glacial outwash, and alluvial fans from Mt. Shasta cover the west and northwest edges of the subsections. The elevation range is about 3000 to 5500 feet. Volcanic, tetonic and fluvial processes predominate, with mass wasting around the base of Mt. Shasta and along the Pit River. To the southeast, very gently to moderately sloping lava flows predominate, with steep risers between these lava flow surfaces and steep canyon cut through the flows. Slopes are very steep in the inner gorge of the Pit River. Some large landslides caused by failure of diatomaceous sediments occur on the north side of the Pit River.

Soils. Soils on the rocky volcanic plateau are mostly Lithic Xerumbrepts, Umbric Vitrixerands, and Humic Haploxerands and Melanoxerands. Haploxerands, Humic Haplohumults, and Haploxerand are common on steep slopes. Soils on alluvium in closed basins on the volcanic Plateau are mostly Vitrandic and Andeptic Xeropsamments, Typic and Umbric Vitrixerands, and Entic Xerumbrepts. Cumulic Humaquepts and Vertic Haplaquolls occur in basin floors to the south and east. Soils on alluvium and colluvium around the base of Mt. Shasta are mostly Andic Xerumbrepts and Typic and Humic Haploxerands. The soils are well drained. Soil temperature regimes are mesic, with some frigid. Soil moisture regimes are xeric.

Potential Natural Vegetation. The predominant natural plant communities are mostly Ponderosa pine series on the volcanic plateau and, from lower to higher elevations on alluvial fans and mudflows from Mt. Shasta, Ponderosa pine series, Mixed conifer series, and White fir series. Lodgepole pine series occurs along drainage-ways on the volcanic plateau. To the south and southeast Oregon white oak, Birchleaf mountain-mahogany series and Wedgeleaf ceanothus series occur on shallow soils at lower elevations. Recent lava flows are barren or sparsely to densely vegetated by vascular plants, including much Greenleaf manzanita series and some Curlleaf mountain-mahogany series, Western juniper series and Big sagebrush series occur in drier areas.

Characteristic series by lifeform include:

Grasslands: Beaked sedge series, Idaho fescue series, Nebraska sedge series, Sedge series, Tufted hairgrass series Rocky Mountain sedge series.

Shrublands: Deerbrush series, Greenleaf manzanita series, Huckleberry oak series, Mountain whitehorn series, Tobacco brush series, Wedgeleaf ceanothus series, Big sagebrush series, Bitterbrush series, Bush chinquapin series, Ribber rabbitbrush series.

Forests and woodlands: Black oak series, Canyon live oak series, Birchleaf mountain-mahogany series, Blue oak series, Interior live oak series, Western juniper series, Douglas-fir series, Engelmann spruce series, Incense-cedar series, lodgepole pine series, Knobcone pine series, Mixed conifer series, Ponderosa pine series, White fir series.

Climate. The mean annual precipitation is about 20 to 60 inches. Much of the precipitation is snow. Mean annual temperature is about 45 to 55 F. The mean freeze-free period is about 75 to 150 days.

Surface Water. Runoff is rapid. Water drains down through joints in basalt to the ground water reservoir, limiting overland flow of water and development of stream channels on the volcanic plateau. Some streams flowing from Mt. Shasta, such as Mud Creek and Ash Creek, are perennial. They generally disappear in alluvial sinks, but flow to the McCloud River in some years. Streams to the south and southeast flow to the Pit River or its tributaries.

Disturbance Regimes:

Fire: At lower and mid-elevations, historic occurrence has changed from frequent, low intensity, surface fires to infrequent, high intensity, stand replacing fires. At higher elevations, historic occurrence has changed from infrequent, low and moderate intensity surface fires to infrequent low, moderate, and high intensity surface or stand replacing fires.

Climate: Wide fluctuations in precipitation and temperature for periods of years result in significant or catastrophic changes in biological communities.

Volcanic Activity: Contains locations with eruptive activity (lava flows and ash fall) with the past 200 years.

M261Df of the Southern Cascades Section

Lithology and Stratigraphy. Pliocene and Pleistocene basalt and andesite flows dominate this subsection. Recent basalt flows and thick pyroclastic deposits are much less extensive, although some volcanic ash has been scattered across entire area. Quaternary glacial till, outwash, and debris flow deposits are extensive on Mt. Shasta and around the foot of the mountain, especially on the northeast side, although debris flows deposits are more widely distributed.

Geomorphology. Steep to moderately steep composite volcanoes dominate this subsection. Many of the volcanoes have cinder cones and plug domes on them. Mt. Shasta is an active stratovolcano that has several glaciers on it. Pleistocene cirques and moraines are extensive on Mt. Shasta, particularly on the older south side of the mountain. Glacial outwash is extensive around the base of Mt. Shasta, and well beyond the mountain on the northeast side. The elevation range is from about 3000 feet on the southwest side of Mt. Shasta up to 14,162 feet on the summit. Volcanic, mass wasting, fluvial, and glacial processes predominate.

Soils. Soils are mostly Dystric Xerorhents, Andic Xerumbrepts, Typic and Umbric Haploxerands, Pachic Ultic Argixerolls, Typic Haplocryands, and on Mt. Shasta, Typic Vitricryands, Lithic Argixerolls occur on Recent basalt. Rock and rubble land dominate the upper slopes of Mt. Shasta and the summit of Ash Creek Butte. On lower slopes on the southwest side of Mt. Shasta, soils are mostly ashy Typic Xeropsamments and Typic Vitrixerands. The soils are well drained. Soil temperatures regimes are mostly frigid, with mesic

on the lower southwest side of Mt. Shasta and cryic on the upper part of Mt. Shasta and the summits of other mountains. Soil moisture regimes are xeric.

Potent Natural Vegetation. The predominant natural plant communities, from lower to higher elevations, are Mixed conifer series, White fir series, Red fir series, Mountain hemlock series, and Whitebark pine series. Lodgepole pine series occurs near timberline and in areas where cold air collects. Barren land and Alpine habitat predominate above about 8000 to 8500 feet on Mt. Shasta.

Characteristic series by lifeform include:

Grasslands: Alpine habitat, Beaked sedge series, Green fescue series, Nebraska sedge series, Rocky Mountain sedge series, Tufted hairgrass series.

Shrublands: Rush chinquapin series, Greenleaf manzanita series, Huckleberry oak series, Mountain heather-bilberry series, Mountain whitethorn series, Parry rabbitbrush series, Tobacco brush series, Wedgeleaf ceanothus series.

Forests and woodlands: Baker cypress stands, Douglas-fir series, Incense-cedar series, Lodgepole pine series, Mixed conifer series, Mixed Subalpine forest series, Mountain hemlock series, Red fir series, Western white pine series, White fir series, Whitebark pine series.

Climate. The mean annual precipitation is about 20 to 70 inches. Most of the precipitation is snow, at least at higher elevations. Mean annual temperature ranges form less than 30 to about 50 F. The mean freeze-free period ranges from less than 25 days to about 150 days.

Surface Water. Runoff is rapid. Much of the water drains through the ground, contributing to springs around the base of the mountains. Ultimately, water drains to the Sacramento River, the Klamath River, or closed basins on theeast side of the subsection.

Disturbance Regimes: see M261Dj and M261Dg above

M261Di of the Southern Cascade Section

Lithology and Stratigraphy. Pliocene and Pleistocene basalt and andesite flows and Recent basalt, andesite, and rhyolite, including obsidian, flows and pyroclastic deposits dominate this subsection.

Geomorphology. The Medicine Lake Highlands are built of Pleistocene and Recent lava flows and pyroclastic deposits on a Pleistocene shield volcano. The center of the shield volcano collapsed and volcanoes around the rim of the crater have partially filled and obliterated it. Slopes range from steep on some volcanoes to gentle on basalt and andesite lava flows. The terrain is rough and chaotic on recent lava flows. There are many cinder cones in the subsection. Basin-fill has accumulated in the crater occupied by Medicine Lake. The elevation range is from about 4500 up to 7913 feet on Mt. Hoffman. Volcanic and fluvial processes predominate.

Soils. Soils are mostly Lithic and Vitrandic Xerorthents and Typic and Humic Haploxerands. Thaptic Vitrixerands occur in Recent pumice deposits. Rock and rubbleland predominate on many Recent lava flows. The soils are well drained. Soil temperature regimes are mostly frigid, with some cryic and mesic. Soil moisture regimes are xeric.

Potential Natural Vegetation. The predominant natural plant communities are Red fir series and White fir series, and in cold valleys and basins, Lodgepole pine series, Mountain hemlock series occurs at the higher elevations. Mixed conifer series and Ponderosa pine series occur at the lower elevation. Many Recent lava flows are barren, lacking vascular plants.

Characteristic series by lifeform include:

Grasslands: Beaked sedge series, Green fescue series, Idaho fescue series, Nebraska sedge series, Rocky Mountain sedge series, Sedge series, Tufted hairgrass series.

Shrublands: Big sagebrush series, Bush chinquapin series, Greenleaf manzanita series, Mountain heather-bilberry series, Mountain whitethorn series, Parry rabbitbrush series, Rubber rabbitbrush series, Tobacco brush series.

Forests and woodlands: Black oak series, Knobcone pine series, Lodgepole pine series, Mixed subalpine forest series, Mountain hemlock series, Ponderosa pine series, Red fir series, White fir series, Whitebark pine series.

Climate. The mean annual precipitation is about 25 to 40 inches. Most of the precipitation is snow. Mean annual temperature is about 35 to 45 F. The mean freeze-free period is about 25 to 100 days.

Surface Water. Runoff is rapid. Water drains down through cinders, pumice, and joint in basalt to the ground water reservoir, limiting overland flow of water and development of stream channels on the volcanic plateau. There are few streams in the subsection, and they are ephemeral, flowing to closed basins. Medicine Lake is in the crater of ancient Mt. Hoffman.

Disturbance Regimes: See M261Dj and M261Dg above.

Appendix G
Spotted Owl Habitat Modeling

[Rules Used to Classify Suitability of Timber Type Polygons (Shasta-Trinity National Forest LRMP Vegetation Database and in collaboration with the Interagency Baseline Technical Committee) as Nesting/Roosting or Foraging Habitat (NRF) for Northern Spotted Owls]

August, 1996 (modified August 1997 to reflect foraging habitat split, with minor text edits 6/1998)

The following are the rules used for inclusion of vegetation polygons as suitable nesting/roosting and foraging habitat for northern spotted owls on the Shasta-Trinity National Forest. The Forest has been divided into 4 general habitat zones (Western Klamath, Eastern Klamath, West Cascades and, Modoc Zones), based on elevation, physiographic conditions, and dominant forest communities. The most important variable across these zones is the relative contribution of hardwood species in forest structure: hardwood species mix and density are not well classified in our existing timber-type database, therefore we are using elevation and general forest community to estimate hardwood contribution.

Definitions

Nesting Habitat: Polygons containing forest habitat of size class and density range typically associated with NSO nest sites.

Roosting Habitat: Owls roost every day, whether breeding, territorial, or dispersing; this makes definition of "roosting habitat" difficult and requires further clarification. For this habitat classification exercise, we consider "roosting habitat" as the stand surrounding the nest site, where the adult owls (when breeding and to a lesser extent, nonbreeding) roost during the day - functionally the same polygons as "nesting habitat." During dispersal and outside of the breeding season, owls may select denser forest patches for cover while roosting. These stands may not be suitable for nesting, but there is little information to permit a separate "roosting" classification.

Foraging Habitat: In the following descriptions, habitats suitable for foraging by northern spotted owls are denoted in boldface and are in addition to those polygons noted as nesting which also are utilized as foraging habitat. Discrimination between habitats suitable for nesting and those used for foraging is possible only in a general sense. For example, the spatial relationship between a grove of nesting habitat and stands suitable for foraging will determine whether a viable territory exists; neither one stands alone. Also, physical location of stands (drainage bottom, north slope) strongly affects stand structure and subsequent suitability for nesting or foraging. In general, unique as foraging habitats are composed of smaller tree sizes and more open conditions than habitats used for nesting. The same classification (e.g. DF4N) could be highly suitable for nesting on a north slope, and only suitable for foraging on a dry, open south slope, due to the contribution of hardwoods to canopy closure and understory density.

West Klamath Zone (Douglas-fir/Hardwood, DF-HDWD) (west-side):

Elevation:		
>6000'	clip out all polygons - typically unsuitable	
4500-6000'	3G, 4N, 4G, 5N, 5G, 6 all slopes	3N, 4P, 5P, 2G
<4500'	3N, 3G, 4N, 4G, 5N, 5G, 6 all slopes	3P, 4P, 5P, 2G

Rationale: This is the Shasta-Trinity National Forest lower-elevation habitats, dominated by DF-HDWD. At low elevation, hardwoods form an important component of stand suitability, allowing stands with scattered conifer overstory to be suitable for NRF habitat. Below 4500 feet, stands on south-southwest exposures tend to be hotter, drier and more open, therefore 3N,4-5P, and 2G stands are only considered suitable on Dunning site class 3 or greater. Above 4500 feet, hardwoods are less prevalent, and conifer density is a better indicator of stand suitability, therefore 3N and 4P stands are suitable only on north slopes where hardwoods may still add to stand structure. Above 6000 feet, stands are typically composed of true firs, with little or no hardwood structure. These stands are typically unsuitable for long-term NRF, but may be used by dispersers or short-term territorial floaters.

East Klamath (Mixed Conifer) Zone:

Elevation:		
<6000'	clip out all polygons - typically unsuitable	
4500-6000'	3G, 4N, 4G, 5N, 5G, 6	3N, 3P, 4P on Dunning site class 1-3
<4500'	3N, 3G, 4N, 4G, 5N, 5G, 6	3P, 4P, 5P, 2G on Dunning site class 1-3

Rationale: Same as above for west-side, except that many habitats tend to be drier and more open, limiting available habitat particularly on south to west slopes. Many south - west slopes are brushfields with scattered pine or Douglas-fir. Open stands, 'P', are typically not suitable above 4500 feet. Although some occupied territories have been located as high as 5500 feet, they typically are in habitats similar to lower elevation (Douglas-fir/White fir), and likely utilize foraging habitat at or below the elevation of the nest stand (5000 - 5600'). Red fir/white fir stands above 6000' are still considered unsuitable for long-term NRF.

West Cascade (Mixed Conifer) Zone:

Elevation:	
6000-7000'	4G, 5G no PP or LPP
<6000'	3G, 3N, 4N, 4G, 5N, 5G, 6

Rationale: The McCloud and portions of the Shasta Lake Ranger Districts lie in the California Cascades, and supports forest communities different from the West and East Klamath Zones of the Shasta-Trinity National Forest. Minimum elevation is about 4500 feet, and slopes are typically gentle, reducing the effects of aspect. Forest communities typically do not support any hardwoods (some oak at extreme NW), therefore stand structure is conifer only. West Cascade Zone consists of Douglas-fir/White fir/Incense cedar and ponderosa pine and is highly suitable for NRF, true fir habitats are typically suitable only at lower elevations (< 6000').

Modoc Zone:

Elevation:		
>6500'	clip out - typically unsuitable	
<6500'	4G, 5G, 6	3N, 3G, 4N, 4G, 5N, 5G, 6 no PP or LPP

Rationale: Much of the McCloud and eastern portion of Shasta Lake are (were) dominated by ponderosa pine, grading into true fir communities at higher elevations. Douglas-fir becomes less prevalent. Early railroad logging and fire suppression has resulted in a dramatic increase of white fir as a stand dominant, creating habitats used to some extent by owls for dispersing, and foraging by rarely-territorial floaters. Nesting attempts and long-term (>2 years) territorial singles are rare, and occurred in dense red fir/white fir Old-growth. Definition of suitable NRF habitat in this area is problematic, and must include some aspect of proximity to dense late-successional habitat. Above 6500 feet, late snowpack and low understory diversity limit habitat suitability for NR habitat.

Capability

The determination of "capability" of LSRs, relative to suitable spotted owl habitat, incorporated the use of existing vegetation as an indicator of suitability. Vegetation polygons which were considered "unsuitable" were sorted to distinguish those that were considered "unsuitable, but capable" and those that were considered "unsuitable and not capable." To the degree possible, the sorting "screens" used to determine suitable owl habitat were also applied to the determination of capability. For example, no stands above 6000 feet elevation on the westside of the forest were considered suitable owl habitat. It followed then, that all stands occurring above 6000 feet on the west were labeled "unsuitable and uncapable."

Appendix H
Historical Perspective of Vegetation

An attempt was made to get a perspective of historical late-successional vegetative conditions. Many factors are involved with the amount of late-successional vegetation that previously existed. The quantity and quality of late-successional forest habitat probably fluctuated both spatially and temporally. Climate and fire frequency were two of the important factors that influenced levels of late-successional forest.

Fire

Fire is a classic disturbance agent and is a relatively discrete event in time. Although it may vary from seconds in a grass fire to weeks or months in a peat fire, fire changes ecosystem, community, and population structure either by selectively favoring certain species or creating conditions for new species to invade. It often favors early successional species but sometimes can accelerate succession to favor late successional species (Agee, 1993). Prior to concentrated Euro-American settlement in the middle to late 1800s, low- and middle-elevation forests of the Sierra-Nevada and California Cascades were characterized by relatively frequent low- to moderate-severity fires (Skinner and Chang 1996). These frequent fires performed important ecological functions (Kilgore 1973). As a result largely of human activities during the past 150 years fires are now less frequent and cover much less area but are more likely to be large and severe when they do occur (Husari and McKelvey 1996; McKelvey and Johnston 1992; Skinner and Chang 1996; U.S. Forest Service 1995; Weatherspoon et al. 1992). Such high intensity fires are well outside the range of variability for these ecosystems and are considered by many to be the greatest single threat to the integrity and sustainability of these forests.

Fire has a variable but predictable effects on plants and vegetation provides the fuel that makes fire possible, so fire effects on vegetation can be looked at as an interaction not just a unidirectional effect.

There are many methods to use to assist with putting together a picture of historical conditions. Research on past fire regimes, interpretations of old photos and aerial photography, and old-growth studies can assist with historical interpretations.

Analysis

The analysis used in this document considers existing vegetative conditions to interpret past conditions determine what vegetative conditions might have looked like prior to intensive forest management. The analysis consisted of using existing late-successional habitat as a starting point and adding approximately 80 percent plantation acreage to it. Records indicate that approximately 20 percent of the plantation acreage was originally brush fields, while the other 70 percent of the plantation acreage was probably late-successional, prior to harvesting. This analysis provides a general idea of trends across the Forest.

The following table displays the results for the LSRs in the Forest-wide LSRA.

Table H1. Historical Perspective - LSRs						
LSR/MLSA	**Existing Late-successional as % of capable**	**% Longterm Sustainable (of capable)**	**Existing Late-successional as % of sustainable**	**Plantation % (x.75)**	**Historical % Late-successional**	**Historical % Sustainable Level**
Yolla Bolla RC328	54	50%	108	6	59	118
South Fork RC330	54	60%	90	13	64	107
Chanchellula RC331	22	50%	44	9	29	58
Corral RC332	15	50%	30	11	23	46
Canyon Creek RC333	20	50%	40	7	25	50
Iron Canyon RC335	33	50%	66	4	36	72
Buckeye RC337	30	50%	60	9	37	74
Eagle RC338	19	50%	38	1	20	40
Graves RC339	0	50%	0	8	6	12
Scott Mtn. RC340	2	50%	4	1	3	6
Eddy RC341	0	50%	0	0	0	0
Deer RC342	2	50%	4	1	3	6
Algoma RC357	4	50%	8	11	12	24
Porcupine RC358	12	50%	24	8	18	36
Harris Mtn RC359	1	50%	2	14	11	22
Elk Flat RC360	46	50%	92	14	56	112
Mt. Shasta RC361	6	50%	12	15	17	36
Wagon RC362	22	50%	44	13	32	64
Castle Lake DD67	0	50%	0	0	0	0
Fons DD72	48	50%	96	30	60	120
McCloud DD76	0	50%	0	2	1	2
Sheepheaven DD78	0	50%	0	4	3	6
Bartle DD79	0	50%	0	4	3	6
Madrone DD83	67	50%	134	11	75	150

Table footnotes:

Column 2 - the acres of existing late-successional forest expressed as a percentage of the total amount of land capable of supporting late-successional forest for each LSR/MLSA ([acres of late-successional forest] divided by [acres of capable lands] multiplied by 100);

Column 3 - the percent of the capable area that can be sustained over the long term based on the analysis presented in Appendix I;

Column 4 - the acres of existing late-successional forest expressed as a percentage of the total amount of land that can be sustained in late-successional conditions for each LSR/MLSA. ([acres of late-successional forest] divided by [(% from Column 3) multiplied by (acres of capable lands)] multiplied by 100);

Column 5 - the percentage of area in existing plantations that were created by harvesting late-successional stands.

Column 6 - the estimated percentage of area in late-successional forest prior to conversion of old forests to plantations.

Column 7 - the estimated acres of late-successional forest (that existed prior to conversion of old forests to plantations) expressed as a percentage of the total amount of land that can be sustained in late-successional conditions for each LSR/MLSA. ([acres of late-successional forest prior to conversion of old forests to plantations] divided by [(% from Column 3) multiplied by (acres of capable lands)] multiplied by 100)

The analysis indicates what late successional conditions might have been prior to intensive Forest management practices. The range of historic late-successional for all the LSRs was 0% - 75%, with a mean of 25%.

To determine reserve function the calculated late-successional levels were compared to sustainable level. Five LSR/MLSAs historically were at or above the long term sustainable level. Seven LSR/MLSAs were close to or greater than half the late-successional habitat sustainable level. The other LSRs were below half the sustainable level.

The analysis of the historic perspective shows that past harvesting has had only small affects on the level of late-successional forest within LSR/MLSAs, since historic levels were only slightly higher then the present levels. This analysis is consistent with the context/intensity of past management within LSR/MLSA areas on the Forests, only 9 percent in plantation.

Appendix I
Vegetation Sustainability Analysis

The following displays the analysis that was completed to determine late-successional sustainable levels within the LSRs/MLSAs. The historical perspective was completed to get an idea how these LSRs/MLSAs may have looked in the past. This perspective is not used to identify the sustainable levels for the LRSs/MLSAs. The intent of the LRSs/MLSAs is to maximize the amount of late-successional habitat that can be sustained at any one time. This figure will generally be higher than those that existed historically. A range of levels is identified that assumes fluctuations in the climatic and fire regimes and its temporal influence on the forest. Forest vegetation patterns are not static but are always changing and in a state of flux. As stated in the main body of the document, desired condition is to maximize the amount of late-successional habitat that can be sustained. It will be desired to have late-successional characteristics at the upper end or even higher than the identified sustainable level. The sustainable levels identified are those that the team felt would be applicable to various LRSs/MLSAs based on their locations, climates, and fire regimes. A fire hazard and risk assessment was considered because fire is a primary factor in establishing the sustainability of a particular LSR/MLSA.

Another important factor that needs to be considered in order to maintain LRSs/MLSAs in conditions that are greater than past conditions is the fact that some type of management or intervention will need to occur in order to sustain the identified sustainable levels.

The basis for this analysis is highlighting the hazard and risk of potential fire expected to burn in LRSs/MLSAs and the intensities associated with wildfires. The ratings were established from data taken from the Fire Caused Mortality Analysis Model (FCMAM) for the Shasta-Trinity National Forest.

The following analysis is done using two scenarios. This was done due to differences seen in historical conditions in the LRSs/MLSAs. Information displays the amount of late-successional habitat that could be expected. **Amounts of mid-successional habitat was also assessed in order to use as a proxy for the amount of suitable spotted owl habitat that could be expected at any one time.** Higher site quality would allow for rapid development of late-successional characteristics. Higher site conditions allowed for late-successional characteristics to develop in approximately 100 years while lower site conditions took approximately 150 years. Mid-successional development ranged from 40 to 50 years based on site conditions. Ranges were based on how long it would take vegetation to develop into mid and late-successional characteristics using various site conditions.

FCMAM expectations for intensity of wildfires and level of mortality within LSRs/MLSAs:

High Fire Intensity (Stand Replacement): on 63% of the area.
Moderate Fire Intensity (25-70% mortality): on 36% of the area.
Low Fire Intensity (<25% mortality): on 1% of the area.

The Shasta-Trinity National Forest Land and Resource Management Plan - Final Environmental Impact Statement page IV-16 predicts a rate of wildfires of 11,000 acres annually across the Forest. Assuming a linear relationship between frequency and area a predicted rate of wildfires of 2,750 acres was assumed for LSRs/MLSAs

FCMAM intensity levels:

High Fire Intensity - 1,732 acres annually
Moderate Fire Intensity - 990 acres annually
Low Fire Intensity - 28 acres annually.

First scenario: High intensity fires will be the only ones that will affect the ability to maintain late-successional habitat on those acres burned.

- 17,320 acres burned per decade in LSRs/MLSAs
- Total LSR/MLSA acreage = 474,832.
- 17,320 / 474,832 = 3.6% of total LSR/MLSA acreage burned per decade.
- This would equate to roughly a 280 year rotation of stands due to fire interval, assuming all stands are affected equally over time.
- Using this as an estimate and based on site, aspect, slope, and soil conditions, approximately **50-60%** would be in late-successional conditions at any one time.
- For **late-successional and mid-successional combined**, it would be expected that approximately **80-90%** of the capable land base would be in these conditions at any one time.

Second scenario: High intensity fires and 20-30% of the moderate intensity fires will affect the ability to maintain late-successional habitat on those acres burned.

- 19,795 acres burned per decade (17,320 High and 2,475 Moderate).
- Total LSR/MLSA acreage = 474,832.
- 19,795 ¸ 474,832 = 4.2% of LSR/MLSA acreage burned per decade.
- This would equate to roughly a 240 year rotation of stands due to fire interval, assuming all stands are affected equally over time.
- Using this as an estimate and based on site, aspect, slope, and soil conditions, approximately **40-60%** would be in late-successional conditions at any one time.
- For **late-successional and mid-successional combined**, it would be expected that approximately **75-85%** of the capable land base would be in these conditions at any one time.

The team reviewed the results of this analysis and drew some conclusions from it. Based on the differences shown in the historical perspective for various LRSs/MLSAs, it was felt that the first scenario was more representative of the South Fork RC-330 LSR.

This was due to climatic regimes, coastal influence, and historical fires and the impacts shown from low and moderate intensity fires. The second scenario was more representative of most

other areas as the climate is drier, there is no coastal influence, and past fires have shown moderate intensity fires to cause more mortality.

Using this analysis as a guide the team identified what they felt would be realistic ranges for determining functioning in terms of the amount of late-successional habitat found at any one time in a particular LSR. Using past situations, an understanding of fire regimes and how it changes across the Forest, and this analysis, the team came up with the following ranges for vegetative functioning.

Appendix J
Growth Modeling

Modeling was done for a variety of stands. Plot inventory data from the old growth inventory, conducted in 1991 and 1992 were used to complete the growth modeling. The Forest Vegetation Simulator (FVS) was used for model inventory data. All runs were completed with a no management option and several alternative harvest treatments. The intent of this analysis was to compare and contrast general trends in development of desired stand characteristics including, number of large trees, recruitment of large snags and logs, mortality levels, and relative stand performance.

FVS modeling attributes:

- WSSN Variant used for all runs.
- Maximum Stand Density Index for ponderosa pine set at 430.
- Mortality flag, which determines the distribution of mortality, was set at variant default.
- Plantation runs were for 10 cycles (10 year cycles).
- Older stand runs were for 10 cycles (10 year cycles).
- Inventory information was taken on high site quality ground (Forest Survey Site Class 3). Results shown in the tables are for high site conditions. While relative principles apply, lower site productivity classes will take longer to develop desired stand characteristics.

The tables display the following information for all the modeling runs.

The tables show basic stand and habitat information. This information will be displayed for both the no treatment and treatment options. Mortality represents the total cubic foot mortality for each decade. For instance, mortality shown for decade 1 represents that mortality which will occur between the first and second decades. Similarly, snags represent the number of snags, in different DBH classes, that are created each decade. All figures were derived from Forest Vegetation Simulation (FVS) outputs.

Modeling Criteria for All Plantations

No treatment:

- Model will use the default basal area increment for inventory growth measurements.

Thinning:

- Three treatment scenarios are: 1) thin to 75 trees per acre at year 10; 2) thin to 100 trees per acre at year 10; and 3) thin to 125 trees per acre at year 10.
- All thinning was from below, codominants and dominants were favored as leave trees.
- In order to simplify analysis, the no sprout option was selected. In the real world there will be hardwood sprouting, but the model was difficult to use in terms of identifying numbers of sprouts to project in the future. It was also assumed that underburning would

control sprouting to some degree. All plantations were run with the same assumptions, so results would be consistent.

- Thinning options increased the basal area increment by 2.0 for two decades following treatment and continued until the start of the 6th decade.

Plantations

Plantations

Table J1.0. No Treatment										
Decade	Trees/Ac.	Basal Area	QMD	Canopy Closure(%)	Cu.ft. Mort./ Decade	Cu.ft. Growth Decade	>24" Trees/Ac.	>36' % Trees/Ac.	Snags 16-24"	Snags >24"
1	345	6	1.8	0	0	41	0	0	0	0
2	340	48	5.1	17	0	152	0	0	0	0
3	339	130	8.4	37	28	225	0	0	0	0
4	276	187	11.2	58	45	280	0	0	0	0
5	233	238	13.7	64	108	290	0	0	1.85	0
6	178	256	16.2	69	123	297	0	0	10.12	0
7	141	268	18.7	68	123	289	11.78	0	16.26	0.08
8	116	280	21.0	67	128	294	28.25	0	13.77	0.96
9	98	290	23.3	66	131	290	43.43	0	11.00	3.09
10	85	300	25.5	65	125	271	47.36	0-10	8.19	4.20
11	74	309	27.6	65	113	223	50.04	10	5.11	4.69
12	67	317	29.5	65	104	190	47.44	10-30	3.49	3.87
13	61	323	31.2	64	102	173	47.14	10-30	2.14	3.63
14	56	329	32.8	64	94	154	46.33	30	1.44	3.36
15	52	335	34.3	64				30-50		

Table J1.1. Treatment - Thinning to 75 trees per acre										
Decade	Trees/Ac.	Basal Area	QMD	Canopy Closure(%)	Cu.ft. Mort./ Decade	Cu.ft. Growth Decade	>24" Trees/Ac.	>36" % Trees/Ac.	Snags 16-24"	Snags >24"
1	345	6	1.8	17	0	11	0	0	0	0
2	74	13	5.6	4	0	87	0	0	0	0
3	73	56	11.9	10	1	256	0	0	0	0
4	71	132	18.5	26	32	370	0	0	2.21	0
5	64	199	23.9	42	51	180	38.00	0	9.63	0.01
6	59	215	25.9	52	91	228	47.02	0	10.64	2.35
7	51	226	28.5	53	100	193	47.53	0	4.98	5.67
8	45	231	30.7	53	95	166	44.58	0-10	1.84	6.87
9	40	234	32.7	53	91	149	39.97	10-30	0.52	5.92
10	36	236	34.7	52	88	145	36.05	30	0.13	4.66
11	33	240	36.6	51	82	122	32.76	30-50	0.05	3.68
12	30	242	38.4	51	76	107	30.07	50-70	0.02	2.97
13	28	245	40.1	50	67	94	27.89	70-90	0	2.50
14	26	247	41.6	50	66	97	26.14	70-90	0	2.23
15	25	250	43.2	50				90+		

Table J1.2. Treatment - Thinning to 100 trees per acre										
Decade	**Trees/ Ac.**	**Basal Area**	**QMD**	**Canopy Closure(%)**	**Cu.ft. Mort./ Decade**	**Cu.ft. Growth Decade**	**>24" Trees/Ac.**	**>36" % Trees/Ac.**	**Snags 16-24"**	**Snags >24"**
1	345	6	1.8	17	0	15	0	0	0	0
2	98	17	5.7	13	0	120	0	0	0	0
3	97	76	12.0	33	4	325	0	0	0	0
4	94	170	18.2	51	45	236	0	0	2.21	0
5	83	202	21.1	54	86	240	3.99	0	9.63	0.01
6	70	217	23.8	55	101	202	36.00	0	10.64	2.35
7	60	222	26.1	54	108	218	45.46	0	4.98	5.67
8	51	227	28.6	53	105	179	45.53	0	1.84	6.87
9	44	229	30.8	52	95	157	42.41	0-10	0.52	5.92
10	40	231	32.7	52	88	138	38.91	10-30	0.13	4.66
11	36	234	34.6	51	82	121	35.60	30	0.05	3.68
12	33	236	36.3	51	77	113	32.78	50	0.02	2.97
13	30	239	38.0	50	77	114	30.36	70	0	2.50
14	28	242	39.7	50	75	105	28.13	70-90	0	2.23
15	26	245	41.4	50				70-90		

Table J1.3 Treatment - Thinning to 125 trees per acre										
Decade	**Trees/Ac.**	**Basal Area**	**QMD**	**Canopy Closure(%)**	**Cu.ft. Mort./ Decade**	**Cu.ft. Growth Decade**	**>24" Trees/Ac.**	**>36" % Trees/Ac.**	**Snags 16-24"**	**Snags >24"**
1	345	6	1.8	17	0	19	0	0	0	0
2	123	22	5.7	16	0	148	0	0	0	0
3	121	94	12.0	39	3	199	0	0	0	0
4	118	152	15.3	50	47	229	0	0	0.22	0
5	101	185	18.4	54	66	225	0	0	11.89	0
6	86	206	20.9	55	92	242	7.86	0	13.34	0.03
7	73	220	23.6	55	105	215	27.89	0	11.90	1.30
8	62	226	25.9	55	118	197	43.59	0	5.76	4.78
9	52	226	28.2	53	116	212	46.54	0	2.08	7.23
10	45	230	30.6	53	103	155	41.40	0-10	1.22	5.96
11	40	231	32.6	52	95	153	38.71	10-30	0.27	4.80
12	36	233	34.5	51	87	128	35.47	30-50	0.10	3.86
13	33	236	36.3	51	85	127	32.75	50	0.01	3.09
14	30	239	38.1	50	81	111	30.14	50-70	0.01	2.65
15	28	242	39.8	50				70-90		

Analysis:

- Acceleration of the development of late-successional size characteristics: Treatment will accelerate development by approximately 50 years. Late-successional characteristics on high site quality ground could be achieved around age 100 -110 with no treatment and age 60-70 with treatment. Analysis of the modeling data shows that the no treatment option will begin to have some late-successional characteristics around age 90-100.

Larger tree development will be present in numbers equal to those found in the treatment option at age 60-70. The primary difference is the large number of smaller diameter material still present in the no treatment option and the high mortality rates associated with the number of trees present per acre.

- Site occupancy - rapid growth decline noted: It can assumed that decadence will become a common characteristic once site occupancy occurs. The rapid growth in the treated stands will cause for site occupancy to occur around the 6th decade. Once this occurs stand growth will not increase but individual tree growth will continue. Decadence will become common once stands are considered late-successional. The non treated stands will be affected by site occupancy around the 7th to 8th decade. These stands will just be entering late-successional size characteristics when decadence becomes common.
- Mortality levels: Mortality will be common in both options, especially once site occupancy occurs. The no treatment option will experience higher levels of mortality and will begin sooner than the treatment option. Mortality in the treatment option will be confined to larger size material. The no treatment option will have mortality in all size classes, starting with smaller material in the earlier decades and shifting to all size material in the later decades.
- Fuel loading and associated risk to fire disturbances: Fuel loading and associated fire risks are lessened in the early decades for the treatment option. Over the analysis period fuels are reduced by 25-30% in the treatment option. Fuels created in the no treatment option are a combination of small flashy fuels and large fuels. The stands in the no treatment option would become more vulnerable to a stand replacing event over time due to fuel conditions created by natural mortality. In either treatment further risk reduction activities, primarily burning, will need to occur in order to sustain characteristics for a long time period. Burning would be easier to achieve in the treated stands as smaller size class material would not be as prevalent and the live trees would be a larger size making them more resistant to fire impacts.

Mid-Successional

- Average age for mixed conifer Stands modeled ranges from estimated 98 to 137 years.
- The runs were for 10 cycles, as this would put the average stand at approximately 200 to 240 years.

Criteria for All Mid-Successional

Assumptions for no treatment:

- Model will use the default basal area increment for inventory growth measurements.

Thinning:

- All thinning was from below, codominants and dominants were favored as leave trees.
- SDI max for ponderosa pine is 430.
- Mortality flag used, which determines the distribution of mortality, is the variant default.

- For Mixed Conifer, five individual Stands were modeled separately under three separate scenarios; 1) thin to 75 trees per acre 2) thin to 100 trees per acre and 3) thin to 125 trees per acre.

  - Scenario 1: Basal area increment multiplier increased at cycle 2 by 2.0 for 3 cycles, it then reverts back to the default of 1.0.
  - Scenario 2: Basal area increment multiplier increased at cycle 2 by 2.0 for 2 cycles, it then reverts back to the default of 1.0.
  - Scenario 3: Basal area increment multiplier increased at cycle 2 by 2.0 for 1 cycle, it then reverts back to the default of 1.0.

- Even though some stands have a hardwood component the no sprout option was selected to allow performance evaluation of the original stand. Certain attributes such as crown canopy cover, and number of trees per acre are conservative because in reality sprouting and ingrowth would occur.

For red fir, simulation of one stand was modeled under three separate scenarios; 1) thin to 150 trees per acre 2) thin to 175 trees per acre and 3) thin to 200 trees per acre.

- Default SDI used.
- Basal area increment multiplier increased at cycle 2 following harvesting by 2.0 for 3 cycles, it then reverts back to the default of 1.0.

Tables J2.0 through J6.3 for mixed conifer and Tables 7.0 through 7.3 for red fir display basic habitat components for mid-successional forest.

*Stand composition reflects the three primary tree species only, and will not always total 100%.

Stand 211: 49% black oak, 39% Douglas-fir, 12% ponderosa pine

Mid-Successional

Table J2.0 - No Treatment Mixed Conifer - Stand 211										
Decade	**Trees/Ac.**	**Basal Area**	**QMD**	**Canopy Closure(%)**	**Cu.ft. Mort./ Decade**	**Cu.ft Growth Decade**	**>24" Trees/Ac.**	**>36" % Trees/Ac.**	**Snags 16-24"**	**Snags >24"**
0	271	230	12.5	85	50	178	7.32	0-10	0	0
1	240	249	13.8	84	89	206	10.89	0-10	0.72	0.21
2	199	262	15.5	82	79	213	10.61	0-10	1.83	0.28
3	173	278	17.2	81	83	206	10.40	0-10	4.37	0.21
4	151	289	18.7	79	85	221	10.20	0-10	5.36	0.20
5	133	303	20.4	78	97	245	10.06	0-10	3.97	0.14
6	118	317	22.1	77	98	230	19.19	0-10	6.68	0.60
7	105	328	23.9	76	99	218	18.78	0-10	6.20	0.40
8	95	339	25.5	75	114	180	37.67	10-30	4.50	1.69
9	86	344	27.2	74	124	181	38.97	10-30	6.02	1.95
10	76	350	29.0	72	137	160	43.55	10-30	5.11	2.90

Table J2.1 - Treatment Mixed Conifer 75 Trees/Acre - Stand 211

Decade	Trees/Ac.	Basal Area	QMD	Canopy Closure(%)	Cu.ft. Mort./ Decade	Cu.ft Growth Decade	>24" Trees/Ac.	>36" % Trees/Ac.	Snags 16-24"	Snags >24"
0	271	230	12.5	85	2	161	7.32	0-10	0	0
1	74	160	19.9	58	4	217	11.09	0-10	0	0.01
2	73	201	22.4	63	40	229	10.98	0-10	0.15	0.11
3	67	233	25.3	66	51	135	14.22	10-30	2.58	0.25
4	61	241	26.9	65	60	138	20.58	10-30	2.41	0.74
5	56	248	28.5	64	66	147	22.66	10-30	2.77	0.99
6	51	255	30.3	63	65	140	28.06	10-30	2.15	1.74
7	46	261	32.2	62	59	133	30.49	10-30	1.78	2.04
8	43	267	33.9	62	67	120	33.65	10-30	1.33	1.94
9	40	271	35.4	61	54	109	31.48	30	0.63	2.16
10	37	276	37.1	61	62	106	30.04	30-50	1.03	1.44

Table J2.2 - Treatment Mixed 100 Trees/Acre Conifer - Stand 211

Decade	Trees/Ac.	Basal Area	QMD	Canopy Closure(%)	Cu.ft. Mort./ Decade	Cu.ft Growth Decade	>24" Trees/Ac.	>36" % Trees/Ac.	Snags 16-24"	Snags >24"
0	271	230	12.5	85	2	187	7.32	0-10	0	0
1	99	185	18.5	67	43	239	11.06	0-10	0	0.4
2	98	220	21.3	69	56	148	10.74	0-10	3.28	0.33
3	79	230	23.0	68	66	146	10.53	0-10	3.15	0.21
4	71	237	24.8	66	62	149	10.32	0-10	3.35	0.21
5	63	244	26.6	65	67	155	22.50	10-30	2.99	0.81
6	57	252	28.4	64	71	160	24.06	10-30	3.09	0.96
7	51	259	30.4	63	72	147	25.25	10-30	4.30	1.10
8	47	264	32.2	62	71	126	29.85	10-30	2.46	1.92
9	43	269	33.8	62	62	115	31.60	10-30	1.26	2.13
10	40	275	35.6	61	65	111	31.17	10-30	1.37	1.81

Table J2.3 - Treatment Mixed 125 Trees/Acre Conifer - Stand 211

Decade	Trees/Ac.	Basal Area	QMD	Canopy Closure(%)	Cu.ft. Mort./ Decade	Cu.ft Growth Decade	>24" Trees/Ac.	>36" % Trees/Ac.	Snags 16-24"	Snags >24"
0	271	230	12.5	85	35	199	7.32	0-10	0	0
1	111	195	18.0	68	39	156	10.76	0-10	0.89	0.34
2	101	213	19.7	68	56	163	10.62	0-10	1.69	0.14
3	90	226	21.5	67	68	158	10.35	0-10	4.18	0.27
4	79	234	23.3	66	69	155	10.13	0-10	4.59	0.22
5	70	241	25.1	65	73	167	9.86	0-10	3.88	0.26
6	63	249	27.0	63	82	177	20.61	10-30	4.25	0.68
7	56	257	29.0	62	78	150	29.02	10-30	3.57	1.72
8	51	262	30.8	61	73	137	27.49	10-30	3.33	1.52
9	46	269	32.7	61	71	119	28.47	10-30	2.82	1.50
10	42	274	34.4	60	69	117	30.53	10-30	1.69	1.78

Stand 241: 63% Douglas-fir, 37% black oak

Table J3.0 - No Treatment Mixed Conifer - Stand 241

Decade	Trees/Ac.	Basal Area	QMD	Canopy Closure(%)	Cu.ft. Mort./ Decade	Cu.ft Growth Decade	>24" Trees/Ac.	>36" % Trees/Ac.	Snags 16-24"	Snags >24"
0	144	260	18.2	74	44	184	28.25	0-10	0	0
1	129	277	19.8	74	55	195	30.90	0-10	2.27	1.15
2	115	291	21.5	74	58	198	36.28	0-10	1.69	1.69
3	103	307	23.4	73	66	186	34.95	10	1.94	1.33
4	92	318	25.2	72	92	186	37.00	10-30	2.40	1.54
5	82	323	26.9	71	96	175	34.78	10-30	4.16	2.21
6	73	325	28.6	69	103	176	36.94	10-30	2.75	2.57
7	64	327	30.6	68	135	169	34.63	10-30	2.78	2.31
8	55	321	32.6	66	149	151	34.64	30-50	2.61	3.40
9	47	311	34.6	63	147	149	31.27	30-50	2.46	3.37
10	41	302	36.8	60	103	120	31.52	50	2.01	3.76

Table J3.1 - Treatment Mixed Conifer 75 Trees/Acre - Stand 241

Decade	Trees/Ac.	Basal Area	QMD	Canopy Closure(%)	Cu.ft. Mort./ Decade	Cu.ft Growth Decade	>24" Trees/Ac.	>36" % Trees/Ac.	Snags 16-24"	Snags >24"
0	144	260	18.2	74	39	243	28.25	0-10	0	0
1	68	254	26.1	63	86	247	37.39	10	2.14	2.22
2	58	276	29.5	63	112	443	37.33	10-30	3.09	4.09
3	49	288	32.8	62	92	143	33.50	30-50	2.13	3.83
4	44	287	34.7	61	74	143	34.19	30-50	1.24	3.26
5	40	290	36.4	60	67	131	34.81	30-50	0.48	2.80
6	37	292	37.9	60	64	134	32.70	50	0.35	2.10
7	35	296	39.4	59	65	133	32.54	50-70	0.18	2.01
8	33	300	40.9	59	59	123	30.80	70	0.19	1.74
9	31	303	42.2	59	60	124	29.27	70-90	0.12	1.53
10	30	307	43.6	58	55	107	28.53	70-90	0.19	1.41

Stand 241: 63% Douglas-fir, 37% black oak

Mid-Successional (continued)

Table J3.2 - Treatment Mixed Conifer 100 Trees/Acre - Stand 241

Decade	Trees/Ac.	Basal Area	QMD	Canopy Closure (%)	Cu.ft. Mort./ Decade	Cu.ft Growth Decade	>24" Trees/Ac.	>36" % Trees/Ac.	Snags 16-24"	Snags >24"
0	144	260	18.2	74	74	255	28.25	0-10	0	0
1	83	265	24.3	65	104	260	35.98	0-10	3.33	3.64
2	68	285	27.8	64	95	150	35.53	10-30	5.68	4.23
3	59	282	29.7	63	95	155	32.62	10-30	4.70	2.91
4	51	282	31.7	61	83	156	33.59	30	3.22	3.17
5	46	285	33.5	60	76	142	31.17	30-50	2.33	2.42
6	43	287	35.1	59	71	145	31.70	30-50	1.06	2.34
7	39	290	36.7	59	69	143	31.70	30-50	0.75	2.19
8	37	294	38.3	59	65	134	32.80	30-50	0.43	2.12
9	35	298	39.7	58	63	131	31.06	50-70	0.38	1.74
10	33	302	41.2	58	64	111	29.53	50-70	0.42	1.53

Table J3.3 - Treatment Mixed Conifer 125 Trees/Acre - Stand 241

Decade	Trees/Ac.	Basal Area	QMD	Canopy Closure (%)	Cu.ft. Mort./ Decade	Cu.ft Growth Decade	>24" Trees/Ac.	>36" % Trees/Ac.	Snags 16-24"	Snags >24"
0	144	260	18.2	74	69	277	28.25	0-10	0	0
1	105	286	22.4	71	67	184	36.81	0-10	2.72	281
2	93	296	24.2	70	77	183	34.83	10	1.71	1.98
3	82	304	26.1	69	89	169	36.03	10-30	3.51	2.25
4	72	307	27.9	67	104	168	33.80	10-30	4.78	2.22
5	63	306	29.9	66	122	154	35.24	10-30	3.95	3.04
6	54	300	31.9	63	131	152	32.21	30	3.51	3.02
7	47	292	33.9	61	97	150	31.65	30-50	2.60	3.56
8	42	292	35.8	59	79	141	29.32	30-50	1.64	2.33
9	39	293	37.3	59	72	141	30.68	50	0.91	2.17
10	36	298	39.0	58	65	115	28.99	50	0.86	1.69

Stand 41: 51% ponderosa pine, 36% Douglas-fir, 7% incense cedar

Table J4.0 - No Treatment Mixed Conifer - Stand 41

Decade	Trees/Ac.	Basal Area	QMD	Canopy Closure (%)	Cu.ft. Mort./ Decade	Cu.ft Growth Decade	>24" Trees/Ac.	>36" % Trees/Ac.	Snags 16-24"	Snags >24"
0	297	252	12.5	70	65	195	17.24	0-10	0	0
1	241	267	14.2	69	75	206	19.53	0-10	3.60	0.74
2	201	280	16.0	68	85	215	25.73	0-10	4.07	1.20
3	170	293	17.8	67	87	210	27.41	0-10	5.03	1.46
4	148	304	19.4	67	87	203	27.64	0-10	5.80	1.52
5	132	314	20.9	66	96	201	30.25	0-10	4.66	1.50
6	118	323	22.4	66	109	187	33.00	0-10	4.33	2.03
7	106	326	23.8	65	129	179	33.93	10	3.99	2.33
8	94	325	25.2	63	137	150	32.61	10-30	4.75	2.71
9	83	319	26.5	62	167	134	34.86	10-30	5.04	2.95
10	72	306	27.9	59	170	122	31.28	10-30	4.72	3.58

Table J4.1 - Treatment Mixed Conifer 75 Trees/Acre - Stand 41

Decade	Trees/Ac.	Basal Area	QMD	Canopy Closure (%)	Cu.ft. Mort./ Decade	Cu.ft Growth Decade	>24" Trees/Ac.	>36" % Trees/Ac.	Snags 16-24"	Snags >24"
0	297	252	12.5	70	5	213	17.24	0-10	0	0
1	73	160	20.0	43	9	256	21.29	0-10	0.08	0.33
2	72	209	23.1	50	53	267	22.27	0-10	0.23	0.37
3	65	244	26.3	53	76	144	25.52	10-30	4.53	1.63
4	58	249	28.1	53	84	130	25.85	10-30	4.14	1.80
5	52	250	29.6	52	86	128	31.48	10-30	3.22	2.53
6	48	252	31.1	52	84	123	33.81	10-30	1.77	2.76
7	44	253	32.4	51	83	122	32.48	30	1.34	2.29
8	41	253	33.7	50	73	114	34.13	30-50	0.75	2.35
9	39	256	34.9	50	82	99	33.87	30-50	0.40	1.92
10	36	256	35.9	49	89	88	31.99	30-50	0.26	1.88

Table J4.2 - Treatment Mixed Conifer 100 Trees/Acre - Stand 41

Decade	Trees/Ac.	Basal Area	QMD	Canopy Closure (%)	Cu.ft. Mort./ Decade	Cu.ft Growth Decade	>24" Trees/Ac.	>36" % Trees/Ac.	Snags 16-24"	Snags >24"
0	297	252	12.5	70	18	261	17.24	0-10	0	0
1	93	209	20.3	52	59	275	25.56	0-10	1.78	0.77
2	81	245	23.6	55	79	157	30.77	0-10	5.28	2.15
3	70	250	25.6	54	85	149	33.02	10	3.89	2.71
4	62	253	27.4	53	85	140	32.18	10-30	3.28	2.78
5	55	255	29.1	53	90	136	32.92	10-30	2.60	2.67
6	50	257	30.7	52	87	126	31.96	10-30	1.86	2.76
7	46	258	32.1	51	83	120	32.43	30	1.38	2.49
8	42	259	33.4	50	74	106	31.76	30-50	0.87	2.25
9	40	260	34.6	50	87	97	31.70	30-50	0.35	2.03
10	37	258	35.6	49	95	89	31.89	30-50	0.48	2.07

Table J4.3 - Treatment Mixed Conifer 125 Trees/Acre - Stand 41

Decade	Trees/Ac.	Basal Area	QMD	Canopy Closure (%)	Cu.ft. Mort./ Decade	Cu.ft Growth Decade	>24" Trees/Ac.	>36" % Trees/Ac.	Snags 16-24"	Snags >24"
0	297	252	12.5	70	41	279	17.24	0-10	0	0
1	108	230	19.8	56	60	166	25.10	0-10	4.96	1.23
2	95	242	21.6	56	72	170	28.52	0-10	5.81	1.62
3	83	251	23.6	56	91	159	28.54	0-10	6.05	1.83
4	72	254	25.4	55	99	148	30.45	10	5.36	2.32
5	62	253	27.3	53	97	143	32.69	10-30	3.77	3.00
6	56	253	28.9	52	96	134	32.21	10-30	2.90	3.00
7	50	253	30.4	51	90	127	31.22	10-30	2.03	2.66
8	46	253	31.8	50	80	108	31.49	10-30	1.50	2.45
9	43	253	33.0	50	106	100	33.01	30	0.92	2.02
10	39	248	34.2	48	98	91	32.24	30-50	0.45	3.23

Stand 42: 40% ponderosa pine, 21% incense cedar, 20% Douglas-fir

Table J5.0 - No Treatment Mixed Conifer - Stand 42

Decade	Trees/Ac.	Basal Area	QMD	Canopy Closure (%)	Cu.ft. Mort./ Decade	Cu.ft Growth Decade	>24" Trees/Ac.	>36" % Trees/Ac.	Snags 16-24"	Snags >24"
0	227	216	13.2	59	79	182	12.79	0-10	0	0
1	195	242	15.1	60	43	193	15.05	0-10	3.26	0.65
2	174	265	16.7	61	55	205	20.96	0-10	3.06	0.72
3	155	285	18.3	62	58	213	30.69	0-10	4.05	1.21
4	140	304	20.0	62	73	218	31.40	0-10	2.75	1.19
5	125	321	21.7	62	80	203	30.22	0-10	5.27	1.18
6	113	331	23.2	62	98	213	36.98	0-10	4.93	1.81
7	100	340	24.9	62	105	197	35.00	0-10	5.60	1.98
8	89	344	26.6	61	109	172	39.47	10	5.40	2.56
9	79	346	28.3	60	122	149	41.04	10-30	5.14	2.98
10	70	345	30.0	59	139	134	37.98	10-30	4.46	3.06

Table J5.1 - Treatment Mixed Conifer 75 Trees/Acre - Stand 42

Decade	Trees/Ac.	Basal Area	QMD	Canopy Closure (%)	Cu.ft. Mort./ Decade	Cu.ft Growth Decade	>24" Trees/Ac.	>36" % Trees/Ac.	Snags 16-24"	Snags >24"
0	227	216	13.2	59	10	115	12.79	0-10	0	0
1	72	181	21.4	36	13	228	23.87	0-10	1.07	0.74
2	70	226	24.3	42	40	243	33.64	0-10	0.89	0.45
3	65	261	27.2	48	35	157	35.68	10	1.66	2.12
4	61	278	28.9	51	53	154	36.08	10-30	1.11	1.40
5	57	288	30.5	52	61	150	36.35	10-30	1.62	2.01
6	53	296	32.1	52	68	151	35.89	30	1.83	2.12
7	48	302	33.8	52	71	145	35.25	30-50	1.53	2.18
8	45	306	35.4	52	70	139	34.89	30-50	0.98	2.34
9	42	311	37.0	52	61	120	36.01	50	0.49	2.39
10	39	315	38.4	52	69	109	34.23	50-70	0.52	1.78

Table J5.2 - Treatment Mixed Conifer 100 Trees/Acre - Stand 42

Decade	Trees/Ac.	Basal Area	QMD	Canopy Closure (%)	Cu.ft. Mort./ Decade	Cu.ft Growth Decade	>24" Trees/Ac.	>36" % Trees/Ac.	Snags 16-24"	Snags >24"
0	227	216	13.2	59	11	143	12.79	0-10	0	0
1	96	222	20.6	51	50	161	22.08	0-10	1.67	.70
2	85	260	23.6	55	65	163	32.19	0-10	4.84	1.84
3	76	268	25.4	54	67	170	33.43	0-10	4.65	1.98
4	68	277	27.3	54	74	168	35.19	10	3.24	2.54
5	61	284	29.2	54	79	157	40.40	10-30	2.45	3.22
6	55	288	30.9	53	76	159	39.26	10-30	1.85	3.08
7	51	293	32.5	53	73	146	38.18	30	1.51	2.79
8	47	297	34.1	53	71	147	37.76	30-50	0.84	2.63
9	44	303	35.7	53	65	118	35.94	30-50	0.79	2.35
10	41	308	37.2	52	64	113	35.23	50	0.54	2.11

Table J5.3 - Treatment Mixed Conifer 125 Trees/Acre - Stand 42

Decade	Trees/Ac.	Basal Area	QMD	Canopy Closure (%)	Cu.ft. Mort./ Decade	Cu.ft Growth Decade	>24" Trees/Ac.	>36" % Trees/Ac.	Snags 16-24"	Snags >24"
0	227	216	13.2	59	12	161	12.79	0-10	0	0
1	108	234	20.0	54	45	171	21.56	0-10	6.37	1.22
2	98	251	21.7	55	62	176	31.44	0-10	3.86	1.42
3	87	262	23.5	55	69	181	31.72	0-10	5.19	1.66
4	77	272	25.5	55	74	175	30.26	0-10	6.19	1.46
5	69	279	27.3	54	75	169	34.56	10	4.31	2.32
6	62	285	29.0	54	85	169	37.25	10-30	3.44	2.51
7	56	290	30.8	53	76	157	39.16	10-30	2.57	2.93
8	51	295	32.4	53	75	151	39.42	30	1.64	2.68
9	47	301	34.1	53	67	123	37.65	30-50	1.30	2.42
10	44	306	35.7	53	73	116	36.10	30-50	1.08	2.00

Stand 75: 49% white fir, 20% ponderosa pine, 9% incense cedar

Table J6.0 - No Treatment Mixed Conifer - Stand 75

Decade	Trees/Ac.	Basal Area	QMD	Canopy Closure (%)	Cu.ft. Mort./ Decade	Cu.ft Growth Decade	>24" Trees/Ac.	>36" % Trees/Ac.	Snags 16-24"	Snags >24"
0	382	292	11.8	71	56	276	16.12	0-10	0	0
1	333	328	13.4	72	103	274	17.30	0-10	3.11	0.34
2	273	342	15.2	70	103	270	25.12	0-10	5.91	0.95
3	233	357	16.7	70	110	288	28.75	0-10	5.43	1.27
4	203	374	18.4	69	130	283	33.05	0-10	6.58	1.55
5	177	385	20.0	69	121	274	38.74	0-10	5.81	2.44
6	158	399	21.5	69	134	250	46.47	0-10	4.40	2.80
7	142	406	22.9	68	136	241	45.08	0-10	4.46	2.76
8	129	413	24.2	68	135	222	44.33	10	5.00	2.98
9	118	418	25.5	68	164	207	45.24	10-30	4.89	2.69
10	106	417	26.9	67	154	200	45.81	10-30	5.32	3.45

Table J6.1 - Treatment Mixed Conifer 75 Trees/Acre - Stand 75

Decade	Trees/Ac.	Basal Area	QMD	Canopy Closure (%)	Cu.ft. Mort./ Decade	Cu.ft Growth Decade	>24" Trees/Ac.	>36" % Trees/Ac.	Snags 16-24"	Snags >24"
0	382	292	11.8	71	2	215	16.12	0-10	0	0
1	74	113	16.8	32	8	300	6.79	0-10	0.26	0.04
2	72	175	21.1	41	14	364	14.73	0-10	0.96	0.20
3	70	239	25.1	48	22	201	27.45	0-10	1.54	0.51
4	68	266	26.9	50	23	194	37.19	10	1.43	0.61
5	66	291	28.4	53	41	192	41.70	10-30	0.77	0.83
6	64	312	30.0	54	79	180	48.49	10-30	1.00	1.51
7	59	323	31.6	55	92	162	48.81	10-30	1.44	2.86
8	55	329	33.1	55	101	149	49.93	30-50	1.04	3.19
9	51	332	34.6	55	97	131	46.93	30-50	0.65	3.42
10	47	334	36.0	55	100	122	45.55	30-50	0.20	3.29

Table J6.2 - Treatment Mixed Conifer 100 Trees/Acre - Stand 75

Decade	Trees/Ac.	Basal Area	QMD	Canopy Closure (%)	Cu.ft. Mort./ Decade	Cu.ft Growth Decade	>24" Trees/Ac.	>36" % Trees/Ac.	Snags 16-24"	Snags >24"
0	382	292	11.8	71	7	323	16.12	0-10	0	0
1	97	210	19.9	48	31	354	30.31	0-10	0.34	0.39
2	92	269	23.2	53	36	178	31.00	10	1.63	1.18
3	87	291	24.7	55	67	176	34.72	10-30	1.13	1.07
4	80	304	26.4	56	86	166	34.41	10-30	2.43	1081
5	73	312	28.0	56	101	157	35.43	10-30	3.20	2.32
6	66	316	29.5	56	108	144	36.05	10-30	2.80	2.84
7	61	316	30.9	55	101	137	35.32	30-50	2.53	2.86
8	56	317	32.2	55	93	126	34.97	30-50	1.85	2.53
9	52	318	33.4	55	100	127	35.20	30-50	1.47	2.24
10	48	318	34.7	55	92	124	37.11	30-50	1.20	2.52

Table J6.3 - Treatment Mixed Conifer 125 Trees/Acre - Stand 75

Decade	Trees/Ac.	Basal Area	QMD	Canopy Closure (%)	Cu.ft. Mort./ Decade	Cu.ft Growth Decade	>24" Trees/Ac.	>36" % Trees/Ac.	Snags 16-24"	Snags >24"
0	382	292	11.8	71	23	387	16.12	0-10	0	0
1	116	254	20.0	55	44	211	29.59	0-10	5.45	0.80
2	107	279	21.8	56	75	199	30.40	0-10	4.89	0.95
3	96	293	23.6	57	92	194	39.29	0-10	5.42	2.42
4	86	302	25.4	57	101	187	41.07	10	4.38	3.21
5	77	308	27.1	57	111	179	44.95	10-30	2.79	3.90
6	69	313	28.8	56	122	165	41.80	10-30	1.76	3.71
7	62	313	30.4	56	101	142	40.16	10-30	0.75	3.86
8	57	315	31.8	55	94	132	38.67	30-50	0.31	2.91
9	53	317	33.1	55	99	128	37.43	30-50	0.23	2.43
10	49	318	34.4	55	90	127	35.56	30-50	0.06	2.53

Stand 138: 84% red fir, 16% other conifer

Table J7.0 - No Treatment Red Fir - Stand 138										
Decade	**Trees/Ac.**	**Basal Area**	**QMD**	**Canopy Closure (%)**	**Cu.ft. Mort./ Decade**	**Cu.ft Growth Decade**	**>24" Trees/Ac.**	**>36" % Trees/Ac.**	**Snags 16-24"**	**Snags >24"**
0	343	260	11.8	56	31	253	7.77	0-10	0	0
1	309	309	13.5	57	51	279	9.23	0-10	2.44	0.05
2	275	349	15.2	57	57	282	18.46	0-10	4.12	0.28
3	249	384	16.8	57	69	295	30.18	0-10	4.59	0.56
4	226	416	18.4	57	78	296	41.29	0-10	5.32	1.07
5	206	446	19.9	57	90	301	51.73	0-10	4.36	1.71
6	189	473	21.4	57	96	303	61.10	0-10	4.27	2.39
7	173	500	23.0	57	132	283	63.62	0-10	4.30	2.44
8	157	517	24.6	56	144	276	62.51	0-10	5.89	3.31
9	142	531	26.2	56	139	246	67.60	10	4.92	3.86
10	130	544	27.7	55	135	215	66.22	10-30	4.02	3.67

Table J7.2 - Treatment Red Fir 150 Trees/Acre - Stand 138										
Decade	**Trees/Ac.**	**Basal Area**	**QMD**	**Canopy Closure (%)**	**Cu.ft. Mort./ Decade**	**Cu.ft Growth Decade**	**>24" Trees/Ac.**	**>36" % Trees/Ac.**	**Snags 16-24"**	**Snags >24"**
0	343	260	11.8	56	5	395	7.77	0-10	0	0
1	148	308	19.5	46	81	443	17.43	0-10	0.72	0.06
2	129	374	23.1	48	152	441	43.35	0-10	11.98	2.38
3	108	416	26.6	48	125	227	59.93	0-10	12.73	6.92
4	97	425	28.4	47	132	197	59.60	10	6.45	5.04
5	86	428	30.2	45	146	176	56.95	10-30	5.72	4.69
6	77	428	32.0	44	158	169	57.03	10-30	3.77	5.55
7	68	425	33.8	43	128	156	56.56	30	2.41	6.44
8	62	427	35.6	42	113	134	53.83	30-50	1.42	4.88
9	57	431	37.3	41	104	133	49.98	50	0.99	3.85
10	53	437	39.0	41	92	119	49.15	50-70	0.37	3.55

Table J7.3 - Treatment Red Fir 175 Trees/Acre - Stand 138

Decade	Trees/Ac.	Basal Area	QMD	Canopy Closure (%)	Cu.ft. Mort./ Decade	Cu.ft Growth Decade	>24" Trees/Ac.	>36" % Trees/Ac.	Snags 16-24"	Snags >24"
0	343	260	11.8	56	22	396	7.77	0-10	0	0
1	164	311	18.6	47	90	453	17.28	0-10	3.02	0.22
2	140	377	22.2	49	91	252	41.77	0-10	9.76	2.57
3	126	396	24.0	48	106	240	55.79	0-10	7.58	3.33
4	113	411	25.8	47	114	218	56.89	10	6.87	3.80
5	101	421	27.6	47	121	200	54.53	10-30	6.11	3.91
6	91	429	29.4	46	136	191	50.88	10-30	5.12	3.65
7	81	433	31.3	45	159	174	52.38	10-30	4.73	4.43
8	72	431	33.2	43	146	156	51.96	10-30	3.36	5.29
9	64	430	35.0	42	125	146	49.91	30-50	2.68	4.92
10	59	432	36.8	41	109	139	48.83	50	1.56	4.05

Table J7.2 - Treatment Red Fir 200 Trees/Acre - Stand 138

Decade	Trees/Ac.	Basal Area	QMD	Canopy Closure (%)	Cu.ft. Mort./ Decade	Cu.ft Growth Decade	>24" Trees/Ac.	>36" % Trees/Ac.	Snags 16-24"	Snags >24"
0	343	260	11.8	56	38	408	7.77	0-10	0	0
1	179	318	18.0	49	57	263	18.58	0-10	6.42	0.43
2	162	350	19.9	49	87	268	27.90	0-10	5.80	0.63
3	144	374	21.8	49	91	253	45.66	0-10	6.67	2.30
4	129	393	23.6	48	109	252	56.83	0-10	7.07	3.21
5	115	409	25.5	48	120	237	53.50	0-10	6.53	3.33
6	103	421	27.3	47	129	217	56.82	0-10	5.54	4.03
7	93	429	29.2	46	140	188	54.69	10-30	4.01	4.04
8	83	432	30.9	45	154	186	55.88	10-30	3.41	4.70
9	74	434	32.8	44	168	166	53.68	30	2.85	5.17
10	65	431	34.8	42	135	150	52.31	30-50	2.49	5.69

Interpretations:

Mixed conifer:

- Acceleration of the development of late-successional size characteristics: Treatment will accelerate development by approximately 30-50 years. Late-successional characteristics on high site quality ground could be achieved around age 180-240 with no treatment and 130-190 with treatment. Analysis of the modeling data shows that the no treatment option will begin to have some late-successional characteristics later than most of the treatment options. One of the primary differences is the large number of smaller diameter material still present in the no treatment option and the high mortality rates associated with the number of trees present per acre.
- Site occupancy - rapid growth decline noted: Stands begin to slow in growth and becoming more decadent near the 6th decade in both treated and non-treated stands.

Decadence will be become prevalent in the treated stands after they reach late-successional size characteristics. In the case of the non-treated stands, it may become prevalent prior to them reaching late-successional size characteristics.

- Mortality levels: Mortality levels are lower in the treated option. They would also be confined to the larger size class material. The no treatment option would have very high levels of mortality in the smaller size class material during the early decades.
- Fuel loading and associated risk to fire disturbances: Fuel loading and associated fire risks are lessened in the early decades for the treatment options. Over the analysis period fuels are reduced by 25-30% in the treatment options. The no treatment option will put mid-successional stands at risk in the future with the high fuel loading that will be created through natural mortality. Thinning will reduce this risk, but both treatments will require future risk reduction activities. It will be easier to conduct prescribed fire in the thinned area because of lower fuel loading and the size of trees will be more resistant to burning. Medium size snags (16-24") in the no treatment option create levels that will put stands at risk to a stand replacing event.

Red fir:

- Acceleration of the development of late-successional size characteristics: Treatment will accelerate development by approximately 40 years. Late-successional characteristics on high site quality ground could be achieved around age 200-210 with no treatment and 160-170 with treatment. Analysis of the modeling data shows that the no treatment option will begin to have some late-successional characteristics around age 210-220. Larger tree development will be present in numbers equal to those found in the treatment option at age 200-210. The primary difference is the large number of smaller diameter material still present in the no treatment option and the high mortality rates associated with the number of trees present per acre.
- Site occupancy - rapid growth decline noted: Site occupancy, reduction in growth, occurs during about the 6th decade for treatment options and about the 4th decade for no treatment. Decadence will begin when the treatment and no treatment options are in late seral conditions.
- Mortality levels: Mortality levels are reduced in the thinning options. In all options mortality continues to increase during most of the analysis period.

General Conclusions on Accelerated Growth Responses

The following identifies approximations as to when the different modeled stand conditions will achieve late-successional size characteristics with a treatment option and a no treatment option. Assumptions are made that treatments will be made during the period of 2000-2010.

The years listed in the table represent the potential year the modeled stands would reach late-successional size characteristics. The determination is based when stand quadratic mean diameter reaches at least 24". The range represent the differences that would occur based on various site conditions. The shortest range is the modeled stand, which represent high site quality, and the longer range represents conditions representative of poorer site quality.

For the mid-successional stands, the modeled stand represents an average of all the sampled stands. When looking at the LSRs at this scale an assumption can be made that half of the stands have the potential to reach late-successional characteristics in a quicker time frame while the other half may take longer to develop. The assumption can then be made that approximately half of the mid-successional acres in a particular LSR would be in late-successional conditions during years displayed in the table.

Table J14. Time Frames for Late-Successional Development

Type of tree stand	Treatment - Av. Yrs.	No Treatment - Av. Yrs.
Plantations	2060 - 2070	2090+
Mid-successional - MC	2020 - 2030	2060 - 2070
Mid-successional - RF	2030	2070

An important attribute to assess is when stand conditions move through various successional stages. Although the processes that created the current late-successional and old-growth ecosystems are not completely understood, they include: (1) tree growth and maturation, (2) death and decay of large trees, (3) low-to-moderate intensity disturbances (e.g., fire, wind, insects, and diseases) that create canopy opening or gaps in the various strata of vegetation, (4) establishment of trees beneath the maturing overstory trees either in gaps or under the canopy, and (5) closing of canopy gaps by lateral canopy growth or growth of understory trees (USDA and others, 1994). There are three distinct stages that characterize late-successional/old-growth conditions. They include the maturation stage, transition stage, and shifting-gap stage. The shifting-gap stage was not reached in the time frames used in this modeling analysis.

Appendix K
Scientific Names of Organisms discussed in this document

Vegetation

Common Name	Scientific Name
ponderosa pine	*Pinus ponderosa*
Douglas-fir	*Pseudotsuga menziesii*
incense cedar	*Calocedrus decurrens*
sugar pine	*Pinus lambertiana*
California black oak	*Quercus kelloggii*
canyon live oak	*Quercus chrysolepis*
mountain whitethorn	*Ceanothus cordulatus*
white fir	*Abies concolor*
Jeffrey pine	*Pinus jeffreyi*
pinemat manzanita	*Arctostaphylos nevadensis*
squaw carpet	*Ceanothus prostratus*
huckleberry oak	*Quercus vaccinifolia*
red fir	*Abies magnifica*
brewer spruce	*Picea breweriana*
greenleaf manzanita	*Arctostaphylos patula*
huckleberry oak	*Quercus vaccinifolia*
sadler oak	*Quercus sadleriana*
snowbrush	*Ceanothus velutinus*
Shasta red fir	*Abies magnifica* var. *shastensis*
western white pine	*Pinus monticola*
tanoak	*Lithcoarpus densiflorus*
Pacific madrone	*Arbutus menziesii*
Port-Orford cedar	*Chamaecyparis lawsoniana*
giant chinquapin	*Castanopsis chrysophylla*
rhododendron	*Rhododendron macrophyllum*
salal	*Gaultheria shallon*
huckleberry App	*Vaccinium ovatum*
hazelnut	*Corylus cornuta*
deerbrush	*Ceanothus integerrimus*
big-leaf maple	*Acer macrophyllum*
oceanspray	*Holodiscus discolor*
creeping snowberry	*Symphoricarpus mollis*
pacific dogwood	*Cornus nuttallii*
shrub interior live oak	*Quercus wislizenii* var. *frutescens*
birchleaf mountain mahogany	*Cercocarpus betuloides*
redbud	*Cercis occidentalis*
poison oak	*Toxicodendron diversiloba*
hariy honeysuckle	*Lonicera hispidula*

Common Name	Scientific Name
wedgeleaf ceanothus	*Ceanothus cuneatus*
whiteleaf manzanita	*Arctostaphylos viscida*
gray pine	*Pinus sabiniana*

Insects and Disease

Common Name	Scientific Name
fir engraver beetle	*Scolytus ventralis*
western pine beetle	*Dentroctonus brevicomis*
pine engraver beetle	*Ips paraconfuscus*
Dwarf mistletoe	*Arceuthobium* spp.
Cytospora canker	*Cytospora abietis*
Annosum root disease	*Heterobasidion annosum*
Armillaria root disease	*Armillaria* spp.
Black Stain root disease	*Leptographium wageneri*
White pine blister rust	*Cronartium ribicola*
Port-Orford-Cedar fungus	*Phytophthora lateralis*

Vertebrates - Fish Species

Common Name	Scientific Name
Chinook salmon	*Oncorhynchus tshawytscha*
Coho salmon	*Oncorhynchus kisutch*
Steelhead[1]	*Oncorhynchus mykiss gairdneri*
Rainbow trout	*Oncorhynchus mykiss*
Eastern brook trout[2]	*Salvelinus fontinalis*
Brown trout[2]	*Salmo trutta*
Golden trout	*Salmo aguabonita*
Cutthroat trout	*Salmo clarkii*
Artic grayling[2]	*Thymallus arcticus*
Green sturgeon	*Acipenser medirostris*
White sturgeon	*Acipenser transmontanus*
Eulachon	*Thaleicthys pacificus*
Pacific lamprey	*Lampetra tridentata*
Pit-Klamath brook lamprey	*Lampetra lethophaga*
American shad[2]	*Alosa sapidissima*
Brown bullhead[2]	*Ictalurus nebulosus*
Yellow perch[2]	*Perca flavescens*
Largemouth bass[2]	*Micropterus salmoides*
Green sunfish[2]	*Lepomis cyanellus*
Pumpkinseed[2]	*Lepomis gibbosus*
Klamath largescale sucker	*Catostomus snyderi*
Klamath smalescale sucker	*Catostomus rimiculus*

Common Name	Scientific Name
Marbled sculpin	*Cottus klamathensis*
Klamath tuichub	*Siphoteles bicolor bicolor*
Golden shiner[2]	*Notemigonus crysoleucas*
Speckled dace	*Rhinichthys osculus*
Threespine stickleback	*Gasterosteus aculeatus*

1 Includes spring-, fall- and winter run steelhead
2 Denotes non-native fish species

Vertebrates - Amphibians

Common Name	Scientific Name
Del Norte salamander	*Plethodon elongatus*
Siskiyou Mountains salamander	*Plethodon stormi*

Vertebrates - Mammals

Common Name	Scientific Name
American marten	*Martes americana*
fringed myotis	*Myotis thysanodes*
long-eared myotis	*Myotis evotis*
long-legged myotis	*Myotis volans*
pacific fisher	*Martes pennanti*
pallid bat	*Antrozous pallidus*
silver-haired bat	*Lasionycteris noctivagans*

Birds

Common Name	Scientific Name
great gray owl	*Strix nebulosa*
marbled murrelet	*Brachyramphus marmoratus*
northern goshawk	*Accipiter gentilis*
northern spotted owl	*Strix occidentalis caurina*

Appendix L
Definitions

Activity fuels: Fuels resulting from or altered by forestry practices such as timber harvesting, thinning, etc., as opposed to naturally created fuels.

Anadromous fish: Fish that spawn, hatch, and rear in freshwater; move to the ocean to grow and mature, and return to freshwater to reproduce. Salmon, steelhead, lamprey and shad are examples.

Aspect: The direction a slope is facing (e.g., north, east, south, or west).

Associated species: A species found to be numerically more abundant in a particular forest successional stage or type compared to other areas.

Bark beetles: A group of beetles that can kill live trees by boring galleries in the inner bark, thereby girdling them.

Basal area: The area of the cross section of a tree stem including the bark, near its base, generally at breast height, or 4.5 feet above the ground.

Biological diversity: The variety of life forms and processes, including a complexity of species, communities, gene pools, and ecological functions.

Blowdown: Trees felled by high winds.

Burn window: The seasonal period available for conducting a burn within prescription.

Cambium: The layer of tissue between the bark and wood in a tree or shrub. New bark and wood originate from this layer.

Canopy: A layer of foliage in a forest stand. This most often refers to the uppermost layer of foliage, but it can be used to describe lower layers in a multistoried stand.

Canopy closure: The degree to which the canopy (forest layers above one's head) blocks sunlight or obscures the sky. It can only be accurately determined from measurements taken under the canopy as openings in the branches and crowns must be accounted for.

Channel erosion: Rearrangement and transport of material from the banks and streamsides of a defined stream or river channel.

Checkerboard ownership: A land ownership pattern in which every other section (square mile) is in federal ownership as a result of federal land grants to early western railroad companies.

Class I area: Zone where air quality is expected to be pristine or void of impairments of visibility from human-caused pollution (e.g., National Parks and Wilderness).

Coarse woody debris: Snags, fallen trees, and decaying logs and large limbs distributed across the forest floor that are larger than 4 inches in diameter.

Controlled burn (or fire): The planned application of a fire to forest or rangeland fuels with the intent to confine it to a predetermined area.

Crown fire: A fire that advances through the canopy of a forest.

Debris flow: A rapid moving mass of rock fragments, soil, and mud, with more than half of the particles being larger than sand size.

Debris slide: A slow to rapid slide, involving downslope translation of relatively dry and predominantly unconsolidated materials, with more than half of the particles being larger than sand size.

Debris torrent: Rapid movement of a large quantity of materials (wood and sediment) down a stream channel during storms or floods. This generally occurs in smaller streams and results in scouring of streambed.

Decommission: To remove those elements of a road that reroute hillslope drainage and present slope stability hazards. Another term for this is "hydrologic obliteration."

Dependent crown fire: A crown fire that depends on a surface fire to sustain itself.

Dwarf mistletoe: Parasitic plant which infects certain conifers, often causing characteristic "witches' brooms" and reducing growth.

Ecosystem: A unit comprising interacting organisms considered together with their environment (e.g., marsh, watershed, and lake ecosystems).

Engraver beetles: Small species of bark beetles that carve characteristic galleries in the inner bark of mostly weakened, injured, dying, or recently killed trees.

Fine fuels: Fuels that ignite readily and are consumed rapidly by fire (e.g., cured grass, fallen leaves, needles, small twigs less than 1/4 inch in diameter).

Fuelbreaks: Generally wide (60-1,000 feet) strips of land on which native vegetation has been permanently modified so that fires burning into them can be more readily controlled.

Fire hazard: A fuel complex, defined by volume, type, condition, arrangement, and location, that determines the degree of ease of ignition and of resistance to control. "Resistance to control" is related both to fire behavior and resistance to line construction.

Fire return interval: The average time between wildfires in a given ecosystem.

Fire Risk: The chance of fire starting, as affected by the nature and incidence of causative agents.

Fire Severity: A qualitative term used to describe the relative effect of fire on an ecosystem, especially the degree of organic matter consumption and soil heating. Thus, fires are commonly classed as low, moderate, and high severity. Fire severity may or may not be closely related to fireline intensity.

Fuel break: Any natural or constructed barrier utilized to segregate, stop, and control the spread of fire or to provide a control line from which to work.

Fuel ladder: A vertical continuity in fuel between the ground and crown of a forest stand.

Habitat type: A distinct assemblage of plants and animals occupying a given area that can be distinguished from surrounding areas on the basis of certain identifiable characteristics, including environmental conditions.

Hazard: (in fuels management) The existence of a fuel complex that constitutes a threat of wildfire ignition, unacceptable fire behavior and severity, or suppression difficulty.

Independent crown fire: A fire that advances only in the crown fuel layer or canopy of a forest.

Intermittent stream: Any nonpermanent flowing drainage feature having a definable channel and evidence of scour or deposition. This includes what are sometimes referred to as ephemeral streams if they meet these two criteria.

Juvenile: For spotted owls, a juvenile is normally considered to be any bird that is less than 1 year old. For the anadromous salmonids, a juvenile is generally considered any fish that has not spent time in salt water and is not sexually reproductive.

Mining claims: Portions of public lands claimed for possession of locatable mineral deposits, by locating and recording under established rules and pursuant to the 1872 Mining Law.

Mortality (in a stand): The number or volume of trees that died because of fire, insects, disease, climatic factors, or competition from other trees or vegetation.

Old-growth forest: Forest ecosystem that has developed over along period essentially free of catastrophic (including humans) disturbance. In the Pacific Northwest, an old-growth forest generally ranges in age from 200 to 750 years or more and contains the following structural features: 1) large, live old-growth trees, 2) snags, and 3) large logs on the forest floor and in streams.

Perennial stream: A stream that typically has running water on a year-round basis.

Prescribed burn: The controlled application of fire to wildland fuels in either their natural or modified state, under such conditions of weather, fuel moisture, soil moisture, etc. as allow the fire to be confined to a predetermined area and at the same time to produce the intensity of heat and rate of spread required to further certain planned objectives.

Riparian zone: The zone of vegetation growing adjacent or in close proximity to a watercourse, lake, swamp or spring. The plants are often dependent on roots reaching the water table.

Salmonid: A member of the fish family Salmonidae. In the Pacific Northwest, typically refers to salmon, steelhead, rainbow and cutthroat trout.

Sedimentation: The accumulation of soil in stream channels, estuaries, and lake bottoms as a result of upland erosion.

Successional stage: A distinct but transitory community in the process of plant succession.

Silviculture: The science and practice of controlling the establishment, composition, and growth of the vegetation of forest stands. It includes the control or production of stand structures such as snags and down logs, in addition to live vegetation.

Stand: A recognizable area of the forest that is relatively homogeneous and can be managed as a single unit.

Surface erosion: The loss of upper layers of the soil profile due to the action of wind, water, or gravity.

Underburning: Prescribed burning with a low fireline intensity fire under a timber canopy.

Values-at-risk: Any or all natural resources, improvements, or other values which may be jeopardized if a fire occurs.

Key sources of definitions for above:

Walstad JD, SR Radosevich, DV Sandberg. 1990. Natural and Prescribed Fire in Pacific Northwest Forests. Oregon University Press, Corvallis, OR.

and

USDA Forest Service, USDI USFWS, USDC National Oceanic and Atmospheric Administration National Marine Fisheries Service, USDI National Park Service, USDI BLM, Environmental Protection Agency. 1993. Forest ecosystem management: an ecological, economic, and social assessment. Report of the ecosystem management assessment team. USDA Forest Service.

Appendix M
List of Reviewers and Contributors

Patti Aberg - Shasta-Trinity NF, GIS

Jane Bardolf - Shasta-Trinity NF, South Fork Management Unit, Wildlife Biologist

Michael Bornstein - U.S. Fish & Wildlife Service, Wildlife Biologist

Bill Branham - Shasta-Trinity NF, Shasta/McCloud Management Unit, Silviculturist

Gary Chase - Shasta-Trinity NF, Publisher, Technical Assistant & Web Conversion

Kristy Cottini - Shasta-Trinity NF, National Recreation Area Unit, District Ranger

Paula Crumpton - Shasta-Trinity NF, Forest Wildlife Biologist

Dale Etter - Shasta-Trinity NF, Shasta/McCloud Management Unit, Fuels Specialist

Jan Fox - Shasta-Trinity NF, GIS

Sam Frink - Shasta-Trinity NF, Trinity River Unit, Resource Planner

Bob Hammond - Shasta-Trinity NF, Shasta/McCloud Management Unit, District Ranger

Jim Harvey - Shasta-Trinity NF, Ecosystem Management Officer

Keith Hughes - Bureau of Land Management, Redding Resource Area

Nancy Hutchins - Shasta-Trinity NF, National Recreation Area Unit, Wildlife Biologist

Francis Mangels - Shasta-Trinity NF, Shasta/McCloud Management Unit, Wildlife Biologist

Dusty Miller - Shasta-Trinity NF, Shasta/McCloud Management Unit, Resource Planner

Shawne Mohoric - U.S. Forest Service, Regional Ecosystem Office

Tom Quinn - Shasta-Trinity NF, Trinity River Management Unit, Wildlife Biologist

Joe Rogaski - Shasta-Trinity NF, Trinity River Management Unit, Resource Planning Officer

Dave Schultz - Shasta-Trinity NF, Zoned Entomologist

Debbie Selby - Shasta-Trinity NF, Shasta/McCloud Management Unit, Wildlife Biologist

Roger Siemers - Klamath National Forest, Goosenest Ranger District, Silviculturist