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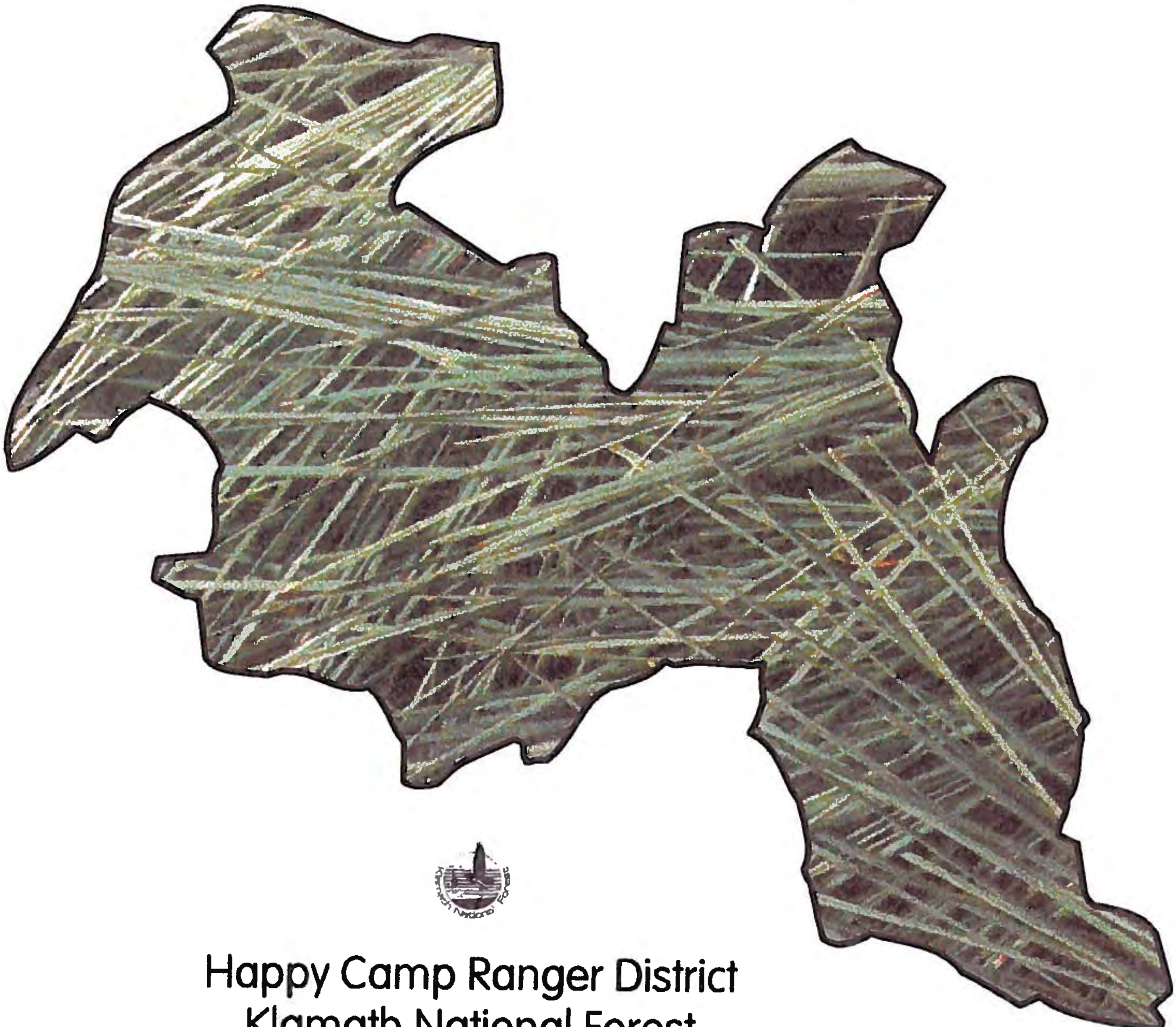
Forest Service

Pacific Southwest Region



Happy Camp Ranger District
Klamath National Forest
1996

Dillon LSR Assessment

LATE-SUCCESSIONAL RESERVE ASSESSMENT
DILLON CREEK LSR, RC-350
KLAMATH NATIONAL FOREST

INTRODUCTION

Late-Successional Reserves (LSR) and their accompanying management standards and guidelines were established in 1994 as a result of 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). This network of reserves is intended to provide old-growth forest habitat for populations of species associated with late-successional forests and to ensure the conservation and diversity of late-successional species. This direction was incorporated into the Klamath National Forest's Land and Resource Management Plan (LRMP) in 1995. The standards and guidelines for management of the LSR are detailed in the Klamath LRMP in several sections including Forest-wide standards and guidelines and Management Area 5 direction.

Late-successional forests include mature and old-growth size/age classes. The structure and composition of these stands vary by forest type, site capability, and disturbance history. Typically, stands include live old-growth trees, standing dead trees (snags), and fallen trees or logs. In Douglas-fir forests, other features include multiple canopy layers with smaller understory trees. In pine dominated forests, stands are more open with relatively fewer snags or logs. Depending upon site productivity and climate, these characteristics may develop in a stand by 80 years of age or may take over 140 years before characteristics are apparent.

The objective of LSRs is to protect and enhance conditions of late-successional and old-growth forest ecosystems that serve as habitat for late-successional and old-growth forest related species, including the northern spotted owl (ROD). 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 has been noted as being in an area of elevated risk to large-scale disturbance due to changes in the characteristics and distribution of mixed-conifer forests resulting from past fire suppression (Skinner 1995). Risk reduction efforts are encouraged where they are consistent with the overall recommendations in management guidelines.

Prior to the design and implementation of activities within an LSR, a management assessment must be prepared. The purpose is to provide information to decision makers who will manage for LSR goals and objectives. The assessment should cover the following: an inventory of vegetative conditions, a list of associated wildlife species, a history and description of current land uses, a fire management plan, criteria for developing appropriate treatments, identification of treatment areas, a proposed implementation schedule, and proposed monitoring and evaluation components.

This document records the assessment process completed for the Dillon LSR, RC-350. The LSR includes areas that have been affected by seven major fires over the last 80 years. The role of fire is considered a critical management issue and the development of strategies that reduce risks of large scale disturbances while maintaining and promoting late-successional forest conditions is a primary emphasis of this assessment.

DESCRIPTION

The Dillon LSR is located within the Dillon and Swillup Creek watersheds. The area is approximately 20 miles southwest of Happy Camp in western Siskiyou County, California (Figure 1). The LSR is approximately 14,546 acres and forms one contiguous parcel. It includes portions of the North Fork of Dillon Creek and Jackass Creek drainages in the western portion of the LSR and portions of the Swillup Creek, Aubrey Creek and Elliott Creek drainages in the eastern portion of the designated area. Nearly 63% of the area is currently classified as late mature and old-growth vegetation. There are 2,892 acres of riparian reserve within the LSR. Much of the water flow within the drainages is through narrow canyons with steep walls and narrow gorges. Overall the terrain is extremely rugged and mountainous. Approximately 65% of the LSR was affected by recent fires. In response to these events, a watershed analysis was completed in July of 1995 for the Dillon watershed.

Dillon LSR is within the Klamath Province. The Klamath Province boundaries are roughly from Weaverville, California to Roseburg, Oregon on the north/south gradient and from Weaverville to Willow Creek, California on the east/west gradient (Figure 2). The geologic and topographic complexity of the Klamath Province contributes to a vast array of soils for plant speciation and community development. Overall diversity of soil types can be considered a good baseline index of potential habitat diversity. The Klamath Province is diverse in topography, forest types, and plant and animal communities.

HISTORY OF RESOURCE MANAGEMENT AND NATURAL PROCESSES

LAND OWNERSHIP

The entire land base in the Dillon LSR is managed by the U.S. Forest Service. No private land exists within the LSR boundary.

LAND MANAGEMENT ACTIVITIES

The development of a transportation system to the Dillon LSR area began between 1944 and 1955, when the road to Pony Peak was constructed. Presently, there are 9.9 miles of road within the LSR boundaries. The road density is 2.3 miles per square mile. Initial entry to the area for timber harvest began in 1963. Timber access into the north end of the LSR occurred as an extension of the Bear Peak Road (15N19) into Vann Creek, and extended further into Lick Creek in 1980. A total of 321 acres or 2% of the Dillon LSR has been harvested in the past.

FIRE MANAGEMENT AND HISTORY OF LARGE FIRES

American Indians used fire to influence watersheds on the Klamath for possibly several thousand years. Until the early part of the century, they ignited fires to enhance values that were important to their culture. Subsequently, early American settlers to this area used fire to improve grazing, to expose rock and soil for mining, and to improve travel routes (Wills, Stuart, 1994).

At the time of establishment of the Klamath National Forest in 1905, uncontrolled fires were thought to be detrimental to the growth and management of the timber reserves. Due to personnel shortages and conflicts with local interests, fires during the first two decades were often allowed to burn. After 1920, attempts were made to suppress all fires. Suppression forces grew in size and enhanced their ability to aggressively enforce fire prevention policies. By the 1940's, suppression efforts were quite effective. It is believed that the majority of fires between the 1920's and present time, have been lightning caused occurrences. In spite of fire suppression efforts, records indicate that seven fires greater than 100 acres

Figure 1. Base map of the Dillon LSR, Happy Camp Ranger District, Klamath National Forest.

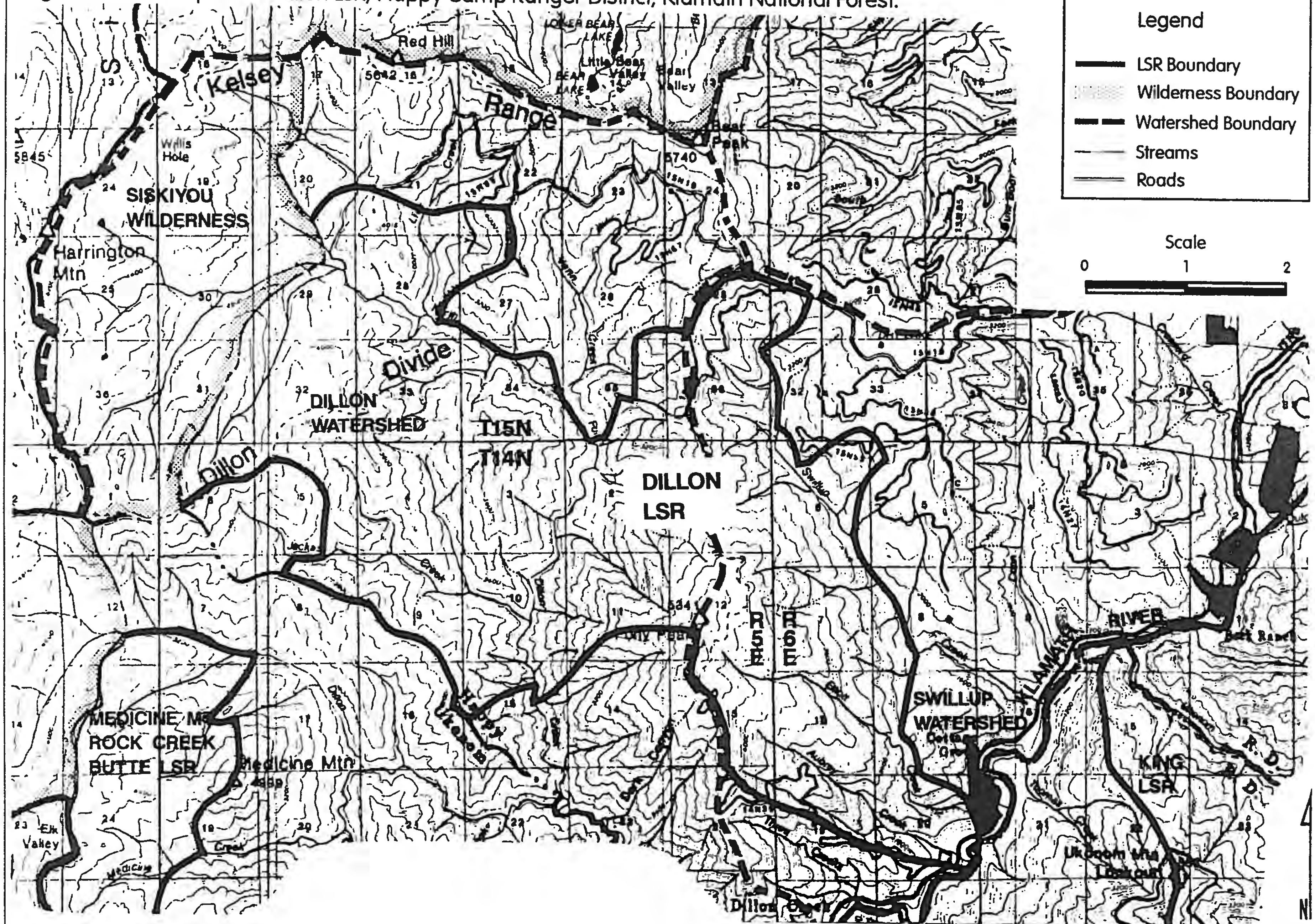
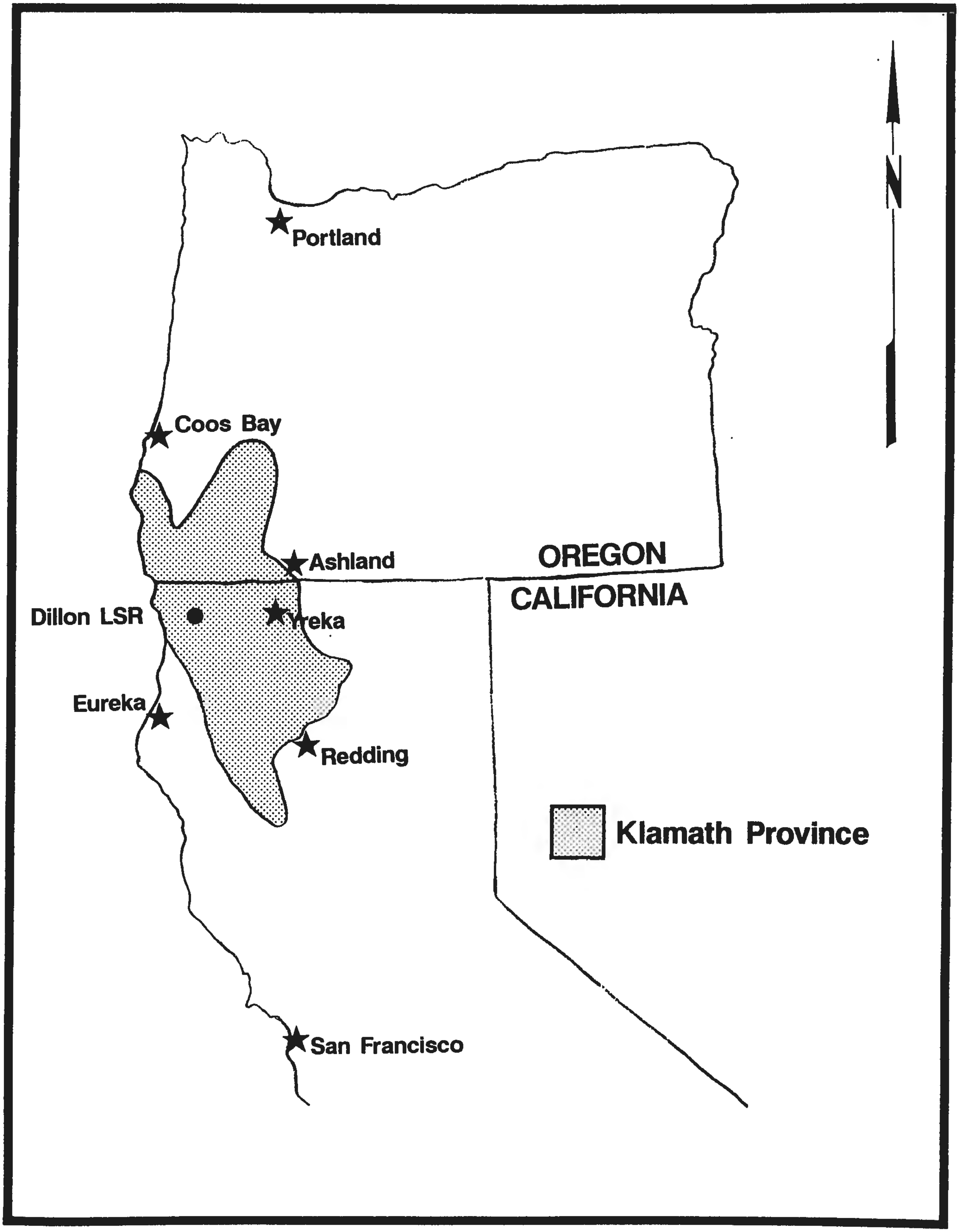


Figure 2. The location of the Dillon LSR within the Klamath province.



occurred within the Dillon LSR between 1917 and 1995. The most recent incidents were the Dillon (1994) and Pony (1995) fires, which burned approximately 9,843 acres of the LSR. Figure 3 illustrates the location, distribution, and dates of large fires within the Dillon LSR since 1917.

HISTORICAL FIRE REGIME

Prior to 1920, the overall historical fire regime was one of generally frequent, low to moderate severity surface fires with occasional higher intensity stand replacement fires. Large scale stand replacement events were uncommon. Fires tended to burn for long periods, weeks to months, and burned through landscapes of complex topography, diverse vegetation and previously disturbed areas. The varying fire severity resulted in a patchy but mostly forest covered landscape. The frequent and low to moderate intensity fires served as a selective stocking control mechanism by reducing vegetation density. This regime favored vegetation best adapted to these fire conditions, reducing stand density and allowing the growth of healthy, scattered large diameter conifers.

Specific fire regimes can also be identified by their association with elevation, aspect, and vegetation types (see Dillon Watershed Analysis, July 1995). Although many factors influence fire regimes, the strongest trends correlate with elevation. In general, lower elevation sites burn more frequently than upper elevation sites, south tending aspects more frequently than north tending aspects, and vegetation types that rapidly produce flammable fuels more frequently than those with lower production and/or less flammable fuels. An exception occurs where stand replacement fires were common in vegetation types such as knobcone pine and montane chapparal.

VEGETATIVE REFERENCE CONDITION

Aerial photos from 1944, our earliest available photo data, were used to interpret vegetative conditions in the LSR prior to extensive fire suppression efforts. Vegetation conditions from the 1944 photos have not been mapped or quantified. The 1944 photos represent only one point in time and conditions observed at that time are influenced by climate as well as fire and other factors. The following interpretations and generalizations were drawn to illustrate trends likely to influence this LSR.

Many of the south facing slopes showed low conifer densities and were dominated by hardwoods or brush.

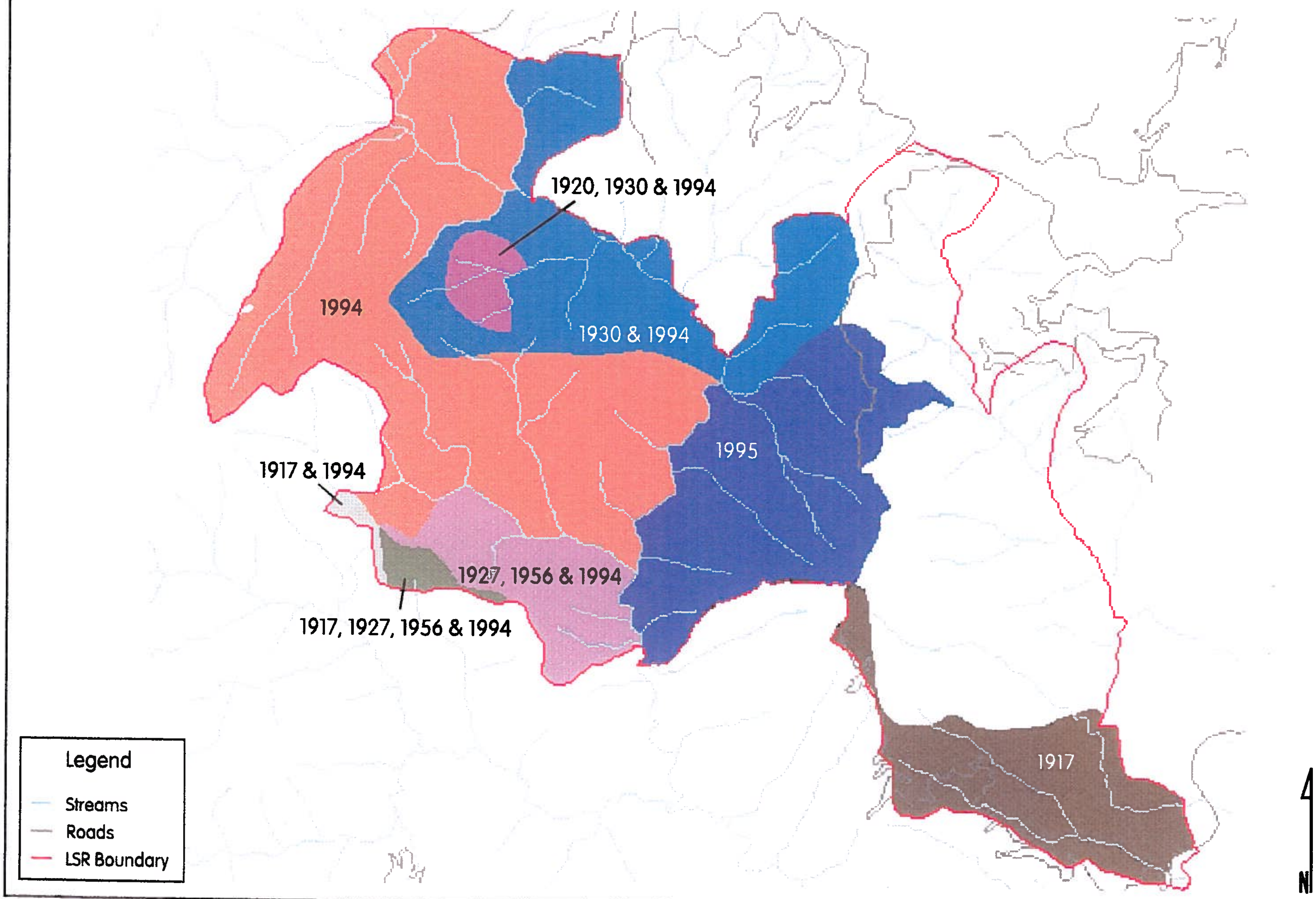
North tending slopes varied from fairly uniform, dense stands of conifers and hardwoods to patchy openings which became larger toward the ridgetops.

Lower slopes tended to have fewer large openings and more uniform conifer distributions. These patterns resulted from a warm, dry environment, topographic formation, and differences in fuel production and flammability.

The moister, productive sites on lower to mid-slope positions supported Douglas-fir in association with tan oak. Tan oak is shade tolerant, produces fuel slowly, is not particularly flammable, and has a dense canopy that shades ground fuel.

The lower slope position moderates fuel moistures through air subsidence, topographic shading, and proximity to perennial streams. These factors tended to moderate fire intensity and resulted in a fine scale mosaic of smaller patches where occasionally one to several large overstory trees would be killed. There were a few larger patches where, whether due to fuel accumulations or topographically induced, fire runs were of increased fire severity. These larger patches were observed on the 1944 photos as an exception to a generally fine mosaic on the lower slopes.

Figure 3. The location, distribution and dates of large fires within the Dillon LSR since 1917.



The warmer and drier productive upslope positions and drier aspects were more conducive to fire spread and higher intensities. Douglas-fir with associated sugar pine, ponderosa pine, black oak, and madrone rapidly produces fuel. Stands were generally more open than the tan oak sites and although fire frequencies are similar, the patch sizes are larger and more common than in the tan oak areas. The upper slope positions, particularly on lower elevation minor ridges, would have contributed to higher fire intensities from uphill running fires.

The least productive sites are dominated by canyon live oak (Montane Hardwood). These sites accumulated fuels slowly and fire intensities were low.

Higher elevation conifer stands were generally denser and composed of larger patches of uniform aged conifer stands than stands at lower elevations. Patches were often large, to several hundred acres. Brushfields were also large, often prevalent on the upper slopes and ridgetops, and most common on south slopes.

Extensive brushfields occurred on upper slopes, south aspects and harsher sites in Dillon Creek.

The west side of the Klamath National Forest was hit by a dry lightning storm during the night of July 20 and morning of July 21, 1994. Happy Camp and Ukonom Districts were faced with approximately 30 individual fires, 15 of those in the Dillon watershed. Most of these fires were in the steep, inaccessible terrain of the North Fork of Dillon and Jackass Creeks. Most of the fires burned together into one large fire area affecting most of the Dillon watershed portion of the LSR. The fire was contained in early August and continued to burn within the perimeter until early November.

A human-caused fire started in the Pony Peak area of the Dillon drainage on August 1, 1995. The fire grew quickly in size, fanned by strong afternoon winds, consuming fuels which had been generated by the construction of a fireline from the 1994 fire. Fire intensity was high in part of the burn and carried into the tree crowns, in an area of steep slopes and poor accessibility. Despite aggressive supression efforts, the fire consumed a total of 2,095 acres within the LSR. On August 12, the fire was declared contained and on August 15 declared controlled.

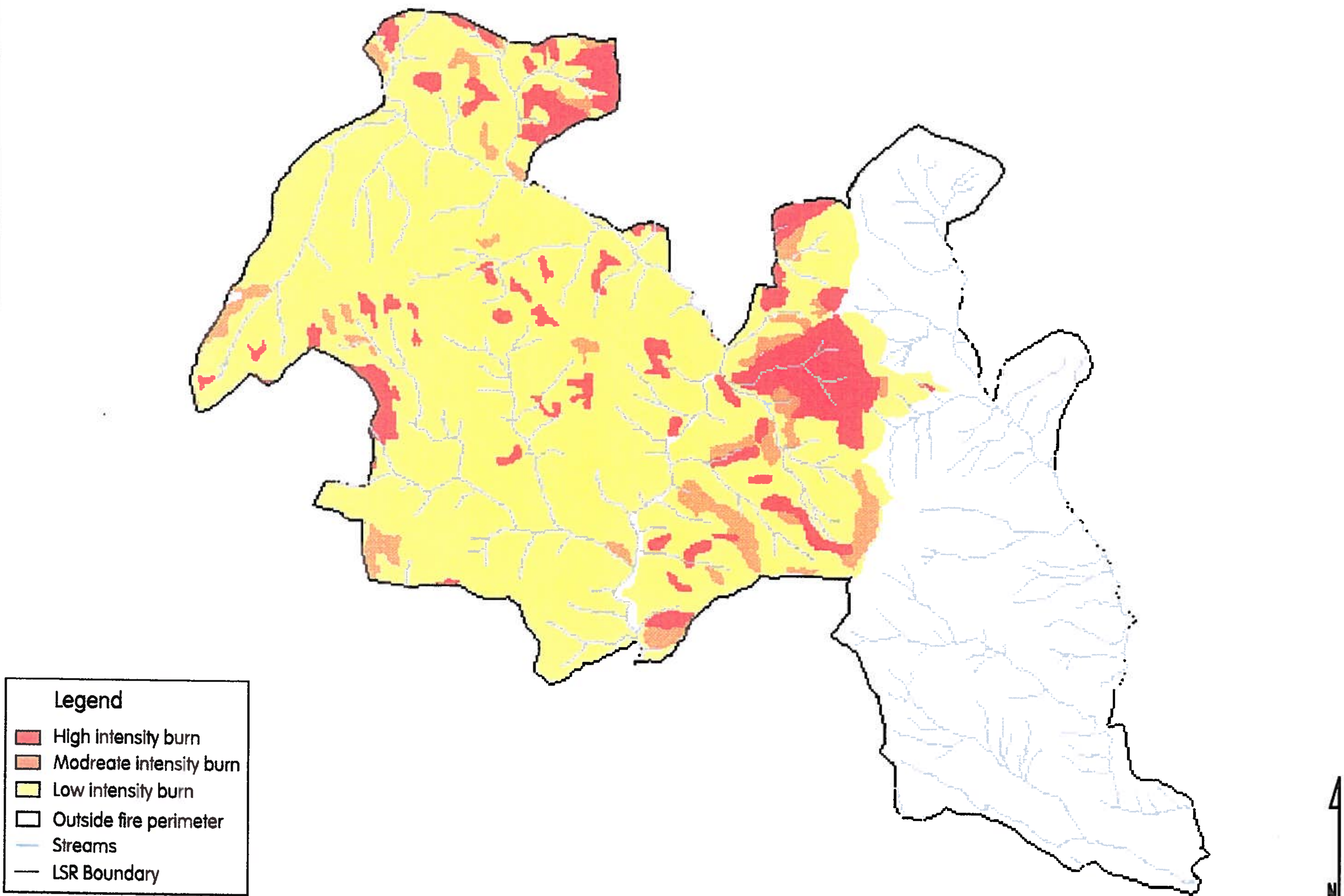
Burn intensity varied considerably throughout the fire areas. Figure 4 displays burn intensities for the areas burned. Burn intensities were influenced by climate and the fuel loading. Due to low fuel moisture, ground fires developed a great deal of heat where heavy fuels existed. The amount of area by burn intensity is described below.

Approximately 1,109 acres (8% of the LSR) were identified as having suffered a high intensity burn (70% to 100% canopy kill), where all of the overstory vegetation was killed outright and partly consumed, and most of the ground fuels were completely consumed. There is little vegetation left on these sites except dead, blackened, standing tree stems and bare, exposed, discolored soil and rock.

Another 560 acres (4% of the LSR) were identified as suffering moderate intensity damage (30% to 70% canopy kill), where the majority of the vegetation was crown damaged, and approximately half was killed outright. Nearly all of the understory vegetation has been killed. Most of the ground fuels have been consumed, and the continuity of the remaining large fuels and any green or scorched vegetation is broken.

The remainder of the burned area covered 8,814 acres (61% of the LSR) experienced a low intensity fire where less than 30% of the overstory was killed as either scattered individual trees or small pockets (less than five acres). The understory suffered damage which varied from scorching of smaller conifers, hardwoods and brush, to mortality of all hardwood trees and smaller conifer saw timber. Here also, much of the surface organic matter and ground fuels were consumed. In areas where the fire intensity was low, there are occasional unburned or less burned "islands" where ground fuels, duff, and litter were not completely consumed.

Figure 4. Fire effects within the Dillon LSR as a result of 1994 and 1995 wildfires.



FOREST HEALTH

With the suppression of fire across the landscape, species composition changed from open stands of conifers and hardwoods to stands with hardwoods and shade tolerant conifers. As the more shade tolerant species (tanoak, white fir, and Douglas-fir) have grown into the understory, they create multi-storied stands and increase stand densities. The vegetation has become stressed as competition for sunlight, moisture, and nutrients increases, tending to result in the potential for unhealthy stands. The definition of forest health or forest pathos is rather subjective, but the working definition used here is as follows: an unhealthy forest is one where mortality and general forest pathology exceed typical background rates found in stands of less than 90% of potential stocking density. Since trees are not evenly distributed in stands, there are always some trees in severe competition - the denser the stand, the more severe the competition. A stand that is not overstocked will usually have a few trees succumbing to insects and pathogens, but if greater than 1% per year is lost on the average, mature forest cover may be difficult to achieve. The losses might be in the form of a 10% die-off after a drought, or a 20% loss to fire, but greatly exceeding the average of 1% per year can result in a stand that is at high risk to a stand replacement fire event.

CLIMATE AND SOILS

Annual recorded precipitation at Happy Camp, 15 miles northeast of the LSR, ranges from 23-88 inches. Due to coastal climatic influence, annual precipitation significantly increases to the west of Happy Camp and may be as much as 50% greater in the Dillon drainage. Precipitation records also reveal periods varying in wetness and dryness. The alternating periods seem to last for a few decades. The drier periods produce approximately 40" of annual precipitation while wet brings an average of 54".

Floods have played a significant role in the conditions of streams and rivers in the Dillon area. Based upon geological and botanical records, periodic large floods naturally occur in the Klamath River Basin. Most recently, records indicate major floods occurred in 1953, 1955, 1964, 1970, 1971, 1972, and 1974.

The occurrence of landslides in the Dillon area has been and continues to be strongly influenced by weather and climate. They may also be triggered by human activities such as road building, timber harvest, and mining activities. Most of the landslide activity of the last 80 years in this area occurred during a wet period between 1938 and 1975. Many landslides were reactivated by intense precipitation during 1982 and 1983.

ASSESSMENT CRITERIA GUIDELINES

The process of assessing conditions in the Dillon LSR can be described by how well it is functioning ecologically. Conditions in the LSR relative to its' functioning are best described in terms of the vegetation and species status. For the purpose of this document, functioning of the LSR is defined using the following criteria:

1. Amount and distribution of late-successional and old-growth forest habitat

2. Sustainability of late-successional characteristics and resiliency to large scale disturbance

3. Acres and condition of riparian reserve in LSR

4. Connectivity of late-successional and old-growth forest habitat to other LSRs, riparian reserves, and wilderness areas

5. Habitat status including anadromous fish and contribution of the LSR to listed and candidate species recovery

The remainder of the document will use these criteria to describe current conditions, desired conditions, and management recommendations for the Dillon LSR.

CURRENT CONDITIONS

The following conditions have been compiled by vegetation, wildlife, fisheries, and fuels specialists. Aerial photographs, GIS data and personal observation has been used to develop this information. It is presented in terms of the assessment criteria for how well the LSR is functioning.

AMOUNT AND DISTRIBUTION OF LATE-SUCCESSIONAL AND OLD-GROWTH FOREST HABITAT

The vegetation in the Dillon Creek LSR is described in terms of dominant plant communities and the seral condition of the communities. These descriptions have been derived by adapting aerial photography-based information to local conditions. Current aerial photography was used to interpret vegetation conditions. The interpretation project included site verification. These data are developed through the most current and accurate methodology.

Groupings of timber strata and timber type have been reclassified to conform to the Wildlife Habitat Relationship (WHR) criteria (Mayer and Laudenslayer 1988). Use of WHR types allow a standardization of terminology between various agencies and the use of wildlife habitat models developed for California which facilitate analysis of habitat change.

The vegetation within the LSR is predominantly characterized by the Douglas-fir and Klamath mixed conifer types (Figure 5). Seventy-nine percent of the LSR has a combined conifer/hardwood canopy closure of greater than 40%. Five percent of the the LSR has been harvested.

VEGETATION TYPES

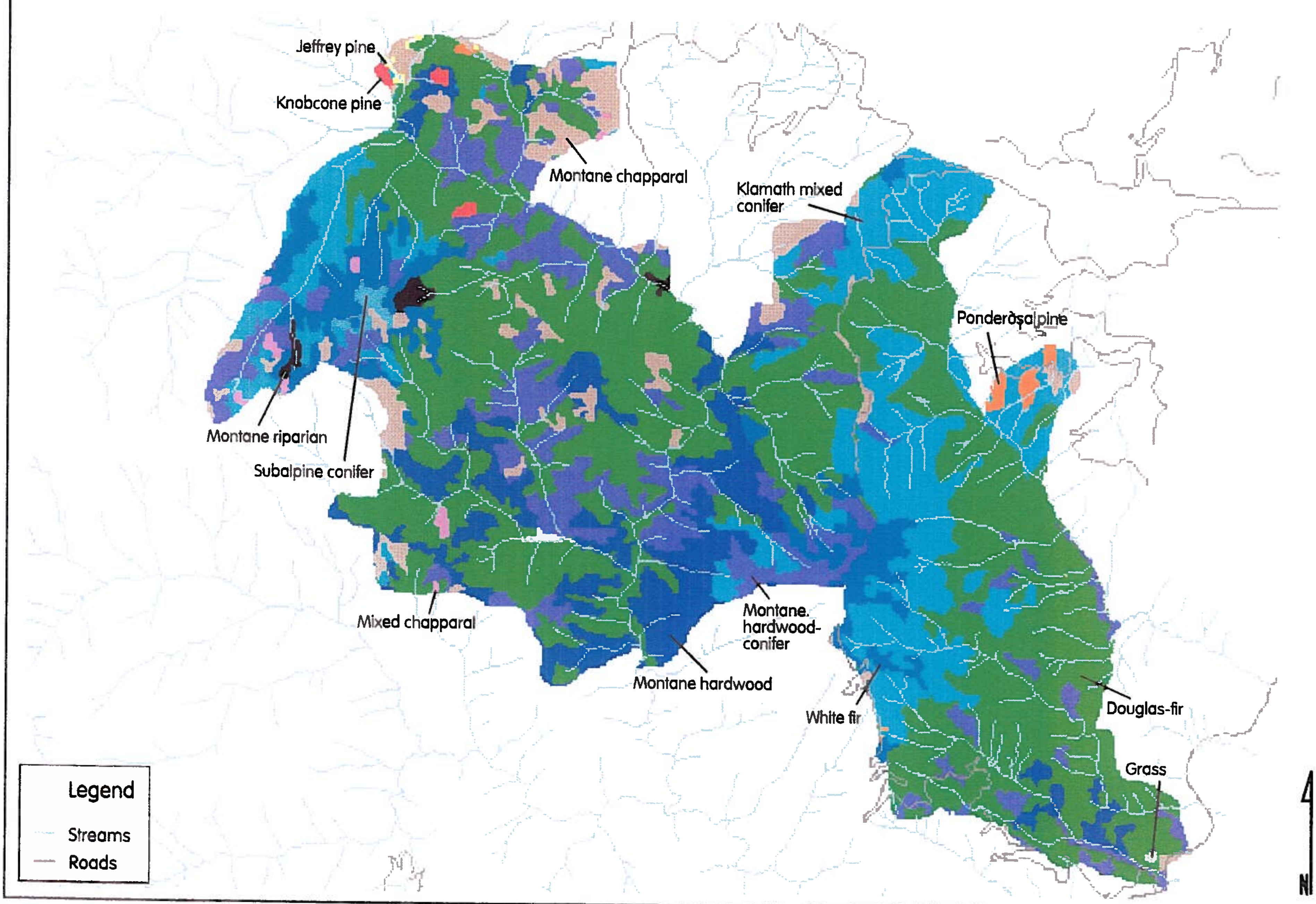
Vegetation types represent the dominant plant communities present on a site. The presence of these plant communities is mostly influenced by environmental conditions such as climate, topography, and soil structure. Although man's activities have very little influence on distribution of vegetation types, some changes have been observed due to exclusion of fire over the long term. Characteristics associated with each type are summarized below. Table 1 displays the breakdown of vegetation types within the Dillon LSR. The distribution of vegetation types is illustrated in Figure 5.

Douglas-fir - In this type, Douglas-fir comprises at least 75% of the overstory trees, with sugar pine and ponderosa pine frequently represented. The understory tends to be tanoak and madrone on mesic soils, with black oak or canyon live oak present in minor amounts on drier areas of Douglas-fir dominated sites. On the wettest sites of the Douglas-fir type and particularly in riparian-influenced areas, Port-Orford-cedar and Pacific yew are sometimes present.

Klamath Mixed Conifer - This type is known as Klamath enriched mixed conifer to distinguish it from its Sierra Nevada counterpart. It generally occurs just above the Douglas-fir type in elevational gradient, and is transitional between Douglas-fir type and the cooler and moister white fir type. Several overstory species are usually present and include sugar pine, Douglas-fir, white fir, incense-cedar, and ponderosa pine. Port-Orford-cedar is occasionally present in riparian influenced areas. In the Dillon Creek drainage, it includes relic populations of Brewer spruce, mountain hemlock, and western white pine. Common understory species include: chinkapin, black oak, saddler oak, thimbleberry, and other members of the montane chapparal type described below.

Montane Hardwood-Conifer - In the definition used here, at least one-third of the overstory is conifer and one-third to two-thirds of the overstory is broad-leaved hardwoods. This type is frequently in a mosaic pattern with the Douglas-fir type. On slightly better adjacent sites, the conifers readily overtake the hardwood layer, but this type refers to areas where the hardwoods persist and occupy up to two-thirds of the overstory layer. Some of this type may have the potential to progress to a Douglas-fir type, but the

Figure 5. Current vegetation type distribution (as assessed after the 1995 Pony fire) within the Dillon LSR.



arrangement is often stable for relatively long time periods and has some distinct differences in wildlife habitat use. Douglas-fir, sugar pine, ponderosa pine, black oak, madrone, tanoak, chinkapin, bigleaf maple, and dogwood are the typical primary components.

Montane Hardwood - This type is normally characterized by a canyon live oak overstory with a poorly developed shrub layer and a sparse herbaceous layer. The overstory is typically widely spaced and crowns seldom overlap, reflecting the low site potential conditions of rocky, shallow soils. Some incense-cedar, Douglas-fir, or sugar pine may be present, but usually only at one or two trees per acre that probably represent favorable microsite conditions within the live oak-dominated areas. This type rarely occurs on sites that have the potential to progress to conifer types, as they are usually very poor sites. Stand replacement events are uncommon in this type. The sites produce dead-fuel loadings very slowly; slower than the fire frequency available to them.

White fir - White fir is present in much of the Klamath enriched mixed conifer type, but it is also considered a distinct type with different ecological characteristics. The stands often have overlapping crowns and cast deep shade when past the early seral condition. The stands are typically arranged in a mosaic of distinct size/age groups that are at different seral stages. Understory vegetation, where present, consists of chinkapin, mountain whitethorn, snowbrush *Ceanothus*, or saddler's oak. Forbs that are common in this type are white vein shinleaf, prince's pine, bracken fern, vetch, and vanilla leaf.

Chapparals - This general type is usually a short-term (20 years or less) seral condition following a stand replacement fire in Douglas-fir, Klamath mixed conifer, or white fir type. It typically is dominated by deerbrush, snowbrush, or a mixture of other mesic shrubs. The mixed chapparal type shown on the map refers to generally higher elevation mixtures of whitethorn *Ceanothus*, sadler's oak, vaccinium, etc., on sites that may slowly develop another cover type that will persist.

Subalpine Conifers - This type includes high elevation mixtures of mesic conifers such as mountain hemlock, Brewer's spruce, western white pine, Alaska yellow cedar, with minor amounts of red fir. A fire frequency of relatively long intervals is common in this moist type. Subalpine conifers can develop late seral conditions but provides a different habitat suitability that the other conifer types. It may provide important habitat for marten.

Ponderosa Pine - Ponderosa pine, as a distinct type, occurs in the Dillon LSR only where artificial regeneration established it as the dominant species. It is generally on sites that have the potential for Klamath Mixed Conifer or Douglas-fir. However, the WHR classification system is more sensitive to existing condition than to potential vegetation conditions, as animal species tend to respond to the existing dominant vegetation. Bear grass frequently occurs as an associated understory species.

Montane Riparian Shrubs - This type includes areas occupied by alders, riparian willows, or dogwood on gravelly washes, which are prone to flood disturbance.

Knobcone pine - This type occurs in areas that are dominated by pure or nearly pure knobcone pine overstory. It often exists on areas with ultramafic soil influence and moderate moisture availability, in contrast to the otherwise similar conditions in montane chapparal areas. It too undergoes periodic intense stand replacement fires, and regenerates by means of serotinous cones and very early (sometimes as young as five to seven years) cone production.

Barren - Barren areas are less than ten percent vegetated.

Figure 5 shows the current vegetation type distribution, based on post 1995 Pony Fire condition. The acres of each type and percentage of the watershed covered by that type is represented in Table 1.

Table 1. Distribution of WHR vegetation types within the Dillon LSR.

VEGETATION TYPE	ACRES	PERCENT OF THE LSR
Douglas-fir	6857	47.0
Klamath Mixed Conifer	2473	17.0
Montane Hardwood-Conifer	1882	12.9
Montane Hardwood	1405	9.7
White Fir	804	5.5
Chapparals	787	5.3
Subalpine Conifers	150	1.4
Others, including ponderosa/jeffrey pine	72	0.5
Riparian Shrubs	61	0.4
Knobcone	31	0.2
Barren	24	0.2
TOTAL	14,546	100

SERAL CONDITIONS

Seral conditions describe the age and development of forest communities and the physical canopy characteristics present during the various stages of succession. They focus on the size of the larger vegetation and its development along a continuum from grasses and forbs to old-growth conditions. These conditions can be readily influenced by man's activities. Table 2 displays acres and percent of each seral condition for 1994. The distribution of the seral conditions is illustrated in Figure 6.

Figure 6. Distribution of seral conditions within the Dillon LSR.

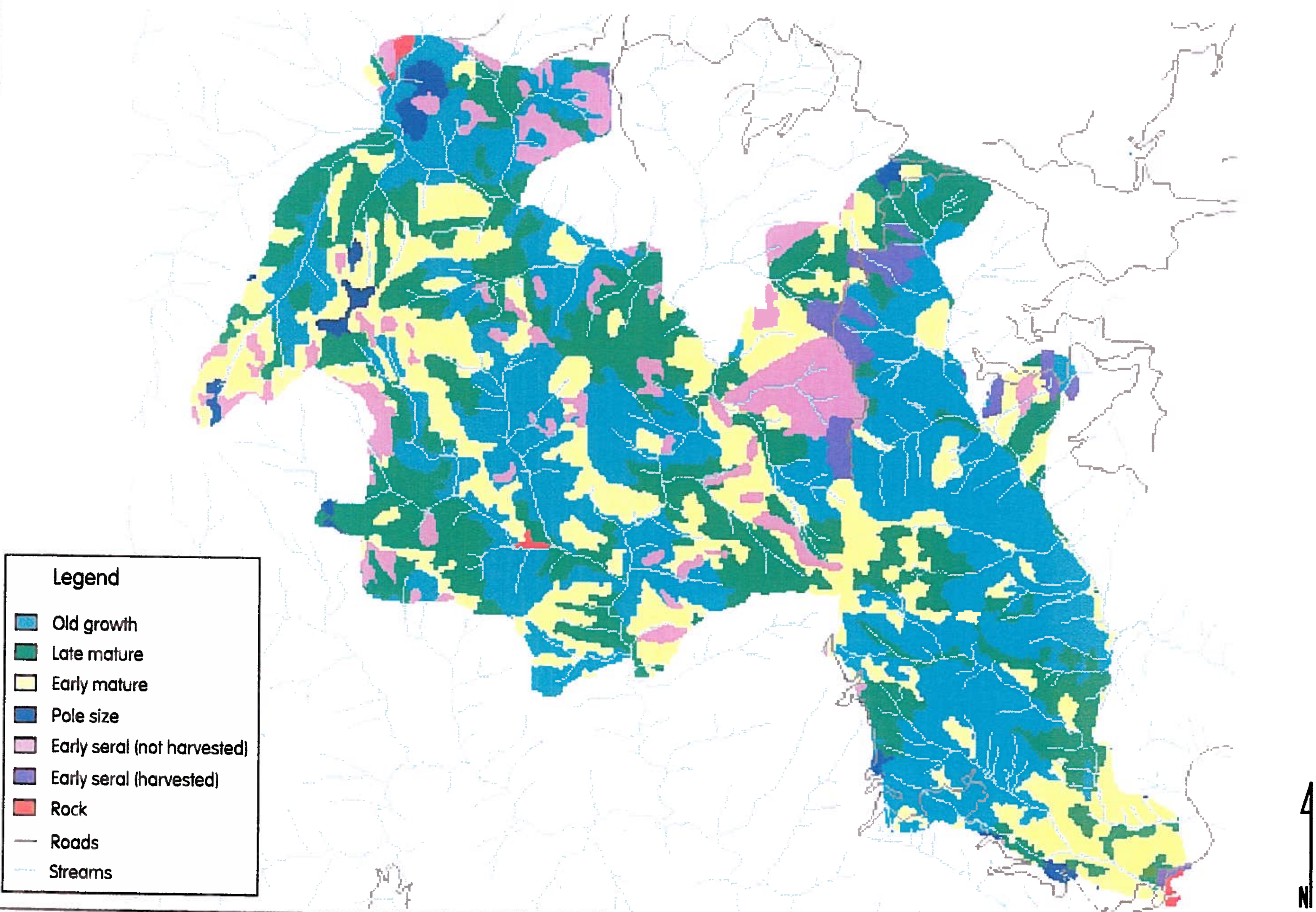


Table 2. Acres of each seral stage within the Dillon LSR as of September 1994.

CATEGORY	ACRES	PERCENT
Early seral shrub/seedling (natural)	1245	8
Early seral shrub/seedling (harvested)	227	2
Pole stands (natural)	197	1
Pole stands (harvested)	29	.2
Early mature	3636	25
Late mature	3864	27
Old-growth	5258	36
TOTAL	**14,456**	**100**

SUSTAINABILITY OF LATE-SUCCESSIONAL CHARACTERISTICS AND RESILIENCY TO LARGE SCALE DISTURBANCE

The Dillon Watershed Analysis enumerates many of the possible disturbances that can interrupt successional processes. Climatological, geological and pathological events are described in that document. However, the primary recurring selective pressure under which the plant communities have developed is fire. Fire often acts as a feedback mechanism with other events such as drought, blowdown, or insect epidemics, but it ultimately exerts control on survival and growth of most members of the forest community.

Fire processes have influenced vegetative patterns for most locations in the LSR. Aboriginal burning and lightning caused fires have been a source of disturbance to vegetation for thousands of years, influencing the development of plant characteristics, as well as vegetative patterns on the landscape.

The foundation for assumptions of the fuels and fire regime in the Dillon Creek watershed are described in more detail in the Dillon Watershed Analysis. Studies have shown that prior to European settlement frequent fires occurred at eight to 25 year intervals (Skinner, 1995). The majority of the fire areas had low to moderate ground fire severity and limited overstory severity in stands of mature conifer and hardwoods within all vegetation types. High intensity fires did occasionally cause stand replacing events, usually in the form of small openings. It is very apparent when looking at conditions in 1944 (aerial photos) that large fires did occur in the area. Recent fire scars are visible and indications of large disturbances through vegetation patterns are visible. These fires were of varying severity, with higher severity on exposed south and west aspect slopes and ridges. The north and east aspects appeared to be infrequently affected by these higher intensity fires. During the 20 year period between 1973 and 1993, the LSR averaged 1.6 ignitions per year.

The Dillon (1994) and Pony (1995) fires burned 9,843 acres (65%) of the LSR. Table 3 defines each fire severity category and displays the acres and percent of the LSR burned.

Table 3. Dillon and Pony Wildfire effects described as acres and percent within each fire severity category in the Dillon LSR.

SEVERITY	ACRES	Percent	DEFINITION
High	1,109	8	>70% crown kill
Moderate	560	4	30-70% crown kill
Light	8,814	61	<30% crown kill

EXISTING FUELS

The high and moderate burn intensity areas within the Dillon and Pony Fires contain large amounts of standing fuel. Average fuel loadings over the assessment area range from 160 tons per acre to 212 tons per acre. In some areas, such as the Pony fire, fuel loadings have been recorded as high as 470 tons per acre. Shrubs, grass, hardwood sprouts, and seedlings are just beginning to establish. These stands include numerous snags and large amounts of down woody material. There are areas where over 60 trees per acre have been killed. These trees, if not removed, will eventually fall down and create a jumble of logs on top of each other. This jumble of logs could burn very hot with the introduction of fire.

The low burn intensity areas within the Dillon and Pony Fires lost little of the large diameter overstory conifers. Most of the understory was killed during the fire and is standing dead. Hardwoods are beginning to resprout. Forbs and grass are occupying small openings that were treated by the fire. Snags and down woody material are abundant in these areas. Inventories indicate an average of 6 snags/acre and 5 large downed logs/acre in the lightly burned areas.

FUELS AND POTENTIAL WILDFIRE EFFECTS

Fire appears to be the dominant, most frequent disturbance in the LSR and a major determinant of historical landscape diversity. Potential ecological effects of fire can be categorized by fire regimes. Over the long term, fire regimes are not stationary and the frequencies (mean time between fire events) and extent change through time (Swetnam 1993; Agee 1991).

Fire severity is largely dependent on the quantity, type and distribution of available fuels and the rate at which they burn. There is a tendency for fire severity to be inversely related to fire frequency in forested ecosystems. Low severity surface fires tend to occur in vegetation types where frequent fires maintain fuels at low levels. High severity crown fires tend to occur in forests where large amounts of fuel accumulate between infrequent fires.

No fire history studies have been completed in the LSR. Several studies have been completed in the Klamath Mountains Province (Wills 1994; Agee 1991), and a major study is in progress on the Thompson Ridge area of the Happy Camp District (Carl Skinner, PSW, Redding; and Alan Taylor, Pennsylvania State University). These studies used historical photography, tree cross section analysis and known site and stand conditions to provide insight into the fire regimes of this area.

Through effective fire suppression there has been a shift in the fire regime within the LSR. The past fire regime is characterized as having frequent intervals (8-25 years) of predominately low and moderate intensity fires. The current fire regime is characterized as having a 25-100 year return interval of crown and severe surface fires. This is a moderate to high severity fire regime. The increasing trend in partial to complete stand-replacement fires in mature stands of conifer and hardwoods is a result of the current fire regime.

Fire exclusion has affected fuel loadings. Duff layers have increased in depth, accumulations of available fuels in all size classes have increased, and the amount of vegetative biomass has increased. A comparison of 1944 aerial photos with current condition shows areas that were once sparsely vegetated by conifers are now heavily stocked. Prior to fire suppression stands were more open, tree crowns were separated, areas with continuous conifer overstory were limited to the north and east aspects, and perennial riparian areas were less influenced by fire. The effects of these changed conditions include increases in dead and live fuel, development of fuel ladders, and a closed canopy that can sustain a crown fire. On very hot, dry days fire cannot be manually controlled. The ground fuels easily burn with flame lengths greater than four feet. These flame lengths will cause torching of the understory vegetation, which preheat and cause torching of the larger trees. Combined with steep slopes, light winds, and dry conditions, this individual torching will advance to running crown fires and large stand replacing events.

The fuel loading in unmanaged areas is variable due to past fire history, stand ages, and vegetation types. Fuel accumulations of less than 10 tons/acre dead and down surface fuels are found primarily in hardwood stands (as depicted by Fuel Model 8). Fuel Loadings as high as 80 tons/acre are found in managed and unmanaged stands of mature timber (as depicted by Fuel Model 10). See Appendix B for a description of fuel models. Large woody material is seldom uniformly distributed on the landscape. Duff and litter depths are from .5 to 4 inches.

The following paragraphs describe fuel conditions and related concerns within the LSR. They are generalizations based on certain vegetation types and situations (fuel conditions within specific subunits will be discussed later in this section).

> The late-successional vegetation currently contains high amounts of live and dead fuel. A considerable amount of understory vegetation is present in most stands. The encroaching vegetation and increased fuel levels have created fuel ladders, increasing the risk of crown fires and stand replacing events.
>
> Areas with greatest concern are those on south and west facing aspects or those on slopes over 65%.
>
> Plantations on any slope or aspect are a concern. The closed nature of these plantations creates a continuous fuel condition with dense tightly packed crowns. The density and associated fuel created by brush increases the likelihood of a crown fire and stand replacing event.
>
> The densely stocked pole and early mature stands contain high amounts of fuel on the ground and the homogeneous character of this vegetation type increases the risk of fire carrying though these stands. Stand replacing events are more of a concern on south and west aspects and steep slopes, but are a high concern on the other aspects and slopes as well.
>
> Sparse conifer stands are a concern where they contain large amounts of fuel from past harvesting or large amounts of decadent brush in the understory.
>
> White fir stands vary in terms of fire risk. Dense stands with high levels of fuel accumulation and decadence are at high risk of a stand replacing event. Fire frequency is lower in white fir stands but tend to be of relatively high intensity when they do occur.
>
> Poorer sites are not of high concern because of the lack of large fuel buildups. Fires will burn in these areas but will generally be ground fires. Hardwoods may be top killed, but readily resprout.
>
> Many areas burned in 1994 and 1995 have fuels conditons where, if left untreated, it is not likely that the developing stand would survive to become late-successional habitat. Very hot fire from down logs could very likely burn developing stands and threaten adjacent late-successional stands causing a net decrease in total late-successional habitat.

The Dillon and Pony fires have temporarily reduced the dead and down fuel loadings. Much of the surface fuel was consumed in the high and moderate fire intensity areas. The continuity of remaining large fuels and any green scorched vegetation has been disrupted. In low fire intensity areas there are still occasional "islands" where surface fuels and duff were reduced, but little was completely consumed.

Future fuel loadings and wildfire behavior will depend on management actions within this LSR. The progression of fuels development in the area affected by the Dillon and Pony fires is quite predictable and of particular concern. Where the overstory was destroyed by crown fire (i.e. high and some moderate intensity burn areas), there will be little fine fuels accumulation for several years. The large amounts of standing dead material poses an extreme threat within the next several years. As large, standing dead trees begin to fall over onto the developing shrub layer, a fuel situation will develop which is prone to both rapid rate of spread and high intensity. Fire behavior modeling and personal observations by fire managers made on the Forest over the past few decades, predict that within 15 years these areas will be very susceptible to another large scale event if there is no reduction of large, ground fuels (Andrews and Chase 1989).

With continuing decay in many of the moderate burn intensity areas, twigs, branches and tree boles will fall on the developing shrub, hardwood and conifer reproduction. Supported by the green vegetation, these above-ground fuels will increase the fuel bed depth and be drier and slower to decay than fuels on the ground. A fire carried by these fuels will be intense enough to cause crowning, spotting, and rapid rates of spread beyond the the ability of suppression forces to control using direct attack. As seen in past fire areas within the Salmon River drainage (Hog Fire, 1977 and the 1987 wildfires), these areas will become very dense with shrubs, hardwoods, conifers, fallen and standing dead material, and will be susceptible to an even more severe fire. Successive high and moderate intensity fires have the potential to reduce soil productivity due to the resulting loss of soil organic matter and reduction in nitrogen (Laurent 1992). A loss in soil productivity can delay the establishment of forested stands. In this LSR, the repetition of intense fires would cause a greater loss of late-successional habitat.

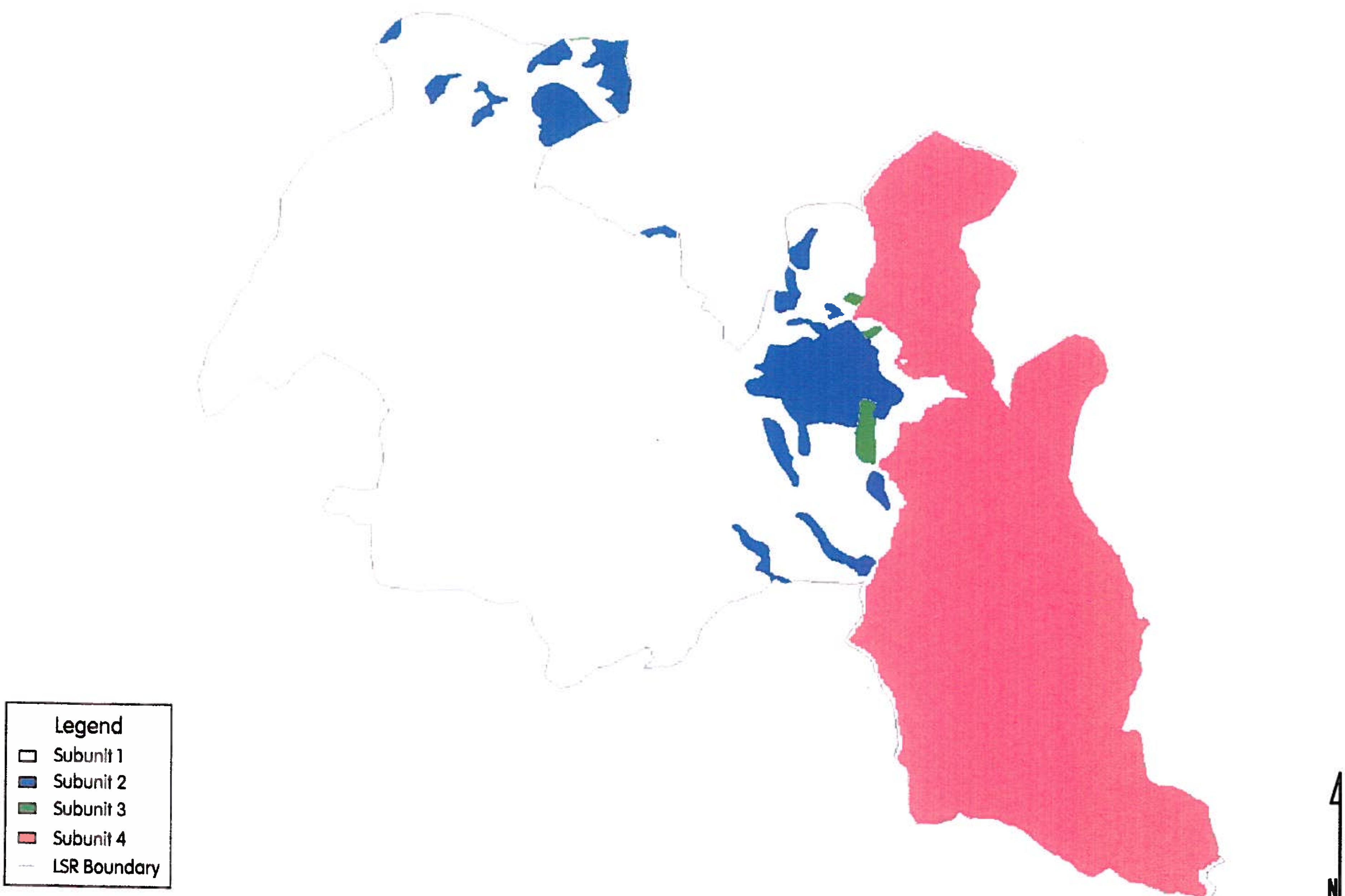
The areas of low burn intensity, from the Dillon and Pony fires, are currently less of a concern. In these areas, the overstory was either not impacted or just scorched on the lower portion of the crown. Small pockets of overstory were killed. Understory vegetation was mostly killed. The fine needles and leaves dropping to the ground from the scorched or killed vegetation will provide a fine fuel loading within the next several years. These areas could support a light, easy-to-suppress ground fire during the first few years. The only area of concern would be small pockets of complete mortality that currently exist adjacent to an area of highly flammable early successional vegetation. A fire originating within one of these high fuel loading areas could easily impact an adjacent plantation with a stand replacing event. Opportunities exist to maintain more favorable fuels conditions through use of prescribed fire.

To facilitate further discussion of conditions within the LSR, it was divided into four subunits (Figure 7). Conditions within each subunit are similar, as described below.

Subunit 1: These areas underburned in the 1994 or 1995 wildfires and were left with low fuel loadings. The fires did not degrade late-successional habitat values. As the burned understory breaks down, fuel loading will increase. Within 15 years, fuel loadings are expected to exceed levels described in the following *Desired Condition* chapter.

Subunit 2: Stands burned at high intensity during the 1994 and 1995 wildfires. The fires converted late-successional habitat to an early seral condition. These areas had heavy conifer stocking prior to the fires. After the fires, 16 to 30 dead trees per acre remain standing on the sites. Current fuel loadings are low. As the burned trees deteriorate and fall to the ground, fuel loadings will increase. Within 15 years, fuel loadings are expected to exceed levels described in the following *Desired Condition* chapter.

Figure 7. Subunits with similar fuels conditions within the Dillon LSR.



Subunit 3: These are areas where young conifer sapling stands were burned at high intensity during the 1994 and 1995 wildfires. Fuel loadings are low in these stands. There are few dead trees which remain on the site and would contribute to future fuel loadings.

Subunit 4: These stands of late-successional habitat have not burned in over 50 years. The burn frequency is outside the natural range of variability of eight to 25 years. Existing fuel loadings are high and these stands are at high risk of future stand replacing fire.

RISK ASSESSMENT

In quantitative terms, it is difficult to access the risk of wildfire occurring at a specific location within the LSR and its effects to the LSR without specific burn-day input. There are many factors that determine fire behavior and the final effect of wildfire. Those factors beyond our ability to control include: location of fire starts, multiple starts (lightning), availability of fire suppression forces, weather, and topography. Fuels and vegetation conditions are the factors we can manipulate. Lightning is the major source of fire starts in the Klamath mountains. As many as 50 fires can occur with one lightning storm and each can burn separately or they may burn together as one, creating high intensity wildfires. In 1987, and again in 1994, thunderstorms with very little rain and dry lightning set multiple fires, burned thousands of acres, and lasted for weeks. Under these typical conditions, suppression resources are quickly depleted and fire managers are forced to prioritize which fires will receive what type of response.

The fire behavior potential maps are developed using criteria found in *Appendix B* to describe fire behavior and effects. Predicted fire behavior depends 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 because they are committed to other fires, a fire will burn unchecked until such time as firefighting resources can be assigned to the fire.

Fire behavior potential was modeled for the LSR. It uses fuel models, topographical factors (slope and aspect), and extreme weather data to predict the resistance to control of a fire in a given area. The modeling showed that approximately 4663 acres (32%) of the LSR is in a high fire behavior potential condition, 773 acres (5%) are in a moderate fire behavior potential, and the remainder (62%) is in a low fire behavior potential (Figure 8). Large continuous areas, greater than 200 acres in size and occurring on south and west facing slopes, with high fire behavior potential pose extreme risk. For illustration, fuel loadings were determined for two future time periods (7 to 10 years and 15+ years) assuming no fuels management and no natural fires within the LSR. The fire behavior potential was modeled for both time periods and is presented in Figures 9 and 10.

Fuel models were also predicted for 10 to 20 years after the Dillon wildfire (1994). The objective was to determine what possible alternatives may exist for treatments within the LSR. Two alternatives were identified. Both would achieve late-successional habitat conditions on sites which are currently in early seral stages due to the 1994 and 1995 wildfires. These treatment alternatives will be used to determine the best course of action for long-term late-successional habitat maintenance discussed in Chapters 4 and 5.

The first alternative would propose to underburn these areas approximately every 10 years. The high intensity burn areas would be reforested within 30 to 40+ years.

The second alternative would propose to enter the high intensity burn areas with a combination of timber salvage and prescribed fire to treat the high fuel loadings and prepare the site for reforestation. Fire would then be excluded for approximately 20 years. At this point, the sites would be treated with prescribed fire to maintain long-term viability. Surrounding forest would be treated concurrently. The high intensity burn areas would be reforested within 7 to 12 years.

Figure 8. The current fire behavior potential within the Dillon LSR, rated from low to high.

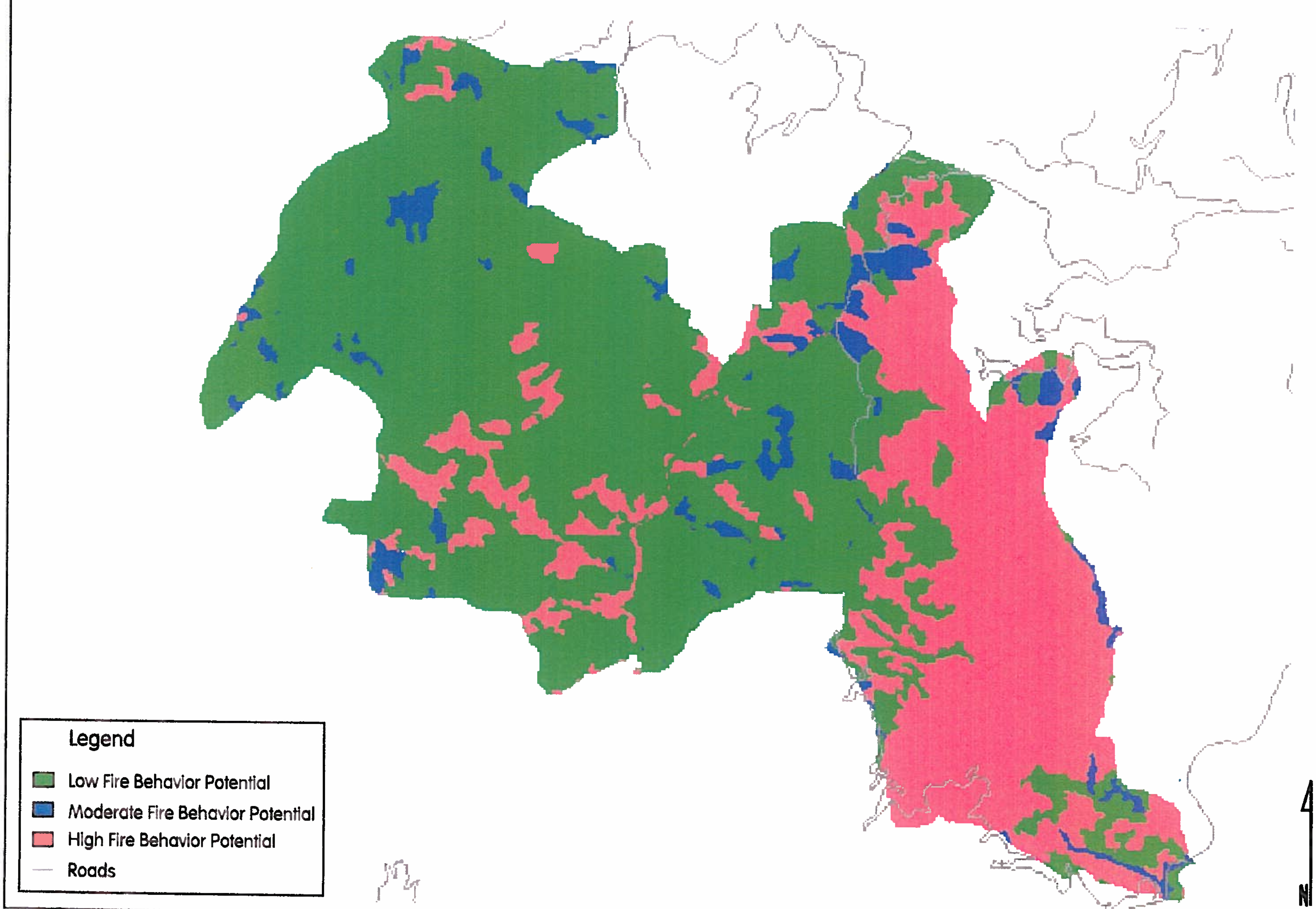


Figure 9. Fire behavior potential within the Dillon LSR, rated from low to high. This condition would exist in 7-15 years with no prescribed treatment or management.

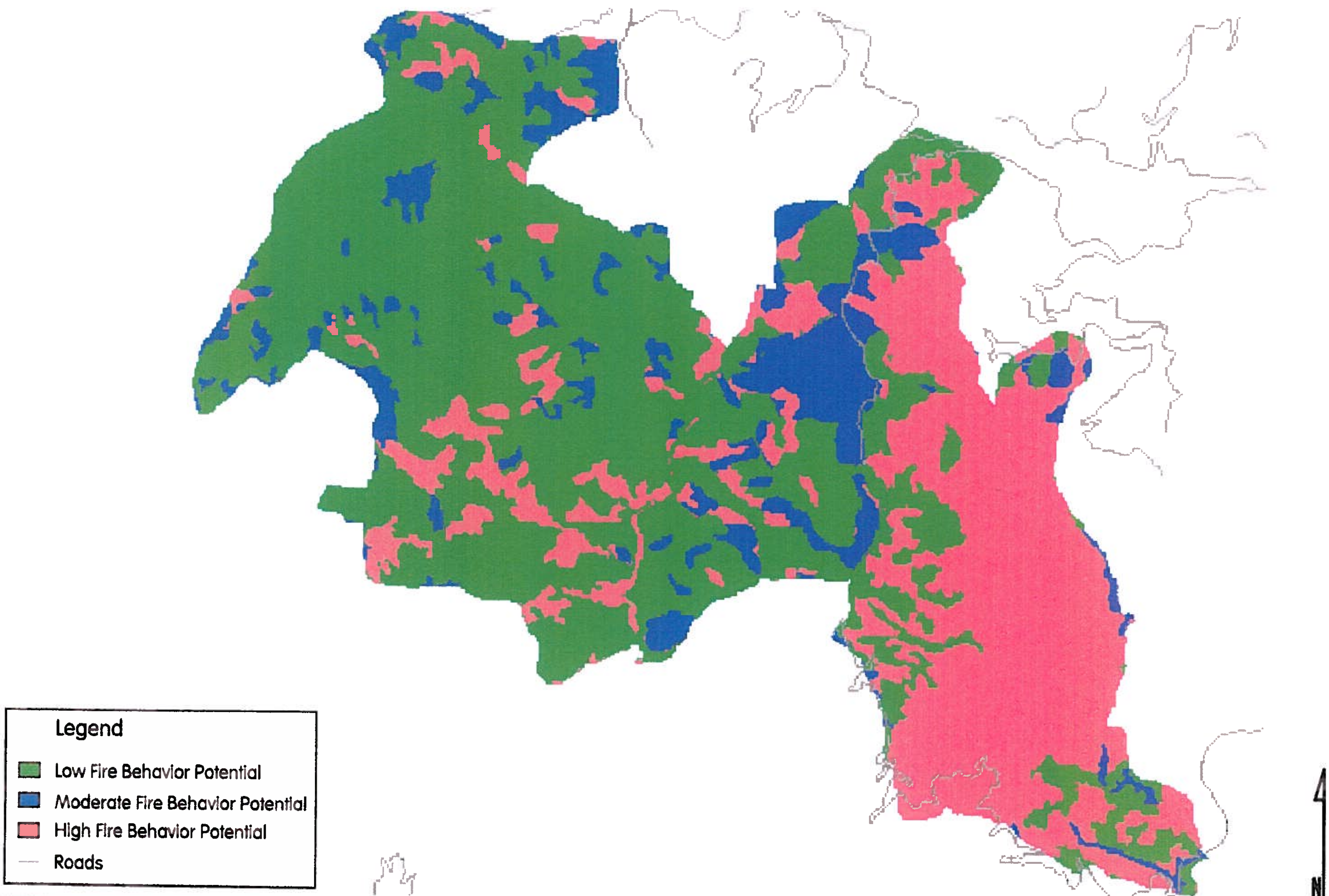
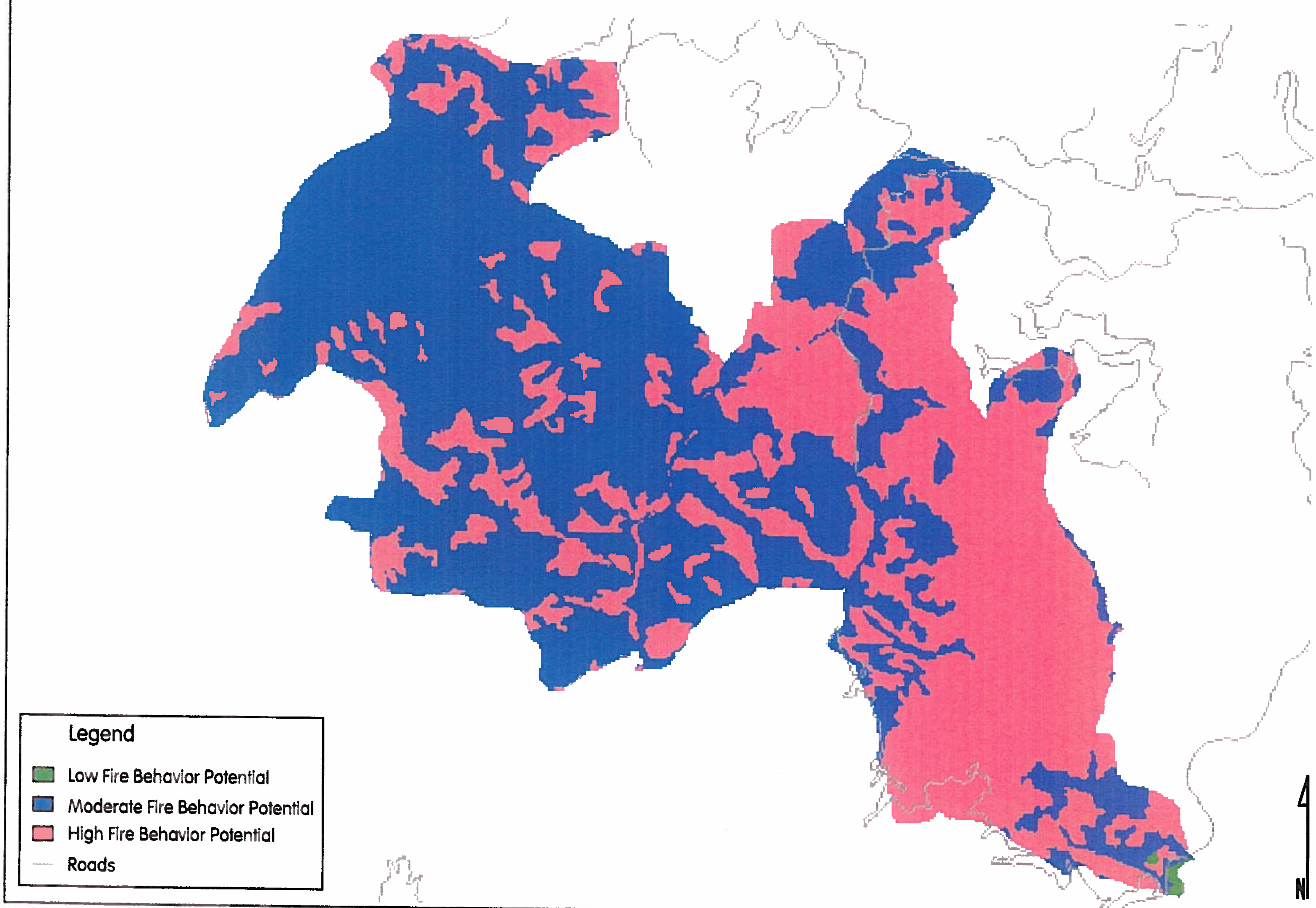


Figure 10. Fire behavior potential within the Dillon LSR, rated from low to high. This condition would exist in 15+ years with no prescribed treatment or management.



ACRES AND CONDITION OF RIPARIAN RESERVES IN THE LSR

The Dillon LSR has an important influence on the water quality and water temperature of the North Fork of Dillon Creek, as well as the recruitment of large coarse woody debris. The North Fork of Dillon Creek contains 44% of the Klamath Mountains Province Steelhead habitat within the Dillon Creek watershed. Approximately 1% of the anadromous fish habitat on the Klamath National Forest is found in the North Fork of Dillon Creek.

An important component within the Dillon LSR are the riparian reserves. There are approximately 2,892 acres of riparian reserve in the Dillon LSR. Riparian reserve boundaries are consistent with definitions described in the LRMP and ROD. Most of the riparian reserve is in a late mature and old-growth seral condition (Figure 11). The riparian reserves are a major component of the aquatic conservation strategy within all land allocations. The following aquatic conservation strategy objectives are particularly applicable to the Dillon LSR:

1. Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.

2. Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.

The Dillon LSR has an estimated 118 trees per 1000 linear feet within the riparian reserves as defined in the LRMP and ROD. This number represents the potential coarse woody debris recruitment within the Dillon LSR. In addition, the live trees provide canopy cover which has a direct affect on stream temperatures. Trees were defined as any standing wood. This includes dead or live trees greater than or equal to 25 inches in diameter. This estimate is based on analysis of 1980 CIA cluster plot data of stand types that fall within a 200 foot horizontal distance of streams inside the Dillon LSR.

During stream surveys in 1989, water temperatures in the North Fork of Dillon Creek varied from 11 to 16 degrees Celsius. Water temperatures from stream surveys in 1978 in Swillup Creek varied from 8 to 10 degrees Celsius. Water temperature taken in the mid 1960's in Aubrey Creek was 12 degrees Celsius. Water temperature taken in 1974 in Elliott Creek was 17 degrees Celsius. This data was collected prior to the Dillon and Pony fires. Post fire temperature data is not available within the LSR.

The above temperatures meet the LRMP desired maximum temperature of 20 degrees Celsius. A recording temperature gage above the mouth of Dillon Creek indicates maximum temperature of 22.6 in 1994. This is above the desired condition for the mainstem of Dillon Creek below the confluence with the North Fork.

Stream water temperature is primarily increased by removing riparian vegetation and exposing the stream to direct solar radiation. An estimated range of canopy closure directly over selected creek segments was taken from 1990 and 1994 infrared aerial photos. The estimate is of vegetation covering water only. Shading due to slope or aspect was not considered. Table 4 displays post-fire canopy closure over streams in the LSR.

Figure 11. The distribution of seral conditions within the riparian reserves - Dillon LSR.

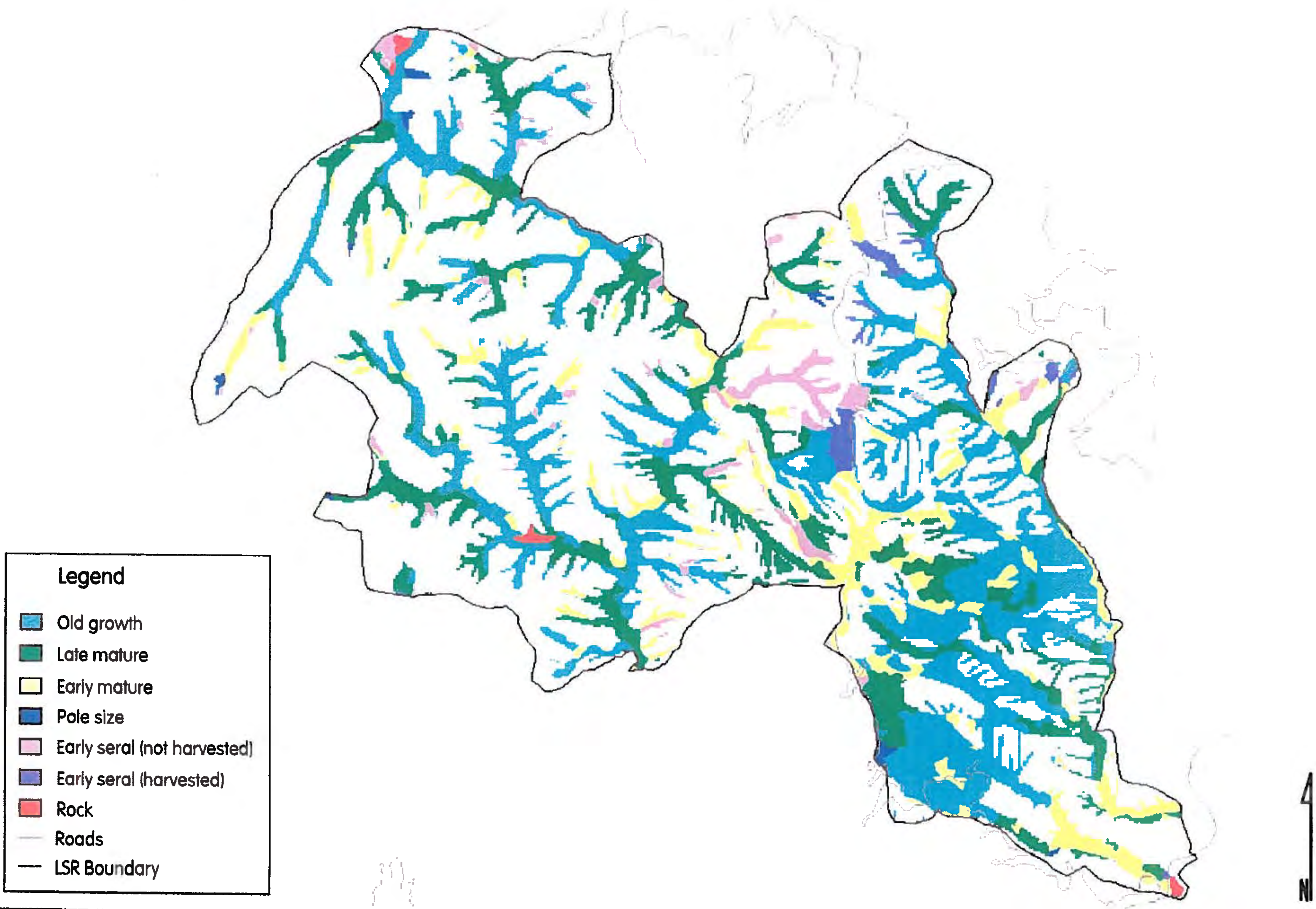


Table 4. The range of percent canopy closure over selected streams within the Dillon LSR.

CREEK	PERCENT CANOPY COVER
Main Jackass Creek	60-70
Jackass Tributaries	50-60
Main Swillup Creek	70-80
Swillup Tributaries	70-80
Elliottt Creek	60-70
Aubrey Creek	80-90
Lower North Fork Dillon	10-30
Lower North Fork Dillon Tributaries	40-50
Upper North Fork Dillon	20-30
Upper North Fork Dillon Tributaries	50-60
Main Lick Creek	40-60
Lick Creek Tributaries	40-60

For comparison purposes the 1978 Swillup Creek stream survey indicated that average percentage shade at noon for the lower 2.8 miles was 72%. The North Fork of Dillon Creek stream survey in 1989 indicated the average shade at noon was 31% for the lower 7.3 miles. Both these estimates include topographical shade where appropriate.

Pool depth can be greatly impacted by sedimentation. Primary pools are defined as pools at least 3 feet deep and comprising greater than 50% of the low flow wetted channel width. They determine the suitability of streams for holding and resting fish. These pools can be crucial to fish survival during low summer flows when other habitat is very limited. In addition to coarse woody debris and water temperature, sedimentation is addressed using riffle embeddedness, fine sediment in spawning areas, and frequency of primary pools were addressed in the Dillon Creek Watershed Analysis. Embeddedness is an ocular measure of fine sediment surrounding larger particles (boulders, rubble, or gravel) in riffle habitat. Embeddedness impacts fish eggs and fry and the production of aquatic invertebrates. All five parameters are displayed below (Table 5).

Table 5. Parameters for assessing fish habitat within the North Fork of Dillon Creek.

PARAMETERS	NORTH FORK DILLON CREEK
Riffle Embeddedness	5 % average
Fine Sediment in Spawning Areas	6 % average
Primary Pools	.8 per 6 bankfull widths
Coarse Woody Debris	No Data
Water Temperature	11-16 Degrees Celsius

The 1978 Swillup Creek stream survey found approximately 2% of the creek was spawning area, 5% of the visible bottom composition was fines, and the maximum pool depth at one transect three feet was meeting the criteria for a primary pool.

PORT-ORFORD-CEDAR

Port-Orford-cedar is a species at particular risk from disease as described and displayed in the Dillon Watershed Analysis. It does not occur in Swillup Creek, but occurs within the Dillon Creek portion of the LSR. It is a very important component of the riparian areas,

FIRE IN THE RIPARIAN RESERVE

Riparian reserves along perennial water are generally cooler and moister than upslope areas. These conditions generally provide a barrier to fire, or slow fire spread. The cooler temperatures, moister air, and less flammable vegetation combine to retard fire intensities except in extreme conditions (i.e., drought). Lower intensity fires often top kill shrubs and deciduous trees, many of which resprout. Low intensity ground fires affect only lower canopy layers. Occasionally small patches of existing vegetation may burn more intensely, killing vegetation in the upper canopy.

In steep narrow canyons and side drainages, fire behavior is influenced less by the cool and moist conditions and more by the steep topography and chimney effects of the drainages. Narrow, steep stream corridors experience frequent and higher intensity fires than broad stream channels. Riparian reserves located upslope in the watershed with multi-layered vegetation, high amounts of down material, and homogeneous closed canopy are very susceptible to high intensity fire.

Fire effects in upslope vegetation are important to riparian reserves. Effects of upslope fire activity may impact runoff, sedimentation and loss of habitat within the riparian reserve. High intensity burns remove ground cover and down woody debris which accelerates surface erosion and increases fire sedimentation downslope with the riparian reserve.

The success in suppressing fires has resulted in increases in fuel accumulations in all areas. As fuels accumulate, potential fire intensities increase. This increases the potential for damage to riparian vegetation and ground cover which can increase run-off and soil erosion, reduce canopy closure and stream shade, and increase the short-term large wood recruitment to the stream. These stand replacing events usually occur during drought periods and can be severe. The less frequent, high intensity fires, recently experienced in the watershed have had severe effects on about 10% of the riparian reserves. These fires have killed or consumed all resprouting vegetation in these areas. In low and moderate burn areas amounts of coarse woody debris and standing snags exceed LRMP minimum standards and guides of 20 pieces (40 cubic foot volume per 1000 lineal feet). Future needs for replacement of existing coarse woody debris can be met as well as current needs. These conditions are not met in the North Fork of Dillon Creek.

Nearly 474 acres of mapped riparian reserves burned with high and moderate intensity in the 1994 Dillon and 1995 Pony fires. Vegetative recovery will be slow in upland riparian areas along intermittent streams, especially in areas of shallow and rocky soils.

CONNECTIVITY OF LATE-SUCCESSIONAL AND OLD-GROWTH FOREST HABITAT TO OTHER LSRs, RIPARIAN RESERVES, AND WILDERNESS AREAS

The ability to move across the landscape may be important to the long-term persistence and viability of some wildlife species. It may be particularly important to late-successional habitat associated species. The movement or dispersal of late-successional dependent species across the landscape is provided by large blocks of late-successional habitat in the LSRs and movement between LSRs by a combination of land allocations, including riparian reserves, administratively withdrawn areas, management prescriptions and retention areas within the Matrix, and 100 acre LSRs. As defined in the FSEIS (1994), 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 range 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 ecosystem conditions species can move (or be carried) across areas that are not in late-successional ecosystem conditions.

Some authors have promoted the concept of habitat corridors for the purpose of connectivity (Harris 1984, Noss 1987). Information regarding the amounts, spatial configuration, and structure of habitat corridors for late-successional and old-growth forest associated species is inconclusive.

In their conservation strategy for the northern spotted owl, the ISC did not designate discrete habitat corridors (Thomas et al. 1990). It was determined that entire landscape mosaics rather than the size or 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 holds 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 populations (Ruggiero et. al. 1994).

Several authors have emphasized the importance of riparian areas for habitat connectivity. Powell and Zielinski (1994) indicate that riparian areas appear to be important elements in marten and fisher home ranges and may be dispersal avenues. It is unknown, however, whether fisher will use corridors of forest through otherwise open habitats (Ruggiero et. al. 1994). Harris (1984) promotes the incorporation of riparian areas as connectors of habitat islands due to their value as wildlife habitat, the complexity of vegetation, and the dendritic pattern that they form on the landscape.

The Dillon LSR connects well with other reserve areas. The west side borders on the Siskiyou Wilderness and is a little more than a mile from a large LSR to the southwest. The area between LSRs on the west side is very remote. Wildfire and succession will continue to be the primary influences on vegetation patterns. Over half of this area is in suitable spotted owl habitat.

There are less than two miles from the Dillon LSR to wilderness on the north. Much of the matrix between the LSR and wilderness to the north is harsh site. Harsh conditions may not be optimal for connectivity, but tend to remain relatively stable over time. The reserve areas in this vicinity are well connected by riparian reserves.

The King LSR is approximately two miles southeast of the Dillon LSR. There is connectivity between the LSRs due to riparian reserve in the vicinity of the Klamath River and a small tributary. Over half of this area is in suitable owl habitat. The only areas where management activities are likely to reduce late-successional vegetation characteristics outside the LSR are to the east. Except for riparian reserves, there is an area of matrix about 7 miles wide that stretches 20 miles to the northeast before reaching another LSR.

The FSEIS (1994) describes the four possible outcomes that characterize different levels of ecological connectivity of late-successional and old-growth forest communities and ecosystems. Based on these FSEIS descriptions (Table 3 & 4-7, page 3 & 4-40), it was determined the Dillon LSR appears to be strongly connected to surrounding LSRs as described in Outcome 2 in the FSEIS.

Connectivity within the LSR is good (Figure 12). Minimal harvesting in the northeast portion did not create significant barriers.

A potential influence on connectivity within the LSR may be stand replacing fire. High intensity fire may break-up connections of late-successional forest or destroy connections provided by riparian reserves. The 1994 and 1995 wildfires did not affect connectivity within the Dillon LSR. The riparian reserves and late-successional habitat (as depicted in Figure 12) provide for biological and ecological flows to sustain late-successional and old-growth associated animal and plant species within the Dillon LSR.

HABITAT STATUS INCLUDING ANADROMOUS FISH AND CONTRIBUTION OF THE LSR TO LISTED AND CANDIDATE SPECIES RECOVERY

WILDLIFE SPECIES

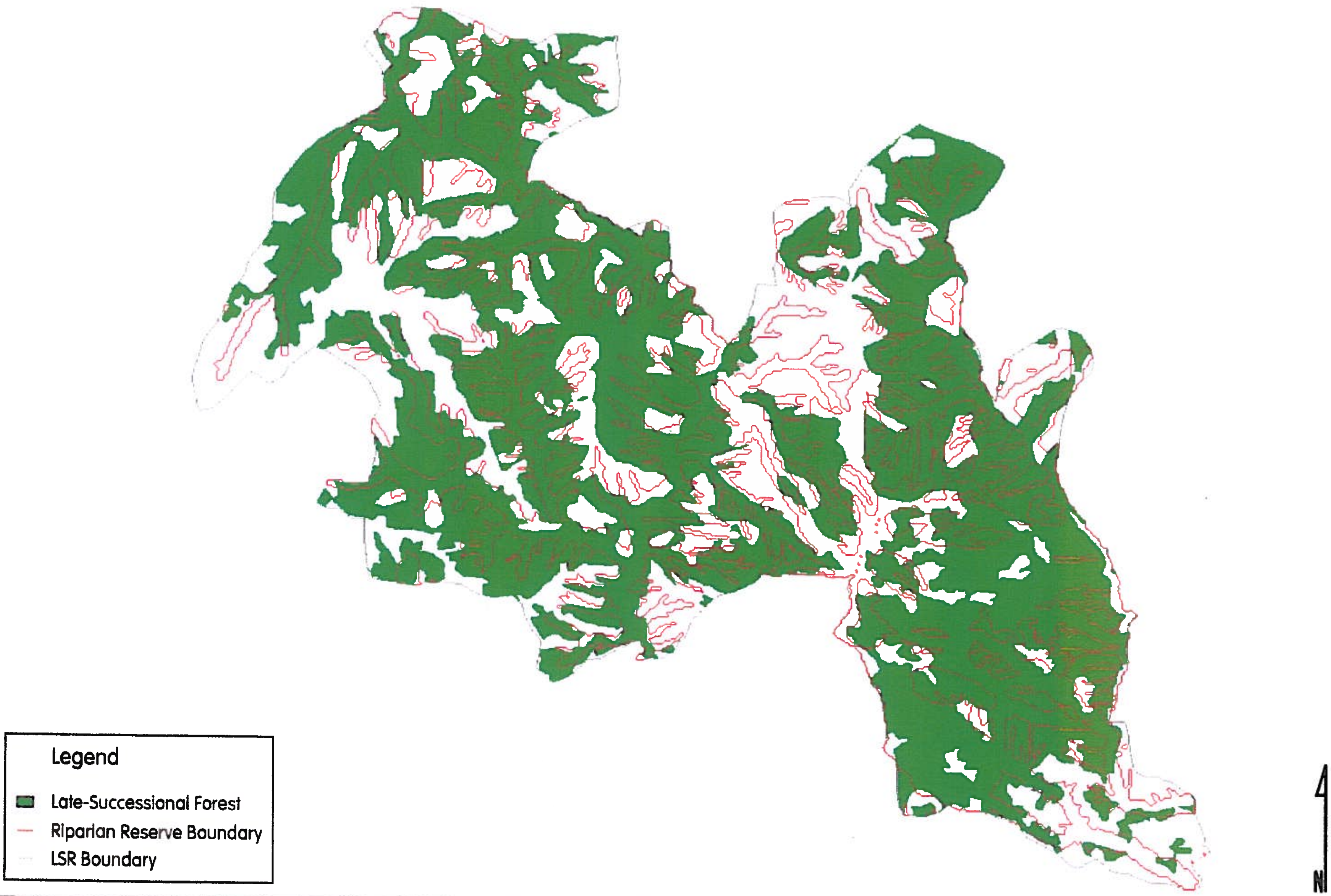
Appendix A lists the mammalian, avian, amphibian, and vascular plant species identified as being closely associated with late-successional forest that are known or suspected to occur within the Dillon LSR (USDA, USDI, 1994). Some species are dependent on habitat attributes most commonly found in older forests, such as large snags. Several of the aquatic amphibians are associated with cold, clear, headwater streams, the optimum conditions for which are often found in late-successional forests. Though not specifically associated with late-successional forested habitats, the occurrence of anadromous fish stocks are described due to the management emphasis of riparian reserves.

Northern Spotted Owl

The Dillon LSR has only recently been considered within the various management strategies for the northern spotted owl. The Lick Creek and Swillup Creek activity centers were managed as Spotted Owl Habitat Areas in the late 1980's. This area was not designated as a Habitat Conservation Area (Thomas, et. al. 1990); nor was it identified as a Designated Conservation Area in the final draft recovery plan for the northern spotted owl (USDI 1992). This area was not designated as Critical Habitat (USDI 1992). This LSR serves as an important refugia for the owl within the province because it is managed to provide late-successional and old-growth habitat conditions.

The Klamath definition of suitable nesting and roosting habitat (5/17/93) for the northern spotted owl is defined as multi-layered, multi-species with > 60% total canopy cover for nesting/roosting, with large (> 18") overstory trees, large amounts of down woody debris, presence of trees with defects or other signs of decadence in the stand. Determinations of suitability also consider size of stand and adjacency to other

Figure 12. Connectivity provided by riparian reserves to stands of late-successional habitat within the Dillon LSR.



habitat types which the owl can use. Small, isolated pieces are not regarded as suitable. This Forest definition is typical of the owl habitat found within the Dillon drainage. On the Klamath, owl nest sites and activity centers are generally found on the lower third of a slope.

Definitions of habitat types are included in the Section 7 Consultation Guidance on Critical Habitat for the Northern Spotted Owl (U.S. Fish and Wildlife Service letter, 5 August 1992). These terms were used to describe owl habitat: nesting/roosting, foraging, dispersal, and capable. These habitats were identified based on tree density, tree diameter, horizontal and vertical diversity, decadence, and canopy closure. Nesting and roosting habitat could not be identified separately using the Dillon vegetation data base and have been identified as one habitat condition for purposes of this analysis. There are approximately 8,396 acres of nesting/roosting habitat well distributed within the LSR.

There are five 100 acre LSRs outside of the Dillon LSR but within the Dillon Creek drainage. Four are located southwest of the LSR. The fifth 100 acre LSR is within the Swillup Creek drainage. It is located just outside the Dillon LSR. The 100 acres of late-successional habitat has not been designated. These LSRs were designated around known owl activity centers.

Table 6 describes all of the activity center's history to date within the Dillon Creek drainage and including the Swillup Creek activity center. Lick Creek (#4226) is the only known activity center located within the Dillon LSR boundaries. The Sawtooth Mountain activity center is located within the Medicine Mountain LSR (RC-304), a portion of which is located in the southwest Dillon Creek drainage.

Table 6. Site history of spotted owl activity centers within the Dillon watershed and including the Swillup Creek activity center.

Site Name (Number)	Last Surveyed	Results	Best Data	Year of Best Data
Dillon Mountain (4081)	1995	No Response*	Reproduction	1987
Cedar Creek (4090)	1995	Presence	Occupancy	1989
Coffee Can Creek (4091)	1995	No Response	Reproduction	1989
Rock Creek Butte (4092)	1989	No Response	Reproduction	1987
Sawtooth (4093)	1989	Occupied	Reproduction	1992**
Lick Creek (4226)	1995	No Response	Occupied	1994
Swillup Creek (4224)	1995	Occupied	Reproduction	1990

*There was an incidental location of a pair at this site in 1995. No birds were located during protocol surveys.

**The 1992 information presented for this site is from an incidental sighting. The site was not surveyed to protocol that year, however, reproduction was confirmed.

Owls have been more easily located on the south side of the drainage due to the better road access. Access problems and difficult terrain continue to be obstacles in conducting surveys on the north side. Limited surveys were conducted in 1990 in parts of the Jackass Creek drainage and along Dillon Divide. Three single owls were located as well as one barred owl. Protocol surveys were conducted in 1995 within areas proposed for salvage harvest in the Dillon drainage. This survey effort has covered approximately 65% of the Dillon LSR. No new owls were located. A barred owl was once again detected near Dillon Divide. Overall, 1995 surveys were largely unsuccessful across the district. A long winter and unusually wet

spring/early summer may have contributed to the apparent poor reproductive year. The Swillup Creek birds were located on several occasions during the 1995 field season. They did not reproduce.
The status and location of the activity center for the Lick Creek owls is uncertain. The owls are typically located in the late evening or night and we believe they are called in from deep in the Lick Creek drainage. Follow-up surveys have repeatedly been unsuccessful.

Figure 13 illustrates the distribution of spotted owl habitat within the Dillon and Swillup Creek drainages. It includes the Dillon and Medicine Mountain LSR boundaries, the 100 acre LSRs, and the location of the Swillup, Lick Creek, and Sawtooth Mountain activity centers. The 100 acres of late-successional habitat around the Swillup Creek activity center has not been designated. As depicted, owl habitat is well distributed in the drainages.

Table 7 illustrates the amount of suitable habitat within 0.7 and 1.3 miles of each spotted owl activity center associated with the 100 acre LSRs. The Dillon Mountain and Sawtooth site's 1.3 mile circle extend outside of the watershed. All of the activity centers are above the take threshold of 1336 acres in the existing condition, except for the Lick Creek site which was reduced from 1548 acres to 1,168 acres as a result of the 1994 Dillon fire. It is currently below the take threshold. Within 1.3 miles of the Swillup Creek activity center, there was approximately 2,078 acres of suitable habitat prior to the 1995 Pony fire. As a result of the fire there is approximately 1,818 acres of suitable habitat. It remains above the take threshold of 1,336 acres.

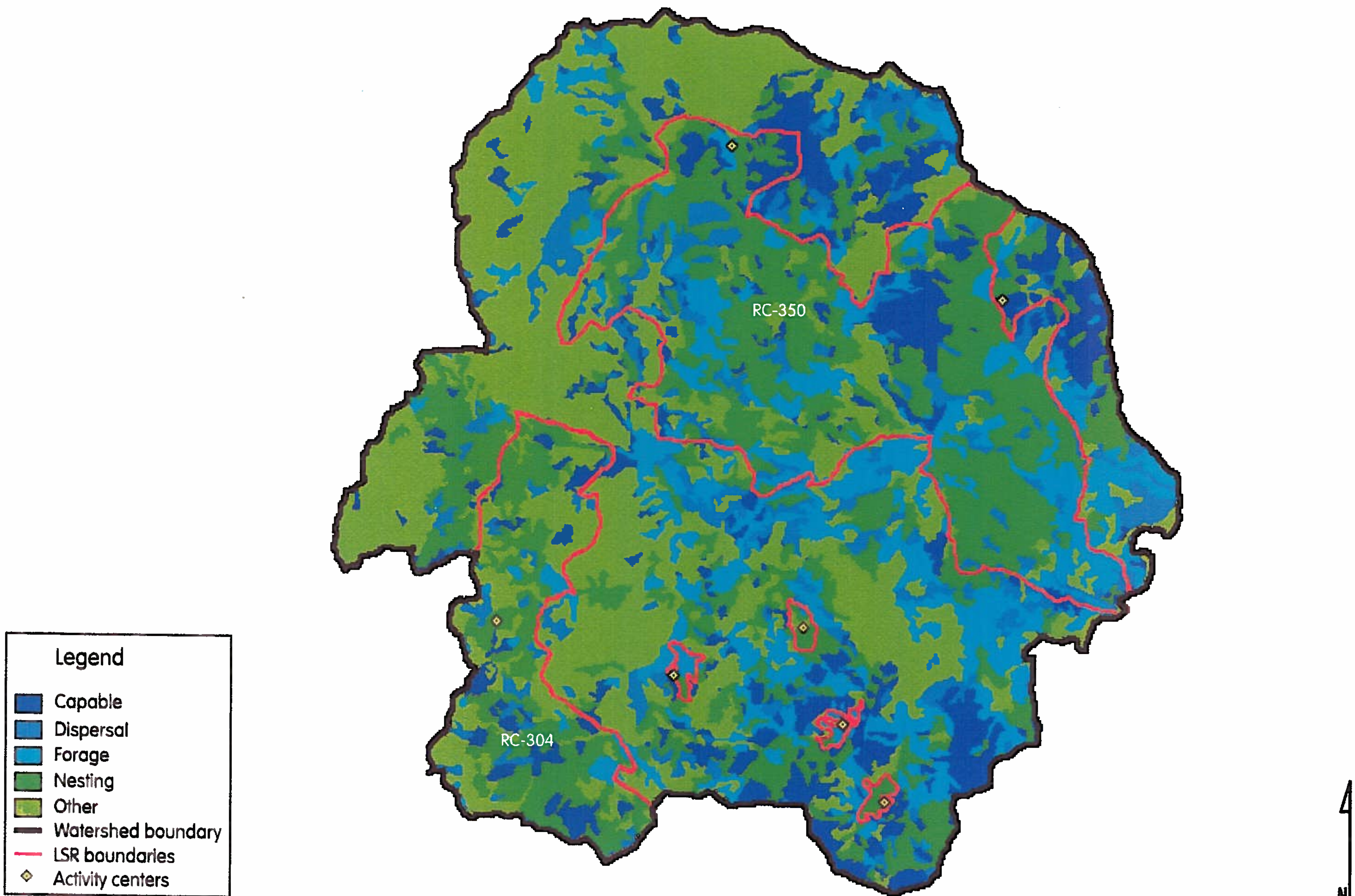
Table 7. Spotted owl nesting/roosting and foraging habitat within 0.7 and 1.3 miles of activity centers within the Dillon watershed.

	Existing Condition	
Site Name (Number)	0-0.7 Miles	0.7-1.3 Miles
Dillon Mountain (4081)	577	1350
Cedar Creek (4090)	486	1295
Coffee Can Creek (4091)	600	922
Rock Creek Butte (4092)	412	951
Sawtooth (4093)	454	1307
Lick Creek (4226)	486	682
Swillup Creek (4224)	585	1233

Bald Eagle

On the Klamath National Forest, bald eagles nest near lakes and rivers in large trees in open, uneven-aged mature/old-growth forests. They often roost in groups of several individuals. The majority of the Klamath's eagle population is found on the Goosenest Ranger District, however nesting pairs are being located regularly on the west side of the Forest.

Figure 13. The distribution of suitable spotted owl habitat in relation to LSRs RC-350 and RC-304, and owl activity centers.



One nesting pair has been located on the Happy Camp Ranger District. This pair fledged one young in 1994 and two in 1995 (these nesting attempts were completed prior to the Dillon fire and Pony fire respectively). The nest is located nearly 18 miles upstream from the mouth of Dillon Creek. A second nesting pair is located near the town of Orleans, on the Orleans Ranger District (Six Rivers National Forest). It is also approximately 18 miles downstream from the mouth of Dillon Creek.

The Klamath River corridor offers prime habitat conditions for the bald eagle. In the past two years, eagle sightings have doubled along the river corridor. Adult bald eagles are being sighted regularly along the river between Dillon Creek and Clear Creek. Extensive surveys were conducted in this area in 1994. Limited surveys were conducted in 1995. A nest was located in April, 1996 approximately five miles from the mouth of Dillon Creek on the Klamath River. The nest is currently active.

American Peregrine Falcon

Peregrine falcons nest on cliffs, feed primarily on birds, and prefer foraging in riparian forest habitat along lakes and rivers. The diet of peregrine falcons consist almost entirely of birds (Bent 1938, Herbert and Herbert 1965).

The Klamath currently manages 14 active peregrine falcon eyries. These areas are managed for nest sites and protective zones around nest sites. There are three eyries within 15 miles of the Dillon Creek watershed. Each known breeding territory is monitored annually to determine occupancy and reproductive success. Inventories of unoccupied suitable nest cliffs are also conducted each year to document establishment of new territories. An aerial reconnaissance was conducted in July 1989 by Joel E. Pagel of potential cliff sites within the Dillon Creek drainage. He concluded that there would be little opportunity for nesting.

Marbled Murrelet

Suitable nesting habitat for the marbled murrelet is considered to be mature to over mature coniferous stands, or those younger stands with interspersed large trees which may provide nesting opportunities. Generally, the habitat characteristics associated with murrelet nesting are large trees with large lateral branches, extensive mistletoe infection, witches broom and a mature understory that extends into the canopy. These elements provide nesting substrate. Such characteristics usually do not develop until trees are 150 to 175 years of age. Also, the majority of murrelet observations to date have been below 2000 feet elevation, with some detections between 2000 and 3000 feet (Paton et. al. 1992).

Paton and Ralph (1988) have found that stands of old-growth larger than 500 acres in California were more likely to have more detections, and presumably support larger murrelet populations. Stands less than 100 acres lack the qualities and microclimates associated with forest interior (Spies and Franklin 1990). Murrelets have been detected in stands less than 100 acres, however detections were few (Paton and Ralph 1988).

Little is known regarding the nesting chronology of the murrelet. Carter and Sealy (1987) have made estimates based on a variety of indicators. Egg-laying appears to begin in the latter part of April. A 30 day incubation period would put the hatch date in mid to late May. The latest fledgling dates have been recorded in the month of September. However, fledglings have been found at sea as early as mid-June and as late as the first week of October. To date, eleven nests have been located in California. All nest trees were located in old-growth trees greater than 32 inches DBH. Nests are not constructed, rather eggs are laid on large or deformed branches with moss covering, in crooks of the tree; or can be situated on clumps of conifer needles or sticks. Murrelets forage primarily on fish and invertebrates in near-shore marine waters.

FEMAT has described recommendations provided by the marbled murrelet working team. Two zones were identified based on observed use and expected occupancy. Zone 1 is closer to the marine environment and is associated with most known murrelet activity (FSEIS, 1994). This zone extends approximately 25 to 35 miles inland on the Klamath, including primarily the Ukonom Ranger District and the western-most portion of Happy Camp. Zone 2 occurs from approximately 35-45 miles inland. This area is defined for survey purposes and is less likely to support murrelets. The Dillon and Swillup watersheds are within Zone 1 and between 23 and 30 miles from the ocean.

Limited surveys have occurred on the Klamath in relation to specific timber sales on Happy Camp and Ukonom Ranger Districts. There were four detections of murrelets on Happy Camp District, approximately 35 miles inland, in 1994, and one detection in 1995 at the same location. This area is approximately 12 miles northeast of the Dillon drainage and just within the Zone 2 boundary. Based on this information, we must assume murrelets are also using the Dillon drainage. Nearly all the surveys were completed within the Dillon drainage prior to the Pony fire. There were no murrelets detected. The second year of surveys will begin in April 1996.

Big Game Species

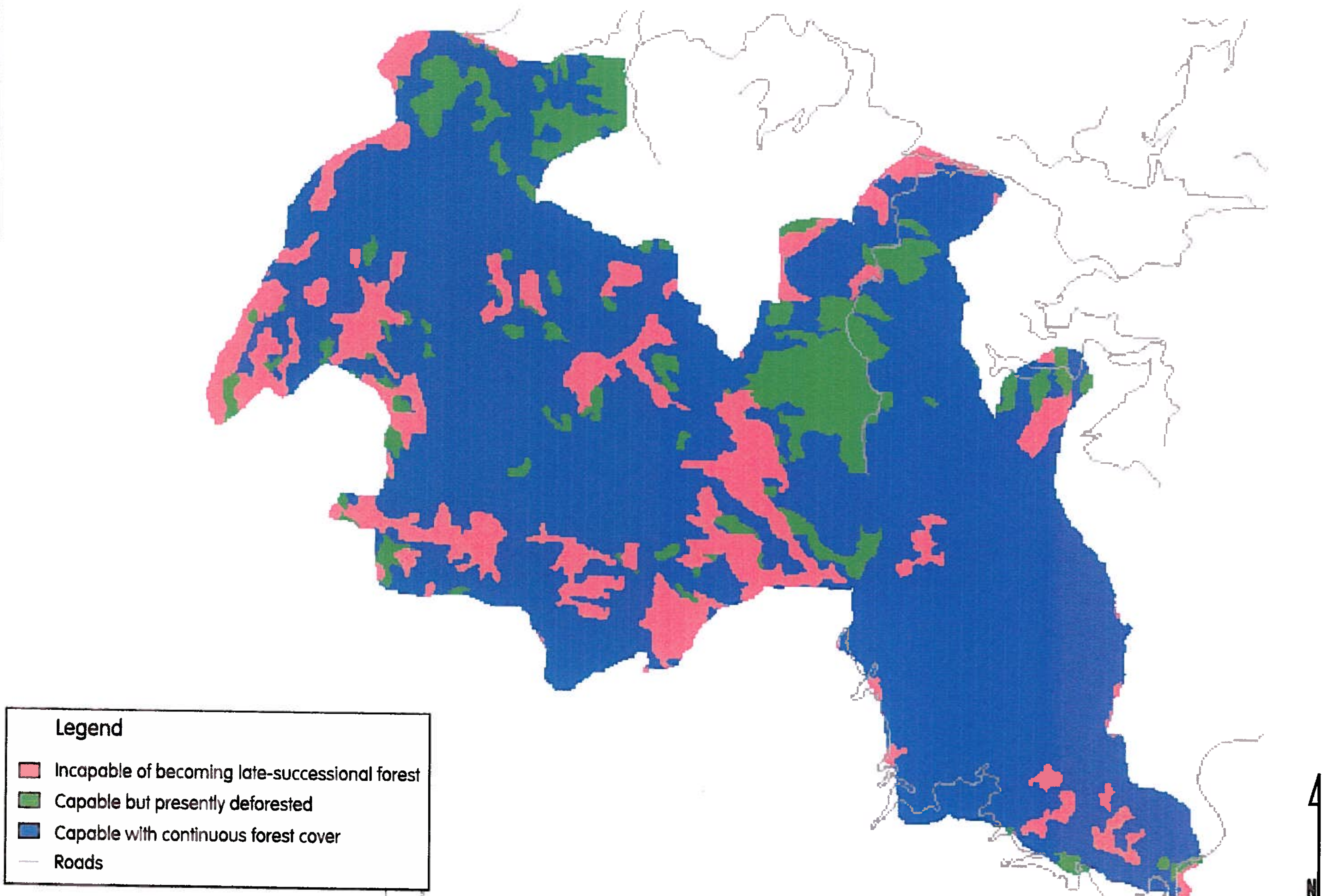
The Dillon LSR provides a unique opportunity to manage for both big game and late-successional wildlife species to the benefit of both groups. Several areas within the Dillon LSR are site limited and will not support late-successional habitat (Figure 14). These sites support montane chaparral, montane hardwood-conifer, and montane hardwood vegetation types and are composed of many ideal forage species. They are generally located within areas of late-successional habitat and provide forage areas in close proximity to cover. Big game species, such as deer, black bear, and elk will benefit from maintenance of these sites as high quality forage areas. The close proximity of late-successional habitat provides good conditions for maintenance of big game populations.

Anadromous Fish Species

Klamath Mountains Province steelhead are the only anadromous fish species found in the Dillon LSR. They are found in the lower 1.6 miles of Swillup Creek and 0.3 mile of Elliott Creek which enter the southeastern portion of the Dillon LSR. Steelhead are also found in the lower 9.3 miles of the North Fork of Dillon Creek which enters the central and northwestern portion of the Dillon LSR. Jackass Creek has resident trout in it's lower 2.4 miles. Stream surveys were conducted in 1989 in the North Fork of Dillon Creek using a modified Bisson (1982) methodology, and in 1978 in Swillup Creek using a transect every 1/4 mile methodology.

Klamath Mountains Province Steelhead were proposed for listing on 3/10/95. Coho salmon are not known to exist in Dillon Creek and chinook salmon are not found within the Dillon LSR but could be impacted by activities within the Dillon LSR. Chinook salmon are found in the lower 3.2 miles of the mainstem of Dillon Creek.

Figure 14. Capability of the ground to support late-successional forest within the Dillon LSR.



DESIRED CONDITION

The desired condition within LSRs 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, and logs in streams. Additional important elements typically include multiple canopy layers, smaller understory trees, canopy gaps, and patchy understory. These conditions typically begin when forest stands are between 80 and 140 years in age, depending on site conditions, species composition, and site history. In short, the desired condition is to promote and maintain these conditions in the maximum amounts sustainable through time.

Processes that create the current 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. The assessment criteria were used to describe the desired condition.

AMOUNT AND DISTRIBUTION OF LATE-SUCCESSIONAL AND OLD-GROWTH FOREST HABITAT

VEGETATION TYPES

The vegetation types described under the current condition represent the plant communities that dominate the site. Factors influencing the distribution of vegetation types include environmental factors such as soil type, elevation, climate, and disturbance history. Since vegetation types are the dominant plant communities based on environmental factors, distribution of these types is not expected to vary over time.

Late-successional and old-growth characteristics develop differently for each vegetation type. The **montane hardwood, montane chapparal, knobcone, and barren areas** are not capable of developing late-successional or old-growth characteristics. Those types cover about 17% of the LSR.

Areas not capable of growing dense conifer stands will be relatively open with 20% to 50% canopy closure. These areas will be dominated by shrubs, hardwoods and scattered conifers. Conifer density will range from 1-10 per acre. Snags will range from 1-2 trees per acre and down wood will be less than 5 large logs per acre.

Within those areas that have the biological potential for achieving late-successional or old-growth conditions, some general goals apply. It is desirable for large trees greater than 24 inches diameter to dominate the overstory, with more than 25 total trees per acre.

Snag densities should be maintained at around 3-5 per acre and the down wood should average at least 5 large logs per acre. This desired condition for snags and down wood is consistent with and developed for the LRMP through the interdisciplinary team (IDT) process. The LRMP provides realistic goals which balance wildlife needs with fuels objectives to reduce fire risk. Results from systematic data collection conducted in this LSR show that areas burned at low to moderate intensity by the recent fires meet or exceed desired levels of snags and down wood. The data collected supports the work done for the LRMP and indicates that the above goals are shown to be sustainable through prescribed fire where fire intensity can be held at low to moderate levels.

It is desirable to have variability in the late-successional vegetative characteristics. It is not desirable to have all the stands containing the same vegetative characteristics, stocking levels, tree sizes, and understory component. Variability will occur in the numbers and sizes of trees found in late-successional stands. Multi-storied conditions will be scattered throughout the landscape, but will be more prevalent on north and east aspects and in riparian areas. South and west facing slopes will have very few multi-storied stands. Canopy closure will vary across the landscape, ranging from less than 50% on south and west slopes to more than 50% on north and east slopes and riparian areas.

The **Douglas-fir and Klamath mixed conifer types** (65% of the LSR) have the highest biological potential for achieving late-successional, old-growth characteristics. These types are most capable of achieving structurally complex late seral stage conditions.

Within the Douglas-fir and Klamath mixed conifer types, 77% of the stands are in late-successional or old-growth condition. Management of these stands should be aimed towards maintaining continuous forest cover over 90% of the area. Stand structure would basically have late-successional or old-growth characteristics with uneven-aged distribution. Inclusions of patches less than 5 acres in size of younger seral conditions would be scattered throughout forests where older characteristics and canopy closure of 40% to 60% dominates.

The **white fir and montane hardwood-conifer types** (18% of the LSR) have the biological potential of achieving late-successional or old-growth characteristics but are at high risk of stand replacing fire. Characteristics of these stands, such as susceptibility to stand replacing wildfire, reduce the likelihood of maintaining late-successional or old-growth characteristics over long periods of time. Currently a little over 50% of these stands are in late-successional or old-growth condition. Management of these stands should be aimed towards 60% to 70% of the area in late-seral to old-growth condition.

White fir stands will be generally even-aged and dense with greater than 60% understory. Montane hardwood-conifer stands will be of open character around 40% canopy closure. Multiple layers will be common with hardwood understory and conifer overstory.

PLANTATIONS

It is assumed that areas currently in plantation stage are capable of supporting mature and late-successional forest, and therefore, the desired condition is to manage them as such. Residual snags, hardwoods, and down logs from the previous stands will be desired components to maintain within these plantations. Ten to fifteen hardwoods per acre should be carried through the life of the stand. In the interim, the stands should be healthy and fast growing with stocking levels and fuel accumulations that reduce the likelihood of loss to catastrophic fire.

ROADS

The desired condition is to minimize the negative effects of roading within the LSR, including a reduction in the amount of road-related sediment within the watershed. Standards and guidelines for LSRs state that road construction is generally not recommended unless potential benefits exceed the cost of habitat impairment. Additionally, standards and guidelines for key watersheds prescribe that existing system and non-system road mileage be reduced. No additional road construction, for the purpose of LSR habitat management, is recommended at this time.

ACRES AND CONDITION OF RIPARIAN RESERVE IN LSR

The desired condition in the riparian reserves will be similar to what was described for the individual vegetation types. The vegetation type along each stretch of riparian reserve will mostly dictate the desired condition with some variation. Riparian areas along perennial streams will tend to have more moisture available for vegetation development and growth. Denser stands are expected and snag and down wood densities can be maintained at the top end of the range for each vegetation type. Availability of large woody material for stream hydraulic function is of prime importance.

The riparian vegetation is to be diverse and dense enough that it stabilizes the stream banks and adjacent hillslopes, providing an area that catches sediment, contributes large wood, and provides shade for temperature control. Large woody material, rocks and live vegetation are present along stream edges to help provide stability to the riparian areas and complexity (differing habitat opportunities) to the semi-aquatic and aquatic habitats.

Manage for fuels conditions that reflect those described under the next section: *Stability and Resiliency to Large Scale Disturbance*. Desired snag densities are 5 to 10 per acre and desired down wood densities are 20 pieces of large wood (40 cubic feet or larger) per 1,000 lineal feet within 3rd to 5th order channels. The goal is to develop stands where the desired mix of vegetation, snags and down wood can be maintained over the long term. Small openings of 5 acres or less are more desirable than large openings such as those created by recent high severity wildfires.

Desired condition for aquatic habitat includes large, deep pools that are intermixed with riffles in a beneficial mix for the fish species using streams within the LSR. Table 8 shows desired conditions for key elements of aquatic habitats. Riparian restoration projects, such as planting along streams banks, help restore the ecological processes and diversity of the riparian reserves. The quality of wildlife habitat in riparian reserves is stable or improving over time.

Table 8. The desired condition of specific stream measurement components as described in the Klamath Land and Resource Management Plan.

PARAMETERS	DESIRED CONDITION
Riffle Embeddedness	<20% average
Fine Sediment in Spawning Areas	<15% average
Primary Pools	1 per 6 bankfull widths
Coarse Woody Debris	20 pieces per 1000 linear feet
Water Temperature	<20 degrees Celsius

The desired condition is to keep **Port-Orford-cedar** populations free from disease. And as such should have any risks to it minimized by following all reasonable management safeguards, especially during fire suppression activities or other management activities.

STABILITY AND RESILIENCY TO LARGE SCALE DISTURBANCE

Large stand replacing, high intensity fires are not desirable within LSRs. The introduction of a fire cycle similar to that which occurred in pre-suppression times, will reduce the risk of catastrophic, stand-replacing fires, and will help stabilize and extend the life of existing late-successional forests. Management tools, such as underburning, salvage logging, and other fuel reduction methods should be used to reduce the possibility of stand replacement fires occurring. Geographic features such as slope, aspect, soil erodibility, and elevation, as well as fuel types need to be examined and priorities for an active fuel reduction program established.

Fuel levels in the LSR need to be managed so that fire can be controlled manually on very hot, dry days. Under these conditions, stand replacing fire is not likely to occur within late-successional forest stands (see Appendix B). It is preferable to treat large blocks, greater than 200 acres, of vegetation. Treatments need to ensure that fuel continuity is variable over the landscape. It is not desirable to have the same fuel condition found over large blocks of the landscape, particularly large areas of heavy fuel loadings that can be lethal to late-successional overstory. Large contiguous blocks of moderate/high fire behavior potential larger than 200 acres in size are not desirable. Top priority of the burning program should be to break up large blocks of high fuel concentrations.

Prior to fire suppression, fire was an integral part of the internal dynamics of a typical stand. The introduction of prescribed fire to the LSR will help encourage the processes and attributes that define late-successional and old-growth ecosystems. It is expected and even desirable to have low to moderate intensity fires burn in LSRs. This is the primary mechanism that created and maintained late-successional stands in the past. Low intensity fires reduce fine fuels and ladder fuels, create a seedbed for a diversity of herbaceous plants, and create a patchy understory. Moderate intensity fires are desirable if they create small openings in the canopy of one to five acres in size. This allows for regeneration of forest stands 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. Stand rejuvenation at this fine scale increases the likelihood that late-successional characteristics can be maintained over very long time periods.

Conditions throughout the LSR should be such that with fire, average flame lengths would be less than four feet and rates of spread less than twenty chains per hour (1,320 feet or 1/4 mile). 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. Site capability will also influence fuel loadings.

The potential for human caused fires is low in the LSR. Road access is minimal and there are no recreation facilities in the vicinity. Past management activities and current policies require fuel treatment along roads.

Fuel treatments need to be balanced with other LSR objectives. Lands adjacent to LSRs, with high fire hazards should be examined for possible treatments to prevent catastrophic fires. Areas downslope or upwind of prevailing wind patterns should be especially examined.

CONNECTIVITY OF LATE-SUCCESSIONAL AND OLD-GROWTH FOREST HABITAT TO OTHER LSRs, RIPARIAN RESERVES, AND WILDERNESS AREAS

The desired condition is to minimize barriers to movement for species dependent on late-successional habitat.

The 100 acre LSRs within the Dillon watershed will also be managed to maximize the amount and quality of late-successional habitat. They provide important links to other Late-Successional Reserves located outside the Dillon watershed boundaries.

HABITAT STATUS, INCLUDING THE CONTRIBUTION TO NORTHERN SPOTTED OWL AND MARBLED MURRELET RECOVERY AND ANADROMOUS FISH

The desired condition of the Dillon LSR is to provide late-successional and old-growth habitat conditions and provide for a diversity of late-successional wildlife species. This LSR will provide late-successional habitat conditions which will contribute to the recovery of the marbled murrelet and spotted owl. There will be approximately 1,336 acres of suitable habitat around each known owl activity center within the LSR boundaries. It will be a refugia for all species which utilize late-successional habitat at some stage in their life cycle. This LSR will also provide habitat for big game species.

There is little information on species status within the LSR, particularly for the owl and murrelet. With the completion of surveys for both species in 1996, we may have new information to augment our current knowledge. This LSR will contribute to the owl and murrelet's recovery and will be managed to maximize the amount and quality of late-successional habitat within its boundaries.

Once plantations grow in late-successional habitat, there should be approximately 10,000 acres in late-successional conditions at any given time. Considering topography, slope, aspect, and vegetation types, it is estimated the LSR could support 2 to 4 owl pairs within that same 10,000 acres of late-successional habitat.

The Dillon LSR will contribute to the recovery of listed fish species and will be managed to maximize the amount and quality of habitat parameters which promote this recovery. These habitat parameters include: cool water temperatures, high quantities of coarse wood, clean spawning gravels, clean bottom substrate, and primary pools.

The Klamath LRMP describes the fisheries habitat desired condition in measurable elements. Water temperature should not exceed 69 degrees Fahrenheit. Coarse woody debris should average 20 pieces per 1,000 linear feet. There should be less than 15% fine sediment in spawning habitat, and less than 20% substrate embeddedness. Primary pools should be at least one per 6 bankfull channel widths.

SUMMARY

The desired condition of the Dillon LSR is to maximize late-successional habitat conditions and provide habitat for those plant, fish, and wildlife species which are associated with late-successional and old-growth habitats to the extent possible. This assessment indicates approximately 75% of the ground is capable of supporting late-successional habitat. The desired condition is that 90% of the capable ground is in late-successional habitat conditions at any given time. Based on available information there is likely to be more late-successional habitat than occupied these sites historically. This habitat should have a diversity of conditions from open to dense stands and variation in the numbers of snags and coarse woody debris across the landscape which would promote a diverse assemblage of late-successional species.

The desired condition includes that this LSR be in a condition to withstand the effects of wildfire and be able to mimic pre-suppression fire regimes. It is unacceptable for wildfire to result in large stand replacing events which destroy the integrity and functioning of the Dillon LSR.

CONCLUSIONS AND RECOMMENDATIONS

Based on the Assessment Criteria used to assess functioning of the LSR, the following conclusions are drawn. Along with the conclusions are recommendations for treatment. Recommended treatments are described in detail in the next chapter: ***Implementation Schedule***. The points used to assess functioning are the criteria on which recommended treatments are based.

AMOUNT OF LATE-SUCCESSIONAL AND OLD-GROWTH FOREST HABITAT

The LSR is currently meeting this component of functioning. Over 70% of the most capable stands are in late-successional or old-growth condition. There is still room for improvement but target habitat does not presently appear to be particularly limiting except where large blocks of stand replacing wildfire has occurred.

Density influences stand growth and transition from one seral condition to the next. If high density is reached at one stage, some individuals must die to make growing space for others to achieve larger sizes. Management to reduce stand density will facilitate achievement of late seral conditions in many stands.

Treatment: Thinning and prescribed fire are recommended outside late-successional habitat to reduce stand density. Thinning mechanically reduces stand density, prescribed fire kills understory competition. Achieving optimal stand density will facilitate achievement and long-term maintenance of late-successional conditions.

Goals for both mechanical and prescribed fire methods of thinning would be to bring young stands (pole size and early mature) that are at 70 to 100 percent canopy closure to 40 to 70 percent canopy closure. This would leave space for growth into larger trees as thinned stands return to over 70 percent canopy closure. Mechanical methods would be most appropriate where conditions would cause excessive mortality with the use of prescribed fire. Commercial thinning should also be considered as a cost effective way to achieve desired conditions.

Road construction is not recommended in LSRs (ROD, C-16). No new roads will be built in roadless areas in key watersheds (ROD, B-19). Please refer to Figure 15 for location of roadless area within the Dillon LSR. Any future road building outside the roadless area will require an addendum to this assessment.

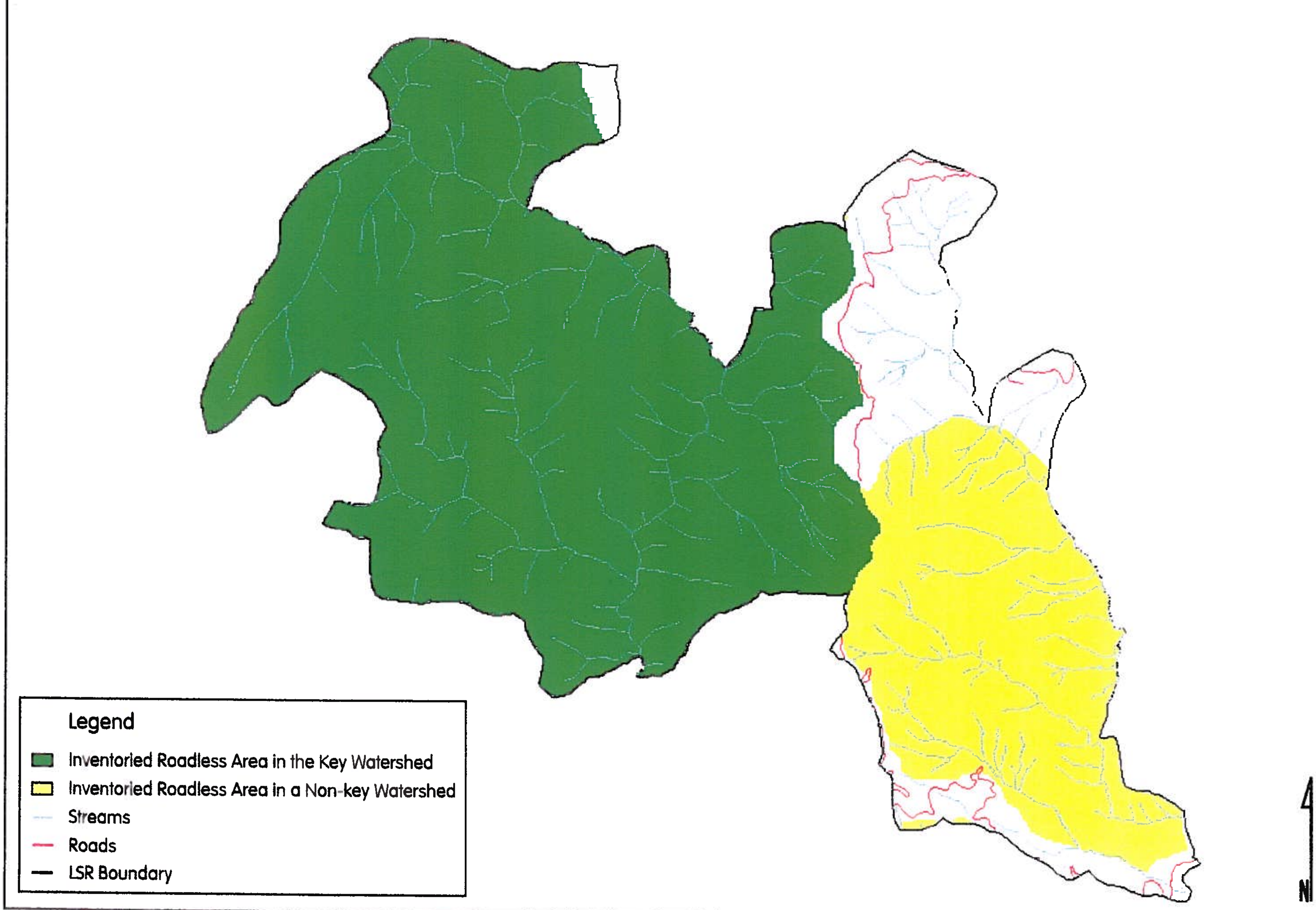
ACRES AND CONDITION OF RIPARIAN RESERVE

The LSR is currently meeting this component of functioning outside the areas burned in 1994 and 1995. Within the burned areas, moderate to high intensity fire behavior removed much of the canopy cover and left some areas with the potential for excessive fuel loads in the future.

Treatment: Recommended treatments in the intensively burned riparian reserves includes: reduction of fuels through salvage, prescribed fire, and tree planting. Salvage will be designed to exceed LRMP standards and guides for snags. Standards for snag retention are 2 to 5 per acre. Recommended treatments will be designed to leave 5 to 10 snags per acre. Salvage would be designed so that all snags that could fall across intermittent channels will be left standing.

Standards and guides for down wood are 20 pieces per 1,000 lineal feet, 40 cubic foot or larger in 3rd or 5th order channels and 5 to 20 pieces 60 cubic foot or larger across the landscape. Survey of current conditions indicates that these standards are generally being met across the landscape. Salvage will not include removal of existing down logs in riparian areas. However, if post salvage conditions do not meet LRMP standards and guides for large woody material, snags will be felled to improve hydraulic function.

Figure 15. Inventoried roadless area within the Dillon LSR.



A liberal amount of snags will be retained if the possibility exists that snags may be felled to meet down wood needs. Salvage treatment is not proposed in riparian reserves adjacent to fish bearing streams. All green trees will be left standing.

Expediting the return of these areas to a forested condition will provide canopy cover for shade and future key wood recruitment. Conifers and hardwoods will be replanted within the riparian reserves where the fire intensity has removed vegetation below a level of desired canopy covering (LRMP - 80% or site capability). The mix of species to be planted will vary and be dependent on vegetation type. Some non-commercial species, such as black cottonwood and willow, will also be planted. Trees will be planted at 12 x 12 spacing and beyond the drip line of existing green trees. This wide spacing will eliminate the need for pre-commercial thinning in the riparian reserve.

An ongoing program of frequent low intensity prescribed fire is recommended as a long term maintenance measure.

STABILITY AND RESILIENCY TO LARGE SCALE DISTURBANCE

The LSR is currently not meeting this component of functioning. Fuel models show 76% of the LSR in a condition of moderate and high fire behavior potential. Large areas (i.e. greater than 200 acres, for instance) of high fire behavior potential occurring on south and west-facing slopes are at extreme risk to stand-replacing wildfire. Areas which were affected by the Dillon and Pony fires are currently in an acceptable fuel loading condition. However, standing dead trees will continue to fall over and a shrub layer will begin to develop. Future fuel loadings (10 to 15 years from present) are expected to create a condition which puts these burned areas and adjacent late-successional stands within the LSR at risk of stand replacing fire.

Treatment: Underburning and salvage is recommended to reduce risk of stand replacing fire and protect adjacent plantations from fire within the next decade. Underburning is minor modification of late-successional stands designed to mimic environmental factors that originally formed and maintained these stands. Salvage would occur where fire has already removed late-successional characteristics. The goal is to achieve conditions where the stands can maintain themselves over the long term within the natural fire regime of low to moderate intensity fire every 8 to 25 years.

Although fuel treatment has occurred in plantations, they are vulnerable to fire until trees have "self pruned" so the limbs and foliage are separated from ground fuels and the bark has thickened. The late-successional stands adjacent to these plantations have excessive fuel build-up, especially where fire has been excluded for over 20 years. Moderate to high intensity fire, expected under current conditions, could easily spread into and destroy young plantations. Low intensity fires under desired fuels conditions are not as likely to move into plantations where fuels have been treated. With lower flame lengths and slower rate of spread, plantations can be protected until they are old enough to be less vulnerable. Eventually, the plantations should become late-successional stands. This can be accomplished without reducing late-successional habitat quality.

Those areas of moderate to high fire behavior potential need two separate burns in order to reach the desired condition. The first burn objective would consist of reducing the existing down fuel levels and begin to reduce the fuel ladder that currently exists from the ground level to the overstory trees. The second burn treatment would be done to remove the fuel concentrations that result from reducing and killing vegetation that created ladder fuels during the first treatment.

The areas that burned in recent fires would need one treatment to reduce the fuel accumulations that have been generated since the initial burn. Dead understory vegetation, limbs and branches, and some larger down material needs treatment. Snags and down wood would be retained to exceed LRMP standards and guides. Burning prescriptions would be designed to achieve desired fuels conditions described in the

Desired Condition section. The areas outside the salvage units would be underburned, areas inside the units would be broadcast and jackpot burned.

If these treatments are achieved in the higher priority areas, the intent of reducing the risk to a stand replacing event would be met. Protection to the remaining late-successional habitats would be greatly enhanced. This would be accomplished by breaking up the continuity of the ground and ladder fuels across the landscape area. It would reduce the amount of total acreage that currently exists as high fire behavior potential.

Salvage logging, fuel treatment, and planting of burned stands is recommended to reestablish conifer dominated stands and protect adjacent late-successional stands over time. Salvage activities would remove only dead material, as merchantable wood products, and other potential fuels that are not needed to meet snag, down and dead, and riparian reserve standards and guides, as described in the Klamath Land and Resource Management Plan. All activities will be designed to meet the intent of the Aquatic Conservation Strategy and the objectives of the LSR.

Reforestation would be completed following the fuel treatment. A mixture of conifer species representative of the original stand will be planted on the sites. Hardwoods will readily sprout in the burned areas.

CONNECTIVITY OF LATE-SUCCESSIONAL AND OLD-GROWTH FOREST HABITAT TO OTHER LSRs, RIPARIAN RESERVES, AND WILDERNESS AREAS

The LSR is currently meeting this component of functioning. The LSR is well connected to other LSRs and wilderness on all sides except to the northeast. Connectivity to the northeast will be achieved through riparian reserves, as described in the Klamath LRMP.

Treatments: There are currently no recommended treatments to improve connectivity.

HABITAT STATUS, INCLUDING THE CONTRIBUTION TO NORTHERN SPOTTED OWL AND MARBLED MURRELET RECOVERY AND ANADROMOUS FISH

The LSR is moderately meeting this component of functioning. Late-successional habitat is well distributed. No marbled murrelets have been detected and only one owl activity center is known within the boundaries. Protocol surveys are incomplete for both species and are not being conducted over the entire LSR. The amount of late-successional habitat will increase over time and its condition is expected to improve as the desired condition is achieved through the various treatments described in this section.

The 100 acres of late-successional habitat has not been designated around the Swillup Creek spotted owl activity center.

The Lick Creek activity center was partially burned by the 1994 Dillon wildfire and is currently below the take threshold.

Treatment: Recommended treatments include thinning, salvage and prescribed burning in and adjacent to the Lick Creek owl activity center to expedite growth of suitable owl habitat.

One hundred acres of late-successional habitat will be designated around the Swillup Creek spotted owl activity center prior to any land management activities in the Swillup Creek drainage.

Big game habitat improvement is also recommended. Treatment would include applying prescribed fire to areas not capable of achieving late-successional conditions. Periodic burning will improve forage and will also be considered for rare and endangered plants and cultural resources.

IMPLEMENTATION SCHEDULE

CRITERIA FOR TREATMENTS

Management activities within LSRs must be consistent with policies and standards and guidelines set for these lands. These have been established in the ROD for the President's Forest Plan and the Forest Land and Resource Management Plan. Accomplishing these objectives will ensure the desired future condition for the LSR is met.

LSRs are designated with the objectives to maintain, protect, and restore conditions of late-successional and old-growth forest ecosystems, which serve as habitat for associated wildlife. Treatments designed to provide these habitat conditions through time support the objectives for LSRs.

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. The treatments suggested here are not expected to degrade existing late-successional habitat. Treatments within late-successional habitat are intended to result in re-establishing those ecological processes that formed and maintained the desired habitat conditions.

While risk reduction efforts should generally be focused on young stands, activities in older stands may be appropriate if:

> The proposed management activities will clearly result in greater assurance of long-term maintenance of habitat.
>
> The activities are clearly needed to reduce risks.
>
> The activities will not prevent the LSR from playing an effective role in the objectives for which they were established (USDA, USDI 1994b).

The following are specific objectives which should be used at the project level to identify treatment areas within and adjacent to the LSR. These objectives are all important and inter-related. They were developed based on the conclusions drawn regarding how well the LSR is functioning. An identification of the general areas to be treated as well as the types of treatments to be considered, according to these objectives, will follow.

OBJECTIVES

1. Protect the existing stands of late-successional forest habitat through reducing the risk of stand replacing wildfire within and adjacent to the LSR.

2. Accelerate the development of future late-successional forest habitat and provide resiliency from large scale disturbances over time. Large blocks of habitat are preferable over isolated, smaller parcels.

3. Increase canopy closure and recruit large woody material to meet short and long term needs for stream hydraulic function.

4. Contribute towards the recovery of the northern spotted owl by improving habitat around existing activity centers.

5. Contribute towards the recovery of the marbled murrelet by improving late-successional habitat conditions within the LSR.

STANDARDS AND GUIDES

Some standards have been identified through this assessment that will be relevant to any project that is designed for the LSR. These standards have been identified in order to emphasize special resource concerns or existing management direction. The following list of standards have been established for proposed projects within the LSR.

1. Harvesting of any green trees over 18" DBH should not occur in any of the proposed activities, with the exception of incidental individual trees required to be removed for safety or operations requirements.

2. Within the salvage areas, only dead trees should be harvested. No green trees should be harvested within areas designated for salvage/fuel reduction activities.

3. Soil cover guidelines found within the Klamath National Forest Land and Resource Management Plan (LRMP) need to be met for all planned activities. Under certain conditions, guidelines may not be met in the short term in order to achieve long term objectives.

4. Desired levels of snags and down wood will be left in all treated areas. Desired snag densities are 5 to 10 per acre of the largest snags and desired down wood densities are 5 to 20 pieces of wood at least 20 inches diameter and 40 cubic foot volume.

Each treatment, objectives achieved, and time frames are described in detail below. Based on the four subunits identified in the *Current Condition* chapter and Figure 7, priority treatment areas were identified. Figure 16 illustrates the location of project opportunities within the Dillon LSR. These treatments would occur within the next five years. Figure 17 illustrates the sequence of events over the next 80 years.

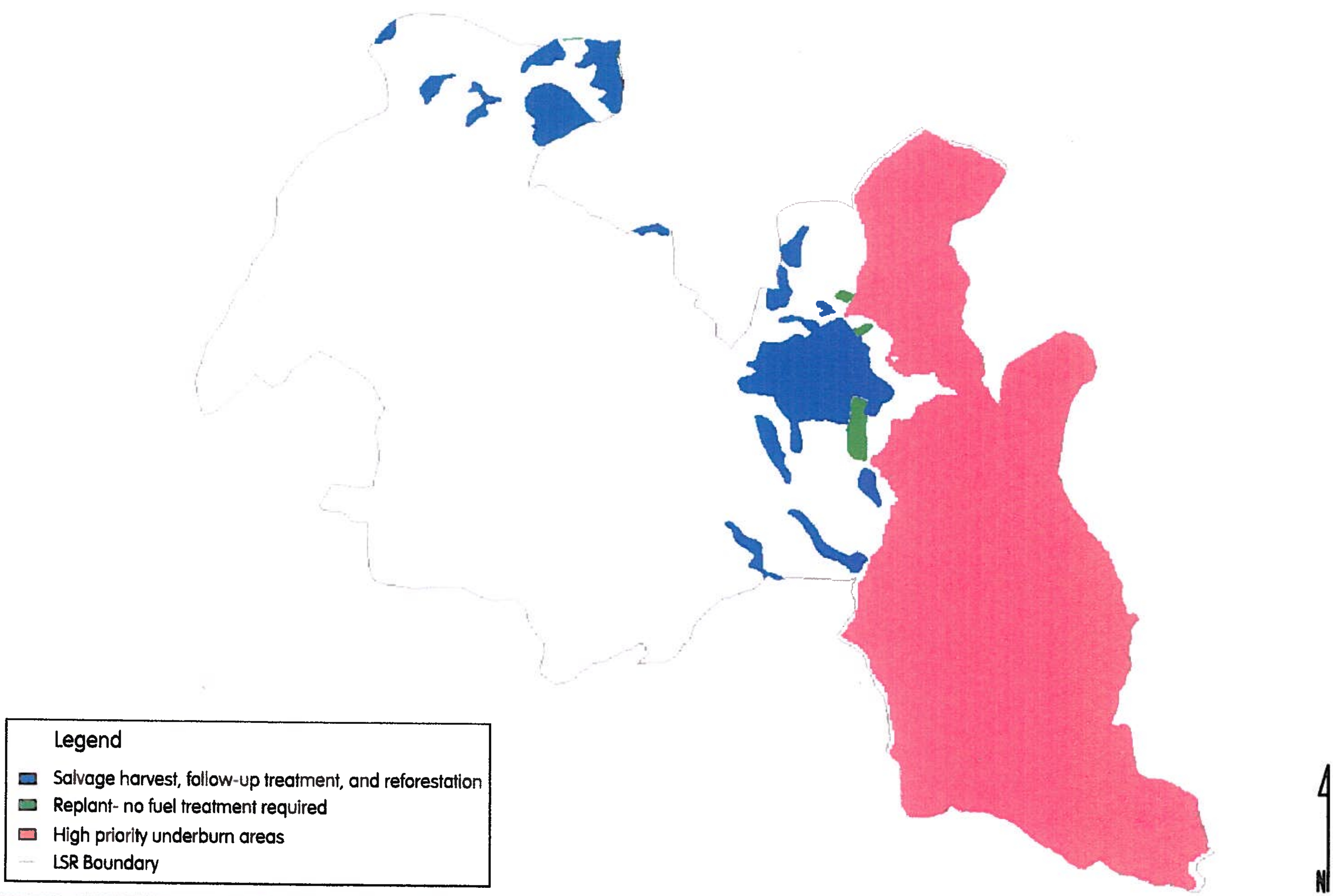
TREATMENTS

The following treatments have been proposed to achieve the objectives described above. The treatments include prescribed fire, thinning, planting, salvage, placement of large wood, and underburning. The treatment descriptions and Figure 17 present the likely sequence of management activities within the Dillon LSR. Planting, underburning, and salvage treatments are likely to occur within the next five years.

Salvage would be conducted only in areas where the fire mortality has left stands completely void of late-successional habitat values. Over 60 trees per acre were killed in areas of high fire intensity. Leaving a potential fuel hazard such as this throughout the LSR threatens developing stands in and adjacent to these areas, adjacent plantations, and existing late-successional habitat. Without salvage there would be delays in achieving the desired condition and maximizing the potential distribution of late-successional habitat within the Dillon LSR. Salvage is a cost effective fuels treatment which reduces the future risk of stand replacing fires in adjacent late-successional habitat.

Underburning is proposed to achieve several objectives within the LSR. It is currently the most likely management activity which would be used to maintain late-successional habitat conditions within the LSR over time.

Figure 16. Location and brief description of project opportunities within the Dillon LSR.



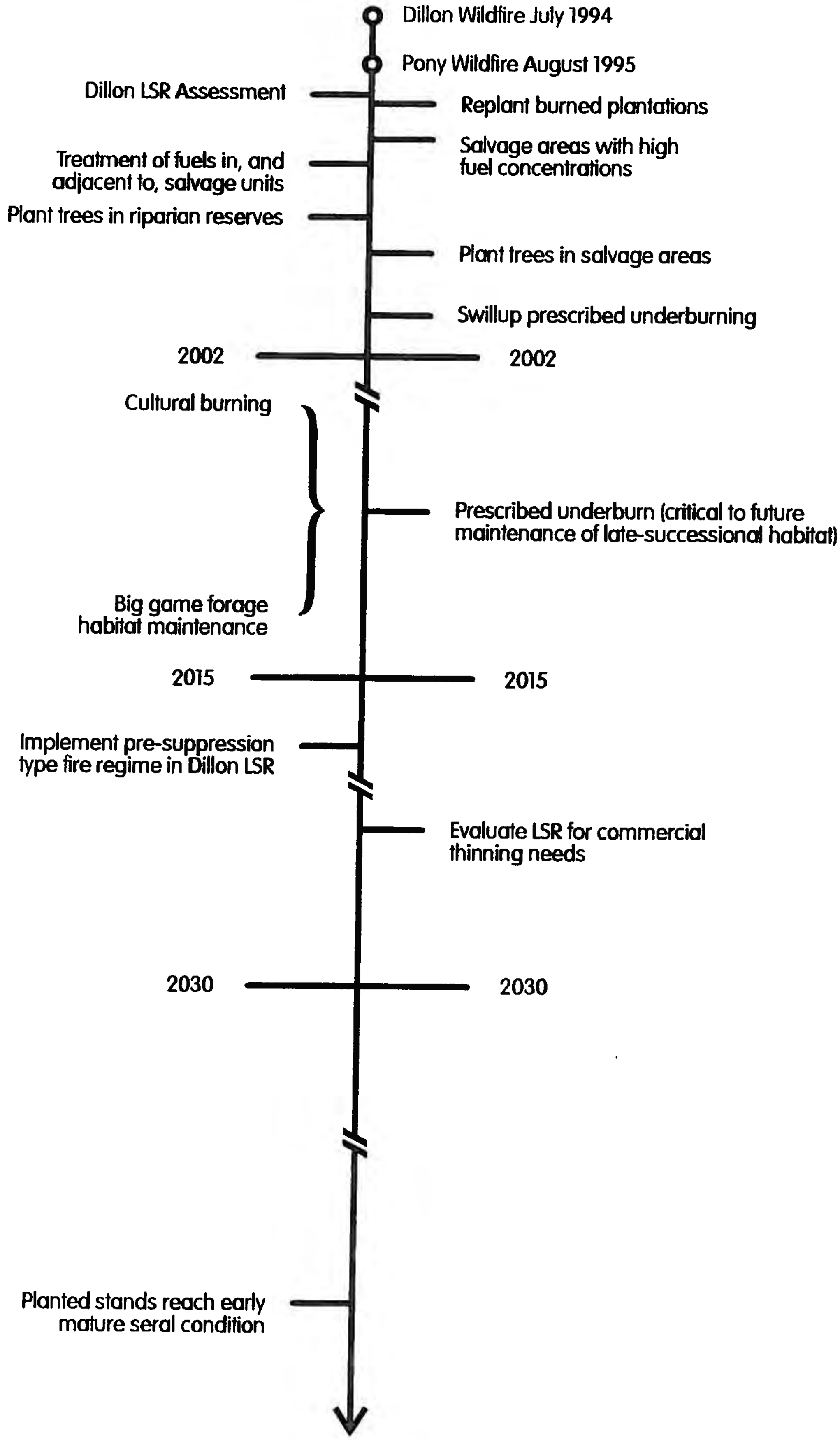


Figure 17. Timeline of potential and planned management activities within the Dillon LSR through 2075.

Prescribed fire and thinning to reduce stand density will achieve objectives 1, 2, 3, 4, and 5. The existing late-successional stands developed with, and were maintained by fire. These stands persisted with repeated fires for many years. Thinning, using fire or mechanical methods, removes hardwoods and younger conifers that were historically killed by fire. Thinning, especially with fire, favors the retention of plants best adapted to achieve and maintain late-successional conditions. Reduction in stand density also breaks up fuel continuity and reduces risk of stand replacing fire. Prescribed fire will take place within 2 to 5 years. Evaluation to determine where mechanical thinning would enhance LSR values will occur within 15 to 25 years.

Maintenance and improvement of riparian reserves by reducing fuels through salvage and prescribed fire, tree planting and placement of large down wood will achieve objective 1, 2, 3, 4, and 5. Salvage and prescribed fire will be conducted in areas where excessive fuel loads pose a risk of stand replacing fire to developing stands and adjacent stands. Measures necessary to exceed LRMP standards and guidelines for snags and down wood will be implemented. These measures include placement of wood where needed to improve hydraulic function. Tree planting inside and outside salvage areas will accelerate recovery of conifer stands in these areas. This will take place within 143 acres (5% of all riparian reserve in the LSR). Eighty-nine acres are adjacent to intermittent streams and 54 acres are adjacent to perennial streams. No salvage is proposed adjacent to fish bearing streams.

As the stands regenerate, shading of streams and hydraulic function will improve. Early mature conditions are likely to be achieved within 80 years. After that time, late-successional characteristics will start to appear. Reduced fuel loading will provide resilient stands for up to 20 years, subsequent use of prescribed fire will implement prescribed natural fire regime. Salvage is planned to occur within 1 to 3 years, prescribed burning within 2 to 5 years, and tree planting within 1 to 5 years.

Underburning to increase stability and reduce risk of stand replacing fire will achieve objectives 1, 2, 3, 4, and 5. Underburning is a very effective tool for achieving fuel levels where fire can be controlled manually on very hot dry days. Under these conditions, stand replacing fire is not likely to occur within late-successional stands. Long term goals include implementing a natural fire regime. This means that late-successional stands will be maintained by frequent (every 10 to 20 years), low intensity fire. Underburning is planned to occur within 2 to 7 years and subsequent burning will occur within 10 to 20 years.

Salvage, post salvage fuel treatment, and planting will achieve objectives 1, 2, 3, 4, and 5. Salvage will reduce fuel levels to desired conditions and set stands up for future implementation of a natural fire regime. Long term goals include managing fuels and vegetative conditions so that large scale stand replacing events such as the Dillon and Pony Fires will not occur in the future. Removal and treatment of existing fuel loading will create conditions where future stands can be maintained with frequent low intensity fires. Salvage is planned within 17 separate units over 790 acres. Salvage is planned to occur within 1 to 3 years and fuel treatment within 2 to 5 years.

Tree planting will be done inside and outside salvage areas on lands capable of growing late-successional forests. This will accelerate development of late-successional forests. Planted stands are expected to achieve early mature conditions in about 80 years. Beyond 80 years, late-successional characteristics will start to appear. Tree planting is planned to occur immediately after fuel treatment.

Salvage, prescribed burning, and thinning adjacent to the Lick Creek spotted owl activity center will achieve objectives 1, 2, 3, and 4. As described above, fuel reduction and planting will accelerate development of resilient, late-successional stands that will provide suitable spotted owl habitat for future use. This activity is planned to occur within 1 to 5 years.

Burning to improve big game forage, create favorable conditions for sensitive plants and encourage fresh growth for native american gathering practices will achieve objective 1. This burning is proposed for those areas that are not capable of achieving late-successional habitat characteristics. Since the LSR will be managed so that 75% of the total area will be late-successional habitat, the goal for this proposed treatment is to maximize the habitat values available on those lands not capable of achieving late-successional characteristics. While burning to improve forage and other values, these areas would also be in a condition where fire starts are not likely to be hot enough to spread into adjacent, late-successional stands. This is planned to take place within 10 to 15 years.

APPENDIX A

A CHECKLIST OF LATE-SUCCESSIONAL AND OLD-GROWTH FOREST ASSOCIATED SPECIES

The following amphibian, mammalian, avian and plant species were identified in the FSEIS as being closely associated with late-successional forest on federal lands within the range of the northern spotted owl, based on criteria developed by FEMAT (1993). Included here are those known or suspected to occur within the Dillon Creek LSR.

Species	Known to occur	ROD Appendix J-2 and C3 Species	Klamath Management Indicator Species	Threatened, Endangered, or Sensitive Species
Black Salamander		•		
Northwestern Salamander				
Pacific giant salamander	•			
Rough-skinned newt	•			
Southern torrent salamander		•		
Tailed Frog		•	•	
Clouded Salamander				
Del Norte Salamander		•		
Siskiyou Mountain salamander		•		
Barred Owl	•			
Brown Creeper	•			
Chestnut-backed chickadee	•			
Common merganser	•	•		
Flammulated owl	•			
Golden-crowned kinglet	•			
Hairy woodpecker	•		•	
Hammond's willow flycatcher				
Hermit thrush	•			
Hermit warbler	•			
Hooded merganser				

Species	Known to occur	ROD Appendix J-2 and C3 Species	Klamath Management Indicator Species	Threatened, Endangered, or Sensitive Species
Northern flicker	•			
Northern goshawk				•
Northern pygmy owl	•			
Northern spotted owl	•			•
Pileated woodpecker	•		•	
Red crossbill				
Red-breasted nuthatch	•			
Red-breasted sapsucker	•		•	
Varied Thrush	•			
Vaux's swift			•	
Warbling vireo	•			
Deer mouse	•			
Douglas squirrel	•			
Dusky-footed wood rat	•			
Elk	•		•	
Fisher	•	•		•
Marten	•	•		•
Northern flying squirrel	•			
Shrew mole	•			
Chipmunk complex	•			
Western red-backed vole				
Big brown bat				
California Myotis				
Fringed Myotis		•		
Hoary bat				
Little brown myotis				
Long-eared myotis		•		
Long-legged myotis		•		

Species	Known to occur	ROD Appendix J-2 and C3 Species	Klamath Management Indicator Species	Threatened, Endangered, or Sensitive Species
Pallid bat		•		
Silver-haired myotis		•		
Yuma myotis				
Western willow flycatcher				
White-breasted nuthatch	•			
White-headed woodpecker			•	
Williamson's sapsucker				
Wilson's warbler	•			
Winter wren	•			
Wood duck				
Salmon Mt. wake robin	•			•
Marble Mt. catchfly	•			•
Clustered ladyslipper	•	•		
Mountain ladyslipper	•	•		

SPECIES NOTES

AMPHIBIANS

Black salamander (*Aneides flavipunctatus*): The Black salamander barely enters the Pacific Northwest in the Siskiyou Mountains of southern Oregon (Nussbaum et.al. 1983). It is otherwise restricted to northwestern California. It inhabits deciduous and coniferous forests and is chiefly ground-dwelling. It is often found near forest streams. It resides beneath rocks, talus of road cuts, under logs, bark, and within cracks of logs (Stebbins 1985).

Northwestern salamander (*Ambystoma gracile*): Northwestern salamanders are associated with a variety of habitats, including dense forest. They are often located under rocks or large logs adjacent to water (Stebbins 1985).

Pacific giant salamander (*Dicamptodon tenebosus*): *Dicamptodon* is the largest salamander in the Pacific Northwest and possibly the world. It is located in the Coastal Ranges of northern California, Oregon, and Washington with the exception of a population in north and central Idaho. They are restricted to moist coniferous forests where they can be found under logs and bark, under stones in streams, or walking along fully exposed on the forest floor during warm rainy weather (Nussbaum et. al. 1983). The species is located in the LSR.

Rough-skinned newt (*Taricha granulosa*): *Taricha* is the most common salamander encountered in the Pacific Northwest (Nussbaum 1983). This species is located in northwestern California, the western half of Oregon and Washington, and the west coast of British Columbia, and the southwest portion of Alaska. They occur in a variety of habitats, including grasslands, woodlands, and forests (Stebbins 1985). They are extremely aquatic, but when on land, it may be found crawling in the open or hiding under rocks, logs, bark, and in rotten wood (Stebbins 1985).

Southern torrent salamander (*Rhyacotriton varigatus*): These salamanders are found in and near small, rapidly flowing, well-shaded permanent streams with clear, cold water. They are selfom more than 3 feet from free-running water. Small, cold (8 to 12 degrees C) streams with water seeping through moss-covered gravel are preferred habitats (Nussbaum et. al 1983).

Tailed frog (*Ascaphus truei*): This is the only species of anurans highly specialized for life in cold, clear, mountain streams (Nussbaum 1983). It frequents these rocky streams in humid deciduous/coniferous forests of northwest California, western Oregon and Washington, and western Montana. It usually stays close to water but will venture into damp woods after a rain (Stebbins 1985). Tailed frogs are very sensitive to water temperature and sediment.

Clouded salamander (*Aneides ferreus*): This salamander is a noted climber, climbing to heights of 20 feet (Stebbins 1985). This species is closely associated with forested habitat, but they occur in forest edge habitats, and are often very abundant in forest clearings caused by fire (Nussbaum et. al. 1983). They are found in bark of standing (Stebbins 1985) and down dead trees, under bark on the ground, in rotten logs, and in cracks on cliff faces (Nussbaum et. al. 1983).

MAMMALS

Deer mouse (*Peromyscus maniculatus*): This species is common throughout the Pacific Northwest. Deer mice do not show a preference for particular stand ages (Thomas et al. 1990). They are often one of the most abundant mammals and constitute an important prey base for numerous forest predators.

Dusky-footed wood rat (*Neotoma fuscipes*): This species is limited in distribution to parts of western Oregon and most of California. wood rats are associated with vegetative seral stages that have abundant understory vegetation and coarse woody debris such as stand conditions found in older forest seral stages (Lujan et al. 1992). It is an important prey species for many forest predators.

Roosevelt elk (*Cervis canadensis roosevelti*): Roosevelt elk were nearly extirpated from the Klamath Mountains early in this century. Recent reintroduction programs have helped to reestablish populations on the Klamath National Forest. Though not entirely an older forest obligate, elk are associated with older forests because this habitat provides high quality hiding and thermal cover as well as an abundance of forage.

Pacific fisher (*Martes pennanti*): The fisher is a mustelid directly associated with older forests (Ruggiero 1994). The largest trees in a stand are particularly important for denning and resting sites. Snags, large live trees and downed logs are all required habitat components for fisher. Home ranges of fisher can be as large as six square miles, however 10-25% can be in younger age classes as these areas provide edges for hunting purposes and prey diversity (Heinmeyer 1994). Generally fisher home ranges occur at elevations below 5,000 ft. elevation. Surveys conducted on other parts of the Klamath National Forest are yielding numerous detections of this forest carnivore.

American marten (*Martes americana*): Marten habitat requirements are similar to that of fisher but generally are at higher elevations, above 5,000 ft. elevation. Marten habitat is characterized by a large number of snags and downed logs which are important components for denning and resting areas. Surveys have been conducted on the western portion of the Klamath National Forest but there have been limited sightings.

Northern flying squirrel (*Glaucomys sabrinus*): Northern flying squirrels have a broad distribution throughout coniferous forests. Flying squirrels are arboreal mammals and are not known to occur in recent clearcut areas (USDI 1992). They nest in cavities of both live and dead trees. This species is known to be an important prey species for forest predators.

Other older forest related rodents: The FEMAT Report documented other groups of rodents that are associated with older forest habitat. These groups of species generally have a tie to dense canopy closures, well developed understories and snag/downed log components. All are important prey for forest predators. Those that are likely to occur within this LSR include: **Douglas' squirrel** (*Tasiasciurus dougalsii*), **Shrew-mole** (*Neurotichus gibbsii*) and **Townsend's chipmunk complex** (*Eutamias spp.*).

Western red-backed vole (*Clethrionomys californicus*): Little is known about its habitat associations. Generally, there is a trend of high species abundance with increasing age of stand. They have limited dispersal capabilities and connectivity of older forests may be important for long-term viability of the species (Thomas et al. 1993). This species is an important prey of forest predators.

BATS

Big brown bat (*Eptesicus fuscus*): This species is generally common throughout its range. They occur in most vegetation types and are the probably the most familiar North American bat (Maser 1981).

California Myotis (*Myotis californicus*): These are the smallest bats in northwest California and southwest Oregon. They occupy a wide variety of habitat but are best characterized as crevice-dwellers, roosting in mines, caves, hollow trees, and beneath flakes of rock and loose bark (Maser 1981).

Fringed Myotis (*Myotis thysanodes*): This species is rarely seen throughout its range. Very little is known about the habitat in which it forages. Caves, mines, rock crevices, and buildings are favored roosting sites (Maser 1981). Snags and large trees appear to be important for roosting and hibernation. They forage at or within the forest canopy, primarily in riparian habitats (USDA, USDI 1994).

Hoary bat (*Lasiurus cinereus*): This species is the most widely distributed bat in North America. It appears to be associated with forested areas, primarily coniferous or mixed coniferous-deciduous forests (Maser 1981). They typically roost in the foliage of trees about 3 to 5 meters above the ground. Females with young and solitary young, however, will roost higher. They have also been recorded to roost in abandoned nest-cavities in tall, dead trees (Maser 1981). Foraging habitat includes riparian zones. This species is migratory and occurs in the area only during the summer months (USDA, USDI 1994).

Little brown Myotis (*Myotis lucifugus*): This species tends to forage low over water at margins of lakes, ponds, or streams. Aquatic insects are the primary prey when available. Night roosts include crevices in rocks and trees.

Long-eared Myotis (*Myotis evotis*): They occur throughout the west coast in appropriate habitat. They primarily inhabit coniferous forest. They typically use buildings and loose bark of dead trees as day roosts (Maser 1981). Caves appear to be primarily used as night roosts (Barbour 1969). They glean and pursue moths and beetles at the edges of mature forests, especially within riparian zones. Small water sources, such as ponds in clearings appear to be important (USDA, USDI 1994).

Long-legged Myotis (*Myotis volans*): They occur throughout the west coast in appropriate habitat. Very little is known about this species. They are known to inhabit coniferous forests of various ages (Maser 1981).

Pallid bat (*Antrozous pallidus*): This species occurs in the Pacific Northwest and throughout the southwestern United States. It potentially occurs within the LSR. It prefers the more Sonoran life zones and thus does not inhabit the coastal ranges of northern California, Oregon, and Washington. It is known to use caves, mine tunnels, crevices in rocks, buildings, and trees for roosts (Burt 1976). They forage widely along riparian zones and hibernation sites include snags and broken-top trees (USDA, USDI 1994).

Silver-haired bat (*Lasionycterus noctivagans*): This species is a familiar species throughout the Coastal Ranges of California, Oregon, and Washington, and the mountainous portion of the western U.S. They dwell primarily in trees and are associated with wooded areas. They are often associated with mature as well as immature conifer stands. The spaces between pieces of loose bark and the trunks of trees are probably their most typical roosting sites during the day. They are known to roost in hollow trees, woodpecker holes, and birds' nests (Maser 1981). They pursue prey over dense, mature forests near streams and ponds. Natural day and maternity roosts include large snags and decadent trees. They are known to follow stream corridors when travelling from roosts to foraging sites (USDA, USDI 1994) .

Yuma Myotis (*Myotis yumanensis*): This species occurs throughout the western states and is closely associated with water. They can be found along large streams, rivers, ponds, and lakes (Maser 1981). They feed close to the surface of the water and thus need ample room to maneuver.

BIRDS

Nearly 30 of the bird species identified as being associated with late-successional and old-growth forests are known or suspected to occur within the LSR. Some are associated with structural components of older forests and some are associated with the overall vegetative characteristics. Some general groupings of species have been made for the purpose of this overview.

Snag Associated Group

Snags are important structural components in forest communities. Studies have described a direct correlation between the abundance of snags and the abundance of cavity nesters (Brown 1985). The species listed below are associated with snags for nesting, roosting, or foraging.

COMMON NAME	GENUS/SPECIES
Brown creeper	*Certhia americana*
Chestnut-backed chickadee	*Parus rufescens*
Common merganser	*Mergus merganser*
Flammulated owl	*Otus flammeolus*
Hairy woodpecker	*Picoides villosus*
Hooded merganser	*Lophodytes cucullatus*
Northern flicker	*Colaptes auratus*
Northern pygmy owl	*Glaucidium gnome*
Pileated woodpecker	*Dryocopus pileatus*
Red-breasted sapsucker	*Sphyrapicus ruberi*
Red-breasted nuthatch	*Sitta canadensis*
Vaux's swift	*Chaetura vauxi*

COMMON NAME	*GENUS/SPECIES*
White-breasted nuthatch	*Sitta carolinesis*
White-headed woodpecker	*Picoides albolarvatus*
Williamson's sapsucker	*Sphyrapicus thyroideus*
Wood duck	*Aix sponsa*

Forest Related Group

The species listed below were described as using old-growth forests, primarily or secondarily, for breeding, foraging, and resting (USDA 1993--SAT). Some are associated with sparse canopies (<25%) while others require stands with multiple canopy layers.

COMMON NAME	*GENUS/SPECIES*
Golden-crowned kinglet	*Rigulus satrapa*
Hammond's flycatcher	*Empindonax hammondii*
Hermit thrush	*Catharus guttatus*
Hermit warbler	*Dendroica occidentalis*
Red crossbill	*Loxia curvirostra*
Varied thrush	*Ixoreus naevius*
Western flycatcher	*Empindonax difficilis*
Warbling vireo	*Vireo gilvus*
Wilson's warbler	*Wilsonia pusilla*
Winter wren	*Troglodytes troglodytes*

Northern goshawk (*Accipiter gentalis*): Goshawk nest in mature and old-growth coniferous stands with open understories and moderate to dense canopy cover. Foraging habitat is quite variable, ranging from shrub and open hardwood areas to mature coniferous forest. Prey includes birds and small mammals.

Northern spotted owl (*Strix occidentalis caurina*): Nesting and roosting habitats selected by northern spotted owls typically exhibit moderate to high canopy closure, multi-layers of vegetation, down logs, snags, and contain mistletoe clumps. These attributes are usually found in mature and old-growth forest. Foraging and dispersal habitat ranges to more open stands. Spotted owls feed mainly on small mammals, particularly flying squirrels and wood rats.

APPENDIX B

FIRE MANAGEMENT PLAN

The objective of this plan is to provide guidelines to managers for fire suppression and fuels treatment activities in this LSR. 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 LSR that will change and/or maintain current fuels characteristics to a desired or sustainable level over time.

For fire suppression, these parameters are provided for the Initial Attack Commander's size-up of the fire or for the Escaped Fire Situation Analysis.

Safety is and will continue to be the number one priority. All fire suppression actions will be tied directly to the Fire Orders and the Watch Out Situations. Safety is everyone's highest priority.

The following guidelines describe fire suppression tactics within the LSR. Fire suppression responses within the LSR should be timely and appropriate for the situation and the resource. Minimum Impact Suppression Methods (MISM) will be considered in determining the appropriate response. Resource Advisors and Resource Specialists will be utilized for establishing the appropriate response.

FIRE LINES

In establishing fire lines, consider the following:

1. Minimize the cutting of green trees, burned trees and snags.
2. Use natural barriers such as ridges, meadows, rocky draws and outcrops, etc. Allow fires to burn to natural barriers.
3. Burn-out or backfire against existing roads and trails to stop fire spread. Use burning-out as a fire suppression tool.
4. Use cold-trail, wet line, or a combination of these when appropriate.
5. When constructing fireline, use minimum width and depth to check fire spread. Minimize bucking and cutting of trees to establish fireline. Construct lines around coarse woody debris, when possible, without compromising fire containment or control.
6. Minimize use of dozers. Consult with resource advisors prior to use of dozers.
7. Adjacent to fireline, limb only what is necessary to prevent fire spread.
8. Inside fireline, cut and limb only those fuels which would spread fire across the fireline, if ignited.
9. Large live trees will not be cut, unless they pose a safety hazard or they will cause fire spread across the fireline.
10. Consider allowing ignited trees or snags to burn out. Identify these hazard trees with flagging and/or a lookout. If they are causing safety and/or control problems, felling is appropriate.
11. Pre-line around snags and trees within the fire area near firelines if they are likely to increase fire spread.
12. 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.
13. Do not fall snags on the unburned side of the constructed fireline, unless they are an obvious safety hazard to fire suppression crews or would become fire brand receptacles.

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.

Maps of known spotted owl activity centers are available on the District and many are in the computerized map file in the Interagency Dispatch Center (Yreka). MISM will be used near these locations.

MOP-UP

Ensure safety of crews at all times. 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. Utilize heat detectors and backs of bare hands to locate hot spots. This will assist in mop-up and will reduce the risk of the fire re-igniting and spreading.

1. Restrict mop-up to hot areas. Mop-up a safe distance from line into the burn area, (100% mop-up may not be necessary or appropriate).
2. Hand feel charred logs near the fireline. Do minimal scraping and chopping to extinguish the fire.
3. Minimize bucking of logs to check for hot spots or extinguish fire. Roll logs when possible. Return logs to original position after checking or after ground is cool.
4. Consider allowing standing trees, snags, and logs to burn themselves out instead of falling or bucking when they do not pose a serious escape threat.
5. If burning trees or snags will spread fire brands and pose an escape threat, extinguish with water or dirt when possible and avoid felling.

LOGISTICS

Logistics in LSRs include incident bases, helispots, and helibases. Interdisciplinary teams will propose sites for these facilities on a watershed basis. This LSR does not have any areas that would be considered appropriate for an incident base camp. Chambers Flat, an area nearby has been utilized in the past for incident camps. It would be appropriate for camps to support large fires in this LSR. Care must be taken in utilizing this location, as it is private property.

Use of spike camps may be appropriate in some areas of the LSR. Site locations should be on naturally draining areas, such as sites with rocky or sandy soils or in natural or created openings surrounded by heavy timber. 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. Adequately mark trails. Ensure that crews do not clear vegetation or dig trenches in sleeping areas. Use fabric ground clothes for protection in high use areas, such as around cooking facilities and feeding 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.

AIR SUPPORT

Air support is likely for this LSR, although, it 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 LSR 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 plan. Consultation should also occur during initial and extended attacks.

When possible utilize rappellers and longline sling operations, rather than constructing helispots. Do not construct helispots within Riparian Reserves. Preplanned helispots and helibases have been determined by an interdisciplinary team and are included on the the Fire Plan Map 4 (located at the Klamath National Forest Supervisor's Office). These are areas that have been utilized in the past and/or are natural openings and already impacted 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. Retardant or foam will not be dropped on surface waters, in riparian reserves, or on spotted owl nests.

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 LSR will be available.

Rehabilitation work should be done by initial attack personnel in order to maximize efficiency, reduce costs, and promptly return the LSR to as natural a condition as possible.

Pick up and remove all flagging, garbage, litter, and equipment. Dispose of all trash appropriately. 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:

FIRELINE PERCENT GRADE	MAXIMUM SPACING (FEET)
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.

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.

Treat (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, but could be used, if needed in the future.

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 interdisciplinary team members will evaluate this plan to ensure that the intent of the President's Plan standards and guidelines have been met. The post-fire evaluation will consist of data collection, documentation, and recommendations. The evaluation will occur prior to the departure of the overhead team, a copy can be placed in the final fire package. A copy of the evaluation will also be given directly to the line officer.

Fire Behavior Potential

Forest Service Manual (FSM) Chapter 5105, defines fuel as combustible wildland vegetative materials, living or dead. FSM, Chapter 5150 on fuel management provides direction to evaluate, plan, and treat wildland fuel to control flammability and reduce resistance to control including mechanical, chemical, biological, or manual means including the use of prescribed fire, to support land and resource management objectives.

The objectives of fuels management are to:

> Reduce fire hazard to a level where cost effective resource protection is possible should a wildfire ignition occur. Fire hazard is the potential fire behavior (intensity and rate of spread) of a fire burning in a given fuel profile and its ability to be suppressed by fire forces.
>
> Reduce the potential fire severity.

The three critical elements of fire behavior are weather, topography, and fuels. The only element that can be manipulated or managed, is fuels.

To determine Fire Behavior Potential Classes, a crosswalk was used that converts vegetation type to standardized fuel model. Each vegetative type was assigned a predictive fuel model (Anderson 1982). A fuel model is a set of numerical values that describes a fuel type for the mathematical model that predicts rate of spread and fire intensity (Rothermel 1972) for each vegetative type.

Fuel Model Definitions

To represent a site a model is selected that best depicts the the actual fuels that are available to support fire. This means situations will occur where one fuel model represents rate of spread most accurately and another best depicts fire intensity. In other situations, two fuel conditions may exist, so the spread of fire across the area must be weighed by the fraction of the area occupied by each fuel. Fuel models are simply tools to help the user realistically estimate fire behavior. Figure 5 displays the fuel models for Dillon LSR.

The prediction of fire behavior has become more valuable for assessing potential fire damage to resources. A quantitative basis for rating fire danger and predicting fire behavior became possible with the development of mathematical fire behavior fuel models. Fuels have been classified into four groups- grasses, brush, timber, and slash. The differences in these groups are related to the fuel load and the distribution of the fuel among the size classes. Size classes are: 0-1/4", 1/4- 1", 1- 3", and 3" and greater.

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. The 13 fire behavior predictive fuel models are used during the severe period of the fire season when wildfire poses greater control problems and impacts on land resources.

The 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, 6 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 8 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 typical, 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 and 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 over maturing and natural events creates a large load of heavy down and 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.

LOGGING 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. These are typically found in light partial cuts or thinning operations in conifer or hardwood stands. Clearcut 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 a fire starts it is generally sustained until a change in conditions occur. Fuels generally total less than 35 tons per acre and are well distributed. This fuel model is found in heavily thinned conifer stands, clearcuts, and medium to heavy partial cuts.

FIRE BEHAVIOR FUEL MODEL 13

Fire is generally carried by a continuous layer of slash. Large quantities of material 3 inches and greater are 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. Clearcuts are depicted where the slash load is dominated by the greater than 3 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 Behavior Potential Classes

Each fuel model is run through the BEHAVE program (Andrews and Chase 1989). 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 thru early September. All fuel models were run through each of the two slope classes, to determine increases in fire behavior with increased steepness of terrain. Figure 6 displays the fire behavior potential for the LSR.

Low, moderate, and high fire behavior ratings are based on flame lengths and rate of spread. Flame length is a good indicator of fire line intensity and resistance to control. Rate of spread is another good indicator of resistance to control. The following describes each fire behavior potential rating and the likely suppression method to be used.

Low - Flame lengths are <4 feet and rate or spread <30 chains per hour (2,000 feet). Fires can generally be attacked at the head or flanks by firefighters using handtools. Handline should hold the fire.

Moderate - Flame lengths are 4-8 feet. Fires are too intense for direct attack at the head of the fire by firefighters using handtools. Handline cannot be relied on to hold the fire. Equipment such as dozers, engines, water and/or retardant dropping aircraft can be effective.

High - Flame lengths are >8 feet. Fires may present serious control problems, such as torching, crowning, and spotting. Control efforts at the head of the fire will be ineffective.

Using the CONTAIN model of BEHAVE, it was determined whether a fire with low flame lengths could be contained by the initial attack forces. These runs indicated that given typical response times, terrain, fuels, and available forces, a low rating had to have a rate of spread <30 chains per hour, for containment to be accomplished during initial attack.

WEATHER DATA

The following weather parameters were taken from the data collected at the Slater Butte weather station from 1972 through 1992. These parameters are representative of 90th percentile weather conditions.

FUEL MOISTURE	PERCENT
1 Hour	4
10 Hour	4
100 Hour	7
1000 Hour	9
20 Foot Wind Speed	13 Miles Per Hour

APPENDIX C

CONSISTENCY CHECK

Management activities within LSRs must be consistent with the objectives, policies, standards and guidelines set for these lands. These have been established in the ROD for the President's Forest Plan and the Forest Land and Resources Management Plan. Accomplishing these objectives will ensure the desired future condition for the LSR is met.

LSRs are designated with the objectives to maintain, protect, and restore conditions of late-successional and old-growth forest ecosystems, which serve as habitat for associated wildlife. Treatments designed to provide these habitat conditions through time support the objectives for LSRs.

Standards and guides in the President's Forest Plan need to be followed when actively managing the LSR. They are found on pages C-11 thru C-20 of the ROD. 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 thru C-38 of the ROD (1994). In addition, the Klamath Forest Land and Resource Management Plan (LRMP) discusses direction, policies, standards and guides for LSRs. In some cases the LRMP guides are more conservative. These need to be adhered to, as well.

The following discusses how the Dillon LSR management recommendations compare with the guidelines from the Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl (ROD).

Thinning is consistent with the guidelines found on page C-12 and C-13 of the ROD (1994). It is one of several silvicultural activities which would reduce the risk of large-scale disturbances and accelerate the development of late-successional conditions within the Dillon LSR.

Riparian area salvage and planting meets all of the standards and guides identified on pages C-14, 15, and 32 in the ROD. The standards that specifically apply include: C-14 and 15 numbers 1-4, 7, 9 and 10; C-32 TM-1 a-c. The 1994 and 1995 fire events have degraded riparian conditions. Salvage and planting are recommended treatments to reestablish stands to meet Aquatic Conservation Strategy Objectives.

Underburning is designed to reduce the elevated risk that can be attributed to fire suppression and the lack of managed fire in the area for the past 70+ years. These activities will provide for resilient and sustainable late-successional habitats that currently exist within the LSR. They will also reduce the risk to younger seral stands allowing them to eventually meet the desired characteristics as late-successional habitat. Some of the activities will occur within older stands but these treatments will result in greater assurance of long-term maintenance of these older stands, and will not prevent these older stands from playing an effective role within the LSR. These planned activities are consistent with the standards, guides, and reasoning stated on pages C-12 and 13 under the section titled "East of the Cascades and in the Oregon and California Klamath Provinces."

Salvage, fuel treatment and planting meets all of the standards and guides identified on pages C-14 and 15 in the ROD. They specifically apply to guidelines 1-4, 7, 9, and 10. Future fuel loadings would put these burned areas at extreme risk to loss from a future fire event. These activities are planned to meet the intent of the section found on pages C-12 and 13 titled "East of the Cascades and in the Oregon and California Klamath Province as well as the section titled "Guidelines for Salvage", found on pages C-13 and 15. As stated in the ROD, " The objective will accelerate development of late-successional conditions while making the future stand less susceptible to natural disturbance."

The ROD also states that ". . . salvage may help reduce the risk of future stand-replacing disturbances. While priority should be given to salvage in areas where it will have a positive effect on late-successional forest habitat, salvage operations should not diminish habitat suitability now or in the future." These activities are designed to meet this intent, but will not diminish habitat suitability as all snag and coarse woody requirements will be met following the fuel reduction salvage, and current live crown closure will not be reduced.

APPENDIX D

MONITORING PLAN

The following monitoring items are applicable to the Dillon LSR. Monitoring should be a continuous process of evaluating the difference between the desired and existing condition. Additional actions may be proposed to remedy any shortcomings identified through the evaluation process.

IMPLEMENTATION MONITORING

Implementation monitoring determines if the Land and Resource Management Plan standards and guidelines were followed.

Implementation monitoring for the Dillon LSR will include:

1. Assess whether proposed management activities are consistent with the standards and guidelines found in the Klamath National Forest Land and Resource Management Plan.

2. Assess whether proposed management activities are consistent with the Dillon LSR Assessment (see Consistency Check, Appendix C).

EFFECTIVENESS MONITORING

Effectiveness monitoring evaluates projects and/or activities and their ability to meet the purpose and need, and desired condition.

FUEL REDUCTION PROJECTS

Fuel reduction projects include prescribed burning, manual fuels treatment, and mechanical fuels treatment. A post burn evaluation will be completed to determine the effectiveness of the prescribed burn program in reducing wildfire effects and meeting overall resource objectives.

The evaluation will determine if the project met the desired results of reducing average fuel conditions to a point of flame length < 4 feet and rate of spread < 20 chains per hour. It will examine moderate intensity burn areas to determine if they are limited to less than 5-10% of the burn area and if the resulting patches were less than 5 acres in size. It will determine if desired soil cover guidelines, and snag and down wood requirements are being met as described in the Forest Resource and Land Management Plan.

SALVAGE HARVESTING

Monitoring will determine if fuels were adequately reduced following salvage harvest activities. It will determine if desired down wood and snag requirements, and soil cover guidelines were met as described in the Forest Resource and Land Management Plan. Monitoring will examine whether trees were harvested in a timely manner in order to capture utilizable wood products.

Revenues generated from the harvest will be used for LSR improvement projects through KV or BD funds. These projects will be monitored to determine if they met the identified objectives.

REFORESTATION

Harvested areas will be monitored using survival exams. Monitoring will determine if prescribed stocking levels were achieved to attain late-successional characteristics.

PRE-COMMERCIAL AND COMMERCIAL THINNING

Monitoring for pre-commercial and commercial thinning will determine if post-activity fuel objectives and appropriate stocking levels were achieved. Long term monitoring will include inventory and evaluation of stand characteristics to compare with prescribed stand objectives. This monitoring will occur approximately every 10 years and may prompt intermediate stand treatments to achieve the desired condition.

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. It will assess if underlying management assumptions are correct and determine if maintained or restored habitat conditions support stable and well-distributed populations of late-successional associated species.

Management recommendations for this LSR are based on the following underlying assumptions:

> Protecting and enhancing conditions for late-successional and old-growth for ecosystems will provide conditions favorable for stable and increasing populations of spotted owls and other associated species.
>
> Providing habitat connectivity will maintain or increase opportunities for some species to disperse between LSRs.
>
> Reducing fuels and implementing other management activities will reduce risk of stand replacing fires or other disturbances.

The answers to the questions are not likely to appear in the Dillon LSR for 5-10 years. There are opportunities to look at other sites with similar habitat to help validate our assumptions. The Elk Creek area that burned in 1987 is being monitored for this type of information. Due to the nature of questions that need to be answered, opportunities to complete validation monitoring in other LSRs or areas with like habitat should be considered. Data collected through spotted owl demography studies may provide such an opportunity.

Within the Dillon LSR 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 needs to be coordinated with the objectives of other LSR assessments and their identified functioning elements. It should be conducted approximately every 10 years. Monitoring will determine what percent of the capable ground is currently in late and old-growth habitat characteristics. It will assess the risk to the LSR from a large scale disturbance and the connectivity between late-successional and old-growth stands within the LSR. It will assess the habitat characteristics and associated acreages within home ranges of known activity centers. Monitoring will assess the effectiveness of the fuel management efforts and adjust priorities based on the Dillon LSR assessment.

Monitoring activities which should be ongoing within the LSR should include: population surveys for threatened and endangered species, surveys of historic spotted owl activity centers, and surveys of other late-successional associated species identified in Appendix A.

All monitoring that occurs within the LSR should be done in an interdisciplinary fashion with at least a minimum team consisting of a wildlife biologist, fuels specialist, and silviculture/ecologist. Other specialties, including the U.S. Fish and Wildlife Service and National Marine Fisheries Service, should be included depending upon the issue being monitored.

At the project level, complete a post burn evaluation to determine effectiveness of prescribed burn program in reducing wildfire effects and meeting resource objectives.

APPENDIX E

DILLON LSR ASSESSMENT

TEAM MEMBERS

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Amy Dixon	Document Preparation
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APPENDIX F

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