

United States  
Department of  
Agriculture

Forest Service

Pacific  
Southwest  
Region



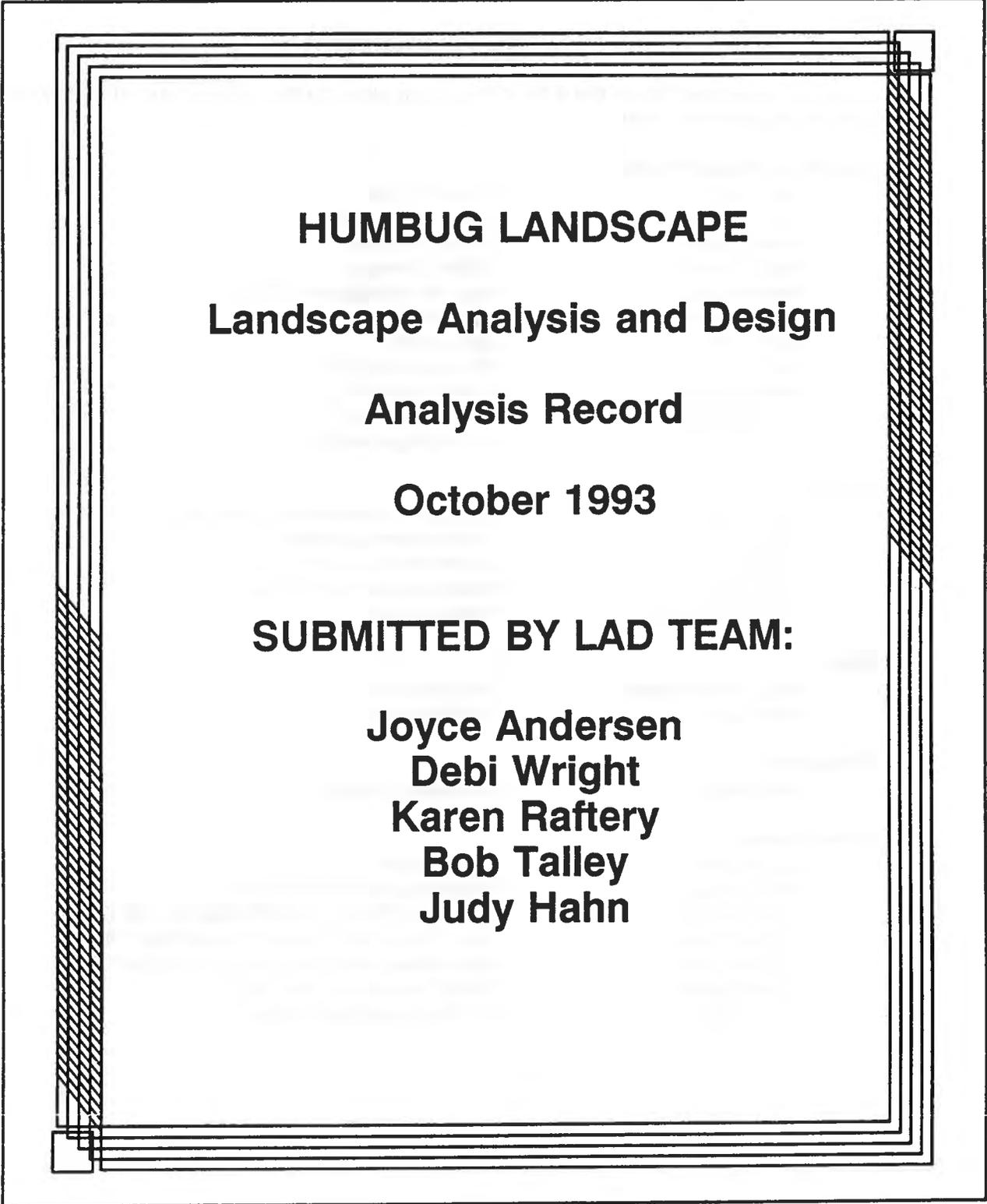
# HUMBUG

## Landscape Analysis and Design

Klamath National Forest  
**OAK KNOLL RANGER DISTRICT**

**FINAL**





**HUMBUG LANDSCAPE**  
**Landscape Analysis and Design**

**Analysis Record**

**October 1993**

**SUBMITTED BY LAD TEAM:**

**Joyce Andersen**  
**Debi Wright**  
**Karen Raftery**  
**Bob Talley**  
**Judy Hahn**

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The LAD Team would like to thank the following individuals for their contribution to the Humbug Landscape planning effort:

### Oak Knoll Ranger District:

Jan Ford	District Ranger
Carol Spinos	District LAD Liaison
Mark Chaney	Resource Officer
Sam Cuenca	Wildlife Biologist
Maxine Kolu	Asst. Fire Management Officer
Sharol Koorda	Hydrologist
Carl Varak	Silviculturist
Steve Fox	Fisheries Biologist
Mike Kroetch	Fuels Technician
Dwayne Johnson	Silviculturist/TMO
Guy Lewis	Fire Management Officer

### Forest:

Rick Svilich	Ecosystem Management Coordinator
Jay Perkins	Fire Behavior Specialist
Lynda Karns	Environmental Coordinator
Linda West	Environmental Coordinator
Candy Dillingham	Forest Analyst

### GIS:

Richard Vandewater	GIS Specialist
Bob Varga	GIS Specialist

### Research:

Jim Laacke	Research Scientist
------------	--------------------

### Peer Review:

Jay Perkins	Fire Behavior Specialist
Jack Darnall	Recreation Forest Staff Officer
Jack West	Watershed/Earth Science/Fisheries Staff Officer
Ed Matthews	Asst. Timber Management Forest Staff Officer
Jim Anderson	Land Management Planning Forest Staff Officer
Bruce Goines	Rural Development Coordinator
Mike Ford	Wildlife Forest Staff Officer

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## HUMBUG LANDSCAPE ANALYSIS AND DESIGN

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### HISTORY

The name "Humbug" has historical roots from the gold mining days. Gold was first discovered in Humbug Creek in 1850. "One of the many prospecting parties that roamed this mountain region in 1851, found gold on a stream, a tributary of the Klamath River. A party going over from Yreka to take up claims, were met by a company of men returning from the stream who said the claims of gold were all humbug. The party of miners continued on their way and subsequently proved the discouraged men wrong. Never the less, the area was named Humbug." (From *Origin of Place Names in the History of Siskiyou County*).

"There were four good-sized towns established, namely, Frenchtown, Forks of Humbug, Humbug City, and Riderville. With daily stages running from Yreka and change of horses near the top of Humbug Divide, where the water box is now located, was established as the stage station and saloon and "Hurdy-Gurdy" girls to give the miners amusement and a chance to spend their gold dust." (From "Output of the Humbug Mines" talk given by H.J. Barton at the Miners' Picnic on Humbug Creek, Siskiyou County Historical Society, Siskiyou Pioneer, 1957.)

The following description of these towns was taken from *Gold Mining in Siskiyou County, 1850-1900*, by Gary Stampf.

**Humbug City** - on Humbug Creek just above the forks. More than 600 men were mining in the area by the fall of 1851. A voting precinct was established and in 1852 the area was declared a township. There were several stores, saloons, and shops.

**Freetown** (Forks of Humbug) - a mining camp two miles above Humbug City on the north fork of Humbug Creek, with two stores and several saloons.

**Riderville** - a town located on the northfork of Humbug Creek, about one and one-quarter mile

above the forks. A store and a saloon were built. It was at first called Plugtown, after a doctor who wore a plug hat, but was later named Riderville after W.G. Rider, a miner on Rider Gulch.

**Frenchtown** - on Humbug Creek about two miles below the forks with a saloon and store. It was originally known as Mowrey's Flat, but the name was changed to Frenchtown because a number of Frenchmen had claims there.

By 1853 one thousand men had moved into the area; by 1880 there were only 50 people left. From the head of Little Humbug over \$2,000,000 (in Barkhouse) was extracted by ground sluicing.

### DESCRIPTION

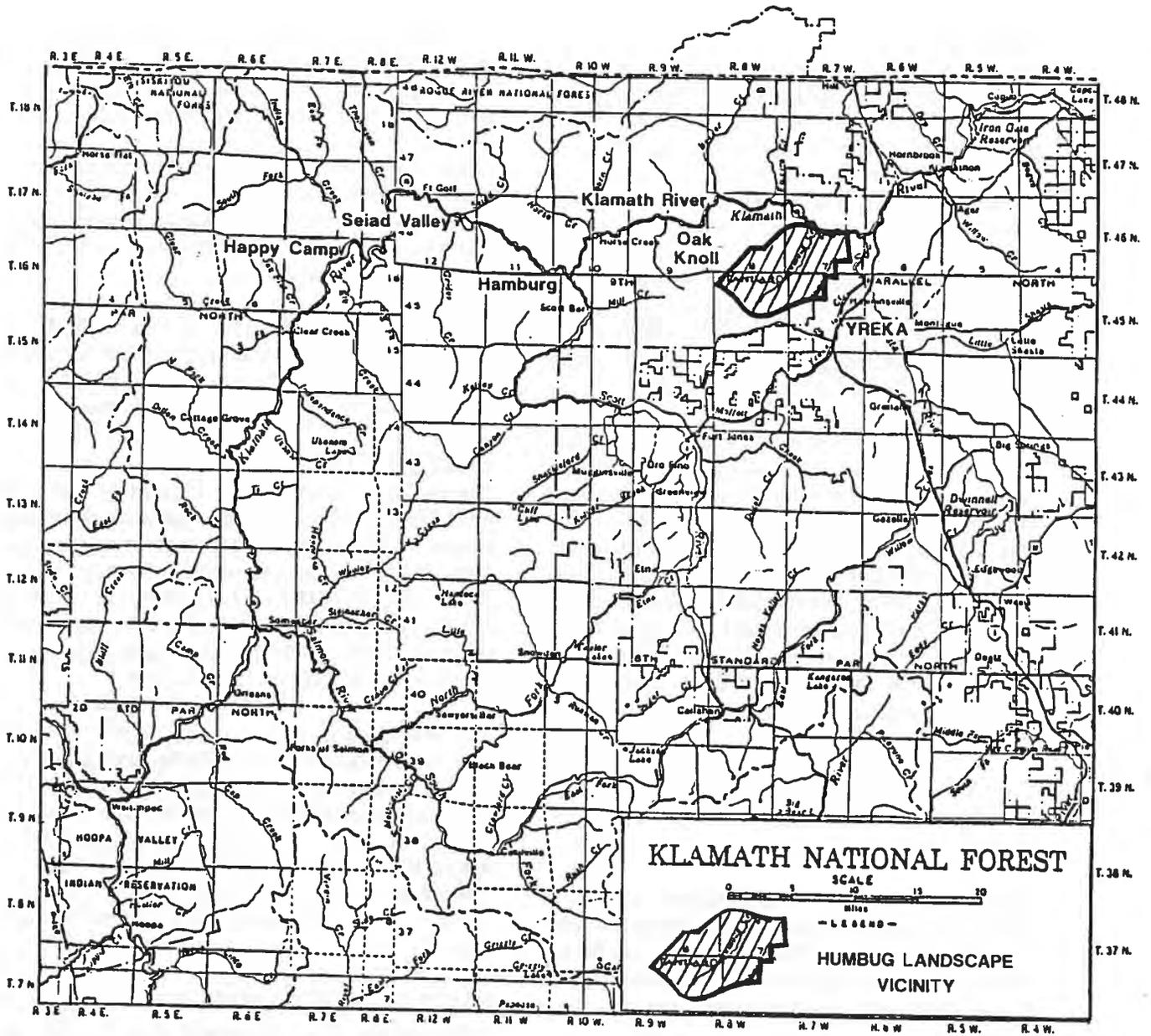
The Humbug Landscape is located on the Oak Knoll Ranger District, Klamath National Forest (see Figure 1 - Vicinity Map). The legal description is T46N,R7W,MDM, all or portions of Sections 16-23, 26-34, T44N,R7W,MDM, all or portions of Sections 4-9, 17, 18, T46N,R8W,MDM, all or portions of Sections 13, 23-27, 33-36, and T45N,R8W,MDM, all or portions of Sections 1-17, and 21-23.

The landscape is approximately 28,600 acres in size, including an estimated ~~6,500 acres of private~~ land. It is bounded by Craggy Mountain on the northeast, the Klamath River to the northwest, Badger Mountain on the east, Mahogany Point to the south, and Deadwood Baldy Peak to the west. Elevational ranges go from a high of 6,220' on McKinley Peak to a low of 2,100' along the Klamath River.

### OVERVIEW OF LANDSCAPE ANALYSIS

The purpose of the Landscape Analysis and Design (LAD) process used on the Humbug Landscape is to provide a means by which the landscape can be understood as an ecological system, and to use this knowledge to help shape the landscape patterns created through National Forest land management activities. The Humbug Landscape was analyzed by the LAD Team July through September, 1993.

FIGURE 1 - VICINITY MAP



The strategies used are intended to be in harmony with existing policies, direction, Draft Forest Plan Standards and Guidelines, and land allocations. This process is a means of implementing current direction, not changing it, but if during the analysis process there is determined a need to modify a Forest Plan land allocation for a given management area, the Forest Plan amendment process will be used. Areas found throughout the process needing feedback to the Draft Forest Land Management Plan (LMP) are listed in Appendix A - LMP Feedback.

Not only is the process a vehicle for beginning the implementation of Forest planning direction, (see Appendix B - Forest Plan Implementation handout) it also is a means of ensuring the ecological health and sustainability of the resources we manage within the Humbug Landscape. It provides a necessary link between the National Forest Management Act (NFMA) and the National Environment Policy Act (NEPA); providing a method for defining the Desired Condition of the landscape and identifying opportunities to achieve and perpetuate the desired landscape character.

#### **PROCESS STEPS**

There are currently six steps in the process: (see Appendix C - Draft LAD Process)

- 1- Landscape Elements
- 2- Flows and Linkages
- 3- Interactions
- 4- Disturbance Regimes, Range of Variability, Trends, and Sustainability
- 5- Forest Plan Objectives & Management Direction
- 6- Management Opportunities

The first two steps are designed to describe the existing condition in terms of composition, structure, and function. The landscape elements are described by vegetative patches and corridors. The key flows, or movement of people, organisms, nutrients, energy and their linkages to other landscapes are also identified.

Step 3 helps to gain a sense of the complexity of the landscape by describing the interactions of the flows with the individual landscape elements, as well as the landscape patterns as a whole.

Step 4 provides the framework for defining ecosystem sustainability. This is done by identifying natu-

ral disturbances, past patterns, and future trends to characterize the natural range of natural variability.

The Desired Future Condition is defined in Step 5 by integrating the Draft LMP's goals and objectives, existing direction, with the unique vegetative characteristics of a landscape and the range of natural variability defined in the previous step.

Finally in Step 6 the process describes opportunities to move towards or maintain the Desired Future Condition, as well as resource uses that will not detract from the Desired Condition objectives. The final outcome provides the District with a purpose and need for implementation of individual projects.

#### **SCALE OF ANALYSIS**

Since the analysis area for Humbug roughly covers 28,600 acres, the detail of the analysis was general in nature. As more detailed analysis is necessary for NEPA sufficiency, project analysis focuses on project specific issues and their potential effects. This general assessment of the landscape condition serves to define the purpose and need for the proposed action, and to identify ecosystem dynamics (composition, structure, and function) at a much larger scale.

Refer to Appendix D - Scale of Analysis for an example of analysis scales and relationships to ecological systems and elements.

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### **STEP 1 - LANDSCAPE ELEMENTS**

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This section describes and maps the structural elements of the landscape. Humbug landscape encompasses approximately 28,600 acres (24% is private land). The landscape is delineated based on the watershed boundary. The arrangement, pattern and structures are described in terms of patches and corridors. Overall, Humbug can be characterized as a very heterogeneous, fragmented, patchy, finely textured landscape. There is no recognizable matrix or contiguous vegetation type which exerts strong control over landscape flows (movement of materials, energy and organisms). Habitat corridors are not well pronounced, although the area is easily accessible by roads.

The landscape is quite diverse with a variety of brush, hardwood, and conifer species present. Some rare and unique features are present; lush riparian areas, productive resident trout and anadromous fisheries, *Calochortus persistens* and *Lewisia cotyledon* var. *howellii* (sensitive plants), and small disconnected patches of old, decadent conifer stands.

Vegetation patterns and distribution are primarily influenced by geomorphic and edaphic conditions, topography, and precipitation. Typical rock types include metamorphosed submarine lava, ultramaphic rock (serpentinite, peridotite) and granitic rock (granite, diorite, gabbro). Geomorphic terranes considered as geologically sensitive within this landscape include granitic and ultramaphic inner gorges.

An Order 2 Soils Survey is completed for approximately one-third of the landscape area (Figure 2). Overall, soils are moderately deep to deep sandy loam to gravelly loams or cobbly loams on mountains. Soils are formed from weathered granitics, phyllite, schist, slate, and greenstone parent material. Slope and aspect significantly affect soil temperature which also directly influences plant growth. Within the soil survey area approximately 25% is considered suitable for commercial timber production. Management concerns include plantability, surface erosion, brush competition, and nutrient deficiencies. Marginal and unsuitable soils for timber production comprise the remaining 35% and 40% of the survey area respectively. These soils provide good wildlife habitat with manzanita, buckbrush, deerbrush and scattered oaks present. Appendix E - Order 2 Soils Survey provides a more detailed summary of survey information.

The Humbug Elements Map (Figure 3) displays brushfields which are considered capable for conversion to conifers based on both the Order 2 Soils Survey and 1984 District information. This was used in the Draft Forest LMP to indicate capable, non-stocked lands. Where the Order 2 Soils Survey indicates that these areas may be marginal sites, it is so noted on the Humbug Elements Map.

Precipitation ranges from 20-50 inches annually. Low precipitation areas, coupled with a distinct rain shadow effect, can severely limit regenerability. An isohyetal map (see Figure 4a - 1984 Isohyetal Map) ) was completed in 1984 which compiles four years of data and field observations. The isohyetal map, derived using information taken from the U.S. Geologic Survey Hydrologic Inventory Atlas (see Figure 4b - 60 Year Isohyetal Map), summarizes precipitation information from 1900 through 1959.

Fire has significantly influenced the condition of vegetation over the landscape. The Humbug Landscape is characterized as ecologically unstable because existing structural elements are likely to significantly change over time. Existing vegetative structures are inconsistent with the ecological functions that occur. Over 21% of National Forest (NF) lands in the Humbug Landscape are dominated by decadent brushfields which are extremely susceptible to catastrophic fire. The presence of intermixed landownership and the close proximity to Yreka accentuate the concern of fire-risk and imminent threat to personal life and property. The Haystack Fire occurred in 1955, which consumed vegetation over approximately 70% of the landscape (see Figure 7 - Fire Occurrence History). The resulting pattern includes irregularly shaped diverse patches of even-aged 38 year old brushfields, 35 year old plantations, sprout regenerated hardwoods, and scattered mixed conifer stands with remnant older trees remaining.

The Humbug Landscape is described by vegetative elements or patches. District personnel helped to delineate these elements based on their uniqueness in composition, structure, and function within the landscape. Brush is differentiated between the longer-lived manzanita chaparral species, the shorter-lived montane species, and existing brushfields capable for conversion to conifer species. Plantations are separated out by age classes. Wetland patches display the riparian vegetation. Hardwood patches differentiate between commercial and non-commercial hardwood species. Grass/forbs and barren, rocky areas are identified. Forested patches are delineated based on size and stocking. Corridors represent roads, streams, and the Klamath River.





# Humbug Landscape Landscape Elements

Figure 3 - Landscape Elements Map

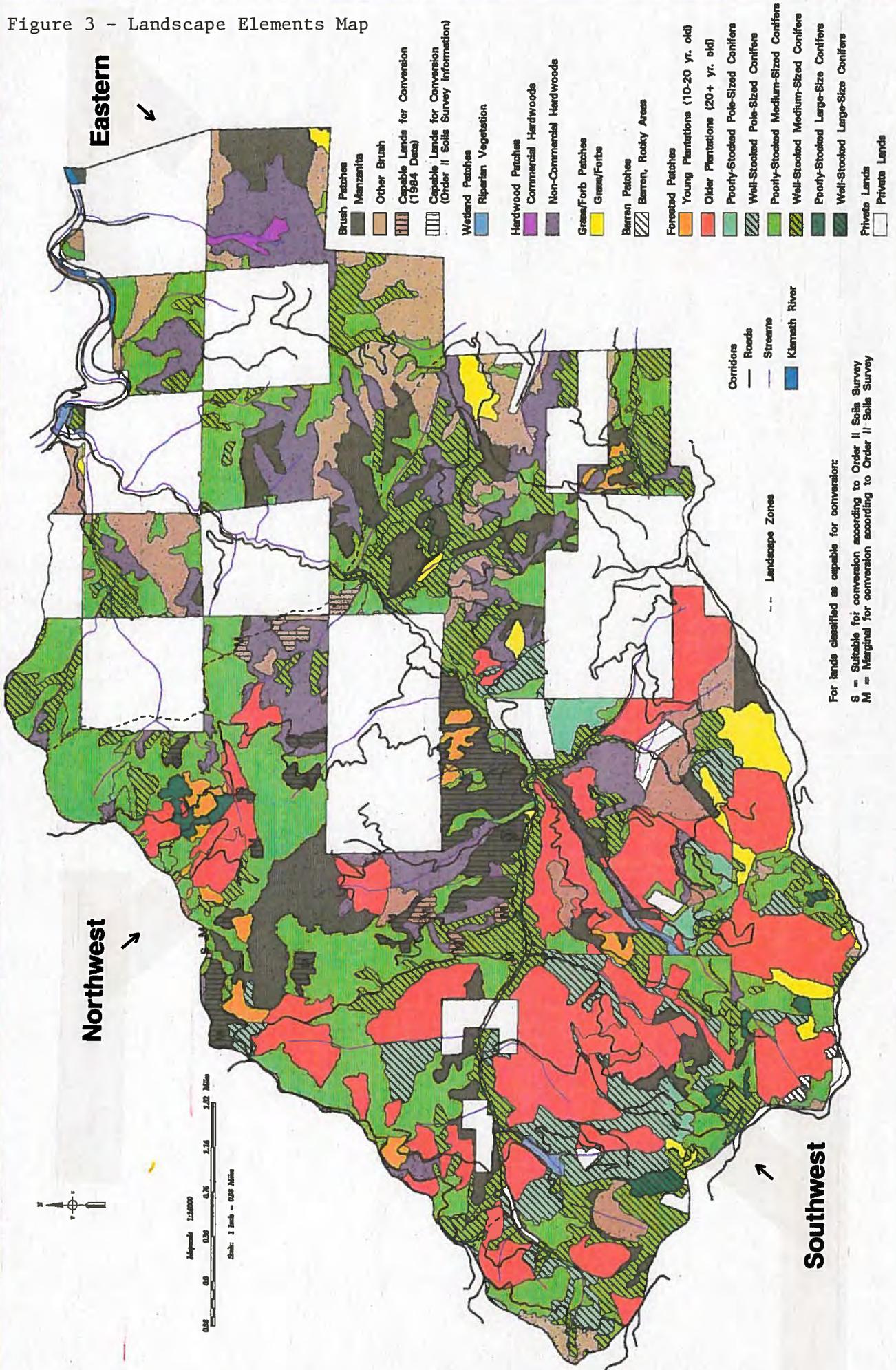
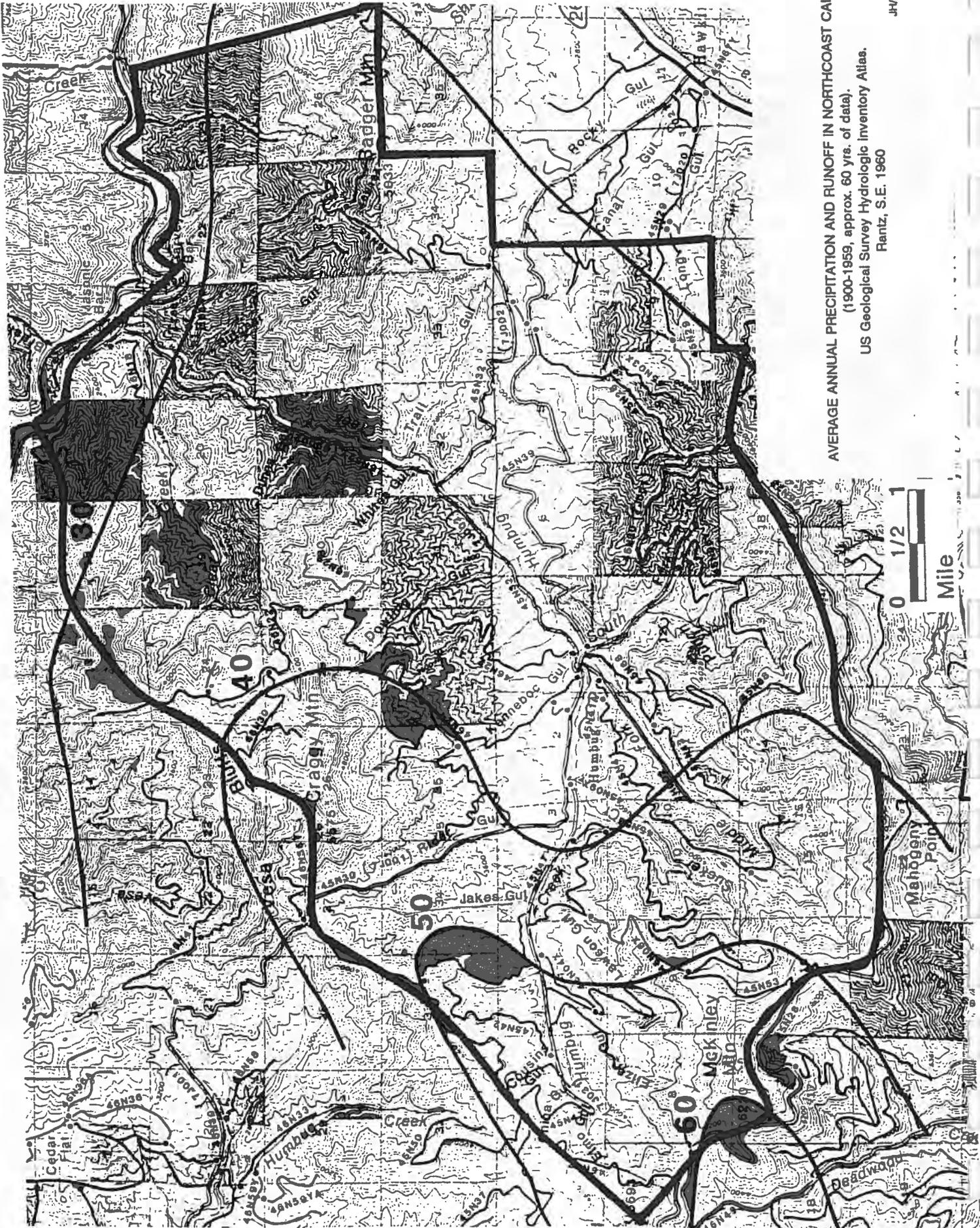




FIGURE 4b - 60 YEAR ISOHYETAL MAP



AVERAGE ANNUAL PRECIPITATION AND RUNOFF IN NORTH-CENTRAL CALIFORNIA  
(1900-1959, approx. 60 yrs. of data).  
US Geological Survey Hydrologic Inventory Atlas.  
Rantz, S.E. 1960

JH/AD, 11-83

## LANDSCAPE ZONES

Landscape elements are further described in terms of three distinct geographic areas due to their uniqueness in species composition, structure, and function. Edaphic and geomorphic conditions as well as the fire regime strongly influence such variation in vegetation. These geographic areas are identified as the **Eastern Zone**, **Southwest Zone**, and **Northwest Zone** (see Figure 3 - Landscape Elements).

**EASTERN ZONE** (20% of NF lands within the landscape) This is defined as the area north and east of Craggy Mountain. Roughly delineated as north of Whites Gulch and Trail Gulch to the landscape boundary.

Soils are developed from metamorphic or ultramafic parent material. A southeast to southwest aspect predominates in this area. The eastern portion is currently dominated by a mid seral stage (hardwoods). Because most of the white oak hardwoods are a shrub-form scattered about decadent brushfields, it is probably more appropriate to visualize this area as a late seral stage. Much of this area is only capable of supporting a brush/hardwood plant community through time. At least half of this area was not burned in the Haystack Fire. A portion of this zone has a high fire-risk (Figure 9 - Potential Wildfire Effects). This zone includes a mosaic of poorly-stocked and well-stocked medium-sized mixed conifer stands, patches of hardwoods, and a large amount of hard woody shrubs. Shrubs include the long-lived green-leaf and white-leaf manzanita chaparral species, other shorter-lived montane brush species such as deerbrush, buckbrush, and chokecherry. Minor amounts of mountain-mahogany, rubber rabbitbrush, silktassel, and yerba santa are also found. There are no plantations.

**SOUTHWEST ZONE** (50% of NF lands within the landscape) Delineated as the area from Trail Gulch to the west around the head of Humbug Creek, including Cousins Gulch (see Figure 3).

Soils are developed from metamorphic or ultramafic parent material. Topography is variable although a northwest to northeast aspect is common. This portion displays an abundance of early seral stage (existing plantations) and some mid seral stages. Site capability is much higher in this portion of the landscape. It is important to note that

this zone is capable of supporting a quantity of mid to late seral stages over time. This portion contains ultramafic soils with a moderate to high erosion potential. A minor amount of granitic soils also occur. This entire area burned in the Haystack Fire. A portion of this zone has a high fire-risk (see Figure 9). This area contains a dense, forested mid seral stage with a large amount of older plantations (30-40 years old). The well-stocked forested area includes both small and medium-sized conifers. The area also contains smaller patches of poorly stocked medium-sized conifers with minimal amounts of brush and hardwood stands. A minor amount of late seral stage occurs.

**NORTHWEST ZONE** (30% of NF lands within the landscape) This is delineated as the area directly under Craggy Mountain to mainstem of Humbug Creek, and to the west including Jakes Gulch (see Figure 3).

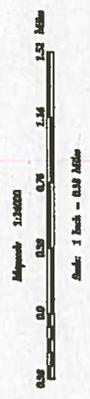
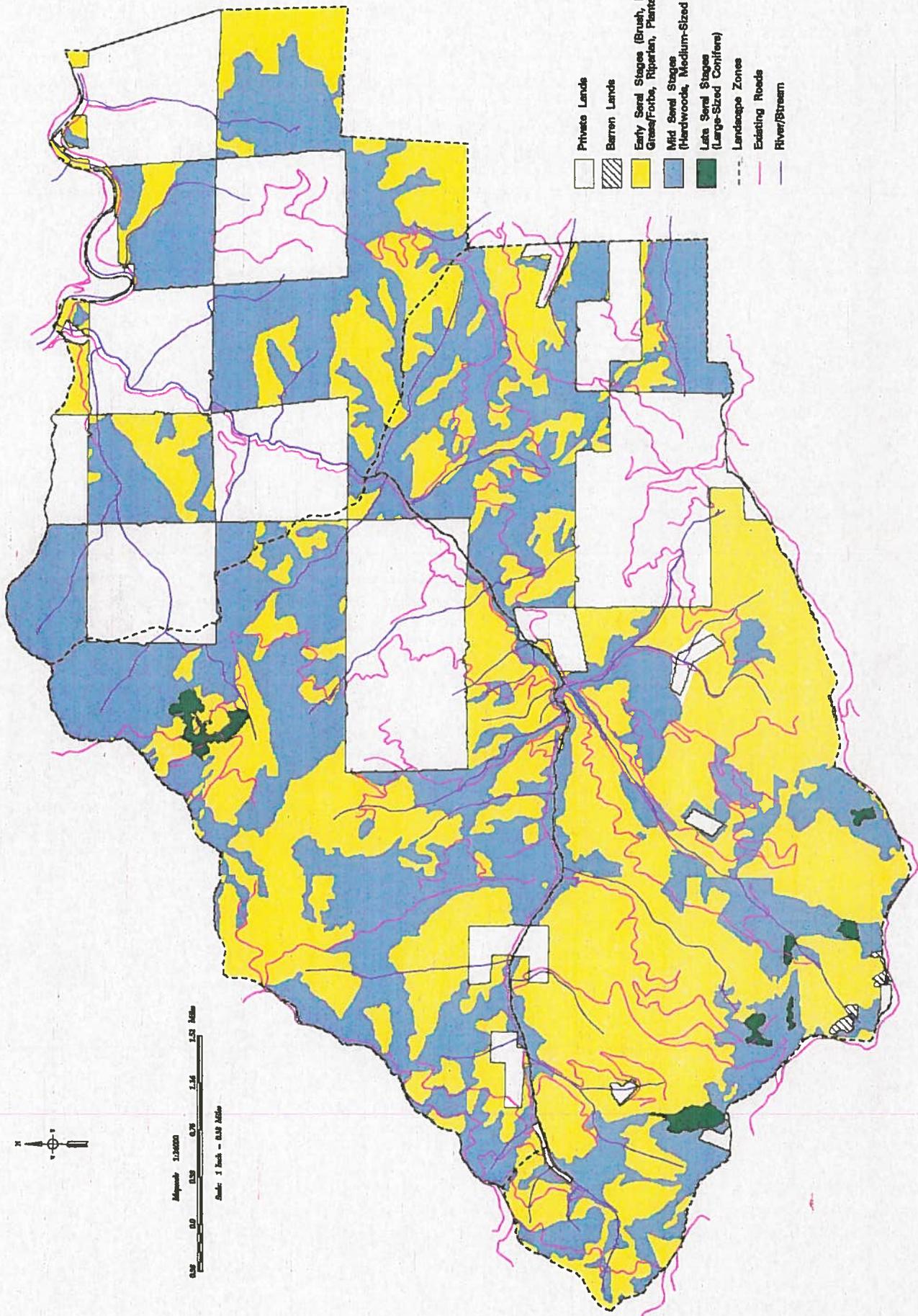
Soils are formed from deeply weathered granitics. The topography is variable and soils are moderate to highly erosive. The northwest portion of the landscape is characterized as a less dense, forested mid seral stage. This poorly-stocked forested area includes primarily medium-sized conifers. The majority of this area contains granitic soils. Most of this zone burned in the Haystack Fire. Two bands of high fire-risk for this zone are displayed in Figure 9. There are fewer older plantations than in the southwest portion, but more acres of younger plantations. A mosaic of larger patches of manzanita and hardwood stands also occur, and a minor amount of late seral stage is found. An Order 2 Soils Survey is available for much of this area (see Figure 2).

## VEGETATIVE STRUCTURES

Vegetation information was gathered using available timber type and timber strata used in the Forest LMP process (Appendix F - Vegetation Typing). This was used to identify unique patches described by District personnel. Seral stage are displayed in Figure 5 - Existing Seral Stages. Information regarding vegetative reproduction, competition, and browse utilization were from various sources listed in Appendix F. Subsequent paragraphs will specifically describe vegetation in terms of the unique portions of the landscape. The Landscape Elements Map (Figure 3) can be used as a reference for the following vegetation descriptions.

Figure 5 - Existing Seral Stages Map

# Humbug Landscape Existing Seral Stages



## EASTERN ZONE

**Brush Patches** - (32% of the eastern zone including private lands) Overall, this patch type is dense and structurally uniform with limited species diversity. Conifers and hardwoods are scattered throughout the brush patch types.

**Manzanita** --Only 32% of the brush patch type is manzanita, although it is important to note that manzanita is abundant in the understory of hardwoods and poorly stocked conifer patches. The manzanita forms irregularly shaped, large patches and is distributed in a mosaic throughout this zone. Generally these patches are impenetrable and decadent. The patches are between 30-40 years old and appear even-aged. The manzanita is approximately 2-3 feet high in lower elevation; taller (4-5 feet) and denser in mid to upper elevation. Manzanita is a long-lived brush species which increases in dominance if left undisturbed.

Both white-leaf and green-leaf manzanita are well adapted to fire ecosystems and have thick seed coats for long-term seed storage. White-leaf manzanita (*Arctostaphylos viscida*) occurs primarily at the low to mid elevations and is generally associated with poorer sites. White-leaf manzanita does not crown sprout. Green-leaf manzanita (*Arctostaphylos patula*) is found primarily at higher elevations on northern aspects. Green-leaf manzanita vigorously stump sprouts following disturbance. There are generally scattered conifers and hardwoods (less than 10% crown cover) within the manzanita patches. Manzanita seedlings grow rapidly and are highly competitive to conifer establishment. Manzanita does not provide high quality deer browse.

**Other Brush** --The remaining 68% of the brush patch type includes a combination of other brush species. Buckbrush (*Ceanothus cuneatus*) and deerbrush (*Ceanothus integerrimus*) are the preferred deer forage in this area but are currently under-browsed because of their poor palatability and decadent condition.

Buckbrush is the predominant species in this zone. It is important winter feed because it has high protein content which is needed to augment protein deficiency commonly encountered by deer in their late winter diet. Buckbrush occurs in pure patches and in association with mountain-mahogany and white oak. Buckbrush readily germinates after fire, but is not a crown sprouter. Con-

tinued reburns on the same area can destroy seedlings. Deerbrush vigorously crown sprouts and has long-term seed storage capability. Deerbrush is an excellent year-round browse species. Although deciduous, deer continue to browse on the twigs during the winter months. Between 15-30 years, *Ceanothus* species will begin to die, allowing the longer-lived sprouting species such as green-leaf manzanita to increase in their dominance.

Existing deerbrush and buckbrush are decadent (30-40 years old) and contains a significant quantity of dead material in the canopy, creating a ladder of combustible fuels. This older age class of deerbrush and buckbrush has limited nutritional forage value for wildlife. Generally these species occur as a mosaic with grass and rock outcrops and are more penetrable for wildlife passage. At lower to mid elevations, buckbrush and white oak are found together. At higher elevations, on north-west and northeast aspects, deerbrush and black oak are found in close association.

There are minor amounts of western chokecherry (*Prunus virginiana* var. *demissa*) on the moister sites and western mountain-mahogany (*Cercocarpus betuloides*) on the drier sites. Western chokecherry is good to excellent forage for deer. Although deciduous, it is cropped year-round by deer and browsed heavily in the summer and fall when chokecherry's protein content is at its highest. Western mountain-mahogany is an excellent year-round browse species and also provides shade during the summer months. Rubber rabbitbrush (*Chrysothamnus nauseosus*), Fremont silk-tassel (*Garrya fremontii*), and California yerba santa (*Eriodictyon californicum*) are also found. These species are all vigorous sprouters except rubber rabbitbrush. The seedlings of rabbitbrush grow rapidly and are considered a strong competitor for conifer establishment. Deerbrush, buckbrush, mountain-mahogany, and western chokecherry are the most important browse species in this zone.

**Capable Lands for Conversion** - (0%) An Order 2 Soils Survey has not been completed for this zone. No capable lands for conversion have been identified in this portion of the landscape.

**Water/Riparian** - (1% including private lands) The majority of riparian vegetation occurs on private land. Cottonwoods, rather than conifers, are

present and provide a future source of large woody debris (LWD). The lower one-third of Humbug Creek is dominated by willow with scattered cottonwoods in the overstory. It is unknown whether the site is capable of producing conifers with different structural components. In this portion of the landscape, willows provide habitat which is preferred by willow flycatcher. Surveys for willow flycatchers have been conducted, but none have been located in the area. Much of the riparian vegetation along private land has been altered with mine tailings. Overall, the riparian vegetation is considered resilient to disturbance.

**Hardwood** - (19% including private lands) The Klamath Forest-wide inventory indicates the average age of hardwood stands to be 85 years old. The average diameter is 10.4" with about 84 trees/acre. Average crown cover is 73% where it occurs as pure stands. Almost all of this patch type is delineated as non-commercial hardwoods. Hardwoods are abundant on the west-side of the forest, but large canopy mast producing black oak are limited in this landscape.

**Commercial** --California black oak (*Quercus kelloggii*) is the only commercial hardwood species present in the landscape. A pure stand of black oak is typed in the Butcher Gulch area but has not been field verified. Black oak is generally scattered and found in the understory of conifers, or associated with canyon live oak, or in association with maples in riparian areas.

The tree form of black oak is uncommon in this area. Multi-stems from crown sprouts is typical, indicating regeneration following frequent fires. Small diameter black oak is sensitive to fire. Complete crown kill from fire is common where individual trees or isolated clumps of trees are surrounded by brush or are on the margin of a stand adjoining brush. Black oak tolerates shade in the early life, but needs full overhead sunlight for good growth. It is commonly overtopped by conifers, when growing in the understory.

Mature acorns are essentially a fattening diet as they are conspicuously low in crude protein and high in fats and carbohydrates. Prenatal mortality in deer is common where acorn production is limited in key winter range areas. Deer feed heavily on acorns during the fall and spring months. Extensive browsing can occur on crown sprouts following a disturbance. Although black oak is scattered

throughout the landscape, large canopy crowned mast producing trees are in limited quantity.

**Non-commercial** --Scattered white oak (*Quercus garryana* var. *breweri*) and large-sized patches of canyon live oak (*Quercus chrysolepis*) occur intermixed with brush. The shrub form of white oak, known as brewer oak, is common in this zone. It generally indicates droughty soils and lower site productivity. White oak crown sprouts following disturbance. It is moderately to heavily utilized by deer, constituting a bulk of their summer diet. Canyon live oak is also an indicator of low site and rocky soils. It is generally concentrated on south aspects at lower elevations. Canyon live oak is poor to fair browse for deer. Because it is evergreen, it is utilized by deer to some extent at most times of the year. Due to its loose, flaky bark that readily ignites, even a low intensity surface fire results in severe damage to the cambium. Canyon live oak produces a moderate to dense re-growth of root crown sprouts following fire.

**Grass/Forbs** - (1% including private lands) A minor amount occurs in this zone.

**Barren, Rocky Areas** - (0%) No barren, rocky areas are typed in this portion of the landscape. However, on a rocky outcrop in the vicinity of Clear Creek, *Lewisia cotyledon* var. *howellii* is found.

**Forested** - (47% including private lands) There are no older or young plantations, poorly-stocked pole, or well-stocked pole-sized forested areas in this portion of the landscape. Site quality is low in this area ranging from a Dunning Site III-V on capable sites (Forest Survey Site Class 5-6). Species composition includes ponderosa pine (*Pinus ponderosa*), Douglas-fir (*Pseudotsuga menziesii*), incense-cedar (*Libocedrus decurrens*), with a minor component of sugar pine (*Pinus lambertiana*) and western juniper (*Juniperus occidentalis*). Conifer species occur scattered within other patch types and as clumps or stands of mixed conifers.

Overall stand health is poor. Many conifer stands have reduced live crowns and appear to have achieved their maximum height growth potential. Conifer stands are generally concentrated on northeasterly aspects, or on gentle slopes where soils are more developed, and in draws where water is more abundant. Some layering or structural diversity is evident and commonly associated

with heavy mortality due to intense competition for limited resources.

*Poorly-Stocked Medium* --Approximately 67% of the forested patch type is poorly-stocked (10-39% crown closure). Average size ranges from 6-24.9" DBH. Forest-wide inventory indicates an average of 84 trees/acre for this timber strata. Average age is 108 with some larger trees around 212 years.

Although there is less inter-tree competition, there is excessive competition with brush and grass in the understory. Conifer stands are mostly single-layered in association with brush and hardwoods. Conifers appear less vigorous and crowns have somewhat rounded tops. There is not much evidence of stand decadence or down woody material. Existing snags are prevalent. There is some structural diversity in this patch type. There is wildlife forage available, but limited thermal cover opportunities.

*Well-Stocked Medium* --The remaining 33% of the forested patch is well-stocked, ranging from 40-100% canopy closure. Average size ranges from 6-24.9" in diameter. Forest-wide inventory shows an average of 156 trees/acre for this forest type. Average age is 120 with some larger trees around 142 years. There is more layering and vertical diversity within this patch type. There is excessive mortality and snags are prevalent. Mistletoe is prevalent in Douglas-fir and the larger-sized pines. Forest health is poor, with trees of all ages dying. Species diversity is reducing as the Douglas-fir component is being lost due to excessive competition. There is a lot of structural diversity and vegetative layering in this patch type. Wildlife cover is provided, but minimal forage is available.

*Poorly-Stocked/Well-Stocked Large* --The only large-sized forested areas occur on private land in Section 27, T46N,R7W,MDM.

#### **Corridors**

*Water* --The eastern portion includes the Klamath River and the main stem of Humbug Creek. Numerous small drainages also enter Humbug Creek. Some of the more prominent draws include Butcher Gulch, Trail Gulch, and Dunns Gulch. Clear Creek is considered a very important drainage as it provides suitable habitat for a territorial spotted owl. In this eastern portion, the stream gradient is generally flat and appears as a wide flood plain. The alluvium deposit at the mouth of

Humbug is a combined result of 19th Century mining (mine tailings) and subsequent construction of dams on the Klamath River which regulated high fishing flows necessary to remove the alluvial material in the Klamath flood plain. Chinook salmon are generally large system spawners. Historically, a fall run of chinook have been found in Humbug Creek. Their occurrence coincides with years of high survival rates and adequate water flows. Chinook salmon utilize low gradient streams and as such are generally found between the north of Humbug to the first bridge on the main stem of Humbug Creek. By comparison, both coho salmon, steelhead and resident trout travel much farther up Humbug Creek. Streamflow commonly runs subsurface through private land in Section 16, adjacent to the mouth of Humbug Creek. There are point source sedimentation problems due to mining activities.

*Roads* --The entire landscape has approximately 108 miles of road (2.4 miles/section). There are approximately 15 miles of road (1.2 miles/section) in this zone (refer to Appendix G - Roads by Zone). Road density is lowest in this portion of the landscape. In the Eastern Zone, all the roads are Maintenance Level 2 with native surfacing. Road 46N52Y is the only Maintenance Level 3 road. Erosion hazard ratings are low in this area. There are no point source sedimentation sources associated with roads identified in this zone. There are no gated roads.

#### **SOUTHWEST ZONE**

The following information will highlight only the differences from what has previously been discussed.

#### **Brush Patches -(15% including private lands)**

*Manzanita* --About 63% of this patch type is manzanita. These patches are small, irregularly shaped, and unconnected.

*Other Brush* --The remaining 37% is other brush. These species include California hazel (*Corylus cornuta* var. *californica*), western chokecherry (*Prunus virginiana* var. *demissa*), golden chinquapin (*Castanopsis chrysophylla* var. *minor*), and deerbrush. All of these species crown sprout following disturbance. They are prevalent in the understory of conifers so there is actually more occurring than what is typed. Generally the seedlings of these species, except deerbrush, are slow-

growing and represent low competition to conifer establishment. These species indicate a more mesic site condition.

**Capable Lands for Conversion** - (3% including private lands) These opportunities were identified in 1984 and modeled as capable lands in the Draft Forest LMP. No Order 2 Soils Survey is available to confirm this information. These are large patches, adjacent to older plantations and poorly stocked forested areas.

**Water/Riparian** - (<1% including private lands) The riparian vegetation follows a much more constrained stream channel as compared to the floodplain in the eastern portion. Conifers, alders, and maples are the prominent vegetation.

According to the 1979 and 1980 channel stability surveys, there are four segments along Middle Fork of Humbug Creek which have less than 50% vegetative cover, and two segments that have between 50-70% vegetative cover. From Middle Fork confluence of Humbug Creek west to Eliza Gulch contact with the main stem of Humbug Creek, there are ten segments where there is less than 50% vegetative cover, and three segments that have between 50-70% vegetative cover. This area is a concern because it does not currently provide adequate shade and it does not have a future conifer source for large woody debris.

**Hardwood** - (9% including private lands) Although there are no pure stands of commercial hardwoods, black oak is quite evident on the lower slopes. Both white oak and canyon live oak occur in small patches. Bigleaf maple (*Acer macrophyllum*) is also much more prevalent in this zone. Young foliage of bigleaf maple is cropped by deer, but is not utilized when leafage grows beyond their reach.

**Grass/Forbs** - (4% including private lands) Although there is a limited amount of this patch type, it is more prevalent here than in any other portion of the landscape.

**Barren, Rocky Areas** - (1% including private lands) All of the delineated barren/rocky areas are located in this portion of the landscape. Isolated populations of *Calochortus persistens* (sensitive plant) occur along the southern boundary of the landscape between Gunsight Peak and Mahogany Point. Marlahan mustard (*Isatis tinetoria*),

a pervasive competitor to *Calochortus*, is also present.

**Forested** - (68% of the southwest zone including private lands) This portion of the landscape has the greatest range and diversity of conifer age, size class, structure, and distribution. Species composition is also more diverse with Douglas-fir, ponderosa pine, Jeffrey pine (*Pinus jeffreyi*), sugar pine, white fir (*Abies concolor*), and incense-cedar occurring. There are no junipers present. Site capability is the highest in this zone, averaging a Dunning Site Class III. Stand structure is more diverse with abundant layering and understory development in the well-stocked patch types. Only the large-sized conifer patches show signs of decadence. Mortality is less apparent in this zone, presumably because the higher site has been able to accommodate higher stocking levels.

**Younger Plantations** --There is a limited amount of younger plantations in this zone (less than 1% of the forested area). Most of these were planted in 1973 with ponderosa/Jeffrey pine, with some Douglas-fir planted on the northerly aspects. There are almost no snags within these plantations. Stocking levels vary between 200-400 trees/acre. There is minimal structural diversity or vegetative layering in this patch type. Young plantations offer limited wildlife cover but do provide forage opportunities where preferred browse species are scattered in the understory.

**Older Plantations** --This zone contains the greatest amount of older plantations in the landscape. Of the forested areas in this zone, older plantations represent 35%. Most of these older plantations (30-40 years old) are terraced and are a result of the Haystack Fire. Terracing was used on steep slopes in order to remove competing vegetation and provide a suitable planting site. Most of these plantations were planted with ponderosa pine, but also include scattered Douglas-fir naturals. In many cases, the seed source is unknown or collected off-site. There is manzanita and deerbrush in the understory and scattered Black oak trees. There are very few snags within these older plantations.

Survival rates are variable and are reflected with the wide range of existing stocking levels. Some plantations are understocked (50-150 trees/acre), while others were just recently thinned from 1989-1991 to 200 trees/acre and have a very high

fuel loading. There are still other older plantations that have not been thinned and are quite overstocked (500-600 trees/acre). There is limited structural diversity within this patch type. The older plantations provide thermal cover for wildlife and serve as future structural and functional diversity in the landscape.

*Poorly-Stocked Pole* --All of the poorly-stocked poles occur in this portion of the landscape. Pole-sized conifers represent 18% of this forested area. Of the pole-sized conifers, 26% is poorly-stocked (10-39% crown cover). Average size ranges from 1-5.9" DBH. Species composition is mixed conifer; primarily ponderosa pine and Douglas-fir. There is grass and brush (primarily manzanita) intermixed with this patch type. There is limited wildlife forage available. At the lower elevations, scattered live oak and white oak occur.

*Well-Stocked Pole* --The majority of this patch type occurs in this zone. Approximately 74% of the pole-sized conifers in this zone are well-stocked (40-100% crown cover). Average size is the same as above (1-5.9" DBH). Species composition is ponderosa and jeffrey pine, Douglas-fir, and some white fir. There is more structural diversity in this type. Wildlife thermal cover and fawning habitat are provided. Limited forage is available.

*Poorly-Stocked Medium* --Medium sized conifers represent about 45% of this zone. Of the medium-sized conifers, 49% is poorly-stocked (10-39% crown cover). Average size ranges between 6-24.9" DBH. Species composition is mixed conifer as described above. Scattered conifers with grass in the understory generally indicates lower site productivity, whereas scattered conifers with brush and hardwoods generally are a result of the Haystack Fire.

*Well-Stocked Medium* --The remaining medium-sized conifers are well-stocked (40-100% crown cover). Average size ranges between 6-24.9" DBH. There are some pure stands of Douglas-fir although most is a mixed conifer composition. There is some mistletoe evident in the Douglas-fir, primarily in the larger size classes.

*Poorly-Stocked Large* --This patch type represents less than 1% of the forested area in this zone. Small patches occur near the south boundary of the landscape, northwest of Middle Fork. Another patch occurs just south of Middle Fork. Average

diameter is greater than 25" DBH. Scattered large trees comprise 10-39% crown closure. Forest-wide inventory indicates 125 trees/acre for this timber strata. Average age is 139 years with some remnants at 256 years.

Conifers appear less vigorous and crowns are very rounded. These are remnants from the Haystack Fire. There are hardwoods and brush in the understory. There is some decadence and large woody debris in this patch type characterized by vegetative layering, providing structural diversity.

*Well-Stocked Large* --There is a minor amount of this type occurring around McKinley Mountain. A much smaller patch occurs along the southern boundary of the landscape, just east of Mahogany Point. Trees average >25" DBH and range between 40-100% crown closure. Forest-wide inventory indicates that there are about 107 trees/acre in this timber strata. Average age is 148 years with some older trees at 291 years.

There is more structural diversity, decadence, and large woody debris. There are snags and mistletoe prevalent in the older trees. There is good thermal and optimal cover for wildlife. Fisher sightings have been reported in this vicinity.

### Corridors

*Water* --The main stem of the Humbug Creek from Whites Gulch to the western boundary of the landscape is included in this zone. The Middle Fork and South Fork of Humbug Creek are also within this zone. Middle Fork has a "Fair Pfankuch channel stability rating". Numerous draws enter Humbug Creek, including Lawson and Eliza Gulch. Chinook salmon are not commonly found in this portion of the stream. Coho salmon are found in the South and Middle Forks of Humbug Creek. Steelhead will travel as far as Eliza Gulch on Humbug Creek (based on District knowledge).

*Roads* --There are approximately 59 miles of road in this zone (three miles/section). This area is the most roaded portion of the landscape. Most are Maintenance Level 2 roads with native surfacing. Roads 45N30, 45N32, 45N39, and 45N47 are Maintenance Level 3 roads with native surfacing. Roads 45N37, 45N43, 45N88, and 45N96Y are Maintenance Level 1 roads. These Level 1 roads are temporary, non system roads which are closed year-round. Erosion hazard ratings are moderate to high in this zone. County road 7J031 (Elmo

Road #45N47) is delivering sediment to Humbug Creek just west of the Humbug picnic area.

#### NORTHWEST ZONE

The following information highlights only the differences from what was discussed in the eastern and southwest portions of the landscape. An Order 2 Soils Survey has been completed for much of this zone.

#### **Brush** - (26% including private lands)

*Manzanita* --The majority of the brush patches is typed manzanita. These patches are larger, irregularly shaped, and impenetrable. The Order 2 Soils Survey has identified some of these areas as marginal to suitable for conifer production (see Figure 3 - Landscape Elements Map).

*Other Brush* --Other brush species include buckbrush, either occurring as pure stands or intermixed with manzanita. Deerbrush has been out-competed by the manzanita component.

**Capable Lands for Conversion** - (1% including private lands) About 1% of the brush type is identified as an opportunity to convert brushfields to conifers. Some of these opportunities were identified in 1984 and has been used in the Draft Forest LMP. Other opportunities were identified from an Order 2 Soils Survey.

**Water/Riparian** - (<1% including private lands) A minor amount of riparian vegetation is typed in this zone. Conifers and alders are the dominant vegetation.

**Hardwood** - (15% including private lands) Black oak is less evident here as compared to the other zones. Both white oak and canyon live oak are present.

**Grass/Forbs** - (<1% including private lands) A minor amount occurs in this zone.

**Barren, Rocky Areas** - (0%) No barren patches are typed in this portion of the landscape.

**Forested** - (58% including private lands) There are no poorly-stocked pole-size conifers or well-stocked large-size conifers identified in this zone. There is more Douglas-fir but no junipers as compared with the Eastern Zone. A minor amount of

knobcone pine (*Pinus attenuata*) is present along with ponderosa pine, white fir, sugar pine and incense-cedar. Site quality ranges between Dunning Site III-V. Erosion hazard is moderate to high. Conifer mortality is lower than in the Eastern Zone.

*Older Plantations* --Of the forested landscape in this zone, older plantations represent about 22%. Most of these are a result of the Haystack Fire. Near Craggy Mountain, there are some older plantations that were thinned 15 years ago to 300 trees/acre. These plantations are still overstocked, but they have a lower fuels buildup. There are also some understocked older plantations within this zone.

*Young Plantations* --This zone contains the greatest amount of young plantations. Of the forested area in this zone, young plantations represent five percent. Most of these were planted between 1970-1980. There are very few snags. Stocking levels vary between 200-400 trees/acre.

*Well-Stocked Pole* --Of the forested area in this zone, well stocked poles represent about three percent. Wildlife thermal cover and fawning habitat are provided.

*Poorly-Stocked Medium* --Of the forested area in this zone, poorly stocked medium-size conifers represent about 54%. Scattered conifers with grass in the understory generally indicate a lower site, whereas brush and hardwoods in the understory may be more a result of the Haystack Fire. The Order 2 Soils Survey could be consulted in this area to identify site potential.

*Well-Stocked Medium* --Approximately 14% of the forested area in this zone includes well-stocked medium-size conifers.

*Poorly-Stocked Large* --About two percent of the forested area in this zone contain poorly-stocked large-size conifers. These large trees are probably remnants of the Haystack Fire.

#### **Corridors**

*Water* --Several ephemeral and intermittent channels join the main stem of Humbug Creek in this zone. Some of the more prominent ones include: Whites Gulch, Dowling Gulch, Kennebec Gulch, Rider Gulch, and Jakes Gulch.

*Roads* --There are approximately 34 miles of road in this zone (2.6 miles/section). There are no temporary roads in this zone. All roads have native surfacing. Road 45N30 along Rider Gulch has been identified as a sedimentation source to Humbug Creek.

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## STEP 2 - FLOWS AND LINKAGES

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Certain types of ecological features or processes tend to move across and interact within a landscape, or otherwise operate at a landscape level. These features or processes have been termed, "flows". A flow can be a group of wide-ranging animals, such as elk, people, or natural disturbance processes such as wind, and wildfire (see Figure 6 - Landscape Flows).

Within the landscape, the group identified eight key flows: fire, humans, water, fish, spotted owl, fisher, surface erosion, and deer. Human flows were classified as being private use, recreation, or commodity oriented.

Vegetative linkages to adjacent landscapes are highly variable. In the Eastern Zone, particularly from the Badger Mountain area to Long Gulch, many of the linkages are in the form of manzanita and other brush species. In the southwest area from Gunsight Ridge to Deadwood Baldy, vegetation along the ridge is predominantly well-stocked medium sized conifer stands. Along the northwest zone, vegetative linkages are a mixture of poor-stocked and well-stocked medium-sized conifer stands, with some patches of hardwoods, manzanita and other brush species.

### LANDSCAPE FLOWS

**Fire** - Fire has played, and will continue to play an important role within the landscape. Fire occurrence information from 1931 through 1990 shows a total of 131 starts during that 60 year period. Natural starts resulting from lightning have been the primary source of the identified starts within the area. Based on fire history information, four bands of high-risk exist within the landscape: In the Northwest Zone along the landscape border, between Humbug Creek and Barkhouse Creek, in the Southwest Zone along the ridge between Humbug and Deadwood Landscapes, in the Eastern Zone around Badger Mountain, and lastly, along the south face of Craggy Mountain. The ma-

majority of the lightning strikes have occurred above 4,000 feet. Human-caused starts have generally occurred along the main road systems. Most fires have tended to be relatively small, with the exception of the 60,000 acre Haystack Fire which affected most of the southwest and northwest portions of the landscape. The most recent fire occurred in the Garvey Gulch area in 1992.

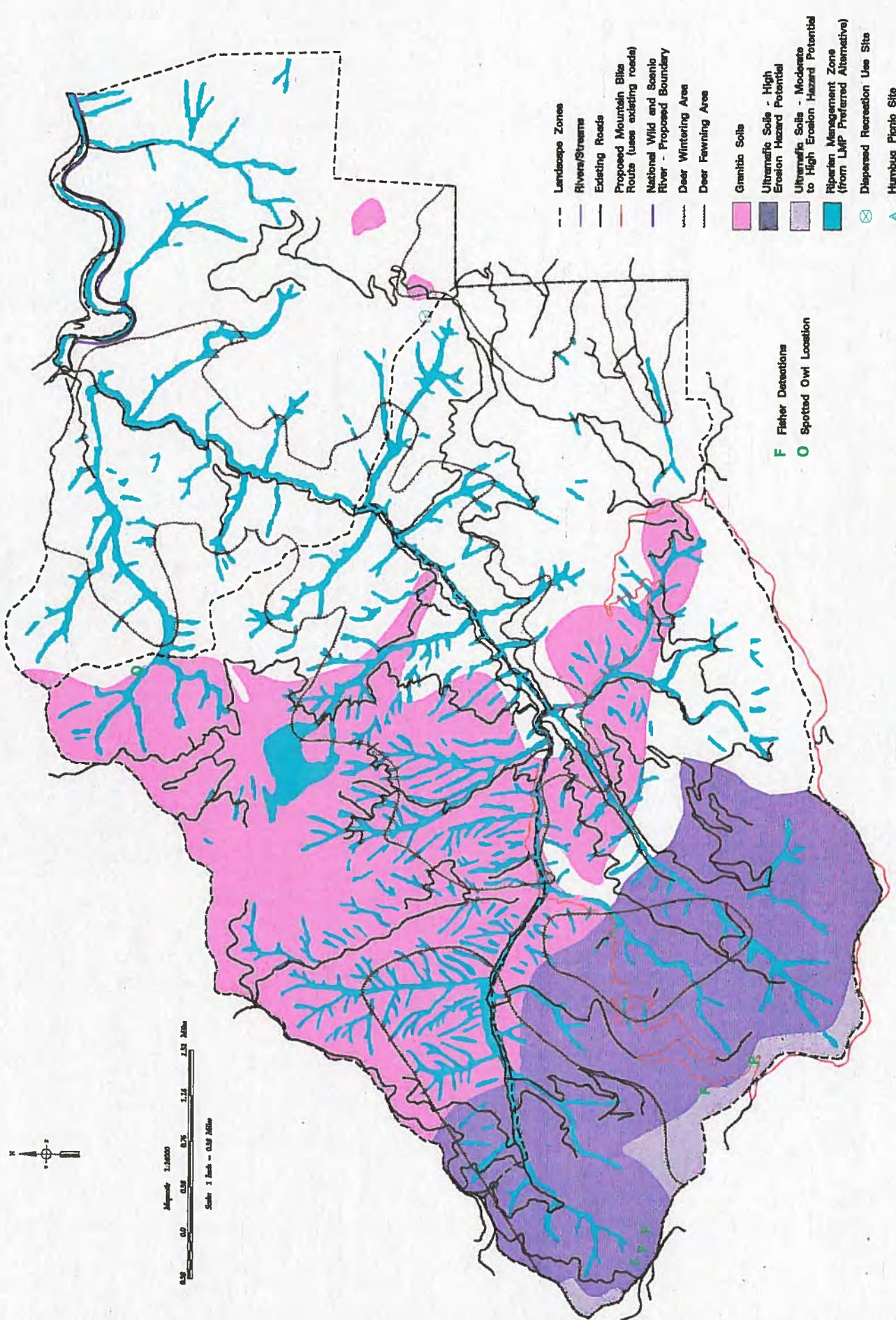
Once a fire begins within an area, its course is influenced by many factors including fuel loading, fuel moisture, slope, and aspect. Out of these factors listed, fuel loading is the one which can be influenced by management practices. Within certain portions of the landscape, the structure and current condition of the vegetation is conducive to carrying and spreading fire. Decadent fields of brush are present in the northeast part of the landscape. Buckbrush, manzanita, and scattered silk-tassel exceed five feet in height in some areas. Much of the deerbrush exists in the form of dead and dying stems, and scattered patches of oak occur as overstory. Several of the drainages contain stringers of conifers which are experiencing significant levels of mortality. In the northwest portion of the landscape, south and to the west of Craggy Mountain, decadent stands of manzanita, intermixed with buckbrush and deerbrush dominate the area. Some of the plantations within this area are overstocked or have been thinned with minimal fuels treatment. Stands of mixed conifer dominate the southwest portion of the landscape. Large patches of overstocked plantations and thinned plantations with accumulated slash present a high fuel hazard. Many of the natural stands have high ground fuel build-ups and considerable understory.

Summer through fall is normally the months during which fire-risk is greatest. The Pacific Coast high pressure system dominates the climate during most of the summer which results in lack of precipitation and drying of fuels. Thunderstorms which occur with little or no moisture are common throughout the summer.

The fire flow within the landscape is potentially linked with adjacent landscapes wherever fuel buildups occur along its boundaries. Currently, the majority of the potential links occur at ridgelines along the southwest boundary where stands of well-stocked medium-sized conifers exist, and along the eastern boundary in areas of decadent brush.

Figure 6 - Landscape Flows Map

# Humbug Landscape Landscape Flows



October 26, 1998

Fire has many effects on the functions within a landscape. The most obvious effects have to do with production. Within Humbug, a high intensity fire would drastically reduce production by killing vegetation and decreasing soil productivity. A low intensity fire, on the other hand could increase production by stimulating sprouting of new shoots, thinning dense stands of vegetation, and causing seeds to germinate. Due to the erosive nature of the soils within portions of the landscape, fire could also have an important effect on the output of sediment and the cycling of soil nutrients.

**Humans; Private** - The amount of use in Humbug, largely due to its proximity to Yreka coupled with the occurrence of private ownership within the landscape make humans an important landscape flow. Human uses occurring on private land were characterized as being mining residences, private timberland, and homes.

Both the mining residences and homes occur mainly along Humbug Creek off the main road and at the mouth of Humbug Creek. While the mining activities are somewhat dependent on the water element, the residences likely occur along water courses for aesthetic reasons. Fruitgrowers' commercial timberland occurs primarily in the Butcher Gulch area. Access to and from these areas occurs mainly along the Humbug Creek Road to Highway 96, and along National Forest Road 45N32 to Hawkinsville.

**Humans; Recreation** - Recreational uses within the landscape include Wild and Scenic River use, off-highway vehicle (OHV) use, mountain biking, picnicking, fishing, hunting, snowmobiling, sledging, and driving for pleasure. Most of the recreation is closely associated with the extensive road system.

Wild and Scenic River activities occur up and down the Klamath River and are typically yearlong. The OHV use occurs on roads throughout the landscape, primarily during the spring and fall. The Oak Knoll Ranger District recreation staff is in the early stages of developing a proposal for designated OHV areas within the landscape. A portion of land around the Canal and Rocky Gulches, managed by the Bureau of Land Management, would possibly be developed into the primary staging area for this activity.

Mountain biking also occurs along the road system, though it is probably more concentrated along the southern portion of the landscape where more of the forested, cooler areas occur. A popular route runs from Yreka along Gunsight Peak ridge, down Sucker Creek, along Humbug Creek, then back up to the ridge along the South Fork of Humbug. This activity occurs from spring through the fall and may see an increase due to the route being highlighted in a newly released booklet of mountain bike routes on the Forest.

Some picnicking does occur within the landscape, primarily along Humbug Creek, at the old Humbug campground, and along the Gunsight Peak area. Water and forested areas which provide shade are likely the most important attributes which affect where this activity occurs.

Fishing occurs primarily during the summer and fall along the main stem of Humbug. In general, Humbug does not provide a high quality fishing experience, but anadromous fish and resident trout do utilize the stream.

The landscape is a popular spot for deer hunting due to its close proximity to Yreka and its well roaded condition. This activity occurs during the late summer and early fall. Hunters typically camp along Humbug Creek and hunt within the brush areas, or travel over to the adjacent Deadwood Landscape. Hunting within the Humbug area used to be considered outstanding by local residents, but has declined significantly over the years, probably due to the decrease in the quality of deer forage.

Wintertime sledding is a popular activity along a portion of Road 46N16. This area is favored by locals due to its slope, its openness, and reasonable wintertime access.

Access to and from the area for the above mentioned activities occurs along the main Humbug Road and along National Forest Road 45N32 to Hawkinsville. Residents from Yreka access the Humbug area primarily from Road 45N32. This maintained road begins just a few miles outside of Yreka. The main Humbug Road is accessed from Highway 96. This route is the one most commonly used by non-local visitors because of its link to Highway 5 and its proximity to Tree of Heaven Campground. The Tree of Heaven Campground is one of the most heavily used on the Forest. The

Oak Knoll Ranger District is currently designing a self guided interpretative trail at the campground. It will emphasize use of the area by neotropical migrant birds, but there are opportunities to expand on its themes.

**Humans; Commodity** - Commodity uses within the area are mainly in the form of timber harvest, fuelwood gathering, and gold mining. These activities occur most commonly from spring to fall.

Timber production and fuelwood gathering occurs primarily within the forested areas of landscape, located at the south half and extreme western portions. These activities are dependent upon the presence of conifer and hardwood stands and the roads which provide access to them. The majority of the mining activities occur along the main stem of Humbug Creek and are dependent upon the flow of water.

In general, through private, recreational, and commodity uses, humans facilitate output functions within the landscape.

**Water** - The quantity and flow patterns of water within a landscape have a strong influence on the processes of production, cycling, storage and output. Humbug Creek, with its two forks, is the primary year-round source of surface water within the landscape.

In addition to the main stem of Humbug, the landscape includes several important sub-drainages which direct water flow year-round or intermittently during the winter and spring. The other important source of water is captured in the form of rain and snow.

The average amount of annual precipitation varies within the landscape. The extreme southwest portion is relatively mesic, averaging between 50 and 60 inches of precipitation a year. The northeast portion of the landscape falls within the 30 to 40 inches per year belt with areas on the extreme eastern fringes falling within the 20 to 30 inches per year range. As is typical for a Mediterranean type climate, most of the precipitation is received between September and May, with 80% falling from November through March. At lower elevations (up to 4,000 feet), this falls primarily as rain, with snow mainly occurring above 4,000 feet. The northerly facing peaks such as McKinley Mountain

and Mahogany Point retain the greatest amount of snow pack in early spring.

Water flow within the landscape is directed mainly into Humbug Creek then on into the Klamath River, although areas along the east side of Badger Mountain drain into the Shasta River. It is primarily via the Klamath River that this landscape flow links with other landscapes. The quality of the water which leaves the Humbug area is generally good, with year-round temperatures averaging between 56 and 68 degrees Fahrenheit.

**Fish** - Humbug Creek provides spawning and rearing habitat for fall chinook salmon, coho salmon, steelhead, and resident trout. It is considered to be one of the best steelhead producing streams on the Oak Knoll Ranger District. Steelhead use Humbug Creek as far up as Eliza Gulch. Chinook do not travel very far up the creek, usually remaining near the mouth. Coho use the creek as far up as the confluence of the Middle and South forks. There is a small population of resident rainbow trout in Humbug Creek.

The overall quality of fisheries habitat is dependent upon several components including water temperature, sedimentation, stream channel integrity, coarse woody material, and stream canopy cover. Spawning habitat in Humbug is very good, though currently, the amount of rearing habitat is limited.

As previously stated, this flow links with other landscapes via the Klamath River. During late summer and early fall, particularly in years of low flow, this linkage is hindered due to the fact that the stream forks near the mouth and goes subsurface.

**Northern Spotted Owl** - Habitats selected by northern spotted owls typically exhibit moderate to high canopy closure, a multi-layered, multi-species canopy dominated by large overstory trees, and a high incidence of large trees with cavities, broken tops and other signs of decadence. These attributes are usually found in mature and old-growth forests. However younger forest stands may provide the necessary structure and conditions. This is especially true if they contain remnant large trees, or if they contain medium sized conifers that occur as co-dominants with hardwoods. Although the Humbug landscape contains only a small amount of dense, older seral stage forest, it does contain relatively more stands

which meet the secondary description of owl habitat.

A single spotted owl territory has been documented within Clear Creek drainage in the landscape. Additional potential nesting/roosting habitat does occur within some of the other forested drainages, primarily in the medium to large well-stocked conifer patches. Foraging habitat is available in those patches as well as in poorly-stocked areas, oak stands, and natural pole stands. The most important habitat linkages to adjacent landscapes probably occurs around the McKinley Mountain area down into the Deadwood drainage, and along Humbug Creek to the Klamath River. The closest pair of spotted owls have been located across the Klamath River within the Empire Landscape.

**Fisher** - Photographic survey stations have documented a pair of fisher within the landscape along the ridgeline between Deadwood Peak and just east of McKinley Mountain. Fisher are typically associated with dense, older seral stage forest. According to Regional habitat capability information, a high to moderate quality territory consists of 6,000 to 9,800 acres, 80 to 50% of which is made up of stands of large conifers with dense canopies. Large snags and down logs are important for fisher denning sites and they provide cover for prey species. Small inclusions of hardwood stands, natural openings, and riparian areas provide additional habitat for foraging.

The documentation of the presence of fisher is the extent of information on fisher within the landscape. Due to lack of site specific habitat use or home range information, the most we can do is speculate on how Humbug may function as fisher habitat. Based on the best available habitat model information, the Humbug Landscape alone does not provide enough suitable habitat to fully support a fisher territory, but habitat within Humbug may contribute to support a territory which overlaps with two or more landscapes. Habitat for fisher within the Humbug landscape is provided primarily within the well-stocked medium and large-sized conifer stands, small stands of hardwoods and riparian areas. The most continuous parcels of suitable habitat occur within the upper elevations of the southwest portion of the landscape and along riparian zones. Similarly, the most continuous vegetative linkages to adjacent landscapes occur around McKinley Mountain into

the Deadwood landscape and along Humbug Creek to the Klamath River.

**Surface Erosion** - A significant proportion of the landscape has been classified as having moderate to high erosion potential based on factors such as inherent soil erosiveness and slope. Within the landscape, granitics and inner gorges greatly influence surface erosion.

Approximately one-third of the landscape is classified as being geologically sensitive due to the presence of granitic bedrock material. Soils in these areas are rich in sand and lack cohesive strength. The largest, continuous area of granitics occurs generally along Dowling Gulch and northeast to the landscape boundary, west to Cousins Gulch, and south to the mainstem of Humbug.

Inner gorges occur throughout the landscape. Inner gorges consist of steep canyon walls that occur along rivers and streams. The upslope boundary is usually marked by a prominent slope break separating the inner gorge from gentler slopes above. Where an inner gorge develops in unconsolidated material, such as granitics, it is extremely prone to slope failure or surface erosion.

Other factors within Humbug influence erosion including the amount of vegetative cover, roads, past timber harvest, prescribed and wildfire, and precipitation. An updated inventory is needed to pinpoint problem areas, but County Road 45N30 appears to be a significant source of sediment. Erosion results in material moving down slope into drainages where material may settle into stream channels and periodically be flushed out into the Klamath River during high waterflow.

**Deer** - The landscape provides winter range and fawning area for deer, as identified by historical deer herd boundary information gathered by California Department of Fish and Game. Much of the winter range occurs at low elevations on the south side main stem of Humbug Creek, and at low to mid elevations on the north side of the main stem, from Rider Gulch, northeast to the Klamath River. This wintering area connects with the Klamath River which is an important movement corridor for many of the Forest's deer herds. Additional wintering areas occur along the upper reaches of Long, Canal, and Rocky Gulch which link with the Hawkinsville area.

Fawning grounds occur around the upper reaches of Sucker Creek and the Middle Fork of Humbug Creek as well as a larger area bordered by Jakes Gulch to the east and Lawson Gulch to the southwest. These use areas are dependent upon the presence of grasses, forbs, and browse species for forage, forested and tall brush patches for cover, and water. Hardwoods also supply acorns in the fall.

Important linkages with other landscapes occur at the mouth of Humbug Creek, northeast of Deadwood Baldy Peak into Grouse Creek and Little Humbug Creek, southwest of McKinley Mountain into the Deadwood drainage, and the ridgeline above the Hawkinsville area.

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**STEP 3 - INTERACTIONS**  
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This step discusses some important ecological interactions that occur between existing elements found within the landscape and critical flows previously identified. The discussions of the interactions between flows and existing elements will attempt to create an understanding of how this landscape functions as an ecological system.

The following table attempts to highlight the primary interactions occurring within the landscape:

**TABLE 1 - INTERACTIONS (Fire, Humans)**

ELEMENTS	FLOWS	
	FIRE	HUMANS (Private Use): A. Mining; B. Residential
<b>BRUSH:</b> Manzanita	Highly flammable, especially late summer, early fall. There are areas where it is flammable earlier in the season due to local drought conditions (dry leaves, duff layer). Well adapted to fire ecosystem, contains thick seed coat for long-term seed storage; white-leaf (does not crown sprout), green-leaf (crown sprouts).	A. No real interaction (NRI), and B. Brush poses a hazard as far as fire potential is concerned; is a negative interaction.
-- Other Brush	Adds to existing fire hazard; decadence, size of patches, and density plays a role. Based on area history it is overdue and prime for a fire. Deerbrush, western chokecherry, western mountain mahogany, Fremont siltassel, California hazel and golden chinquapin all crown sprout. Buckbrush and rubber rabbit brush do not crown sprout. Mountain mahogany-prescribed fire recommended in years of heavy seed crop before seeds are nearly ripe. The ideal burn is one that is intense enough to kill the tree and other shrubs, but not so severe to injure the seeds on the tree.	A. No real interaction (NRI), and B. Brush poses a hazard as far as fire potential is concerned; is a negative interaction.
<b>WATER</b>	Natural fire barrier. Insignificant except to lower intensity fires.	A. Provides a cycling function for gold; mining increases sedimentation, and B. Preferred location for homes.
<b>RIPARIAN</b>	In the event of fire riparian areas may be damaged. The likelihood of losing altogether with a high intensity fire is great. In a low intensity fire it will serve as a barrier.	A. Minimal interaction unless mining of old creek bed areas; removes riparian vegetation, and B. Conifers are less prevalent in the overstory (many have been cut). Preferred location for homes.
<b>HARDWOODS:</b> Commercial	Black oak - non-fire tolerant species, not significant to overall landscape. Generally scattered throughout and found in the understorey of conifers; crown sprouter.	A. NRI, and B. Firewood, visual aesthetics.
-- Non-Commercial	White oak and canyon live oak crown sprout; both highly susceptible to fire damage.	A & B - Similar to Commercial Hardwoods.
<b>GRASS/FORBS</b>	Lower fire intensity but higher rate of spread.	A. Possible increase following reclamation, and B. NRI
<b>BARREN, ROCKY AREAS</b>	Provides a natural barrier.	A. NRI, and B. Provides visual contrast but not a preferred location for houses.

TABLE 1 - INTERACTIONS (Fire, Humans) Continued

ELEMENTS	FLOWS	
	FIRE	HUMANS (Private Use): A. Mining; B. Residential
<b>FORESTED:</b>		
Older Plantations	Dense, untreated plantations are likely to be lost; not able to suppress fires as with treated/thinned stands. Most are pine stands; fire tolerant.	A. NRI, and B. Road access to these areas may be frequently used.
-- Young Plantations	Dense, not thinned, and thinned, not fuels treated plantations are likely to be lost; not able to suppress fires as with thinned, fuels treated plantations. Most are pine stand; fire tolerant.	A & B - Similar to Older Plantations.
-- Poorly-Stocked Pole	Brush understory would be the fire carrier. Interactions similar to Other Brush.	A & B - NRI
-- Well-Stocked Pole	Low to moderate fire intensity, similar to "treated" older plantations.	A & B - NRI but has more visual aesthetic values and is more of a travel barrier than Poorly-Stocked Pole.
-- Poorly-Stocked Medium	Brush understory is fire carrier, increased intensity over well-stocked pole, likely moderate fire hazard.	A. Has potential for tree removal associated with mining, and B. NRI
-- Well-Stocked Medium	Low ground fire intensity; in general, good survival.	A. Has potential for tree removal associated with mining, and B. Same as Well-Stocked Pole.
-- Poorly-Stocked Large	Comparable to Poorly-Stocked Medium, more likely to result in torching. The understory will be primary fire carrier.	A. Has potential for tree removal associated with mining, and B. Provides visual contrast.
-- Well-Stocked Large	Crown fires are more likely to occur. Presence of snags, coarse and down woody material, as well as ladder fuels or vertical continuity will increase crown fire potential. Provides good thermal cover.	A. Has potential for tree removal associated with mining, and B. Same as poorly-stocked large.
<b>SUMMARY</b>	< >	With the exception of wetland patches and the medium and large conifer patches, from a private use perspective, the area is of low aesthetic value and scenic contrast. Protection of private property values from wild fire is an issue with large brush matrix and is a high wild fire hazard potential. Mining is concentrated in wetland riparian areas. Has potential to be a negative impact to high quality winter steelhead and chinook rearing habitat.

TABLE 1 - INTERACTIONS (Humans)

ELEMENTS	FLOWS	
	HUMANS (Recreational Use)	HUMANS (Commodity Oriented):
BRUSH: Manzanita	Presents a barrier to move through.	Limited interaction. Areas benefiting from vegetation management contributes to commodity oriented benefit in the future and present economic condition in the form of service contracts. Plantations represent an investment for future use; biomass production.
-- Other Brush	Presents a barrier to move through.	Same as Manzanita.
WATER	Provides fishing and hiking opportunities.	Generally not suitable for harvesting --unless the objective is to improve riparian habitat.
RIPARIAN	Access for fishing; visually aesthetic for hiking and picnicking.	Similar to Water.
HARDWOODS: Commercial	NRI, minimal recreation but has increased aesthetic value, provides hunting opportunities.	Minimal interaction but does provide firewood production.
-- Non-Commercial	NRI, minimal recreation but has increased aesthetic value, provides hunting opportunities.	Minimal interaction but does provide firewood production.
GRASS/FORBS	Visually pleasing.	Provides foraging habitat and forage production.
BARREN, ROCKY AREAS	Visually pleasing and focused interaction with wildflower viewing.	NRI.
FORESTED: Older Plantations	Terraced plantations offer possible off-highway vehicle (OHV) opportunities; visually offensive to some, provides hunting opportunities.	Same as Manzanita.
-- Young Plantations	They provide little recreational value and are visually offensive to some (i.e. like a tree garden, not natural) , provides hunting opportunities.	Same as Manzanita.
-- Poorly-Stocked Pole	Has slightly higher aesthetic values than brush and minimal OHV opportunity.	NRI, limited firewood production.
-- Well-Stocked Pole	Has slightly higher aesthetic values than brush and presents a barrier to move through.	Provides firewood and biomass production.
-- Poorly-Stocked Medium	Begins to become suitable for non-motorized vehicle, has slightly higher aesthetic values than brush, and is more desirable to hunt.	Low-level interaction; good firewood production.
-- Well-Stocked Medium	Has slightly higher aesthetic values over poorly-stocked medium stands and minimal increased desirability for hunting.	Production of firewood, biomass, and commercial timber products. Has the highest potential for timber production.
-- Poorly-Stocked Large	Increased aesthetic values and increased hunting. Second highest interaction and second most likely to be of value to motorized and non-motorized recreation. Large tree character draws people, particularly in an area devoid of that type.	Production of firewood, biomass, and commercial timber production; limited patch type.
-- Well-Stocked Large	Same as Poorly-Stocked Large; increased aesthetic values and increased hunting. Second highest interaction and second most likely to be of value to motorized and non-motorized recreation. Large tree character draws people, particularly in an area devoid of that type.	Limited patch type so is less likely to be used for timber commodities.
SUMMARY	Recreational use is basically related to its proximity to Yreka with the dispersed recreational use concentrated in the riparian areas and high elevation ridge lines; visitors seeking shade or cooler temperatures. The impenetrable nature of the brush restricts use to road system. Primary use is with local residents as there is nothing substantial to draw non-locals to the area.	<>

TABLE 1 - INTERACTIONS (Water, Fish)

ELEMENTS	FLOWS	
	WATER	FISH
BRUSH: Manzanita	Well stocked: provides surface cover in the form of leaf-litter and brush cover disperses the water droplets; intercepts and saturates faster than forested patches. Less stocking: more likely for surface water movement during rains. Does not assist in snowfall retention.	Vegetation adds soil stability, reduces surface erosion which reduces potential for sediment delivery to stream which can negatively affect fish.
-- Other Brush	Same as Manzanita but more likely to have less stocking.	Similar to Manzanita.
WATER	Year around surface water is limited. Provides a capture and cycling function.	Critical habitat, lower segments serve as capture, cycle, and production functions for anadromous fish, deeper pools upstream serve same functions plus storage for resident fish.
RIPARIAN	Reduces water velocity and provides a capture function; high concentrations of soil moisture where riparian area is well developed. Produces cooler stream temperatures and captures sediments before entry. Is an immediate nutrient source for aquatic organisms. Mining and the existence of roads reduce ability of riparian areas to function.	Vitally important to cool water temperatures through shading, provides habitat for insects which is a food source for fish. Source for LWD; source of nutrients for fish and invertebrates. Provides hiding cover and bank stability.
HARDWOODS: Commercial	Interception is seasonal; during winter events interception is less due to limited foliage. Surface litter slows water velocity; heavier uptake of soil/water during active growing periods; interception highest when it is leafed out.	Similar to Manzanita.
-- Non-Commercial	White oaks: similar to Commercial Hardwoods, Live oaks: similar to Other Brush.	Similar to Manzanita.
GRASS/FORBS	Provides faster hydrologic response, has earlier saturation, greater likelihood of surface water movement, and increased run-off.	Similar to Manzanita.
BARREN, ROCKY AREAS	Has increased run-off; fastest.	Similar to Manzanita.
FORESTED: Older Plantations	There is greater infiltration and interception; less direct ground splash and less surface disturbance with the exception of terraced plantations.	Similar to Manzanita.
-- Young Plantations	Has more surface area to be disturbed by rain; less interception and more likely for surface rill erosion.	Similar to Manzanita.
-- Poorly-Stocked Pole	Similar to Other Brush.	Similar to Manzanita.
-- Well-Stocked Pole	Similar to Plantation (older, non-terraced); greater evapotranspiration.	Similar to Manzanita.
-- Poorly-Stocked Medium	Similar to Manzanita but has more interception.	Similar to Manzanita.
-- Well-Stocked Medium	Has greater interception (rain and snow) with even distribution.	Similar to Manzanita.
-- Poorly-Stocked Large	Holds snow in the openings longer.	Similar to Manzanita.
-- Well-Stocked Large	Has increased infiltration and provides shade which lowers water temperatures; keeps peak flows flattened and lengthens hydrologic response time.	Similar to Manzanita.
SUMMARY	< >	Humbug Creek is not large enough to support a breeding population of chinook salmon. Its principle fishery value is as a coho salmon stream and a steelhead producer. Information regarding non-anadromous species in Humbug Creek is not available at this time.

TABLE 1 - INTERACTIONS (Deer, Spotted Owl)

ELEMENTS	FLOWS	
	DEER	SPOTTED OWL
<b>BRUSH:</b> Manzanita -- Other Brush	Beyond the seedling stage, manzanita is not a high quality browse species. Many of the manzanita fields are old and decadent and are too dense to be penetrable by deer. In areas where they are penetrable, they do provide some hiding cover. Deerbrush, buckbrush, mountain mahogany, and western chokecherry are important browse species within this patch type. The decadent condition of the brush species, however, lowers their value as forage. Where tall and dense, but still penetrable, brush stands provide hiding cover for deer.	Due to lack of tree cover, it is unlikely that these areas are used by spotted owls. Woodrats, a common prey item, are often abundant in chaparral communities. The possible exception to use of these areas, therefore, might be along edges where they interface with conifer stands. Similar to manzanita.
WATER	Required by deer.	NRI
RIPARIAN	Provides high forage value, high hiding cover, and high thermal cover.	Provides cover and foraging habitat where vegetation is dense and multi-layered. Also provides connectivity of suitable habitat patches.
<b>HARDWOODS:</b> Commercial -- Non-Commercial	Black oak provides excellent forage for deer, especially during the spring and fall. The foliage, as well as the highly nutritious acorns are eaten by deer. White oak provides good forage for deer. Deer feed on the foliage and acorns. Canyon live oak acorns are eaten by deer, though its foliage is not as palatable.	Provides habitat for prey species, provides some foraging habitat for spotted owls, most likely along edges of conifer patches or where hardwood patches occur as inclusions in conifer stands. Similar to commercial hardwoods.
GRASS/FORB	Has high forage value especially in the spring.	NRI
BARREN, ROCKY AREAS	NRI	NRI
<b>FORESTED:</b> Older Plantations -- Young Plantations -- Poorly-Stocked Pole -- Well-Stocked Pole -- Poorly-Stocked Medium -- Well-Stocked Medium -- Poorly-Stocked Large -- Well-Stocked Large	Provides hiding cover and some provide thermal cover. They have some value as forage habitat where they occur with grasses, deerbrush, and scattered black oaks. Provides some hiding cover and little thermal cover. They have value as forage habitat where they occur with grasses, forbs, and desired brush species. Provides forage habitat for deer where they occur with understory composed of grass, forbs, whit oak, or live oak. Provides hiding and thermal cover and some forage habitat. Forage value similar to that described for "poorly-stocked poles". The occurrence of brush within some areas may also provide for hiding cover. Provides thermal cover; provides optimal cover in stands where dominant trees exceed 21' dbh. Similar to poorly-stocked medium. Provides thermal cover and optimal cover.	As with the manzanita and other brush, these areas may provide habitat for woodrats and other rodents. Foraging use by spotted owls may occur along some forest edges, but in general, plantations provide poor cover from predators. Similar to older plantations. May provide some foraging habitat, but lacks good canopy cover. May provide some foraging habitat due to its canopy cover and beginnings of some structural diversity. These areas may receive some use for foraging, dispersal, and roosting where hardwoods are dense enough to increase overall canopy closure above 40%. Provides suitable habitat for nesting/roosting, foraging, and dispersal. Mistletoe, a structure often used as a nesting platform, is present in this vegetative stage. Similar to poorly-stocked medium. Provides the highest quality habitat for nesting/roosting, foraging, and dispersal.
SUMMARY	Due to the presence of desired browse species, the area has potential to provide high quality foraging habitat. Currently, the decadent state of the browse reduces its value as forage habitat for deer. The eastern zone lacks adequate amounts of thermal cover. The proportion of thermal cover improves within the northwest and is greatest within the southwest.	Overall there is minimal desired habitat for the spotted owl.

TABLE 1 - INTERACTIONS (Surface Erosion, Fisher)

ELEMENTS	FLOWS	
	SURFACE EROSION	FISHER
<p><b>BRUSH:</b> Manzanita</p> <p>-- Other Brush</p>	<p>Has the potential, based on spacing (the closer the more effective) to minimize and/or prevent sheet/rill erosion depending on intensity of the rainfall event.</p> <p>Has the potential, based on spacing (the closer the more effective) to minimize and/or prevent sheet/rill erosion depending on intensity of the rainfall event.</p>	<p>These elements provide habitat for prey species (rabbits, hares, etc.) and, therefore, may provide some foraging habitat for fisher, particularly along interfaces with dense conifer stands. Use of these areas should be considered as incidental or opportunistic.</p> <p>Similar to manzanita.</p>
<p><b>WATER</b></p>	<p>Short duration, intense rainfall events may cause extensive surface erosion to occur.</p>	<p>Fisher may require drinking water.</p>
<p><b>RIPARIAN</b></p> <p><b>HARDWOODS:</b> Commercial</p> <p>-- Non-Commercial</p>	<p>Well developed riparian areas minimize surface erosion and may entrap sediment from upslope, preventing delivery to stream.</p> <p>Minimizes soil erosion by good canopy closure and the continual development of ground cover from leaf litter.</p> <p>Minimizes soil erosion by good canopy closure and the continual development of ground cover from leaf litter.</p>	<p>Riparian areas provide foraging habitat and serve as travel corridors.</p> <p>Use is similar to that described for manzanita and other brush.</p> <p>Use is similar to that described for manzanita and other brush.</p>
<p><b>GRASS/FORBS</b></p>	<p>Some potential for surface erosion to occur due to lack of overstory canopy closure, especially in areas where vegetation does not form a continuous "mat" for good ground cover.</p>	<p>Provides foraging habitat where they have good ground cover and occur as small interspersions.</p>
<p><b>BARREN, ROCKY AREAS</b></p>	<p>Very little soil erosion potential due to poorly developed soils and the trapping effect of the rocky surface.</p>	<p>NRI</p>
<p><b>FORESTED:</b> Older Plantations</p> <p>-- Young Plantations</p> <p>-- Poorly-Stocked Pole</p> <p>-- Well-Stocked Pole</p> <p>-- Poorly-Stocked Medium</p> <p>-- Well-Stocked Medium</p> <p>-- Poorly-Stocked Large</p> <p>-- Well-Stocked Large</p>	<p>Well stocked plantations with good canopy closure and litter layer will result in very little contribution to soil erosion.</p> <p>There is a greater potential for surface erosion in young plantations due to the removal/grubbing of competitive vegetation that results in bare soil conditions.</p> <p>See Summary</p> <p>See Summary</p> <p>See Summary</p> <p>See Summary</p> <p>See Summary</p> <p>See Summary</p>	<p>Use is similar to that described for manzanita and other brush.</p> <p>Use is similar to that described for manzanita and other brush.</p> <p>May provide foraging habitat where cover is &gt;30% and some type of ground structural diversity exists.</p> <p>May provide foraging habitat where some type of ground structural diversity exists.</p> <p>Provides foraging habitat where cover is &gt;30%. Medium and some large-sized down material (&gt;20" dbh, an important element of foraging habitat, begins to occur within this size class.</p> <p>Provides foraging habitat due to canopy cover, occurrence of medium and some large-sized down material and snags provided within this age class.</p> <p>Similar to poorly stocked medium.</p> <p>Provides habitat for foraging and denning/resting due to the combination of good canopy closure and greater occurrence of large (&gt;30" dbh) down material and snags.</p>
<p><b>SUMMARY</b></p>	<p>Surface erosion will vary depending on the cohesiveness of the soils. The granitic soils in this landscape are more readily eroded due to the fact that they are coarse grained with a lack of fines. The soils derived from the metamorphic rocks in the watershed are more fine grained and cohesive and are more resistant to surface erosion than the granitics.</p>	<p>Overall, the quality of habitat for fisher provided within the landscape is low. Fisher are typically associated with dense mid and late seral stage forest, particularly for denning and resting habitat. They are opportunistic feeders and foraging habitat may vary, depending on the overall composition within a home range. The amount of habitat suitable for denning/resting occurs in a few small, fragmented parcels, and good quality foraging habitat is limited. Nonetheless, fisher have been located within the landscape. In all likelihood, portions of Humbug contribute to the support of a fisher territory that is shared among adjacent landscapes. This is based on habitat capability information which describes home ranges as varying in size from 8,000 to 11,300 acres, depending on the amount of mid to late seral stage vegetation available within an area.</p>

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**STEP 4 - DISTURBANCE REGIMES, RANGE OF VARIABILITY,  
 TRENDS, AND SUSTAINABILITY**  
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Landscapes and associated ecosystems are not static. Landscapes are dynamic and patterns change (sometimes radically) through time. The stability of the landscape character can be described using the disturbance process, natural range of variability, and general trends.

Fire is identified as the key natural disturbance process which has shaped the landscape. Therefore this discussion begins with a general characterization of the fire regime for the entire landscape. The past condition of each landscape element is also discussed in general terms. Past conditions are defined as prior to active fire suppression efforts. Presumed to be prior to the 1850s when the Humbug area was influenced by mining activities.

Parent material and topography are significant factors contributing to the natural range of variability in the Humbug landscape. As a result the landscape was characterized in three distinct zones. For each zone there is discussion of differences relative to the changes in vegetative community, parent material, and topographic features in the zone. Descriptions include changes in species composition; fire perspective; and individual landscape elements, including natural range of variability

The summary of the general trends provides a brief overview of landscape character as a whole, relative to fire as a key disturbance process and the existing condition of the landscape.

**FIRE REGIME**

Fire history records indicate a high likelihood of frequent low intensity ground fires. A risk assessment based on records for a 60 year period (1931-1990) indicate a moderate fire risk overall (Figure 7 - Fire Occurrence History Map). The majority of occurrences, 50%, are listed as undetermined cause. Lightning fires are identified as 41% of the occurrences. Only 9% of the starts are listed as human caused.

Human caused fires tend to be concentrated along the road systems and river corridor. Lightning fires are predominantly above 4,000 feet elevation, although starts have occurred randomly across the landscape at all elevations. A concentrated band of lightning fires occurs along the upper elevations in the Southwest Zone, and mid elevation in the Northwest Zone (south face of Craggy Mountain). Fires of undetermined origin occur both as concentrations and random patterns. These tend to be fires that occurred prior to 1960.

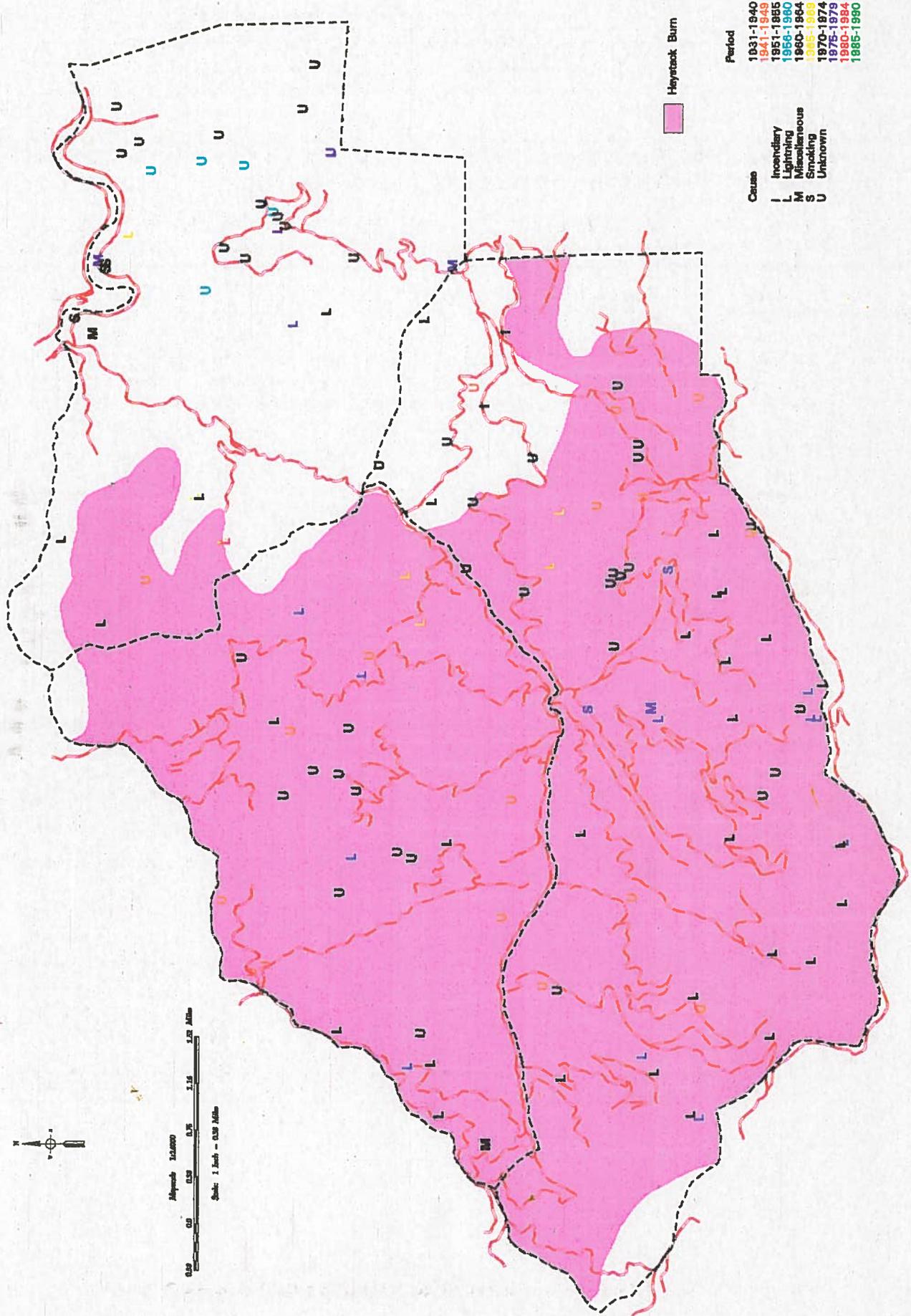
The following tables outline the number of fires, causes, decadal occurrence, and risk rating for each landscape zone:

**TABLE 2 - NUMBER OF FIRE STARTS BY CAUSE BY LANDSCAPE ZONE**

ZONE	LIGHTNING	HUMANS	SMOKING	INCENDIARY	UNDETERMINED	TOTAL
East	11	2	3	0	19	35
Northwest	11	1	0	0	17	29
Southwest	32	2	2	2	29	67
TOTAL	54	5	5	2	65	131

# Humbug Landscape Fire Occurrence History

Figure 7 - Fire Occurrence History Map



**TABLE 3 - NUMBER OF FIRE STARTS BY DECADE BY LANDSCAPE ZONE**

DECADE	EASTERN	SOUTHWEST	NORTHWEST	TOTAL
1931-40	6	9	3	18
1941-50	1	10	7	18
1951-60	7	9	5	21
1961-69	7	4	4	15
1970-79	11	30	6	47
1980-90	3	5	4	12
TOTAL	35	67	29	131

**TABLE 4 - FIRE FREQUENCY AND RISK RATING BY LANDSCAPE ZONE**

ZONE	ACRES	# OF FIRES	FREQUENCY	RISK RATING *
East	7,862	35	1.7 years	0.74
Northwest	8,104	29	2.1 years	0.60
Southwest	12,629	67	0.9 years	0.88

\* Per Thousand Acres Per Decade

All three zones have a risk rating that places them in a moderate risk class, defined as at least one fire per thousand acres every 11-20 years. Appendix J - Fire Hazard and Risk Assessment, outlines the risk assessment process.

Bands of concentrated occurrence have been defined in each landscape zone. There are four bands characterized as a high-risk after further refinement of risk assessment. Refer to Figure 8 - Fire Hazard Classes to display the condition of existing fuels. Figure 9 displays Potential Wildfire Effects which displays these risk bands. The refined assessment indicates much of the landscape (58%) is in a low-risk category, with expectations of at least one fire per thousand acres at greater than 20 year intervals. The high-risk bands indicate that 42% of the landscape has an expected fire occurrence of at least one fire per thousand acres per decade. Refer to Appendix J for description of fire risk assessment process.

**TABLE 5 - RISK BANDS WITHIN LANDSCAPE ZONES**

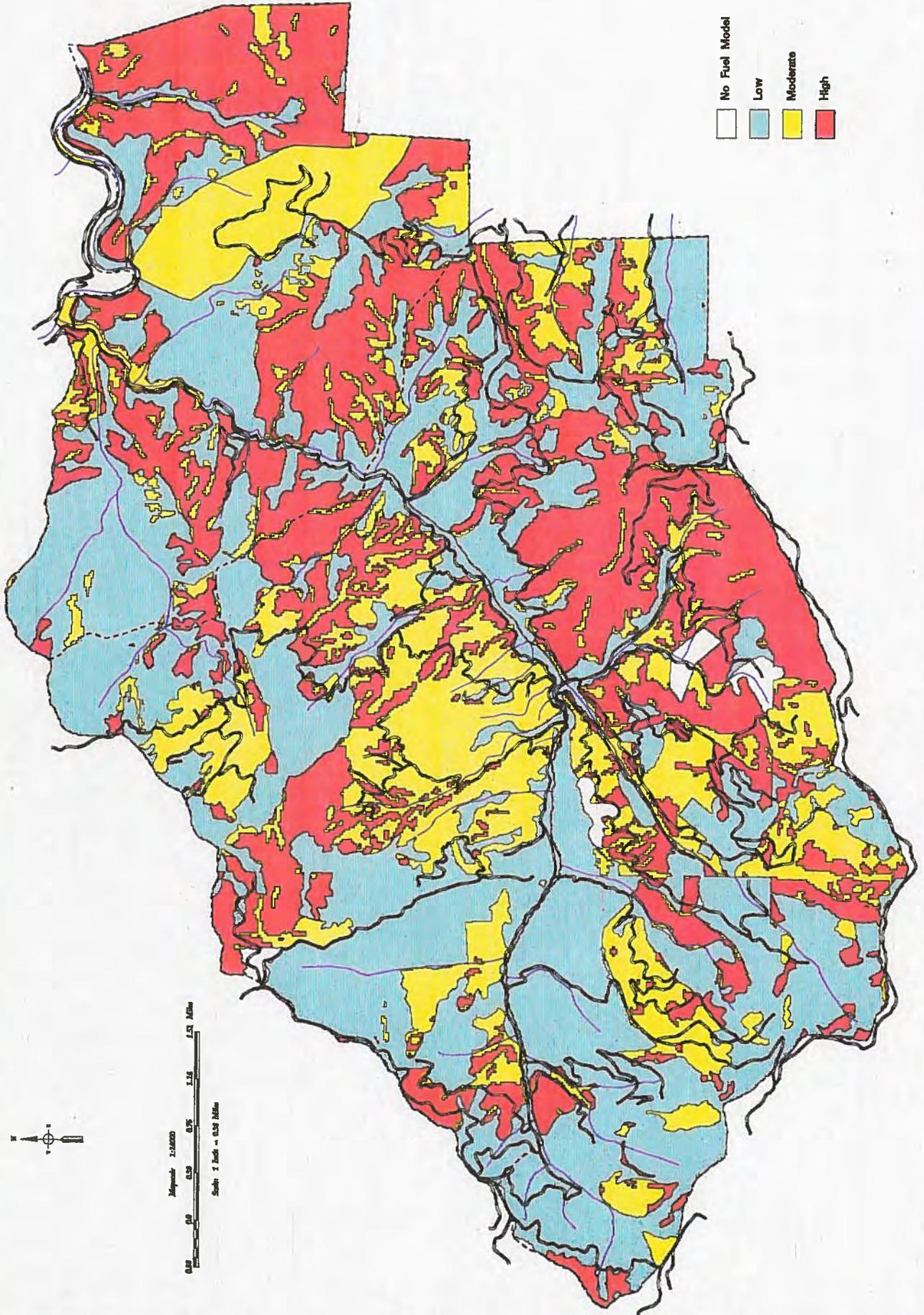
RISK BAND	ACRES	LANDSCAPE ZONE	# OF FIRE OCCURRENCES	RISK RATING	RISK CLASS
A	18,490	All 3*	32	0.32	Low
B	722	Northwest	9	2.14	High
C	3,266	Northwest**	24	1.21	High
D	2,755	East	25	1.49	High
E	5,362	Southwest	41	1.27	High

\* Risk Band A encompasses the lower elevations of all three zones where fewer fire starts have occurred at random.

\*\* A small portion of this risk band crosses the boundary of the Eastern Zone.

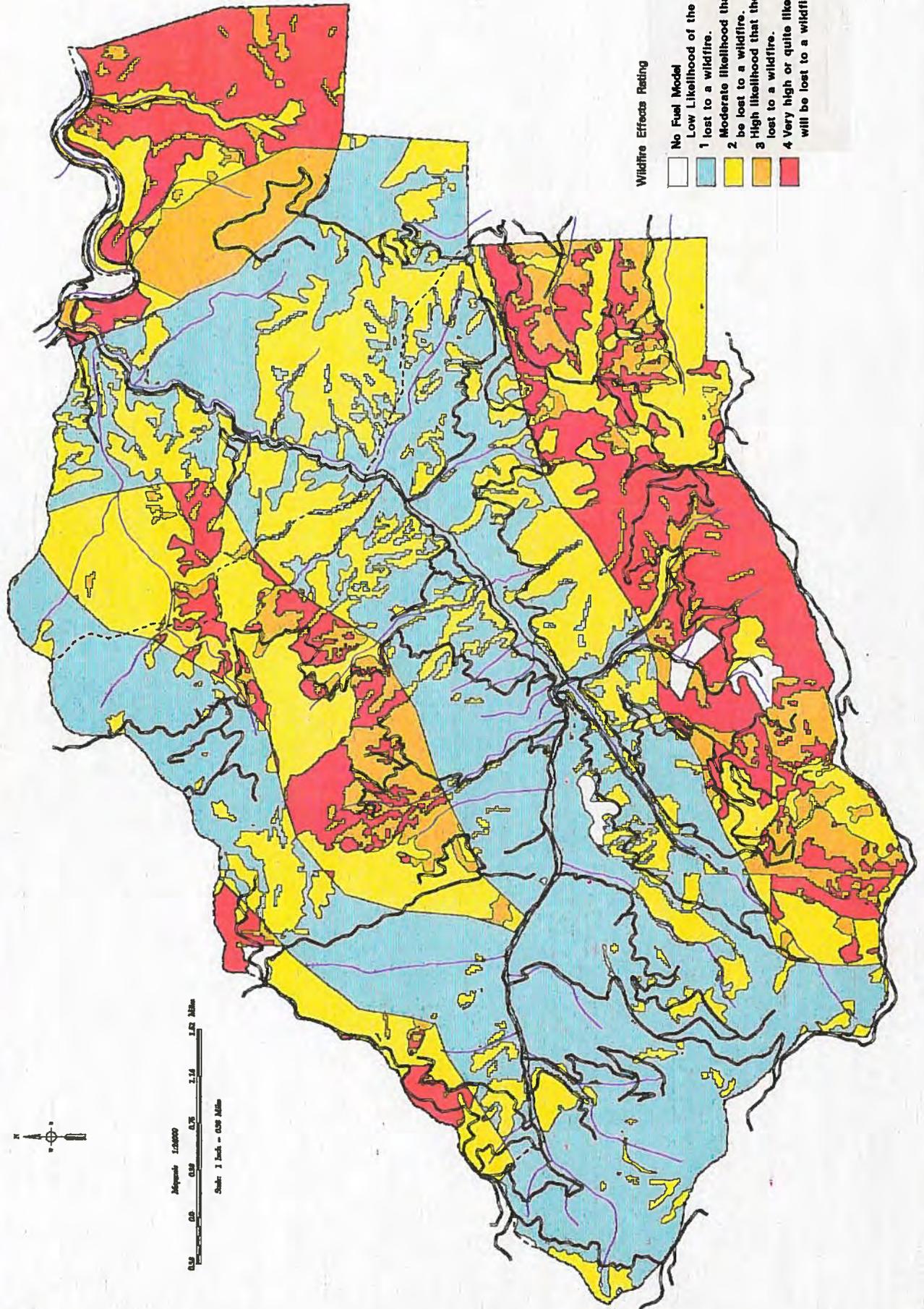
Figure 8 - Fire Hazard Classes Map

# Humbug Landscape Fire Hazard Classes



# Humbug Landscape Potential Wildfire Effects

Figure 9 - Potential Wildfire Effects Map



Although over half of the landscape is characterized as low-risk, the high-risk bands occur across all portions of the landscape. The present condition of the fuels across the landscape creates a high likelihood of fire spread from high-risk bands into the areas of low-risk.

Review of the historical fire records, vegetation types, climatic variables, and known fire frequencies for other areas of the Klamath National Forest (Skinner unpublished, Appendix H), was used in characterizing likely fire effects. Generalization of the community types (Holland 1986) support the premise that repeated low intensity fires have been a factor in this landscape. Reference Appendix I for a description of Holland terrestrial plant community types.

Based on the various information reviewed above, overall fire frequency is estimated at 6-12 year intervals for the Humbug landscape. These are characterized as low intensity ground fires, with stand replacement fires in the brush component presumed to be at 25-40 year intervals. This coincides with general life span of the brush species involved. These intervals were considered when the natural range of variability was defined for the brush component throughout the landscape.

A stand replacement interval for conifer patches was not estimated. Instead, site capability and fire occurrence in each zone was considered when describing the natural range of variability.

In general the fires were characterized as smaller in size, ranging from 10-300 acres (Class C or D fires). With frequent fire intervals that maintained vegetation in a healthy condition with low levels of ground fuel accumulation, large acreages of high intensity stand replacement fires were not likely.

The Haystack Fire is considered an unusual event due to the amount of area that burned at high intensity. This is attributed to early Forest Service fire suppression efforts creating an unnatural proportion of decadent brush causing stand replacement fire effects over a large area. The Haystack was a 60,000 acre fire that affected approximately 70% of the Humbug landscape, and at least three other landscapes. This assessment only attempts to characterize the effects of the Haystack Fire in the Humbug Landscape.

#### PAST CONDITION BY ELEMENT

The brush component has been a dominant vegetative feature in the landscape, although its large expansions of its present condition is not within the natural range of variability. Climate and soil are significant factors in perpetuating the brush species, including some patch types characterized as conifer patches with a brush understory. Fire was the process which maintained the health and vigor of both brush and tree species.

Based on historical information, it is presumed that frequent fire starts maintained brush patches in a healthier, more penetrable condition than at present. Also the stand conditions in the conifer types were more open, with lower density of the tree component, and more grass/forbs and juvenile brush in the understory.

The following is a general characterization of past conditions for the various elements relative to the present condition. Refinements of element descriptions will be made for each zone where appropriate.

**Manzanita/Other Brush** - These patches were more porous in the past. The array of a variety of brush species present today, as well as the arrangement of the patches of mixed species composition, existed in the past. Deerbrush (*Ceanothus integerrimus*) has a shorter life cycle than other brush species in the landscape. It is presently being phased out of the present vegetative composition. It is presumed that more frequent fire intervals would have perpetuated a vigorous deerbrush component in patches capable of supporting this species.

The natural range of variability for brush patches in all zones was considered to be within a single range.

**TABLE 6 - NATURAL RANGE OF VARIABILITY (Brush)**

BRUSH	PAST	PRESENT
Juvenile/Palatable Browse	40-60%	0-5%
Mature Healthy	40-60%	5-10%
Decadent	0-5%	90-100%

In general the vertical structure was not considered to be significantly different between zones. The significant difference across the landscape

would be the age of the brush stands. At present, the stands are an even aged mosaic of impenetrable brush. It is presumed that frequent fires would have maintained stands in a variety of conditions. The majority of the brush was either in a juvenile or mature stage, with patches of decadent brush apparent. The patches would be more of a mosaic of various ages, with greater penetrability and a high grass/forbs component evident. **Note:** Brush patches were probably large, even pre-fire suppression. The events that led up to the Haystack Fire, and the Haystack Fire itself probably provided basis for the even-layer conditions that exist today.

**Water/Riparian** - This landscape consists of streams and adjacent riparian areas. The lower reaches of certain stream segments have been altered as a result of mining activity. The riparian areas along those reaches may have also been altered as a result of mining activity. It appears that much of the riparian area remained intact after the Haystack Fire.

**Hardwood** - A single stand typed as commercial hardwoods in Butchers Gulch has not been field verified. Presently black oak exists as an understory layer in conifer stands, with few large trees evident. In general there was likely to be more oaks under past conditions, and it was more likely to occur in a large tree form when conifer stands were in a more open condition. The relative abundance of black oak changes within zones.

The persistence of a scrub form of white oak (*Quercus garryana* var. *Breweri*) is an indicator of droughty soils and lower site capability. This form does not achieve a large size, therefore it is susceptible to fire kill. The species is adapted to low to moderate severity fires by sprouting from the bole, root crown, and roots.

It is likely that white oak stands in the past would have been less dense, and patches of various ages would be evident. With frequent fire return intervals, some areas would be recently rejuvenated with sprouts providing palatable browse, while other patches would be small mast producing trees.

Canyon live oak is also an indicator of low site and rocky soils. The live oak component is not likely to be any different than it was in the past, either in quantity of tree size.

The relative abundance of all oak species changes within zones.

**Grass/Forbs** - Areas that are typed as grass/forbs are not characterized as different in the past, although size of remaining patches may be reduced as brush species slowly encroach. In general there was a greater grass/forb component in the past associated with other patch types.

**Barren, Rocky Areas** - Areas are considered to be unchanged in our span of historical reference.

**Forested** - In general stands were more open, with higher proportion of ponderosa pine, and lesser quantities of understory vegetation, than presently exist. These patch types are distinctly different in each of the three zones, therefore they will be described in detail at that time.

**Older/Young Plantations** - Most of the plantations were a result of reforestation efforts after the Haystack Fire. It is presumed that these were previously conifer patches of varying ages and sizes. The species composition and stand densities would vary by zone.

## LANDSCAPE ZONES

### EASTERN ZONE

This is an area of steep terrain; soils developed from metamorphic or ultramafic parent materials, characterized as predominantly southeast to southwest aspect. The rain shadow effect in this portion of the landscape is evident in the existence of species of vegetation typical of buck brush chaparral community on xeric soils (Holland 1986).

**Species Composition** - In general the species presently found in this zone existed in the past with minor exceptions. Although Douglas-fir existed in the past, it is not likely that it occurred in the dense stand conditions that presently exist. Deerbrush may have been in high proportions than at present. The life cycle for deerbrush is shorter than the other brush species. Given the length of time since the last disturbance, the longer lived brush species are outcompeting the deer brush. In areas where it persists, roughly 3/4 of the plant appears dead. For this portion of the landscape it may be less of a factor than the other two zones, because of the lower site capability.

**Fuels Perspective** - The present condition for the brush in this area has been characterized as high

hazard brush fuel model, within large areas in a high degree of decadence. With moderate winds fire will carry through the shrub layer, creating flame lengths greater than eight feet. At present there are localized patches of brush that are likely to burn more characteristic of a low hazard brush model.

Conifer patches are predominantly characterized as a low hazard timber fuel model, producing slow burning ground fires and low flame lengths, with occasional jackpots of fuel causing flare-ups. Fuels only pose a hazard under severe weather conditions, involving high temperatures, low humidities, and high winds. Where ladder fuels dominate, moderate conditions (mid-summer-like) will lead to crown fires which are not typical. Effective fire suppression efforts have resulted in some patches becoming high hazard areas, due to accumulations of fuels and development ladder fuels in the understory.

In the past much of this zone might have been described as being a low fire hazard, with low intensity surface fires being characteristic of the fuel models that existed with frequent fire intervals. Refer to Appendix J - Fire Hazard and Risk Assessment for description of fire hazard assessment process.

**Landscape Elements** - The following discussion is a comparison of how individual elements were likely to have differed in composition and structure in the past, from the present condition.

*Manzanita/Other Brush* --Both brush patch types are characterized as being more of a mosaic. It is likely the brush component was patchier with a higher proportion of deer brush and grass/forbs. Frequent low intensity ground fires would have maintained a healthier vegetative component and provided some level of repeated disturbance necessary to perpetuate a deerbrush component.

*Hardwood* --White oak may have been more commonly found in a newly sprouted shrub form, rather than even aged component of scrubby trees.

Canyon live oak presence relatively unchanged. Although low intensity fires cause severe damage to cambium. Frequent fires may have created multiple stems from crown sprouts.

*Grass/Forbs* --Grasses and forbs would have been more prevalent as an understory component in open conifer stands (associated with brush) and as a larger component within the brush patches, as described.

*Forested* --The conifer component mainly existed where presently found. Although views of 1955 photos indicate that scattered large diameter ponderosa pine may have existed in areas where none are present today.

It is presumed that the lower site capability of this zone would have maintained conifers in late seral stage for longer periods of time. Frequent low intensity ground fires would perpetuate open stand conditions, with minimal decadence in the brush and grass/forbs understory and low levels of fuel accumulation.

Site limitations and climatic conditions are not conducive to rapid development of large diameter trees. It is presumed that most of the conifer patches were mature stands of medium size trees. Frequent low intensity ground fire would have maintained open stand conditions and kept the understory component healthy. Maintenance of open stand conditions with reduced site competition would have enabled a portion of the conifer component to attain larger sizes, but the majority would have been in the medium range.

**TABLE 7 - EASTERN ZONE NATURAL RANGE OF VARIABILITY (Conifer)**

CONIFER	PAST	PRESENT
Seedling/Sapling (<6" dbh)	5-10%	0%
Pole (6-10.9" dbh)	10-20%	0%
Medium (11-24.9" dbh)	40-60%	100%
Large (≥25" dbh)	20-40%	<1%

**SOUTHWEST ZONE**

**Species Composition** - The same species existed, but in different proportions in the past. Douglas-fir is more common than in the other two zones, but was not likely to have existed in the dense stands that are presently found. Many of the single trees left from remnant stands are sugar pine and ponderosa pine, with an occasional large Douglas-fir. Black oak was also likely to have existed in higher proportions than in the other zones. White fir is found in the higher elevations.

Existence of California hazel, bigleaf maple, chokecherry, and chinquapin indicate mesic site conditions in much of this zone; although manzanita, buckbrush, white oak, and live oak are also found.

**Fuels Perspective** - This zone is presently a mixture of various high hazard fuels. Thinning slash, and decadent brush are the greatest contributors to fire hazard. The remnant timber stands also have higher fuels build up and understory regeneration than expected under presuppression conditions. The crown fire potential cannot be quantified at this time.

It is presumed that in the past frequent low intensity ground fires would have maintained low levels of small diameter fuels. Occasional pockets of fuel accumulation or understory regeneration would make it possible for fire to reach into the crowns for stand replacing fire runs. Overall stand conditions would have been much less susceptible to fire than at present.

The higher site capability of the Southwest Zone allows for development of stands with higher canopy closure and biomass accumulation. Although frequent fires would maintain stand conditions that are more open than the present, the topography of the area, canopy closure, and species composition indicate a higher crown fire potential in this zone. Therefore it was concluded that this zone would tend to have a greater range of variability and higher proportion of early seral stands.

**Landscape Elements -**

**Manzanita/Other Brush** --The brush component exists as a patch type in this zone; both as early seral stage in forested areas and as a distinct component on westerly aspects and shallow soils. Range of variability described earlier for brush patches would apply only to the areas where brush occurs as a distinct patch type.

Refer to following description of grass/forbs for discussion of brush as an early seral component in forested patches.

**Hardwood** --The black oak component is most evident in this zone, mainly along lower slopes. Small black oak stands as a possible patch type may have existed in the past.

Both white oak and canyon live oak occur in small patches; again an indicator of lower site capability. Patches appear more localized than in the other two zones.

**Grass/Forbs** --Grasses and forbs would have existed in lesser quantities than the other two zones, due to the likelihood that timber stands were more densely stocked. Although this component was less prevalent in this zone, it is still likely to have occurred in greater proportions than found today.

Herbaceous vegetation would have been a dominant component in the seedling stage, replaced by brush as stands moved into the sapling stage. Herbaceous vegetation may have been none existent in well stocked stands during the pole and mature stages. As stand decadence begins, openings would have been created with a return of herbaceous vegetation followed by brush.

**Forested** --Generally there was likely a higher degree of variability in seral stages, with more early seral (and decadent) conifer patches than would be found in the other two zones. The ability of stands in this zone to produce biomass would increase the opportunity for stand replacement fires to occur across the zone. Therefore, this zone is characterized as having a greater range of natural variability.

**TABLE 8 - SOUTHWEST ZONE NATURAL RANGE OF VARIABILITY (Conifer)**

CONIFER	PAST	PRESENT
Seedling/Sapling (<6" dbh)	5-20%	1%*
Pole (6-10.9" dbh)	10-30%	18% 35%**
Medium (11-24.9" dbh)	20-40%	44%
Large (≥25" dbh)	30-50%	2%

\* Young Plantations

\* Older Plantations (generally presumed to be >6" dbh although some may not be)

Under unmanaged conditions, early seral conifer patches were likely a result of occasional torching in areas of concentrated fuels. In general patches shaped by fire in this zone have distinct edges, although the patch size is variable. High intensity fires may have made runs up hill creating patch shapes that were long and narrow, following topographic features.

The higher site quality of this zone would allow more closed stand conditions, with a greater proportion of large diameter conifer stands. Although canopy closure had the potential of being >70%, conditions were more open than they are at present.

A review of fire occurrences over a 60 year period indicate fire frequencies are highest on the upper slopes of this zone (a result of lightning). It is presumed that frequent fires would have maintained low fuel loads and minimal understory development.

It should be noted that although there is a projected increase in the large diameter conifer component, it is presumed that it was maintained for a period of time in a relatively healthy state, with minimal decadence. This is a result of frequent low intensity ground fire maintaining healthy stand conditions. The range of variability described for large diameter conifers should not be confused with old-growth conditions.

**NORTHWEST ZONE**

**Species Composition** - Most of this zone is best characterized as a westside pine forest community (Holland 1986). Described as open park-like forests dominated by ponderosa pine, with sparse understory of scattered chaparral shrubs and young trees.

Edaphic factors are still an important variable in determining patch configuration. Presence of knobcone pine also indicates a history of fire disturbance in this area.

**Fuels Perspective** - At present much of the brush component is characterized as a high hazard fuel model with concentrations of dead fuel in patches where deerbrush has died. The discussion for brush fuels in the eastern zone can be applied to this zone. The higher proportion of manzanita in this zone indicates a greater proportion of moderate hazard fuels intermixed.

The plantations are characterized as a moderate to high hazard. Ponderosa pine litter will carry fire in closed canopy plantations that have not been thinned. Compared to the conifer patches described in eastern zone, expect more rapid fire spread and longer flame lengths. Concentrations of dead/down woody material will contribute to

possible torching, spotting, and crowning. Untreated thinning slash poses a high hazard condition with fairly active fire conditions, with increased likelihood of stand loss.

Historically this zone might be characterized as more typical of that described in the Eastern Zone. Although fires might have burned through a stand rapidly, open stand conditions and frequent low intensity fires would have kept fuel levels low. It is not likely that fuel accumulations would have been sufficient to create the high hazard that characterizes much of the existing condition.

**Landscape Elements -**

**Manzanita/Other Brush** --The brush component was in a more vigorous condition than at present, particularly the deerbrush. Occurring largely as a component of the open pine stands. Although pure brush areas probably existed, the scattered nature of the conifers may have made it difficult to distinguish brush patches as a separate component.

**Hardwood** --Black oak was likely as an associated species. Although there is less evidence of it than in other zones.

Both white oak and canyon live oak are found throughout this zone. Again, it is more likely to have patches of multi-stem form as a result of post fire crown sprouts.

**Grass/Forbs** --Grass and forbs would have been more prevalent as an understory associate in open pine stands.

**Forested --**

**TABLE 9 - NORTHWEST ZONE NATURAL RANGE OF VARIABILITY (Conifer)**

CONIFER	PAST	PRESENT
Seedling/Sapling (<6" dbh)	5-15%	5% *
Pole (6-10.9" dbh)	10-20%	3% 22% **
Medium (11-24.9" dbh)	40-60%	69%
Large (≥25" dbh)	20-40%	1%

\* Young Plantations

\*\* Older Plantations (generally presumed to be >6" although some may not be)

The natural pine component is not present in the proportion that it was in recorded history. Photos of the area prior to 1955 show scattered skid roads as a result of logging directly under Craggy Mountain. Historical records for the Yreka District (Klamath National Forest records) show a salvage sale in Jakes Gulch (east of Craggy Mountain) was logged after the Haystack Fire. Records indicate that just under three thousand board feet (MBF) per acre was removed, with 74% of the volume being ponderosa pine. There is no way to determine spatial distribution or diameter of the trees removed, or the utilization standards, but rough calculations indicate that overall 2-5 trees to the acre were removed.

Patterns are more difficult to discern than in the eastern portion. Present patterns (areas not in plantation) and old photos indicate that the conifer patches may not have had the sharp edges evident in the northeastern portion. Conifer stocking tends to be concentrated in draws, but scattered trees can be found across the slopes.

In general it is presumed that much of the area was maintained as open pine stands in a late seral condition for long periods through repeated low intensity ground fires. Occasionally areas would torch creating patches of an early seral condition. Stocking levels were likely higher on the lower portion of the slopes, with stand closure thinning to a scattered pine overstory on the upper slopes.

#### **GENERAL TRENDS - All Zones**

When drawing correlations between the past and present condition of the landscape, it appears that this landscape is not very resilient. The present structures are inconsistent with ecological functions that occur. Exclusion of fire has created a vegetative condition (for all elements) that is not resilient to fire processes and climatic variations (evident in the high degree of mortality as a result of recent drought years).

Although recent fire suppression efforts have been successful in initial attack stages to date, it is quite likely that at some point in the future a set of circumstances will occur, which creates a situation where initial attack efforts will be unsuccessful (e.g.1987).

An uncontrolled fire would likely result in a large scale stand replacement event. This is particularly applicable to the eastern zone that wasn't burned

in the Haystack fire. Steep slopes combined with decadent brush create a high hazard fuel condition.

The brush species, with their relatively short life cycles, require repeated disturbance to maintain health and vigor in brush stands. At present the brush is predominantly in a decadent condition and poses a high fire hazard during late summer conditions.

Although the brush species would rapidly invade, a large scale event could have negative effects of surface erosion, site quality degradation, and stream sedimentation.

This is of particular concern in the Northwest Zone. Since much of this area consists of deeply weathered granitics, stream health and site productivity would be adversely effected. In the Order 2 soil survey much of the area that is characterized as marginal site as a result of erosion processes exceeding soil development. Another large scale disturbance would exacerbate this condition.

In general the conifer stands are overstocked (both plantations and natural stands). This contributes to the continued mortality that is occurring as a result of site competition. Even stands with scattered conifers have brush occupying the site, beyond historical conditions.

Even if fire were excluded, these stands would continue in a low vigor condition with increased risk to insect and diseases. Trees that do persist will take a long time to achieve any size. Some stands already have reduced live crowns and appear to have achieved maximum potential for height growth, although additional diameter growth may be achieved. The continued self thinning process will create additional fuels and contribute to the likelihood that the stands themselves may be lost. They are relatively small diameter and may not withstand moderate fire intensities.

The larger diameter conifer stands in the Southwest Zone are not experiencing the level of mortality occurring in stands on lower sites in the other zones. A particular concern in these stands is development of a white fir understory that will increase crown fire potential.

The plantations are mostly overstocked and in need of thinning. Left unthinned they present an

increased risk to insect and diseases. This will also lengthen the time before these stands will be available to create the future desired stand structures. Thinning without slash treatment will increase the fire hazard and potential loss (which already exceeds acceptable levels).

In summary, this landscape is particularly vulnerable to wildfire at this time. Not only in terms of losing the existing natural conifers and their associated values, but also in terms of losing a significant economic investment in the plantations and future structural and functional diversity in the landscape.

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## STEP 5 - FOREST PLAN OBJECTIVES AND MANAGEMENT DIRECTIONS

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The Draft Forest Plan provides a framework with objectives around which the pattern of the landscape is expected to develop, and reflects agreements made between the public and the Forest Service. The objective is to define the applicable forest standards and guidelines, and use the knowledge of the landscape character, and ecological processes at work, to describe the desired condition of the landscape.

### DESIRED FUTURE CONDITION

This portion of the step attempts to narratively describe objectives regarding landscape pattern and endeavors to put the desired condition for the landscape in words. Several questions were answered to further identify future objectives for the landscape. (Although some answers may appear cryptic, they are good ticklers for the thought process.)

**QUESTION 1:** What are some rare, unusual, critical, or unique landscape elements we want to protect or enhance?

**ANSWER:**

- Sensitive Plants
- Older Seral Stage
- Steelhead Populations
- Only Known Pair of Fishers
- Winter Range for Deer, High-Use
- Plantations; critical to protect
- Fuelbreaks
- Craggy Mountain and Vesa Bluffs

- Little Patches of Timber
- Mining Adits
- Snags at Mid and Higher Elevations
- Mountain Bike Route (published)
- Recreational Mining
- Mast Production
- Willow Fly Catcher Habitat
- Spotted Owl Habitat

**QUESTION 2:** Are there patches or areas of the matrix between which connectivity should be maintained?

**ANSWER:**

- Where:** Along creeks  
**What:** Riparian  
**Why:** Little critters

**Where:** Around McKinley and stretches along that ridge

**What:** Fisher

**Why:** Linkage to late successional forest in Deadwood drainage

**QUESTION 3:** Is there anything missing that should be introduced or restored?

**ANSWER:**

- Fire
- Year-round connection between Humbug and stream flow
- Older seral stage
- Conifers in riparian areas (enhance)
- Diversity of vegetation species
- Large woody material
- Dispersal habitat (50-11-40) where capable (reintroduce)
- More grass/forb areas
- Increase thermal cover (conifer/hardwoods) at lower elevations

**QUESTION 4:** To what extent, and where, do we want to emulate certain elements of natural landscape patterns?

**ANSWER:**

- Retention/partial retention areas emulate naturally occurring landscape patterns found in characteristic landscapes - (form-line-color)
- Fire patterns ??? Frequency is an element of fire (age of brush?) fire indicator
- Recreate a more varied structural/age pattern for brush
- Start with ridge tops more than south slopes multiple treatments - mtc. burns

- Fire input

**QUESTION 5:** Are there areas of the landscape where it is desirable to minimize fragmentation?

**ANSWER:**

- Connect late seral stage to younger stands - provides better habitat connectivity
- Riparian
- Connect less susceptible stands

**QUESTION 6:** Are there areas where gradual changes rather than sharp edges are desirable?

**ANSWER:**

- Habitat connectors should be similar in seral stage type
- Adjacent to riparian areas (structural characteristics)
- Retention/partial retention areas feathering edges of activity, unless we're emulating stand replacing fires

**QUESTION 7:** Are there areas where a high degree of edge contrast is desirable?

**ANSWER:**

- Adjacent to plantations and private inholdings
- Ridge lines - recreational areas
- Remnant stands (older seral stage); along ridge line and sides of ridges

#### ***Humbug Landscape - What will it look like?***

As previously stated, the landscape is divided into three geographic zones which display a unique arrangement, composition, and structure of vegetation. Geomorphic and edaphic conditions, topography, and precipitation are the reasons for such variation in the vegetation.

There are two major factors which will influence the appearance of the landscape in the future: 1) fire, and 2) management goals and objectives for the area.

Fire will strongly influence vegetative patterns across the landscape. Overall the landscape has a moderate fire risk and a moderate to high hazard rating. Fire risk is associated with fire occurrence and hazard relates to the condition of the fuels. The Northwest Zone has two bands of high fire risk, while the east and Southwest Zones each have one band of high fire risk (see Figure 9). High hazard areas are associated with decadent brush fields and thinning slash. Areas which have both a high fire risk and high hazard will have a very high likelihood that the stand will be lost to wildfire.

The Eastern Zone has a high hazard because of the amount of decadent brushfields and a single band of high-risk. The Northwest Zone has a moderate hazard and two bands of high fire risk. The Southwest Zone has a high hazard due to the amount of thinning slash and a single band of high fire risk.

There are six management areas within the landscape. They include: Management Area (MA) 6 - Sensitive Species Habitat Areas, MA 10 - Riparian Management Zone, MA 11 - Retention Visual Quality Areas, MA 13 - Designated and Recommended Recreational Rivers, MA 15 - Partial Retention Visual Quality Areas, and MA 17 - General Forest. General Forest is further subdivided into 1) No Scheduled Harvest and 2) Limited Scheduled Harvest (see Figure 10 - LMP Preferred Alternative). Appendix K - Natural Range of Variability, summarizes how the natural range of variability discussed in Step 5 links between management areas and zones. Implementing the goals and objectives of each management area will influence vegetative composition, structure and function. The following chart displays what percent of each management area is within the landscape and each geographic zone (NF Lands).

# Humbug Landscape LMP Preferred Alternative

Figure 10 - LMP Preferred Alternative Map

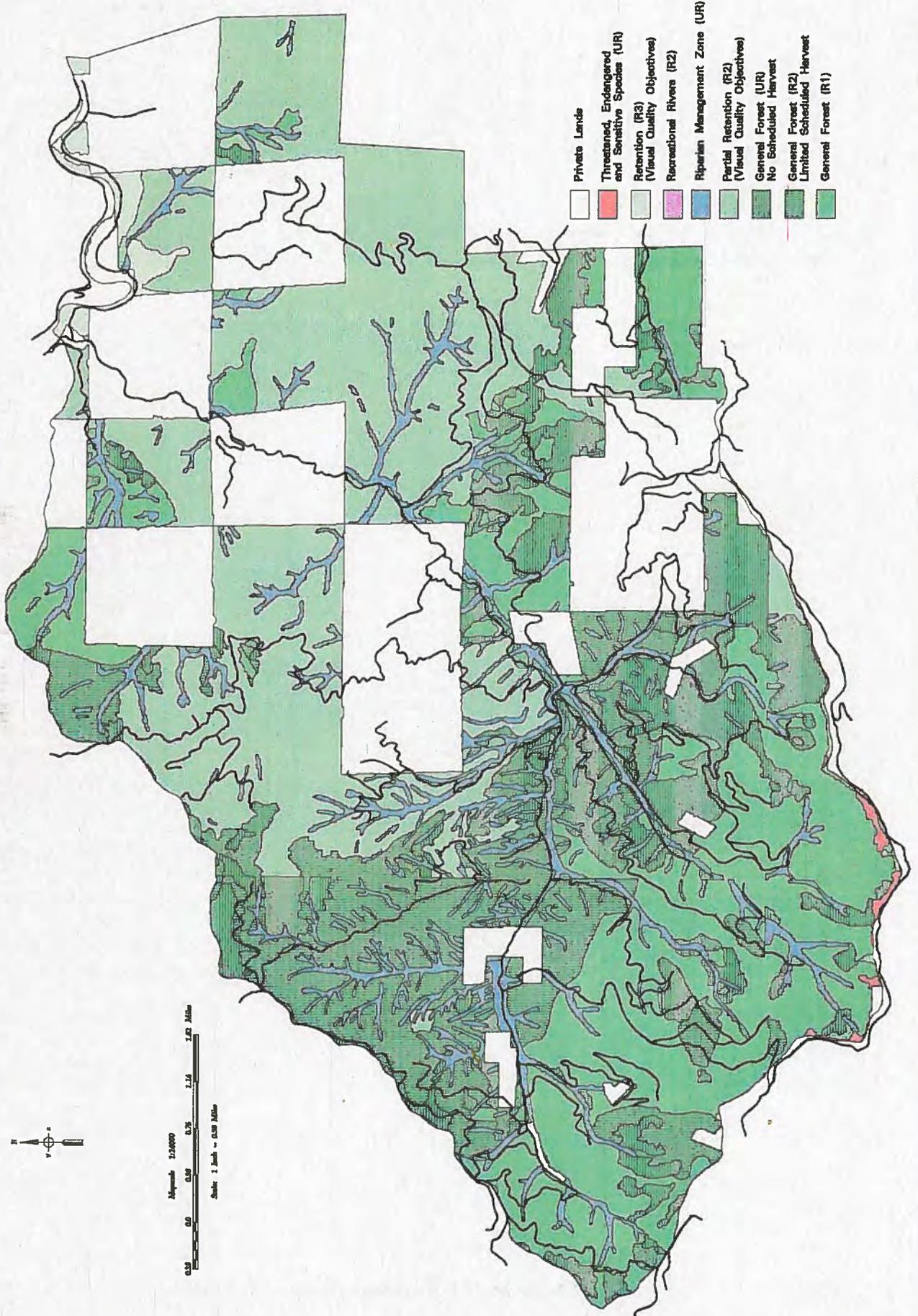


TABLE 10 - MANAGEMENT AREA PERCENTAGE BY LANDSCAPE ZONE

MANAGEMENT AREA	PERCENT BY LANDSCAPE ZONE			
	ENTIRE LANDSCAPE	EASTERN	SOUTHWEST	NORTHWEST
MA8-Sensitive Species	<1	0	<1	0
MA10-Riparian	11	7	9	15
MA11-Retention	1	6	0	0
MA13-Recreational River	<1	<1	0	0
MA15-Partial Retention	32	72	12	40
MA17-General Forest	26	13	45	3
Limited Scheduled <sup>1/</sup>	15	<1	10	32
No Scheduled Harvest <sup>2/</sup>	15	2	10	24

<sup>1/</sup> Included are areas having moderate to high erosion hazard concerns.

<sup>2/</sup> These include geologically unsuitable areas or lands within General Forest that are considered not capable (brush, grass, hardwoods).

**Eastern Zone** - In the future this zone will be more diverse in vegetative age and size class distribution. Healthier, more open growing conifers will occur. There will be minimum understory development and low fuel levels. Regenerated sites may appear intensely managed to reduce competing vegetation to assure conifer survival and growth. Younger brush will be evident. Brush patch size and shape will be variable. Within the deer winter range and on slopes less than 45%, patches may be larger to optimize forage production. Manzanita brushfields will be more open with grass/forbs interspersed in the understory. There may be no stands of older, decadent conifer stands appearing in this zone. Conifer crown closure in draws will be maintained in a healthy condition to provide shade for wildlife which has been identified as an important microclimate in this portion of the landscape. Future snags will be limited due to the limited site capability as compared to the southwest portion. A high degree of contrast will occur in areas where fuel treatment, site preparation, and brush rejuvenation occurs.

**Southwest Zone** - Compared to present conditions, this area will have more young plantations, less older plantations, more openly growing and healthy pole-sized conifers, less medium-sized conifers, and more larger-sized conifers. Overall, there will be a balanced distribution of age and size classes compared to what occurs today. There will be more snags in future plantations because trees will be saved in clumps and will also be individually scattered throughout regenerated

units. This zone will be entered more frequently and management activities will be evident. This area will have a high degree of contrast and edge especially in areas where fuel treatment is needed to protect investments in plantations and older conifer stands for future structural diversity.

**Northwest Zone** - In the future, this portion will have a higher proportion of mature, openly-growing conifers and mature to older brushfields. Management practices on unstable soils will strongly influence patch size, shape and distribution. Emphasis will be placed on maintaining slope stability and soil productivity. For example, on unstable steep slopes (greater than 45%) approximately 50% of brush patches would be in a mature state within a five acre patch. The lower elevations constitute much of the deer winter forage areas where larger, younger patch sizes are desired. This zone has the greatest potential for conflict in desired condition between brush patch size, condition, and arrangement. Careful coordination should be given to unstable soils, discontinuity of existing fuels, and deer winter range forage areas. Generally, management activities will appear visually subordinate to the character of the landscape. There will be larger, connected patches of large-sized conifers. Gradual changes in vegetation rather than sharp edges will prevail.

#### DIRECTION BY MANAGEMENT AREA

**MANAGEMENT AREA 6** - Sensitive Species Habitat Areas, *Calochortus persistens* (Siskiyou mariposa lily)

**Description** - Habitat for this sensitive plant species has been delineated along the southern boundary of the landscape between Gunsight Peak and Mahogany point (64 acres).

**Management Goals** - Maintain currently known, and any newly discovered, habitat in an undisturbed condition. Inventory similar habitats for potential expansion populations.

**Desired Condition** - Habitat conditions consist primarily of undisturbed rocky outcroppings and openings. Conifers adjacent to primary habitat would be maintained to hold snow and moisture on the site.

**Unaffected Elements** - Localized habitat to be maintained in undisturbed condition. None of the landscape elements will be substantially effected.

**Affected Elements** - Within those patch types identified as barren areas or grass/forbs, non-native invasive plant species, such as Marlahan mustard, that compete with the *Calochortus* for water, space and nutrients would be reduced or eliminated.

*Lewisia cotelydon* var. *howellii* --A new population has been located in the Craggy Peak/Clear Creek area (T46N,R8W,MDM, Section 24, SE 1/4). Forest standards and guides (S&G) call for development of management strategies for each sensitive plant species on the Forest, with the intent of preventing the need for the species to become listed as an Endangered or Threatened species (S&G 7-1).

The location has been recorded on the Forest Sensitive Plant atlas. The Land Management Planning staff will also be informed. Management strategies will be consistent with those identified for *Lewisia cotelydon* var. *howellii* throughout its range. Individual projects shall develop project-level mitigation measures to avoid adverse impacts (S&G 7-4).

#### **MANAGEMENT AREA 10** - Riparian Management Zone

**Description** - Riparian Management Zones include Class I-IV streams and lakes, ponds, springs, seeps, meadows, and small wetlands. Buffer zones have been identified to protect riparian vegetation to help serve as a functional interface between terrestrial and aquatic ecosystems. These have been identified at the Forest

level by using inner gorges to proxy Class III and IV streams, and using mapped streams as Class I and II streams. Ponds, springs, seeps, and small wetlands will need to be identified during project level planning. Buffer zones will adopt the Final Forest Ecosystem Management Assessment Team (FEMAT) Report guidelines.

**Management Goals** - The objective of this management area is to maintain water quality parameters that provide for a stable and productive riparian ecosystem. Water quality parameters include:  
1- Water Temperature --maintain below 68° F  
2- Sediment Loads --do not exceed transport capacity of stream  
3- Nutrient Loading --maintain nutrient loading at background levels

Maintain a "good" Pfanckuch channel stability rating and provide large coarse woody debris for habitat types capable of meeting a "good" Pfanckuch habitat rating. Minimize soil erosion and sediment movement. Provide for channel stability. Maintain instream flows to support riparian and aquatic habitats.

Class I and II streams provide for a minimum buffer of 300 feet from the edge of the active stream channel on each side, or to the top of the inner gorge, or to the top of the extremely high-risk landslide areas associated with the inner gorge, or to the outer edge of the 100 year floodplain, or to the outer edge of the riparian vegetation, or a distance equal to the height of two site trees, whichever distance is greatest. Class III and IV streams or wetlands provide for a minimum of 100 feet from the edge of the active stream channel on each side, or similar to the above for Class I and II with the exception of the height of one site tree. Management direction for this area is somewhat different from the Final FEMAT report. The Final FEMAT report specifies buffer widths as they relate to five categories: 1) fishbearing streams, 2) permanently flowing non-fishbearing streams, 3) ponds, reservoirs, and wetlands greater than one acre, 4) lakes and natural ponds, and 5) seasonally flowing or intermittent streams and wetlands less than one acre, and unstable or potentially unstable areas. Any discrepancies between the Draft Forest LMP and the Final FEMAT Report will be changed to adopt Final FEMAT standard and guidelines.

**Desired Future Condition** - A multi-layered, vegetative canopy would be present in forested RMZs

except where soils are shallow or unproductive. An overstory of conifers to provide shade and thermal cover to the streams should be the dominant species. An intermediate layer of deciduous vegetation and a mixture of brush, grass, forbs, and sedges are also desirable to provide nutrient cycling, bank stability, and sediment filtering. The riparian plant community includes all ages and sizes. Some mature and decadent conifers have broken tops and large pieces of wood have fallen into the stream. Log jams are distributed along the stream channel. The microclimate is cooler and shadier than adjacent areas. Fish habitats in perennial waters are in good condition, with stable populations of fish present at various times of the year. Stream flows are adequate to protect aquatic

habitat and maintain the natural hydrologic processes within the stream.

**Landscape Elements Unaffected** - Overall, 10% of the landscape is classified within the RMZ Management Area. None of the landscape elements within this management area are expected to change in amount, size, or arrangement. The size of individual trees will grow over time and larger diameter conifers will be more apparent on better sites. Emphasis will be placed on enhancing, maintaining and creating structural diversity within each patch type according to the site's capability. The desire is to have a multi-layered, vegetative canopy with conifers dominant in the overstory.

**TABLE 11 - EXISTING AND DESIRED PERCENTAGES (Riparian Management Zone)**

ELEMENT:	EXISTING %	DESIRED %
<b>MANZANITA AND OTHER BRUSH</b>	14 Juvenile = 0-5 Mature = 5-10 Decadent = 90-100	<> Juvenile = 50-60 Mature = 40-50 Decadent = 5-10
<b>CAPABLE LANDS</b>	2	4/
<b>RIPARIAN</b>	1	4/
<b>HARDWOODS</b>	11	4/
<b>GRASS/FORBS</b>	1	4/
<b>BARREN/ROCKY</b>	0	4/
<b>FORESTED</b>		
—		
<b>Younger Plantations</b>	1	4/
<b>Older Plantations</b>	18	4/
<b>Pole 1/</b>	6	4/
<b>Medium 2/</b>	46	4/
<b>Large 3/</b>	<1	4/

1/ Pole = 6-10" dbh

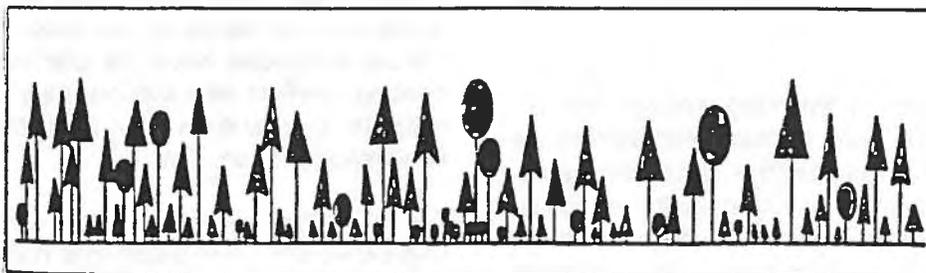
2/ Medium = 11-24" dbh

3/ Large = ≥ 25" dbh

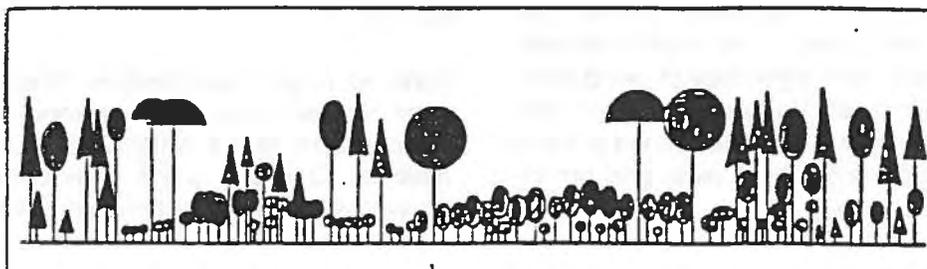
4/ Size or amount of elements not expected to change, examples of desired vegetative structure within these elements is displayed in Figure 11 below.

**FIGURE 11 - DESIRED STRUCTURE FOR RMZ**

**Single Tree Selection (Uneven-aged Silvicultural System)**



**Group Selection (Uneven-aged Silvicultural System)**



**MANAGEMENT AREA 11 - Retention Visual Quality Areas**

**General Description** - The Humbug Landscape includes 238 acres (1% of the total landscape) of lands which are to be managed to meet the Retention Visual Quality Objective (VQO). All of the lands are located either along the Klamath River in the East Zone, or Craggy Mountain in the Northwest Zone.

**Management Goals** - Provide a level of attractive, forested (where capable) scenery by maintaining the areas in natural or natural appearing condition. Manage human activities so they are subordinate to the characteristic landscape. Also manage human activities so they are not evident to the casual Forest visitor.

Manage for a programmed, sustained harvest of wood products in areas that are capable, available, suitable and appropriate for timber management.

**Desired Future Condition** - The signs of management activities will not be apparent. Foreground views from Highway 96, an eligible State Scenic Highway, and to recreationists on the Klamath River, a designated component of the National Wild and Scenic Rivers System, will provide a forested (where capable), natural or natural appearing forest. Variety Class A scenery areas (as defined by the visual management system), which includes Craggy Mountain, would also be managed to meet Retention.

Vegetative or ground-disturbing management activities that have been implemented will repeat form, line, color, and texture that represent characteristics of the landscape. Changes in their qualities of size, amount, intensity, direction, pattern, etc. would not be evident to the average Forest visitor.

**Landscape Elements Unaffected** - Certain elements will be maintained in the current amount and relative distribution regardless of being managed to meet Retention Management Objectives. The following landscape elements are not present in this particular management area, and not intended to be introduced:

- A. Barren, Rocky Areas
- B. Capable Lands for Conversion
- C. Commercial Hardwoods
- D. Non-commercial Hardwoods

**Landscape Elements Affected** - Overall the changes that occur to the elements listed below (ie. manzanita and other brush, and grass\forbs) will not be apparent to the average Forest visitor.

*Manzanita and Other Brush* --(Existing 17%, Desired 17%) This element consists of 17% of the management area. The amount will not change, although a greater distribution of young and mature brush is desired.

A change in age class is desired to enhance wildlife utilization, decrease fire hazard, and to provide long term stability on granitic soils by improving root strength with younger or mature brush patches. The arrangement of the decadent brush component is desired to be interspersed among the young and mature brush age classes to provide hiding cover for some wildlife species.

*Grass\Forbs* --(Existing 1%, Desired 1%) This element represents 1% of the management area. Overall amount will stay the same, however grass/forbs may become established within and throughout patches of brush, thereby adding additional color(visually) in the landscape.

*Young and Older Plantations* --(Existing 0%, Desired 0-5%) To perpetuate a multi-layered stand structure over time, young trees must be introduced either by natural regeneration or planting. A mixture of species would be planted in random spacing to reflect what was originally in stand. It is estimated that up to 5% of the total acres would be in plantations at any time.

*Forested, Medium-Sized Conifers* --(Existing 60%, Desired 40-60%) This patch type represents 60% of the total management area, and all of the forested component is in this patch type. It is desirable to manage to retain the forested component at 40-60%.

*Forested, Large-Sized Conifers* --(Existing 0%, Desired 15-30%) Although not currently found in the management area, it is desirable to develop and maintain 15-30% in a late seral stage. This will provide visual diversity, enhance wildlife diversity

within the landscape, and improve contiguous linkages to adjacent landscapes.

**MANAGEMENT AREA 13 - Designated and Recommended Recreational Rivers**

**General Description** - The landscape includes approximately a six mile portion of the Klamath River, which is a designated component of the National Wild and Scenic Rivers System. The river contains outstandingly remarkable anadromous fisheries values, and has a recreational classification as it links to the landscape.

Along this portion of the Klamath River, the corridor boundary basically follows the centerline of the Walker Road. This includes one percent (240 acres) of this management area in the landscape.

Management activities proposed within the corridor boundary would be required to meet a Retention Visual Quality Objective. Management activities proposed in the middleground distance zone (beyond the river corridor out to five miles), as viewed from the river corridor, would be required to meet a Partial Retention VQO.

**Management Goals** - Preserve the Klamath River in a free-flowing condition. Protect the river and its

immediate environment for the benefit and enjoyment of present and future generations.

Protect and enhance the outstandingly remarkable anadromous fisheries value for which the river was designated, while providing for public recreation and resource uses that do not adversely impact or degrade those values.

Manage recreation activities to assure that the character and quality of recreation use will not cause adverse impacts on the resource values for which the river was designated.

**Desired Future Condition** - The river area may be developed for the full range of agricultural and forestry practices, may show evidence of past and on-going timber harvest and may include some residential, commercial, or similar development. The waterway should remain generally natural and riverine in appearance.

**Landscape Elements Unaffected and Affected** - The elements for Recreational Rivers are the same as those for Retention Management Areas (see both the Retention write-up and Figure 12).

**TABLE 12 - EXISTING AND DESIRED PERCENTAGES (Retention/Recreational Rivers)**

ELEMENT:	EXISTING %	DESIRED %
<b>MANZANITA AND OTHER BRUSH</b>	17 Juvenile = 0-5 Mature = 5-10 Decadent = 90-100	17 Juvenile = 50-60 Mature = 40-50 Decadent = 5-10
<b>CAPABLE LANDS</b>	-	-
<b>RIPARIAN</b>	21	21
<b>HARDWOODS</b>	-	-
<b>GRASS/FORBS</b>	1	1
<b>BARREN/ROCKY</b>	-	-
<b>FORESTED</b>		
<b>Younger Plantations *</b>	0	0-5
<b>Older Plantations *</b>	0	0-5
<b>Pole <sup>1/</sup></b>	0	5-15
<b>Medium <sup>2/</sup></b>	60	40-60
<b>Large <sup>3/</sup></b>	0	5-10

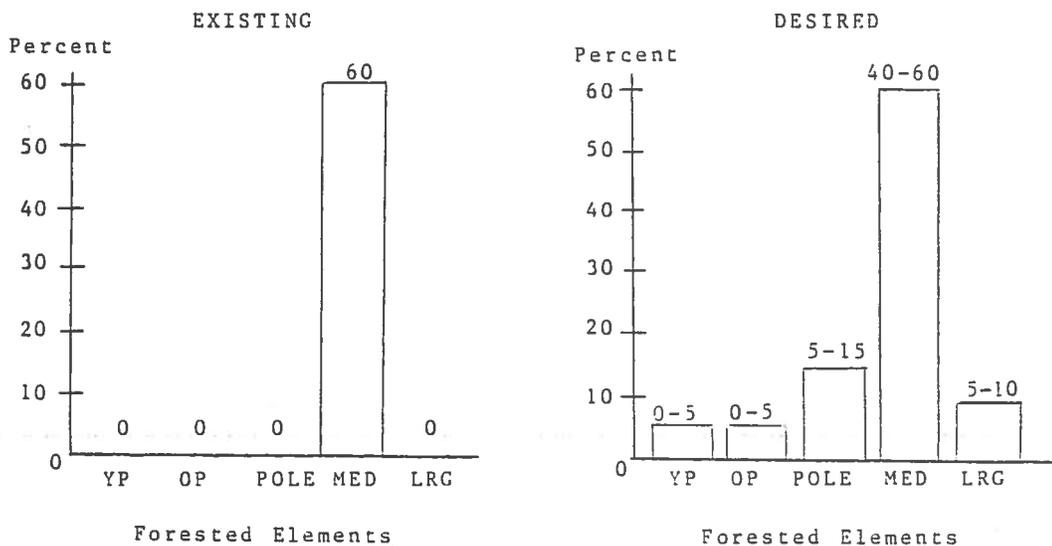
\* Younger/Older Plantations = These areas represent young seral stages which may be a result of natural processes.

<sup>1/</sup> Pole = 6-10' dbh

<sup>2/</sup> Medium = 11-24' dbh

<sup>3/</sup> Large = ≥ 25' dbh

**FIGURE 12 - EXISTING AND DESIRED GRAPHS (Recreational River/Retention)**



**MANAGEMENT AREA 15 - Partial Retention Visual Quality Areas**

**General Description** - The landscape includes 7,010 acres (32% of the total landscape) of lands which are to be managed to meet the Partial Retention Visual Quality Objective (VQO). These lands are located in all three zones, with 44% in the East Zone, 38% in the Northwest Zone, and 18% in the Southwest Zone.

**Management Goals** - Provide an attractive, forested landscape where management activities remain visually subordinate to the characteristic landscape. Manage human activities so they are subordinate to the character of the landscape.

Manage a programmed, sustained harvest of wood products in areas capable, available, suitable and appropriate for timber management.

**Desired Future Condition** - Areas managed to meet a Partial Retention Visual Quality Objective will show evidence of management activities, but will be visually subordinate to the characteristic landscape. The visual effects of these activities (form, line, color, texture) will remain subordinate to the characteristic landscape.

Middleground views from Highway 96, an eligible State Scenic Highway, and to recreationists on the Klamath River, a designated component of the National Wild and Scenic Rivers System, will appear near-natural. Foreground views from the Gunsight Peak road (Forest road #45N28) would also be managed as Partial Retention.

Other management areas which would be managed to meet Partial Retention VQOs while managing for other resource values include Riparian Management Zones and Sensitive Species Management Areas. (The acreages for these management areas are not included in the totals for this area.)

**Landscape Elements Unaffected** -Certain elements will be maintained in the current amount and relative distribution regardless of being managed to meet Partial Retention Objectives. The following elements represent either less than 1% or not present at all of the total Partial Retention acres:

- A. Barren, Rocky Areas
- B. Commercial Hardwoods
- C. Non-Commercial Hardwoods
- D. Urban Development

**Landscape Elements Affected** -Overall the changes that occur to the elements listed below (ie. riparian, manzanita and other brush, and grass\forbs) may be evident to the average Forest visitor (see Figure 13 - Existing and Desired Graphs for Partial Retention).

*Manzanita and Other Brush* --This element consists of 36% within the management area. The amount will not change, although a greater distribution of young and mature brush is desired.

A change in age class is desired to enhance wildlife utilization, decrease fire hazard, and to provide long term stability on granitic soils by improving root strength with younger or mature brush patches. The arrangement of the decadent brush component is desired to be interspersed among the young and mature brush age classes to provide hiding cover for some wildlife species.

*Grass\Forbs* --This element represents 2% within the management area. Overall amount will stay the same, however grass/forbs may become established within and throughout patches of brush, thereby adding additional color(visually) in the landscape.

*Capable Lands For Conversion* --(Existing 1%, Desired 1%) This element represents 1% of the management area. Conversion of areas from brush to forested areas would not only help perpetuate existing stand structure overall, but also move the landscape more toward the desired future condition (DFC) of a "forested" landscape.

Conversion opportunities are more successful in low to mid elevations where white-leaf manzanita is present. The northwest and southwest portions of this landscape offer the greatest opportunities.

*Young and Older Plantations* --(Existing 8%, Desired 5-10%) To perpetuate the stand structure over time, young trees must be introduced either by natural regeneration or planting. A mixture of species would be planted in random spacing to reflect what was originally in stand. It is estimated that up to 10% of the total acres in the management area could be in plantations at any time.

*Forested, Pole-Sized Conifers* --(Existing <1%, Desired 10-20%) As young trees grow into this size class, it is estimated that up to 20% could be in this size class at any time. Pole-size conifers would be thinned to retain clumps and scattered trees.

*Forested, Medium-Sized Conifers* --(Existing 31%, Desired 40-60%) This patch type represents 31% of the total management area, and all of the forested component is in this patch type. It is desirable

to manage to retain the forested component at 40-60%.

*Forested, Large-Sized Conifers* --(Existing 1%, Desired 15-30%) Although only one percent of the management area is in large-sized conifers, it is anticipated that between 15-30% of older, large-sized conifers are desirable to meet visual diversity and improve wildlife's utilization of late seral stage.

**TABLE 13 - EXISTING AND DESIRED PERCENTAGES (Partial Retention)**

ELEMENT:	EXISTING %	DESIRED %
<b>MANZANITA AND OTHER BRUSH</b>	36 Juvenile = 0-5 Mature = 5-10 Decadent = 90-100	36 Juvenile = 50-60 Mature = 40-50 Decadent = 5-10
<b>CAPABLE LANDS</b>	1	1
<b>RIPARIAN</b>	-	-
<b>HARDWOODS</b>	<1	<1
<b>GRASS/FORBS</b>	2	2
<b>BARREN/ROCKY</b>	<1	<1
<b>FORESTED</b>		
— <b>Younger Plantations *</b>	2	5-10
<b>Older Plantations *</b>	6	5-10
<b>Pole <sup>1/</sup></b>	<1	10-20
<b>Medlum <sup>2/</sup></b>	31	40-60
<b>Large <sup>3/</sup></b>	1	15-30

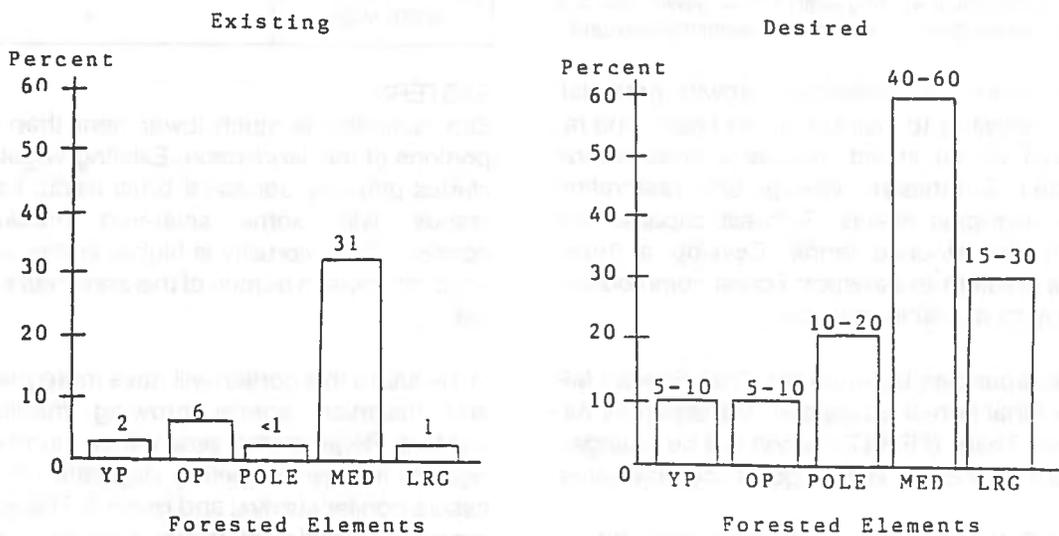
\* Younger/Older Plantations = These areas represent young seral stages which may be a result of natural processes.

<sup>1/</sup> Pole = 6-10" dbh

<sup>2/</sup> Medium = 11-24" dbh

<sup>3/</sup> Large = ≥ 25" dbh

**FIGURE 13 - EXISTING AND DESIRED GRAPHS (Partial Retention)**



**MANAGEMENT AREA 17 - General Forest**

**Description** - These are capable, available, and suitable lands where no other constraining land allocation occurs. This will be consistent with Final FEMAT Report and Option 9 allocations.

**Management Goals** - The objective of this Management Area is to provide a regulated, non-declining flow of timber products, sustainable through time. Conifer stocking levels would be commensurate with the capability of the site, ranging from 75 - 200 trees/acre. This are R5 recommended densities; FSM 2472.03--1:

**TABLE 14 - R5 RECOMMENDED DENSITIES (FSM 2472.03--1)**

Forest Type	R5 Site Class	# Trees Recommended <sup>1/</sup>	Minimum <sup>2/</sup> Acceptable for Certification
Ponderosa pine	I	200	150
	II	200	125
	III	150	100
	IV	125	75
Red/white fir	All	300	200
Douglas-fir	All	225	125
Mixed Conifer	All	200	150

<sup>1/</sup> Recommended stocking is defined as that number of well-spaced growing stock trees able to produce an intermediate commercial harvest as early as possible in the life of the stand.

<sup>2/</sup> Minimum acceptable stocking is defined as that number of well-spaced growing stock trees that will result in full site occupancy, but with a delay of twenty years for the first commercial harvest. The minimum stocking levels can be superseded by a site-specific prescription approved by a certified silviculturist.

Manage stands to maximize growth potential. Manage activities to maintain stand health and resilience to wildfire, insect, disease or other natural processes. Emphasize salvage and restoration from catastrophic events. Reforest capable, but currently non-stocked lands. Develop a transportation system to transport Forest commodities efficiently to available markets.

Any discrepancies between the Draft Forest LMP and the Final Forest Ecosystem Management Assessment Team (FEMAT) Report will be changed to adopt Final FEMAT Report goals and objectives.

**Desired Future Condition** - These areas will be a mosaic of vigorously growing forest stands made up of a variety of vegetative species. Stand struc-

ture will vary over time from bare ground to forest plantations, and to mature, well stocked conifer stands. Generally, the forest will look younger than the surrounding area, but stand size and structure will be quite variable over time. Forest plantations will become available for regeneration between 80 - 120 years or will adjust to be consistent with Option 9. Clearcutting will be infrequent. Regeneration with residuals and uneven-aged stand structure will be more common. Retain clumps of green trees (15% - 20%/acre) and individually scattered trees (2 - 5 trees/acre of average stand diameter). Commercial thinning will be used frequently to maintain healthy, vigorously growing trees.

**General Forest - What does it look like now and in the future?**

Overall, 26% of the Humbug Landscape is within the General Forest Management Area. The Humbug Landscape is divided into three unique geographic zones. This management area will primarily affect activities within the southwest portion. The following displays the percent of General Forest within these three zones (NF lands):

**TABLE 15 - GENERAL FOREST PERCENTAGES BY LANDSCAPE ZONE**

ZONE	PERCENT BY ZONE
EASTERN	10
SOUTHWEST	86
NORTHWEST	4

**EASTERN**

Site capability is much lower here than in other portions of this landscape. Existing vegetation includes primarily decadent brushfields, hardwood stands, with some scattered medium-sized conifers. Tree mortality is higher in this portion of the landscape. A portion of this zone has a high fire risk.

In the future this portion will have more plantations and healthier, openly growing medium-sized conifers. Regenerated sites will be intensely managed to reduce competing vegetation in order to assure conifer survival and growth. There will be a greater distribution of conifer ages and size classes. Brushfields will be treated and a greater amount of younger brush will be evident. Man-

zanita brushfields will be more open with grass/forbs appearing evident in the understory. There may be no stands of older seral stage appearing in this portion. Conifer stands in draws will be maintained to provide shade for wildlife which has been identified as an important microclimate in this portion of the landscape. Future snags will be concentrated in groups where salvage is impractical or sites are not regenerable. A high degree of contrast may occur in areas where fuel treatment, site preparation, and brush rejuvenation occurs.

#### SOUTHWEST

General Forest is a large component in the southwest portion of the landscape. Site capability is higher in this area. This portion has the greatest range and diversity of conifer age and size class distribution in the landscape. Existing forested stands are mostly densely-stocked, medium-sized conifers. A second tier of smaller sized conifers is common in the understory, creating a fuel ladder prone to crown fires. There is also a large component of older plantations, primarily composed of ponderosa pine. This zone contains areas identified as a high fire risk.

Compared to present conditions, this area will have more young plantations, less older plantations, more openly growing and healthy pole-sized conifers, less medium-sized conifers (but maintained in an open-growing, healthy condition), and more larger-sized conifers. Overall, there will be a more even distribution of age and size classes than what occurs today. There will be more snags in future plantations because trees will be saved in clumps and will also be individually scattered throughout regenerated units. This area will have a high degree of contrast and edge especially in areas where fuel treatment is needed to protect investments in plantations and unique habitats.

#### NORTHWEST

Site capability is somewhat better than the eastern portion but lower than the southwest area. Existing vegetation primarily includes scattered medium-sized conifers with larger patches of manzanita, smaller buckbrush patches, and hardwood stands. All of the younger plantations are concentrated in this area. A portion of this zone is identified as a high fire risk.

In the future, this portion will have a higher proportion of mature, openly-growing conifers and ma-

ture to older brushfields. There will be larger, connected patches of large-sized conifers. This area contains deeply dissected granitics and concerns regarding slope instability and surface erosion will reduce the amount of site disturbance. Less intensive regeneration will occur. Smaller regenerated openings will prevail. Stand entries will be less frequent than in other portions of the landscape. Generally, management activities will appear visually subordinate to the character of the landscape. Gradual changes in vegetation rather than sharp edges will prevail.

**Landscape Elements Unaffected** - Certain landscape elements will maintain the same amount and distribution regardless of being managed to meet General Forest Management Objectives. These elements include:

*Hardwoods* --Commercial and non-commercial hardwoods represent approximately 1% within this management area. The amount and distribution is not expected to change based on General Forest Management objectives. Hardwoods are not available for conifer conversion opportunities.

*Grass/Forbs* --Grass/forbs represent less than 1% within this management area. This element will not change in patch size although there may be more in the understory as a result of management activities such as regeneration or intermediate treatments, brush conversion to conifers, or underburning.

*Barren* --This element is also very limited within this management area (less than 1%) and will not change in size or arrangement.

**Landscape Elements Affected** -The following landscape elements are likely to change in size, condition, and/or arrangement within this management area.

*Manzanita and Other Brush* --(Existing 1%, Desired 1%) The relative amount of this element will not change but a greater distribution of young and mature brush is desired.

**Existing Condition:**

Juvenile Brush = 0-5%  
Mature Brush = 5-10%  
Decade Brush = 90-100%

**Desired Future Condition:**

Juvenile Brush = 50-60%

Mature Brush = 40-50%

Decadent Brush = 5-10%

A change in age class is desired to enhance wildlife utilization, decrease fire hazard, and to provide long-term slope stability on granitic soils by improving root strength with younger or mature brush patches. The arrangement of the decadent brush component is desired to be interspersed among the young and mature brush age classes to provide hiding cover for some wildlife species.

*Capable Lands for Conversion* --(Existing <1%, Desired 1-5%) It is estimated that at least 5% is regenerable based on the Order 2 Soil Survey and personal communication with district personnel. Conversion opportunities are better in low to mid elevation and where white-leaf manzanita is prevalent. There would be limited opportunities in the eastern zone due to limited resources available for conifer survival and growth. The northwest portion of this landscape provides the greatest opportunity for converting capable lands to conifer species. General Forest objectives specify that capable lands, **not currently stocked with conifers or hardwoods** should be reforested as soon as possible. This desired range for conversion opportunities is a one time occurrence. When this opportunity is achieved, it will no longer be tracked as a desired condition.

*Young Plantations* --(Existing 1%, Desired 10-20%) Conversion of capable lands and regenerating some of the existing stands within this management area (concentrating with the medium-sized conifers) can contribute to this desired condition. Based on the Klamath National Forest's plantation inventory and assuming an average site class 3 for mixed conifer, existing plantations will reach an average DBH of 13" at 60 years.

Stand growth has been projected to culminate at 100 years without commercial thinning or 120 years with commercial thinning. This correlates to the desired range for rotation length (80-120 years) for this management area. Young plantations are desirable to maintain growth, productivity and structural diversity over time. Less regeneration would occur in the northwest and eastern portions, while the southwest portion would provide the greatest regeneration opportunities.

Approximately 343 acres/year of openings can be created in this landscape and still meet the forest's threshold levels for watershed cumulative effects (see Appendix L - Watershed Cumulative Effects). Often fewer trees/per acre will be planted to promote the growth of larger trees in a shorter period of time, avoid precommercial thinning costs, and reduce excessive fuel loadings. Recommended stocking levels are 150-200 trees/acre for the mixed conifer forest type and 75-150 trees/acre within the ponderosa pine forest type.

Plantations have been identified by the district as an important investment, representing a unique vegetative component. Plantations provide future opportunities for wildlife habitat and vegetative diversity over time.

*Older Plantations* --(Existing 32%, Desired 10-20%) The amount of desired young plantations would become the desired amount of older plantations over time. This meets General Forest objectives for the same reasons described above. These areas will be a mosaic of vigorously growing stands made up of a variety of vegetative species. The existing older plantations range between 30-40 years and closely resemble the size class of pole-sized conifers. In areas with high fire risk, a high degree of contrast or edge is desirable. Fuel treatment is desirable where needed to reduce potential loss of this resource.

*Forested, Pole-Sized Conifers* --(Existing 15%, Desired 20-40%) Approximately 89% of existing pole-sized conifers within this management area are well-stocked (40-100% crown closure). There are opportunities to reduce overstocking within this patch type in order to better achieve General Forest objectives. Harvest operations should be prioritized to treat stands where the greatest increase in conifer growth and yield can be obtained or where the presence of disease and insect problems jeopardize meeting resource objectives.

*Forested, Medium-Sized Conifers* --(Existing 49%, Desired 15-35%) This patch type provides the greatest opportunity for management activities to meet General Forest objectives. Approximately 58% of this type is poorly stocked and the remaining 42% is well stocked with some opportunities for intermediate treatments to reduce some overstocking. General Forest objectives specify that commercial thinning will be used frequently to maintain healthy, vigorously growing stands. Tree

mortality due to drought and insect attack has reduced the future available seed source in certain portions of the landscape. Protecting and maintaining the remaining existing seed source is critical to future resource opportunities. Additionally, General Forest management direction specifies that salvage and reforestation efforts are a priority. Minimize the loss of timber value where possible.

*Forested, Large-Sized Conifers* --(Existing 1%, Desired 1-5%) There are small, fragmented patches

of existing large-sized conifers in the western portion of the landscape. It is desirable to increase the existing nominal amount to meet the forest wide standard of providing 5% of each vegetative type in an older seral stage. It is desirable to prescribe treatment within this component, where needed, to maintain structural diversity for multiple species which are dependent upon this late seral stage habitat.

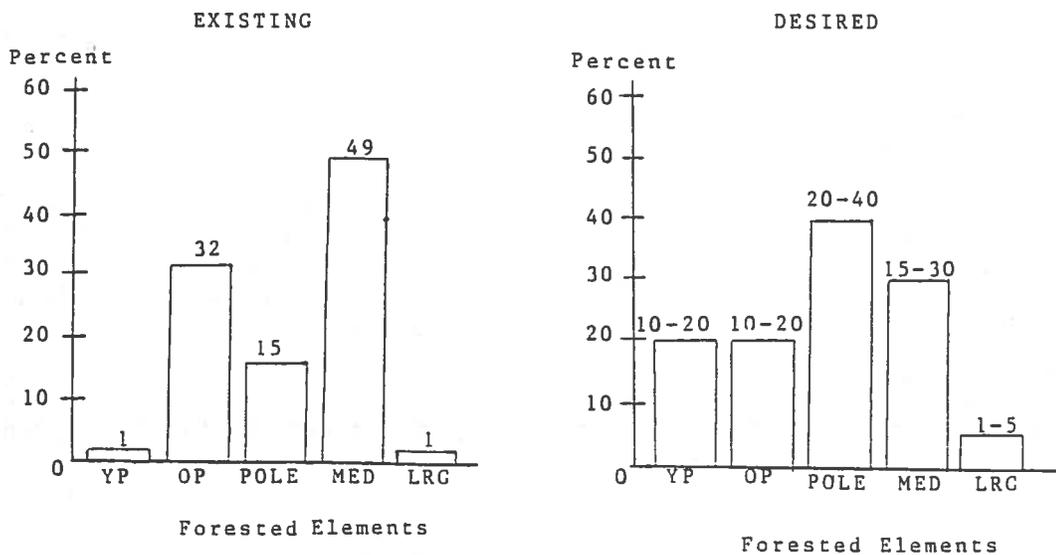
Component	Existing (%)	Desired (%)	Management Direction
Forested, Large-Sized Conifers	1%	1-5%	Prescribe treatment to maintain structural diversity for multiple species dependent upon this late seral stage habitat.

**TABLE 16 - EXISTING AND DESIRED PERCENTAGES (General Forest)**

ELEMENT:	EXISTING %	DESIRED %
<b>MANZANITA AND OTHER BRUSH</b>	1 Juvenile = 0-5 Mature = 5-10 Decadent = 90-100	1 Juvenile = 50-60 Mature = 40-50 Decadent = 5-10
<b>CAPABLE LANDS</b>	<1	1-5
<b>RIPARIAN</b>	<1	<1
<b>HARDWOODS</b>	1	1
<b>GRASS/FORBS</b>	<1	<1
<b>BARREN/ROCKY</b>	<1	<1
<b>FORESTED</b>		
— <b>Younger Plantations</b>	1	10-20
<b>Older Plantations</b>	32	10-20
<b>Pole <sup>1/</sup></b>	15	20-40
<b>Medium <sup>2/</sup></b>	49	15-30
<b>Large <sup>3/</sup></b>	1	1-5

<sup>1/</sup> Pole = 6-10" dbh  
<sup>2/</sup> Medium = 11-24" dbh  
<sup>3/</sup> Large = ≥ 25" dbh

**FIGURE 14 - EXISTING AND DESIRED GRAPHS (General Forest)**



## LIMITED SCHEDULED HARVEST

**Description** - Comprises 15% of the National Forest lands. These are areas within the General Forest allocation where concerns about the geologic sensitivity reduce timber production capabilities. Much of the acreage falls within the Northwest geographic zone. Following is a display of the percent of the area within each zone:

**TABLE 17 - LIMITED SCHEDULED HARVEST PERCENTAGES BY ZONE**

ZONE	PERCENT BY LANDSCAPE ZONE
EASTERN	<1
SOUTHWEST	67
NORTHWEST	33

These percentages are based on preliminary queries and should be expected to change based on site specific field review. They are used only to provide a general characterization of the area, not as absolute values.

It should also be noted that these percentages do not include all sensitive soils, as General Forest is the only allocation where these areas are distinguished separately, for the purposes of this query. The geo-sensitive layer should be referenced for a more accurate display of sensitive soils (see Figure 15 - Sensitive Geo-Types Map).

**Management Goals and Desired Condition** - These lands are not identified as a specific management area in the Draft Forest Plan. The management goals and desired condition objectives for General Forest are applicable, with the exception that timber yields would be reduced to maintain emphasis on slope stability and soil productivity.

Vigorously growing stands in a variety of age and structural classes would be apparent. Stand structures would be maintained to minimize crown fire potential, insect and disease risk, or other potential stand replacement disturbances.

When implementing stand management activities, prescriptions would be developed with emphasis

on composition, amount and arrangement of the reserve trees that best meet soil retention objectives. Total soil cover would include retention of low growing vegetation, rock fragments, or organic material in sufficient quantities to meet Forest Standard 3-2. Size, shape, and arrangement of openings would also be designed to minimize potential soil loss.

**Unaffected Elements** - The non-forested landscape elements will maintain the same amount and relative distribution. These are non-conifer patch types which account for only 4% of the area in limited scheduled harvest.

Emphasis is placed on soil productivity and slope stability objectives when implementing activities in these patch types on geo-sensitive areas, regardless of management area designation. Refer to No Scheduled Harvest desired condition objectives for individual element descriptions.

**Affected Elements** - All capable, available, and suitable forested areas may be affected. Longer rotations would shift seral stage distribution towards a higher proportion of mature stands, as compared to General Forest lands. Structural characteristics for each conifer element would emphasize stand vigor and reduced fire hazard. Site capability will directly affect stocking levels, canopy closure, and species composition to be expected.

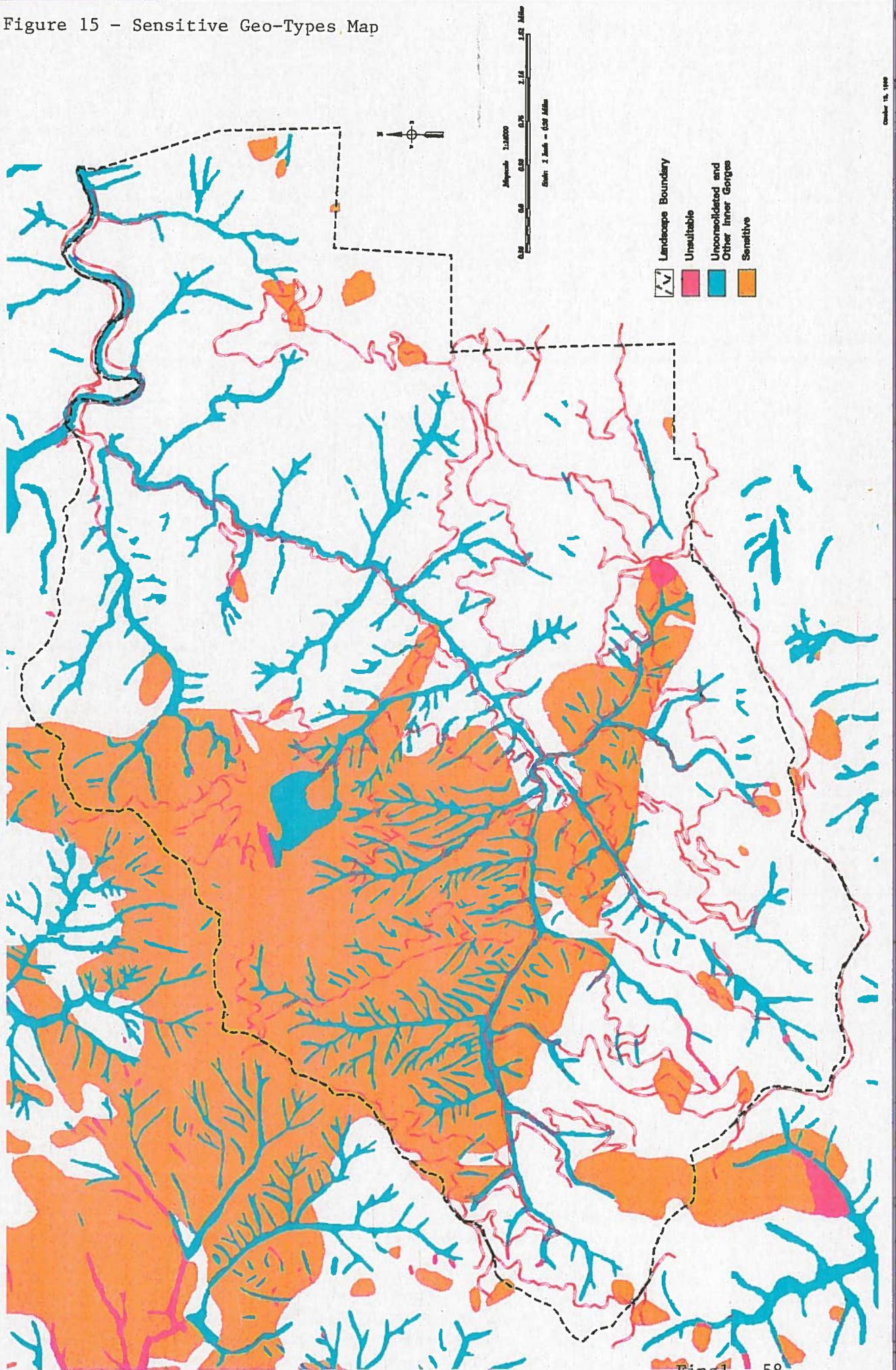
On sites capable of sustaining a scheduled timber harvest, stand characteristics would be similar to that described for General Forest, with stand management emphasis designed to minimize loss of soil productivity. On sites not capable of sustained levels of timber harvest stand characteristics may be similar to that described for noncapable lands under No Scheduled Harvest. Again, emphasis is on maintaining stand vigor, to minimize loss of soil productivity.

Forested stands would become available for regeneration between 180-200 years. Stands would be established as regeneration with residuals or uneven-aged stand structures. Clumps of green trees (15-20% of stand area) and individual scatter trees (2-5 trees per acre of average stand diameter) would be left in regeneration units.

# Humbug Landscape Management Areas Sensitive Geo-Types



Figure 15 - Sensitive Geo-Types Map



October 15, 1998

**TABLE 18 - EXISTING AND DESIRED PERCENTAGES (Limited Scheduled Harvest)**

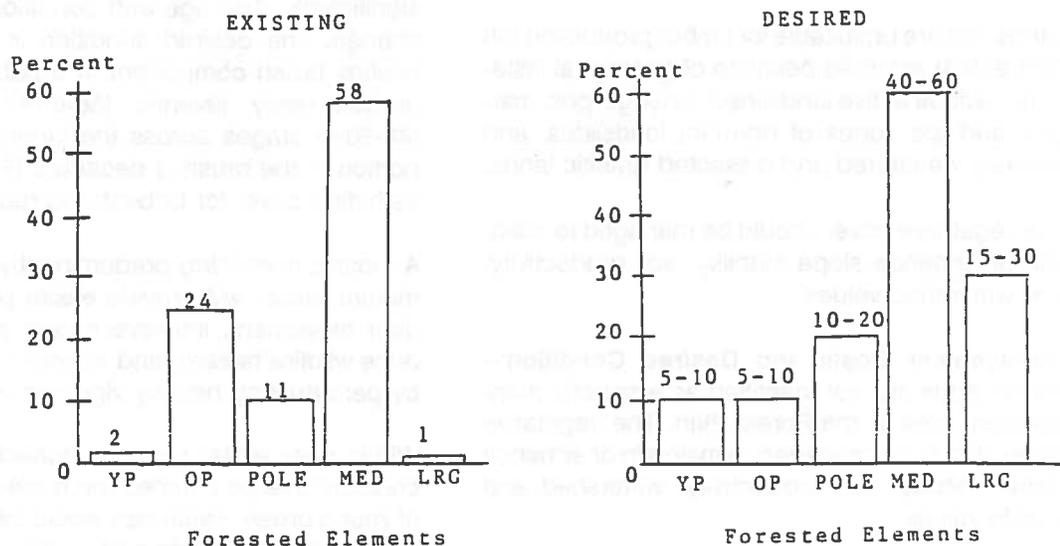
ELEMENT:	EXISTING %	DESIRED %
<b>MANZANITA AND OTHER BRUSH</b>	1 Juvenile = 0-5 Mature = 5-10 Decadent = 90-100	1 Juvenile = 50-60 Mature = 40-50 Decadent = 5-10
<b>CAPABLE LANDS</b>	2	0
<b>RIPARIAN</b>	0	0
<b>HARDWOODS</b>	1	1
<b>GRASS/FORBS</b>	<1	<1
<b>BARREN/ROCKY</b>	0	0
<b>FORESTED</b>		
— <b>Younger Plantations</b>	2	5-10
<b>Older Plantations</b>	24	5-10
<b>Pole <sup>1/</sup></b>	11	10-20
<b>Medium <sup>2/</sup></b>	58	40-60
<b>Large <sup>3/</sup></b>	1	15-30

<sup>1/</sup> Pole = 6-10" dbh

<sup>2/</sup> Medium = 11-24" dbh

<sup>3/</sup> Large = ≥ 25" dbh

**FIGURE 16 - EXISTING AND DESIRED GRAPHS (Limited Scheduled Harvest)**



**NO SCHEDULED HARVEST**

**Description** - Comprises 15% of National Forest lands within the General Forest zone that are not capable or suitable for scheduled timber production. The reason for this designation has a direct bearing on the desired condition description.

**TABLE 19 - NO SCHEDULED HARVEST PERCENTAGES BY ZONE**

ZONE	PERCENT BY LANDSCAPE ZONE
EASTERN	<1
SOUTHWEST	80
NORTHWEST	20

These percentages are based on preliminary queries and depict areas **only** within General Forest allocation where no scheduled harvest is expected. Project specific analysis will refine the delineation of actual location of lands that should not be part of the scheduled timber base.

Lands that are not capable of producing a minimum of 20 cubic feet of wood fiber per year, on a non-declining, sustained basis (36 CFR 219.14) are also included in this category, as well as lands where there is not reasonable assurance they can be adequately restocked within five years (36 CFR 219.27).

Lands that are unsuitable for timber production (36 CFR 219.4) activities because of geological instability, include active landslides, inner gorges, margins and toe zones of dormant landslides, and severely weathered and dissected granitic lands.

The vegetative cover should be managed to maintain or enhance slope stability, soil productivity, and watershed values.

**Management Goals and Desired Condition** - These lands are not identified as a specific management area in the Forest Plan. The vegetative cover should be managed to maintain or enhance slope stability, soil productivity, watershed and wildlife values.

**Affected Elements** - All elements within the landscape may be affected. Shifts in management em-

phasis will occur, depending upon whether these lands are considered not capable or unsuitable. Therefore this section first describes non-forested elements (mainly noncapable lands); then the forested elements on either geologically unstable or noncapable lands.

**Non-forested Elements** - Approximately 71% of the General Forest No Scheduled harvest lands consists of non-forested patch types. The desired condition would be to maintain the health and vigor of these patches to provide wildlife habitat values, maintain slope stability and watershed health, and minimize potential for large stand replacement wildfire occurrence. Each element in this group is described separately.

*Barrens* --Minimal component (<1%), occurs as openings along the ridge tops. Management activities will not change this component.

*Grasses/forbs* --Size and arrangement of grass/forbs patches will not change. These areas will be perpetuated as a patch type within the brush and tree patch elements.

It is desired to increase the grass/forb component in association with brush and timber patch types. Reintroduction of fire through underburning will return to stand conditions that are more resilient to ecological processes, by reducing site competition and fuels buildups.

*Brush* --Patch size and locations will not change significantly. The age and condition of brush will change. The desired condition is to maintain a healthy brush component in a patchy mosaic of predominantly juvenile (50-60%) and mature (40-50%) stages across the landscape. A minor portion of the brush is decadent (5-10%), serving as hiding cover for bobcat and rabbits.

A mosaic consisting predominantly of young and mature brush, will provide easier penetrability for deer movement, improve forage production, reduce wildfire hazard, and maintain slope stability, by perpetuating healthy vigorous vegetation.

Within deer winter range, emphasis would be in creation of large patches (no more than 60 acres) of young brush. Patch size would be fairly round to maximize effectiveness of forage area, but the edges would be irregular. Within the juvenile patch, individual clumps of decadent or mature

brush serve as hiding cover. Priorities for browse enhancement would be placed on areas where *Ceanothus integerremus* is most likely to be established after disturbance and are adjacent to patches that provide thermal cover (upland areas adjacent to draws).

On sensitive soils with slopes  $\geq 45\%$ , the mosaic of age classes would be patchier to maintain slope stability. Approximately 50% of the brush would be in a mature state within a five acre patch.

From a fire management perspective, in addition to replacement of the decadent component with a healthier juvenile or mature growth stage, the overall arrangement would be the creation of more linear edges, smaller patches, and less homogeneity within patches to reduce susceptibility to stand replacement fires.

When implementing a prescribed fire program, careful attention should be given to the autecology of various brush species affected. This includes fire effects, post fire response, and length of time until species reach sexual maturity. Certain species, such as *Arctostaphylos patula* are vigorous post fire crown sprouters. While others, such as *Ceanothus cuneatus* and *Arctostaphylos viscida*, do not crown sprout following fire disturbance, but are effective post fire germinators. A fire regime that does not allow desired nonsprouting brush species to attain sexual maturity could have the affect of leaving a site unvegetated.

When accomplishing brush rejuvenation activities it would also be desirable to plant conifers in areas capable of supporting a conifer component. This will add to future structural diversity, provide wildlife cover and increase slope stability.

In the Eastern zone the patches tend to occur higher on the slopes and are above the deer winter range, therefore more emphasis may be given to watershed health and fire management objectives in brush treatment, than to optimizing forage habitat.

In the Northwest zone the lower elevations constitute much of the deer winter forage areas. Care will need to be taken in this zone to integrate soil productivity/slope stability objectives with deer forage production due to the sensitive granitic soils.

In the Southwest Zone brush occurs as a small patch type mainly on ridges with a west aspect, in a mosaic with manzanita patches, opposite predominantly forested slopes. Preliminary fire risk information shows highest risk potential in landscape.

**Hardwoods** --Occurs as part of the brush mosaic. These types contribute to forage production, mast production, and hiding cover for wildlife species. The desired condition would be to manage these patch types in a healthy condition, with reduced susceptibility to stand replacement fires.

**Lands Capable of Conversion** --(8% of this designation) These are areas where district personnel have confirmed opportunities for conversion to conifers. They occur in small patches in both the Northwest and Southwest Zones.

The desired condition is to develop forested stands that support a variety of tree species, including ponderosa pine, Douglas-fir, sugar pine, and black oak. Once established, the desired condition of these stands would be the same as the existing forested patches at various structural stages under General Forest objectives (or Limited Scheduled Harvest objectives on sensitive soils).

**Forested Elements** - There could be a shift in management emphasis depending on whether lands are geologically unstable, or not capable of producing 20 ft<sup>3</sup> per year of wood fiber. Therefore the forested elements are described in two separate categories.

Plantations comprise approximately 25% of the area defined as no scheduled harvest. This percentage is based on preliminary queries and may change based on site specific field review. In some instances this may reflect unsuccessful reforestation attempts following the Haystack Fire on land that has been shown to be noncapable. In other cases, subsequent review may have identified land as geologically unsuitable. Successfully regenerated plantations, where geologic sensitivity concerns have not been identified, should be returned to the General Forest allocation.

Natural stands comprise 5% of the area defined as no scheduled harvest. The majority (58%) is typed as poorly stocked (<40% canopy closure). With the remaining 42% typed as well stocked ( $\geq 40\%$  canopy closure). The medium size conifers

(11-24.9" dbh) make up most of the naturally forested stands. A minimal component occurs as either a poles (6-10" dbh), or large diameter conifers ( $\geq 25$ " dbh).

**Geologically Unstable Lands** - In general the desired condition objectives in these lands would be to perpetuate a vigorous mature tree component. Stands would consist of a variety of conifer and hardwood species; providing cover, forage, and other habitat values for a variety of wildlife species. Maintain basal areas consistent with site capability at levels which minimize intratree competition and unacceptable levels of mortality.

*In the sapling and pole stands* the desired condition is to maintain stand structures that are conducive to rapid growth and minimize potential for loss to wildfire. The goal would be to establish tree growth, and root strength, as quickly as possible, as well as to move the stands through stages of high fire susceptibility.

*In the medium and large conifer stands* use stocking control to maintain tree vigor for long term persistence of the stand. Maintain overstory component in vigorous condition. Understory composition would be patchy mosaic of healthy brush or grass/forbs, with minimal development of ladder fuels to minimize crown fire potential. Snags and down logs may be present, but emphasis is on maintaining stand health, therefore slope stability.

When creating new stands, utilize silvicultural techniques and harvest systems that minimize potential for triggering instability. Consider development of two storied stands or creation of small openings to establish young vigorous tree growth. Maintain open stand characteristics that do not increase potential for loss to wildfire. Individual stand characteristics, such as species composition or site productivity, may determine appropriate methods.

**Noncapable lands** - These are lands that are capable of supporting scattered conifers, but do not meet minimum productivity or regenerability requirements for scheduled timber production.

The desired condition is to maintain a scattered overstory component of large diameter conifers.

The understory composition would be patchy mosaics of healthy brush, grass/forbs, and scattered regeneration of conifers. Canopy closure is likely to be  $< 20\%$  in these stands. Fuel residue on the forest floor would be low.

It would be most desirable to establish young conifers under existing stands. Particularly if fire return intervals were long enough to allow scattered conifers to get beyond a fire susceptible stage.

*Sapling and Pole stands* would be dominated by brush with scattered small diameter conifers and hardwoods. Conifer species would be predominantly ponderosa pine, with sugar pine and Douglas-fir evident. Live oak and white oak would be the predominant hardwood species, with black oak present.

The brush component would be mostly in a mature or juvenile stage, with scattered decadent patches. Grasses and forbs would be evident. These would be healthy open stands with very little dead material on the ground and occasional snags.

*Medium size conifers* would consist of scattered trees. Expect less than 30 conifers per acre with full crowns. A 3 size class with crown diameter of 13-24 ft. and maximum crown closure of 20% has a range of 19-66 TPA. Open grown stands would tend to have full crowns and with 20% canopy closure at high end, the conifer densities will be quite low in these stands.

Both brush and grass/forbs components still evident. Brush is maintained in a healthy juvenile or mature stage as a result of previous underburns. Stands are healthy. Snags are present. There is a slight increase in coarse woody material, but levels still remain quite low.

*Large size conifer stands* would have fewer conifers (7-18 per acre) present. With scattered live oak, and possibly black oak, present. White oak persists in association with healthy brush component. Scattered conifers are developing flattened crowns, with some broken tops. Snags and down logs are present. Low intensity fuels ( $< 3$ " diameter) still maintained at low levels.

**TABLE 20 - EXISTING PERCENTAGES (No Scheduled Harvest)**

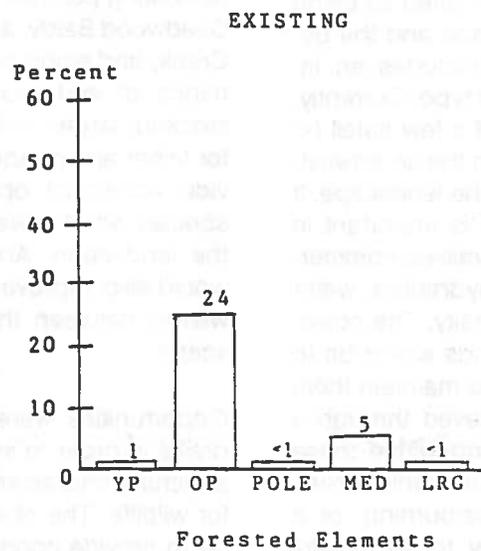
ELEMENT:	EXISTING %	-
<b>MANZANITA AND OTHER BRUSH</b>	36	-
	Juvenile = 0-5	-
	Mature = 5-10	-
	Decadent = 90-100	-
<b>CAPABLE LANDS</b>	8	-
<b>RIPARIAN</b>	1	-
<b>HARDWOODS</b>	17	-
<b>GRASS/FORBS</b>	8	-
<b>BARREN/ROCKY</b>	1	-
<b>FORESTED</b>		
—		
<b>Younger Planta-tions</b>	1	-
<b>Older Plantations</b>	24	-
<b>Pole <sup>1/</sup></b>	<1	-
<b>Medium <sup>2/</sup></b>	5	-
<b>Large <sup>3/</sup></b>	<1	-

<sup>1/</sup> Pole = 6-10" dbh

<sup>2/</sup> Medium = 11-24" dbh

<sup>3/</sup> Large = ≥ 25" dbh

**FIGURE 17 - EXISTING GRAPH (No Scheduled Harvest)**



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**STEP 6 - MANAGEMENT  
 OPPORTUNITIES**  
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This step is a culmination of all prior steps, the objective being to identify possible management practices which would contribute towards achieving and maintaining the desired condition for the landscape. The management opportunities identified for the Humbug Landscape are intended to meet desired vegetative patterns, to improve the resilience of the landscape, and to maintain critical flows and linkages within and around the landscape. The possible management practices are organized by the primary benefiting resource, although for any given management practices, several resources may benefit (see Figures 18 and 19 - Management Opportunities Maps 1 of 2 and 2 of 2).

**Wildlife Habitat** - Management opportunities for wildlife were related to improving and increasing the amount of late seral stage forest habitat, improving habitat conditions in brush dominated and hardwood sites, improving and increasing the amount of late seral stage forest habitat, and improving conditions for snag-dependent wildlife species.

Opportunities to improve the existing condition of well-stocked, large conifer stands were identified. This particular patch type was identified as being critical and unique to the landscape and the desired condition within Humbug includes an increase in the amount of this patch type. Currently, this element occurs in the form of a few small (< 100 acres), isolated patches within the southwestern and northwestern portions of the landscape. It occurrence within the landscape is important in terms of wildlife habitat, aesthetic values, commercial products, and its effects on hydraulics, water quality, and riparian channel diversity. The objective of management of these stands would be to improve their resilience in order to maintain them in the future. This could be achieved through a reduction of fuels adjacent to and within these stands. Treatment could include mechanical treatment and removal of fuels, underburning, or a combination of the two. The key to successful treatment within stands would be to achieve a reduction in fuels while still maintaining a functioning

level of structural diversity. An example of an acceptable level might be maintenance of all large overstory trees, a total canopy closure greater than 60%, two to five snags greater than 18" dbh per acre, and two to five large logs per acre. Burning when moisture content of duff and large fuels is high would help minimize excessive duff consumption while still consuming litter and small woody debris. Treatments applied to bands or patches could be used to achieve a disruption in continuity of fuels without reducing the structural diversity of the entire stand.

Additional opportunities exist to increase the amount of continuous patches of large sized conifers within the landscape. The desired condition within the Humbug landscape includes an increase in the proportion of this patch type. The following is a summary of the desired proportion large conifer stands by management area:

**TABLE 21 - EXISTING AND DESIRED PERCENTAGES OF LARGE CONIFER STANDS BY MANAGEMENT AREA**

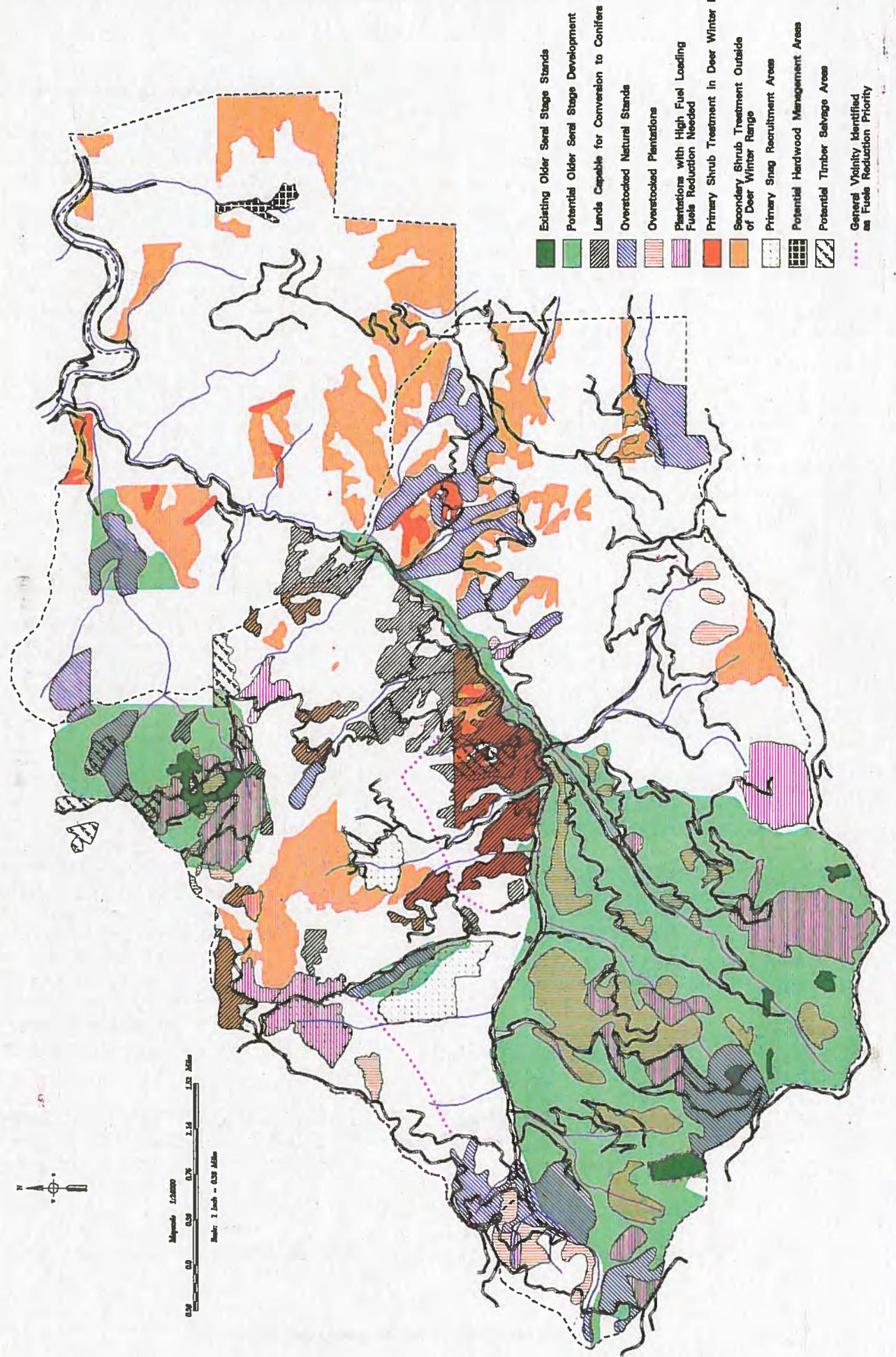
MANAGEMENT AREA	EXISTING %	DESIRED %
General Forest	1	1-5
Retention/Rec Rivers	0	15-30
Limited Scheduled Harvest	1	20-40
Riparian	<1	<>
Partial Retention	1	15-30

Priority areas for this improvement are: adjacent to existing patches between Mahogany point and Deadwood Baldy, along the main stem of Humbug Creek, and along portions of Clear Creek. Maintenance of and increase in the amount of well-stocked, large conifers would improve conditions for fisher and northern spotted owl as well as provide additional optimal cover for deer. These species which were identified as key flows within the landscape. An increase in this patch type would also improve opportunities for movement of wildlife between the adjacent Deadwood Landscape.

Opportunities were identified to treat important draws in order to maintain and protect vegetative structural characteristics, thereby providing cover for wildlife. The objective of such activities would be to provide connectivity of cover for movement throughout the landscape and to provide thermal cover at lower elevations. This is particularly impor-

# Humbug Landscape Management Opportunities (1 of 2)

Figure 18 - Management Opportunities Map (1 of 2)

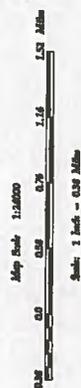
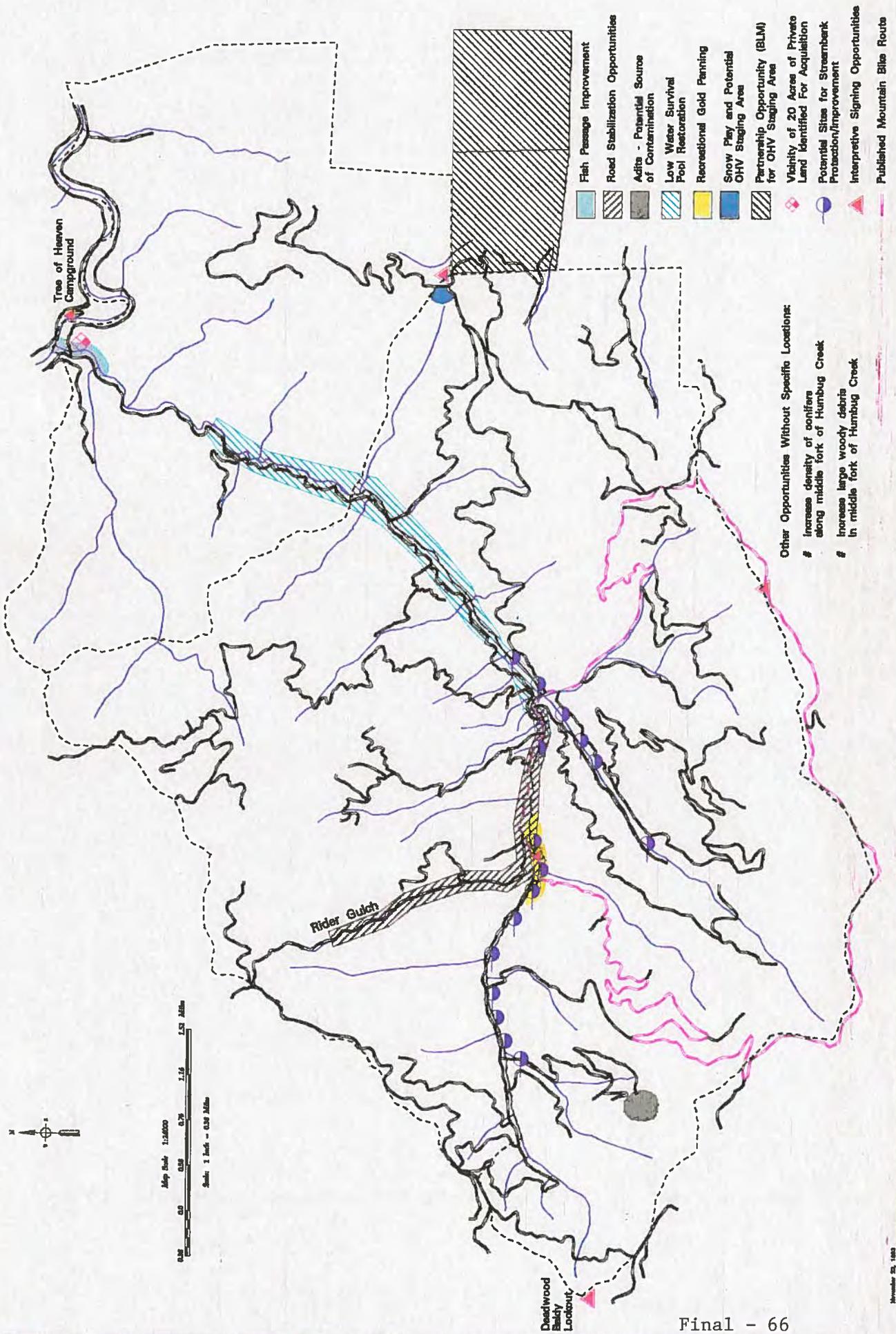


- Existing Older Seral Stands
- Potential Older Seral Stage Development
- Lands Capable for Conversion to Conifers
- Overstocked Natural Stands
- Overstocked Plantations
- Plantations with High Fuel Loading
- Fuels Reduction Needed
- Primary Shrub Treatment in Deer Winter Range
- Secondary Shrub Treatment Outside of Deer Winter Range
- Primary Snag Recruitment Area
- Potential Hardwood Management Areas
- Potential Timber Salvage Areas
- General Vicinity Identified as Fuels Reduction Priority



Figure 19 - Management Opportunities Map (2 of 2)

# Humbug Landscape Management Opportunities (2 of 2)



- Fish Passage Improvement
- Road Stabilization Opportunities
- Adits - Potential Source of Contamination
- Low Water Survival Pool Restoration
- Recreational Gold Panning
- Snow Play and Potential OHV Staging Area
- Partnership Opportunity (BLM) for OHV Staging Area
- Vicinity of 20 Acres of Private Land Identified For Acquisition
- Potential Sites for Streambank Protection/Improvement
- Interpretive Signing Opportunities
- Published Mountain Bike Route

- Other Opportunities Without Specific Locations:
- # Increase density of conifers along middle fork of Humbug Creek
  - # Increase large woody debris in middle fork of Humbug Creek

tant within the eastern portion of the landscape along south facing slopes where brush dominated sites offer little thermal cover. Many of the conifer stands which occur within draws are currently experiencing loss of vigor resulting in excessive mortality. The desired condition for thermal cover is to maintain an uneven-aged stand which includes medium sized and larger trees, with an overhead canopy closure greater than 40 percent. Treatments might include thinning to release and to maintain structural diversity. The well-stocked medium conifer patches along Clear Creek should be considered as priority sites for treatment.

Projects should be implemented to increase the proportion of juvenile and mature age classes within the brush species. The desired condition is to return portions of brush dominated areas to a mix of age classes which likely existed when frequent, low intensity fires occurred within the landscape. Currently, the majority of the brush within the landscape is decadent and provides low quality forage. Relatively shorter lived species, such as deerbrush, are being replaced by longer lived species. The desired condition is to maintain a healthy brush component in a patchy mosaic of predominantly juvenile and mature stages across the landscape. Deerbrush, buckbrush, and western mountain mahogany are the desired browse species within the landscape. Manzanita offers little in the way of forage, but it does provide some hiding cover. The desired condition within the manzanita stands is to open them up, making them more penetrable and increase species diversity within the stands. Prescribed burns within brush dominated areas could eliminate dead and dying stems, stimulate the germination of seeds stored within the soil, stimulate sprouting, open up impenetrable areas, and increase the amount of grass and forbs. This would greatly improve forage quality as well as reduce fire hazard through creating a discontinuity in hazardous fuels. Priority areas for treatment are within and adjacent to key deer winter range, and throughout the landscape where patches of desired brush species occur adjacent to areas that provide thermal cover.

Management opportunities to maintain and improve hardwood stands in some portions of the landscape. Activities such as burning and thinning to increase the diameter of oaks (primarily black and white oak) would also add to the improvement of forage conditions through an increase in acorn production. Areas for treatment might include the

non-commercial hardwood stands dominated by white oak and the black oak stand in Butcher Gulch.

Within and adjacent to older plantations, opportunities exist to increase the density of snags by identifying individual and clumps of trees to be maintained through rotation of stands. Currently, many of these stands are deficient in the snag component and do not meet forest guidelines for snag retention. Depending on the management emphasis within an area, guidelines call for maintaining an average of two to five snags per acre, greater than 11" dbh, in a variety of decay classes.

**Recreation** - Recreational use was identified as being a key flow within the Humbug Landscape. Several projects were identified to maintain or enhance existing opportunities or create new ones. This area will remain important for recreation use due to it's proximity to Yreka and existing popularity with locals.

An opportunity was identified to create an area for recreational gold panning near the Humbug picnic area (former campground). The area would include a stretch of Humbug Creek, approximately one-quarter mile upstream and downstream of the picnic area. The actual size would be contingent upon the number of active claims and the ability of the Forest Service to withdraw the area from mineral entry. The District has identified a need for this activity based on numerous requests and inquiries from the public.

There is an opportunity to maintain the snowplay area just northwest of Hawkinsville, due to the site's proximity to Yreka and wintertime access. This general area could also be developed into an OHV staging area for bicycles and other off highway vehicles. The proximity to Yreka and Interstate 5 make it a prime location. Development for this type of use would help meet the current increase in demand as well as fill a geographical gap which exists between Redding, Bend, and the coast. The recreation staff of the Oak Knoll Ranger District has completed some initial steps in the proposal for an OHV route which would begin at this site and continue on through the south half of the Humbug drainage, utilizing existing roads and trails. That planning effort would need to be completed as the first step in furthering this project. The project would likely involve partnerships with the Bureau of Land Management who administer parcels

identified as potential staging sites. Opportunities also exist to work with the County and with the State's Green Sticker Fund program.

Lastly, there is an opportunity to continue to maintain a mountain bike route through the southwestern portion of the landscape. This published route is currently described in *"Mountain Bike Routes on the Klamath National Forest"* booklet and partially overlaps with a portion of the "Humbug Hurry Up" route, an annual biking event which is rapidly growing in popularity.

Currently, there are no interpretative displays within the landscape. The closest exhibit will soon be in place at the Tree of Heaven Campground. There are opportunities to develop interpretative sites within and near to the landscape, both in the short-term and long-term. Within the short-term, opportunities exist to add on to the display at Tree of Heaven to incorporate the Scenic Byway, the Wild and Scenic River System, and additional information on wildlife within the area. Opportunities also exist along the Gunsight Road to highlight the geological development of Craggy Mountain or the role of fire within the area. The opportunities identified for the long-term are not practical at this time given the existing level of vandalism which occurs within portions of the landscape. Should the situation improve, other opportunities for development might include interpretation at the Humbug picnic site to highlight fisheries and riparian habitat associations and/or at the snow-play area to highlight the ecology of the brush vegetation community.

Opportunities exist to increase recreational use of the area throughout the year by renovation and development of the Deadwood Baldy fire lookout site. A shelter could serve as a ski hut in the winter and a picnic or camping site during spring through fall. It would serve as an excellent site to develop an interpretive display about the history and role of fire lookouts on the Klamath.

Within three years after the approval of the Forest Land Management Plan, a River Management Plan will have to be completed for the Klamath River, a portion of which occurs within the Humbug Landscape. The purpose of the plan would be the protection of river values through the establishment of appropriate levels of use and development, the monitoring of river use, and the clarification of management objectives. This plan is required by law and Forest Service Manual direction.

Hunting opportunities could be greatly improved through the rejuvenation of brush and other forage species. This would help to concentrate deer within the landscape and possibly increase the number of animals within the landscape.

**Vegetation Management** - Opportunities exist for treating young conifer stands (10-40 years old), natural pole and small saw timber stands in order to develop them into older seral stages. Currently, many of these stands exist as slow-growing, overstocked stands and are at high-risk of loss from fire. The majority of these stands occur in the northwestern and southwestern portions of the landscape, primarily within General Forest and General Forest-No or Limited Scheduled Harvest. The desired condition within these areas is to create a mosaic of vigorously growing, structurally diverse stands. The younger plantations exhibit minimal structural diversity in the form of vegetative layering. The older plantations are somewhat more diverse. Many are terraced and dominated by ponderosa pine, with a small component of Douglas-fir. Manzanita, deerbrush and black oak are scattered in the understory.

Thinning has been shown to maintain stand vigor and stability, produce large trees, and initiate the development of understory trees. Thinning these overstocked plantations would meet several objectives including a reduction in the risk of fire, optimization of growth for forest products, creation of thermal cover for deer, and an increase in soil stability. Identification of individual trees and clumps of trees to be maintained would contribute towards diversity of age classes within the stands. Further along in the development of the stand, some dominant and codominant trees could be felled to provide large woody debris.

Opportunities exist to reduce high fuel loads which are concentrated in many of the older plantations in the northwest and southwest portions of the landscape. These plantations represent significant investments which are important to protect because they represent future structural and functional diversity within the landscape. Some of the thinning opportunities have potential for biomass and fuelwood products.

As assessment should be made for the Humbug landscape in order to identify potential sites for conversion to conifer stands. This would contribute towards meeting desired condition in areas

currently dominated by decadent brush stands. The Order 2 Soils Survey completed for a portion of the Northwest Zone one to five percent of the existing decadent brush fields provide feasible sites for conversion. Within these areas, it would be appropriate to plant conifer trees in order to improve deer cover.

There are opportunities to manage for healthier stands within the pole-size and medium-sized conifer patches throughout the Humbug Landscape. Many stands are experiencing mortality due to stocking which exceeds site capability. Salvage opportunities should be emphasized as long as wildlife snag requirements have been met. Opportunities displayed are outside identified snag recruitment areas. Thinning within overstocked stands could release suppressed trees resulting in healthy, vigorous stands. Other stands are in need of sanitation treatments to remove mistletoe and other infections.

**Watershed and Fisheries** - Opportunities to improve habitat for anadromous fish include deepening of the channel near the mouth of Humbug, creation of pools and side channels for summer survival and rearing habitat, and improvement of vegetative structural diversity within and adjacent to stream channels. Refer to Appendix M - Habitat Type Classifications for supporting documents.

Conditions along the lower quarter mile of Humbug Creek are such that movement of fish during the summer and early fall is impaired. There are a number of factors which contribute to this, including the subsurface nature of the stream and the accumulation of old mine tailings. An opportunity exists to deepen and stabilize the channel near the mouth, however the most appropriate site for this improvement occurs on private land. Options exist to either acquire (through acquisition or exchange) the land or work with the land owner and other agencies or organizations (California Dept. of Fish and Game, Trout Unlimited, etc).

Although Humbug does support good spawning habitat and good production of fry, summer mortality of young fish is high because it lacks sufficient deep pools and side channels for rearing habitat. Opportunities to create pools and side channels exist along the entire stretch of main stem Humbug, the first priority site being near the picnic area where some rearing habitat already exists.

Generally speaking, the riparian zones within the Humbug landscape are in good condition. Vegetative structural diversity along streams provides shading and helps maintain instream yearlong temperatures between 56 and 68 degrees Fahrenheit. The density of conifers within riparian areas is adequate along most stretches of Humbug, though there are opportunities for improvement along portions of Middle Fork Humbug and on private land sections. Within those areas, the primary tree species in the riparian zones are cottonwood and alder.

An attempt should be made to maintain or restore 80% shading where site capability will allow. More site specific information is needed to determine what type of opportunities (planting, thinning, underburning) and their consequences are appropriate to improve structural diversity.

Within channel diversity can be improved through the recruitment of large woody debris within riparian zones, particularly along the Middle Fork Humbug and on the main stem of Humbug near the picnic area.

Numerous roads and past management activities coupled with granitic soils have resulted in erosion problems throughout portions of the landscape. There are opportunities to stabilize soils and reduce erosion, but in order to identify specific sites for treatment, a WIN inventory is needed. A Pfankuch Streamside Inventory is also needed in order to rate the condition of the watershed and assess compliance with RMZ standards and guidelines. There are areas where bank failure has occurred and where channels are unstable.

Implementation of a road management plan would be a useful tool for reducing erosion within the landscape. An important first step in a road management plan should be an assessment of road density within the entire landscape. It is possible that there are non-system roads within Humbug which do not occur on transportation maps. Implementation of a comprehensive road management plan could reduce problems with erosion as well as improve fire protection and reduce disturbance to wildlife.

Lastly, three adits within Eliza Gulch are suspected of being sources of contamination. Water samples have been taken and need to be analyzed. If the results determine that they are a source of contam-

ination, appropriate measures will have to be identified to correct the problem.

**Fire and Fuels** - To maintain the health and resilience of the Humbug landscape, it is desired to maintain fuel levels and stand conditions which are more resilient to frequent fire intervals. A general characterization of vegetative community types, known fire frequencies from other areas on the Klamath National Forest, and an assessment of historical fire records suggest that the the landscape experience repeated, low intensity fires at estimated intervals of 6-12 years. Prioritization of areas for treatment should be based on current Fire Risk assessment coupled with other resources opportunities identified previously.

Three specific needs are identified for the conifer elements in the northwest and southwest zones are:

- 1) Treat existing thinning slash to reduce fire hazard to acceptable levels
- 2) Incorporate fuels treatment objectives into future thinning prescriptions to minimize buildup beyond acceptable levels. Particular emphasis is on stands adjacent to remnant conifer patches where desired condition objective is to increase patch size and connectivity.
- 3) Treat natural fuels to reduce and maintain stands in a fuel model 8 in the mixed conifer stands, or fuel model 9 in pine stands. This includes reduction of ladder fuels, as well as accumulated ground fuels. This applies to the conifer element in all zones.

A priority emphasis for the desired condition of the landscape is to maintain the remnant large diameter conifer stands in the southwest zone in a healthy condition with low likelihood of stand loss to wildfire. Since this portion of the landscape is in a moderate to high-risk class, reduction of fuels hazard would be necessary to achieve the desired condition objectives (see Figure 9 - Potential Wildfire Effects Map).

In addition to maintaining the remnant stands, another stated desired condition for the landscape is to increase patch size and connectivity of remnant stands. The objective is to maintain the functional capability of existing patches as late seral habitat, while managing older plantations for recruitment of future structure in the landscape. This broadens the scope of the fuels hazard reduction to include adjacent pole stands and plantations. Specific treatment needs and opportunities would be determined after review of the conditions of stands adjacent to the remnant patches.

A second opportunity was identified in the very western portion of the northwest zone. This is another area of high fire risk (lightning occurrences) and at present relatively low to moderate fire hazard. It is desired to maintain the area in a reduced fire hazard to protect existing patches of remnant stands and minimize potential loss of older plantations and pole stands. Fewer stands have been thinned in this area, therefore pretreatment of fuels prior to a prescribed fire is less of an issue than in the Southwest Zone.

It is also desired to maintain much of the brush element in a vigorous condition, with minimal decadence or accumulation of dead fuel. A patchy mosaic will breakup the fuel bed continuity and minimize potential for large scale stand replacement fires in the brush matrix.

At present, much of the brush matrix exists as an uninterrupted patch type, with a large proportion characterized as decadent and impenetrable. An opportunity has been identified to begin creation of a patchy mosaic on the lower slopes of the northwest zone. This portion of the landscape is identified as geologically sensitive, due to the erosive nature of the granitics. This area also lends itself to the use of mechanized equipment, which allows for a higher degree of control in patch creation and project design than use of prescribed fire. It could serve as a priority area for treatment of the brush matrix to begin transitioning towards a condition more resilient to frequent fire return intervals. Refer to Step 5 for the specific desired condition objectives within the brush types.

# ***Appendices***

## APPENDIX A

### LMP FEEDBACK

1- Recreational River Management Area 13 - MA states activities should be designed to meet retention VQOs yet modeled as Reg 2.

2- Nested LMP Preferred Map has errors - Unsuitable should match unsuitable on Geo Layer but it doesn't. Debi, you are correct that the nested sort did take out Not Capable (brush, grass, and hardwoods) as well as Geo Unsuitable in General Forest Queries...we just need to note this in the document. Also, some of the limited scheduled harvest acres are within partial retention, but do not show...this is because PR was listed first in the sort. Again need at least to note this in the document and include the geo layer map as the primary geo layer to use for project planning.

- nested sort not in order of most constrained in terms of modeling
- geo-layer not consistent with LMP nested sort (ie limited scheduled geo is Reg 3, but PR comes before in the sort and is modeled Reg 2)
- Query acres for General Forest in nested sort is accurate for how it was modeled (brush, hardwoods, or grass not counted towards Reg 1 acres) but those veg types might be important to discuss in terms of condition, age, and distribution within General Forest.

3- Incorporate Order 2 Soils Survey between Draft and Final (need surveys to be completed). Argument here is that inventory be used only for the population sampled).. theoretically, if Order 2 removed acres or change polygons from suitable landbase, then population should be resampled. We will not be receiving \$ from the RO for new Forest-wide inventory for some time.

4- RMZ - S&Gs call for retaining 20 pieces of LWD (40 cubic ft or larger per 1,000 lineal ft) for 3rd order stream. This is not feasible for many habitat types and should read where appropriate to capable habitat types. Also, we question whether a "Good Pfankauch" rating shouldn't be tied more specifically to the habitat types that are capable for supporting this rating, instead of averaging Pfankauch ratings for all habitat types.

5- Partial Retention DFC states that lands capable of growing coniferous veg will be forested, but

Wildlife S&G states that area will be forested to meet mid to late seral stage(3A, 3BC,4C). Suggest rewording that areas will be forested to a seral stage which is consistent with the site capability and ecological processes.

6- LECOH - Sensitive plant located in section 24. New location for Humbug...should be tracked in sensitive plant data layer..will this be considered as a Sensitive Plant Mgmt Area for Humbug area? Richard is digitizing sensitive plant locations, starting with Scott River quads.

7- Fuel Model - strata crosswalk not accurate for Humbug. Crosswalk doesn't take into account thinned plantations, age or condition of brush (decadence) etc. Reference the fire assessment process paper for description of changes made to crosswalk.

8- Garvey Fire not incorporated into the database. Affects fuel model and elements layers. Fire perimeter was digitized on Humbug fuel model layer.

9- Retention MA - Recommend delete "near-natural" language in management goals and DFC statements.

10- Retention and Partial Retention MA - add "where capable" after "forested scenery in management goals and after "forest" in DFC.

11- Need to identify the purity of data layers used, i.e., derived versus data layers.

12- Deer winter range considered as an important component in the landscape. LMP may wish to consider incorporating as key deer winter range between draft and final. Jim McGinnis has sent the deer winter range/fawning maps to the contractor so they will be available in electronic form.

13- Revisit lands capable for conversion identified in 1984, in light of Order 2 survey information. Appearance of discrepancies which may affect modeling. Lands identified as capable for conversion appear to be marginal or unsuitable for timber production in the soil survey.

14- Need follow up on cumulative effects analysis. (Both visuals and hydrology - Humbug was able to assess watershed cumulative effects because the landscape was nested within the clustered com-

partment analysis used in LMP analysis). Where is landscape along threshold for visual impacts?

15- Suggest that between Draft and Final LMP, some edits to the General Forest Mgmt Goals might read "Manage activities to maintain stand health and resilience to wildfire, insect and disease or other natural processes" instead of "Manage activities to maintain stand vigor and protect from wildfire..."

16- How will we know when we have landscapes with isolated stands which LMP modeled as unregulated lands? We won't be able to verify these areas for LMP. They are not included in the nested LMP Preferred Alt sort or as a separate layer accessible to Richard Vandewater (or other Zone GIS coordinators).

17- We need to settle on a single landscape boundary that is appropriate for LMP cumulative effects analysis and modeling, watershed analysis, LAD process, project cumulative effects analysis, etc. There are too many conflicting boundaries and data layers!

18- LMP seral stage crosswalk does not fit Humbug Landscape (Brush and hardwoods that would ordinarily be tracked as an early seral stage 1) may actually be more of a late seral stage-decadent brushfields or shrub-form white oak resulting because of edaphic conditions and 2) may not ever continue to grow through time to reach a "mid seral

stage". This is also supported by some of John Menke's studies in the Marble Mtns where certain riparian shrub complexes are characterized as relatively stable associations and have achieved "near potential".

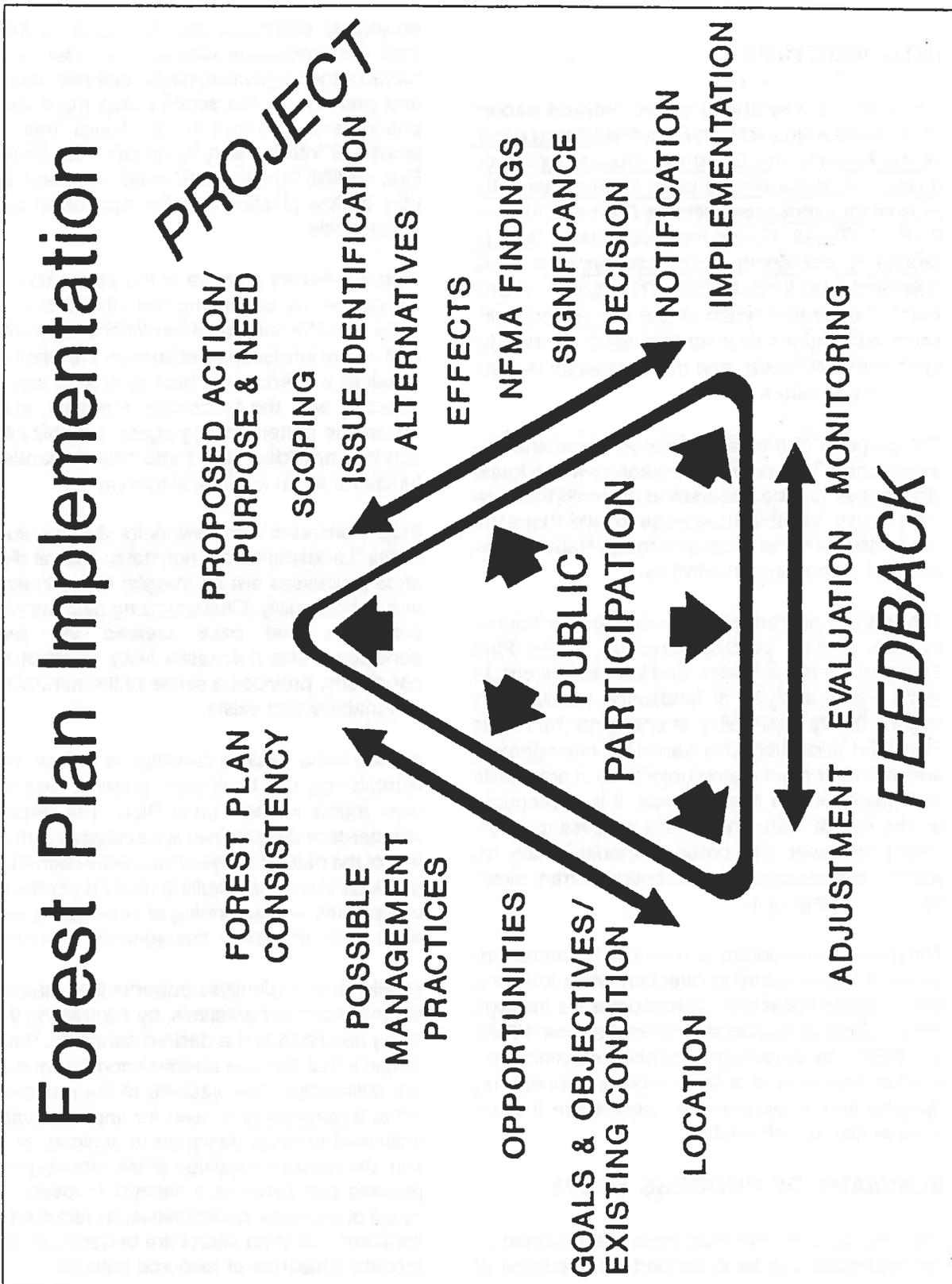
19- RMZ #10 Veg Management S&Gs (MA10-45) "where possible, manage conifer vegetation for a basal area greater than or equal to 25 sq. ft." Doubt if this is always desirable where possible. Replace with this wording, suggest: "Manage conifer vegetation to maintain healthy stocking densities which contributes to 80% stream surface shading during the summer."

20- Add "Retention Visual Quality Management Areas- The S&Gs also apply to areas identified as Variety Class A lands. These lands are not currently shown in the Retention MA, but in Partial Retention. A data sort from the IVQO-IVQO data layer would be required to identify them for the Preferred."

21- RMZ MA #10 - RMZ 1 or RMZ 2 references height of 2 trees and height of 1 tree respectively. We think you mean to say "site trees".

22- Water quality parameters include "water temperature - maintain below 68° F" --we can affect habitat which effects water temperature, but we can not control all elements to ensure the water temperature stays at a specified degree.

FOREST PLAN IMPLEMENTATION HANDOUT



# LANDSCAPE ANALYSIS AND DESIGN PROCESS

## KLAMATH NATIONAL FOREST

### INTRODUCTION

This paper is a synthesis of two previous papers on landscape analysis. The first titled Forest Landscape Analysis and Design: A Process for Developing and Implementing Land Management Objectives for Landscape Patterns (Diaz and Apostol R6 ECO-TP-043-92) and the second titled Our Approach to Sustaining Ecological Systems (Desk Reference R1-MSE-92-02). This paper distills salient points from each of the two papers, with some adaptations to meet the needs of the Klamath National Forest, and the ecosystem dynamics of this province.

The purpose of the Landscape Analysis and Design process is to provide a means by which forest landscapes can be understood as ecological systems, and to use this knowledge to help shape the landscape patterns created through National Forest land management activities.

The strategy presented is intended to be in harmony with existing policies, direction, Forest Plan Standards and Guidelines, and land allocations. In some cases analysis of landscape relationships might indicate desirability of changing the Forest Plan land allocation of a particular management area to better meet stated objectives or standards and guidelines. In that instance, it is appropriate for the Forest Plan amendment process to be invoked. However, this process should initially be viewed as a means of implementing current direction, not changing it.

The process is intended as a vehicle for implementation of forest planning direction while ensuring the ecological health of the resources we manage are sustainable. It provides the link between NFMA and NEPA, by providing a method for defining the desired condition of a landscape and identifying opportunities to achieve and perpetuate the desired landscape character.

### SUMMARY OF PROCESS STEPS

The first two steps in the process are designed so the landscape can be described in the context of

ecological structures and functions. In the first step the landscape elements are described in terms of the vegetative matrix, patches, corridors, and patterns. In the second step the ecological phenomena (referred to as flows) that move across, or interact with, landscapes are identified. Fire, wildlife, humans, and water are some examples of flow phenomena that operate at a landscape scale.

Step 3 provides a sense of the complexity of the landscape; by describing the interactions of the flows with the individual landscape elements, as well as the landscape patterns on the whole. Individual flow phenomena have a specific way of interacting with the landscape elements, and the landscape pattern in aggregate. It is this interaction that provides insight into how the landscape functions as an ecological system.

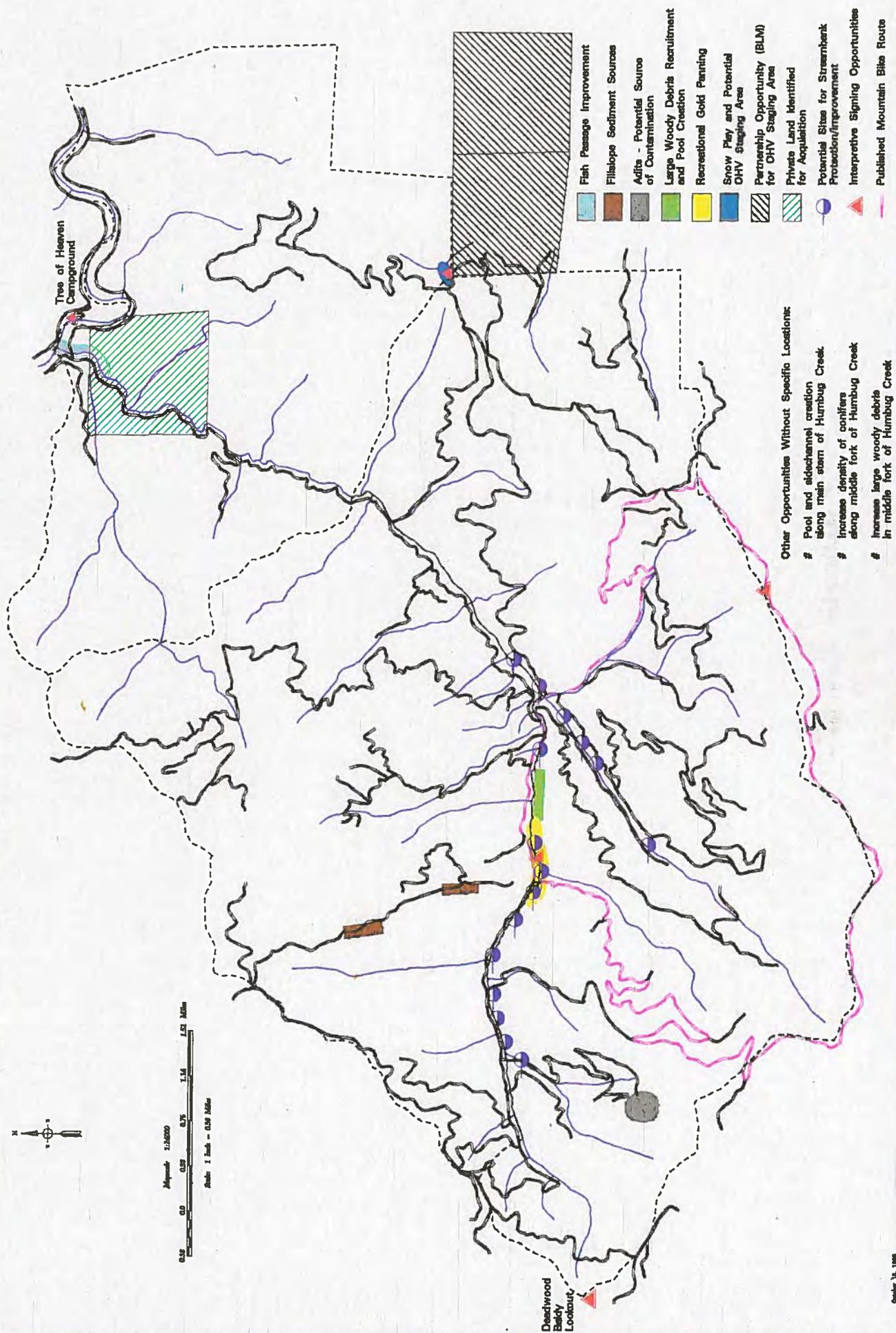
Step 4 provides a framework for defining sustainability. Landscapes are not static; natural disturbance processes are an integral factor in ecosystem sustainability. Characterizing past conditions, processes that have created the present conditions, and processes likely to affect future conditions, provides a sense of the natural range of variability that exists.

In Step 5 the desired condition is defined by first establishing the landscape patterns and objectives found in the Forest Plan. The applicable standards and guidelines are evaluated in the context of the natural range of variability defined in the previous step. The resulting desired condition encompasses understanding of ecological processes at work, as well as management direction.

Finally, Step 6 identifies opportunities, and possible management practices, by contrasting the existing condition to the desired condition. Potential projects that achieve desired condition objectives are delineated. The outcome of the process provides a purpose and need for implementation of individual projects designed to achieve, or maintain, the desired condition of the landscape. This process can serve as a catalyst to identify a full range of resource opportunities; by reducing functionalism, planning efforts are better integrated to provide a balance of resource outputs.

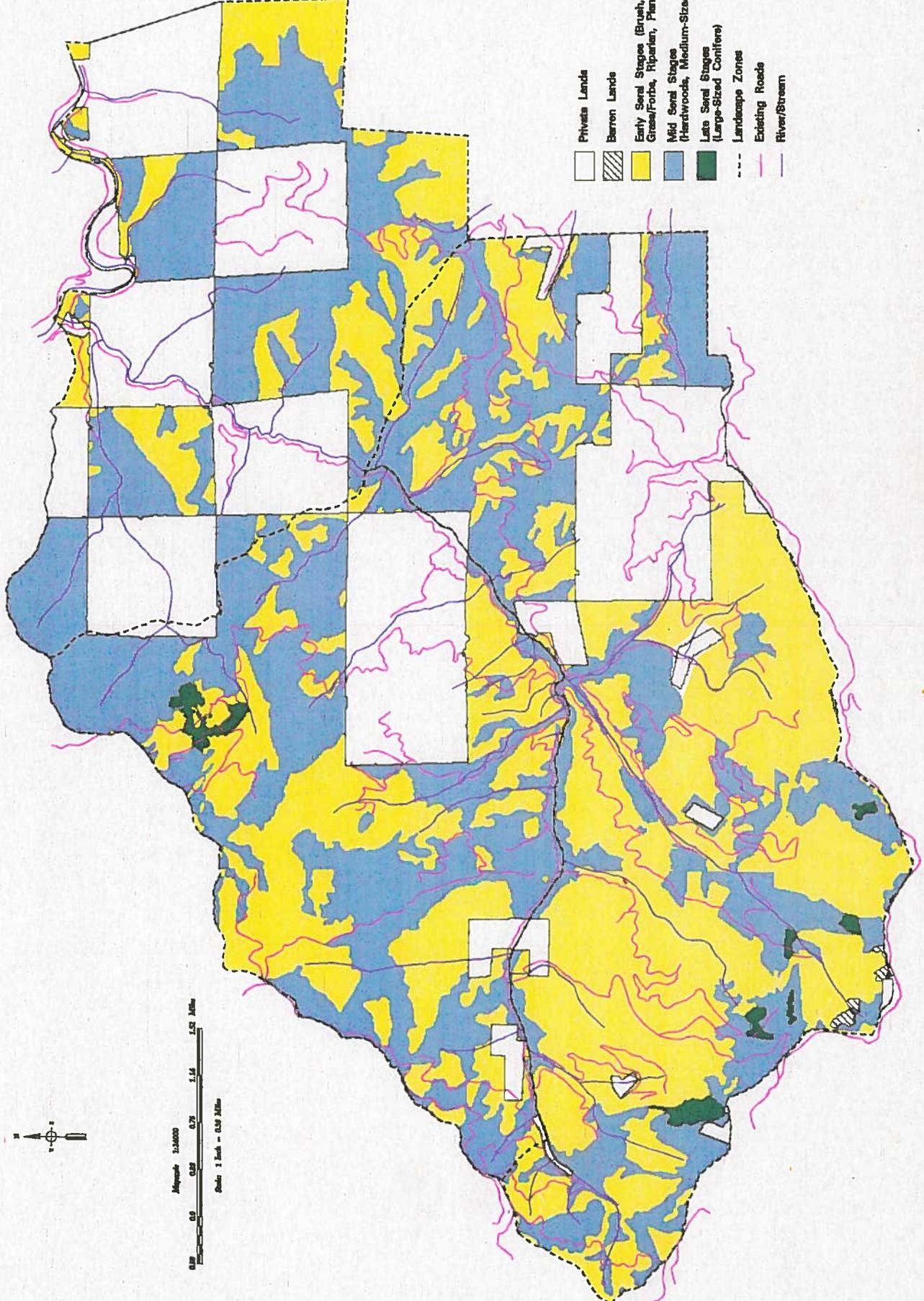


# Humbug Landscape Management Opportunities (2 of 2)





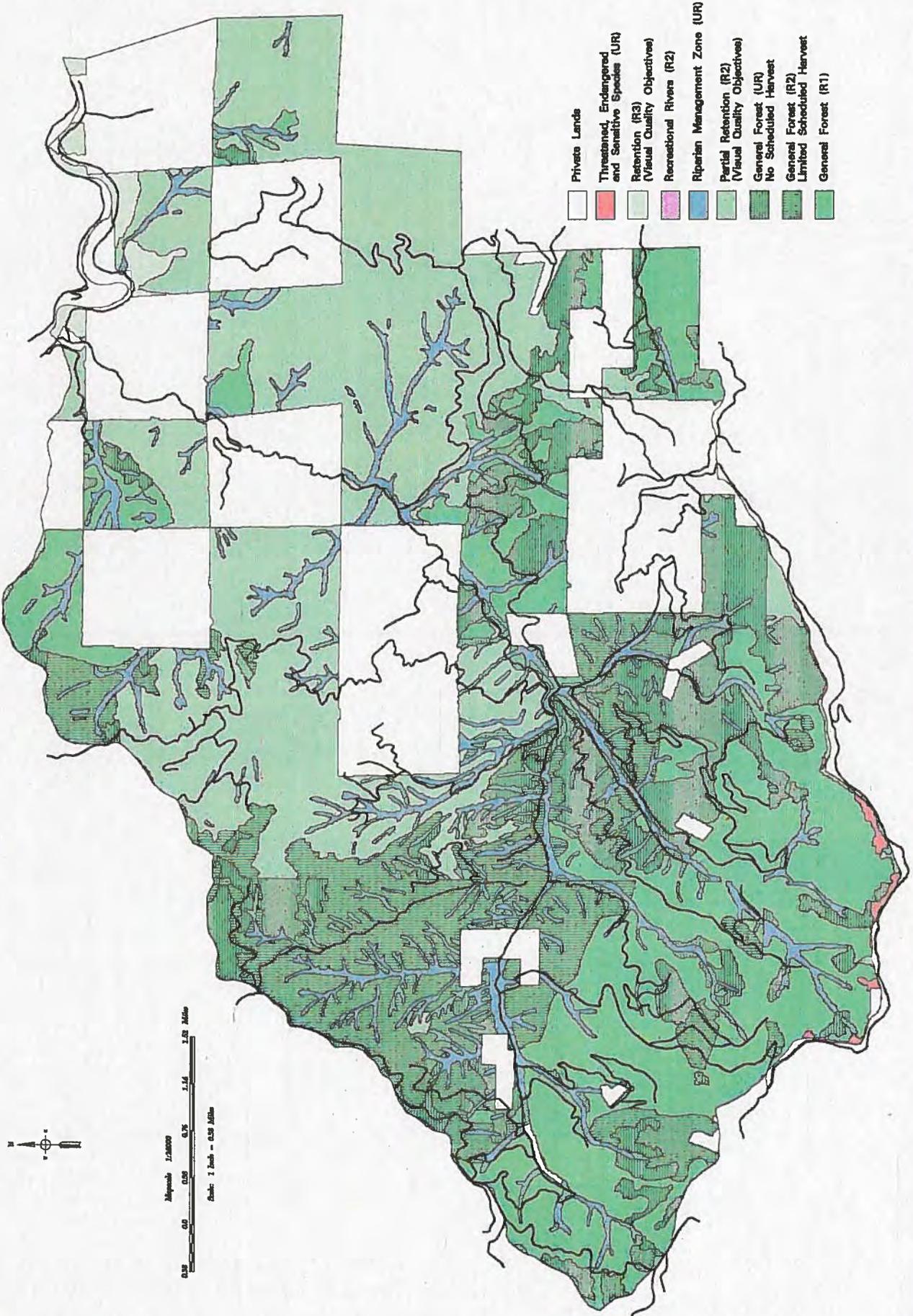
# Humbug Landscape Existing Seral Stages



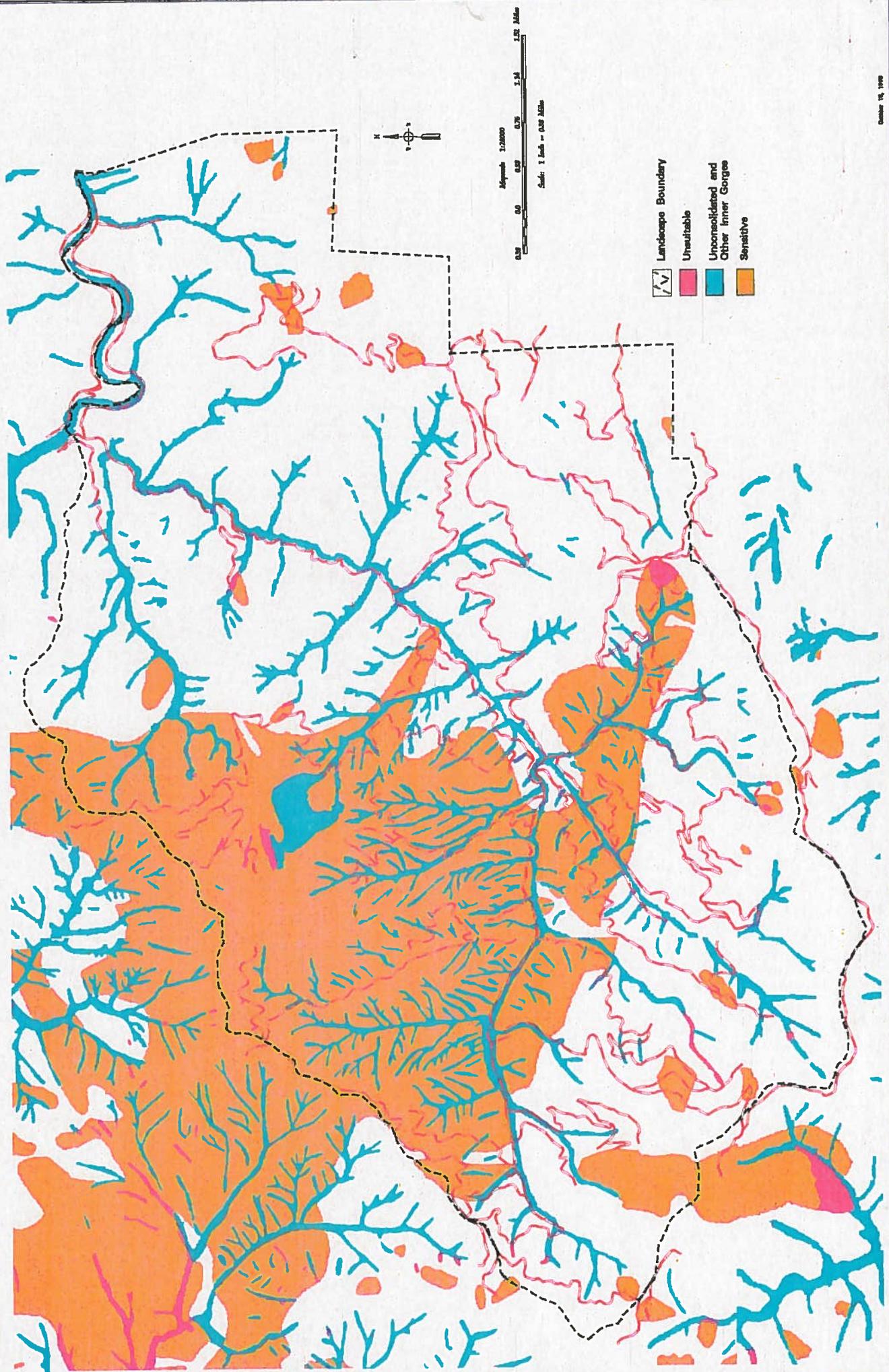
- Private Lands
- Barren Lands
- Early Seral Stages (Brush, Pole-Strad Conifers, Grass/Forbs, Riparian, Plantations)
- Mid Seral Stages (Hardwoods, Medium-Sized Conifers)
- Late Seral Stages (Large-Sized Conifers)
- Landscape Zones
- Existing Roads
- River/Stream



# Humbug Landscape LMP Preferred Alternative

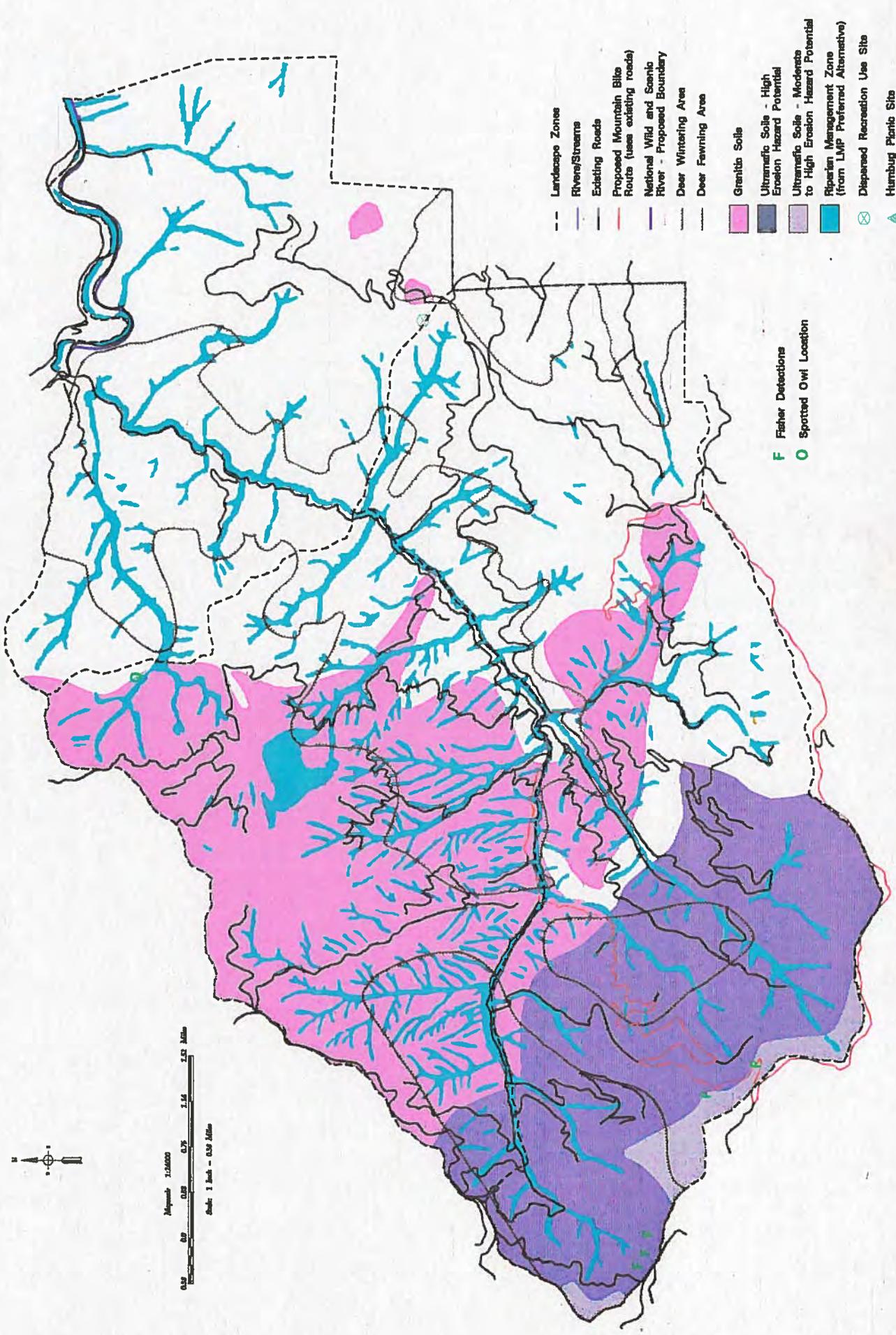


# Humbug Landscape Management Areas Sensitive Geo-Types



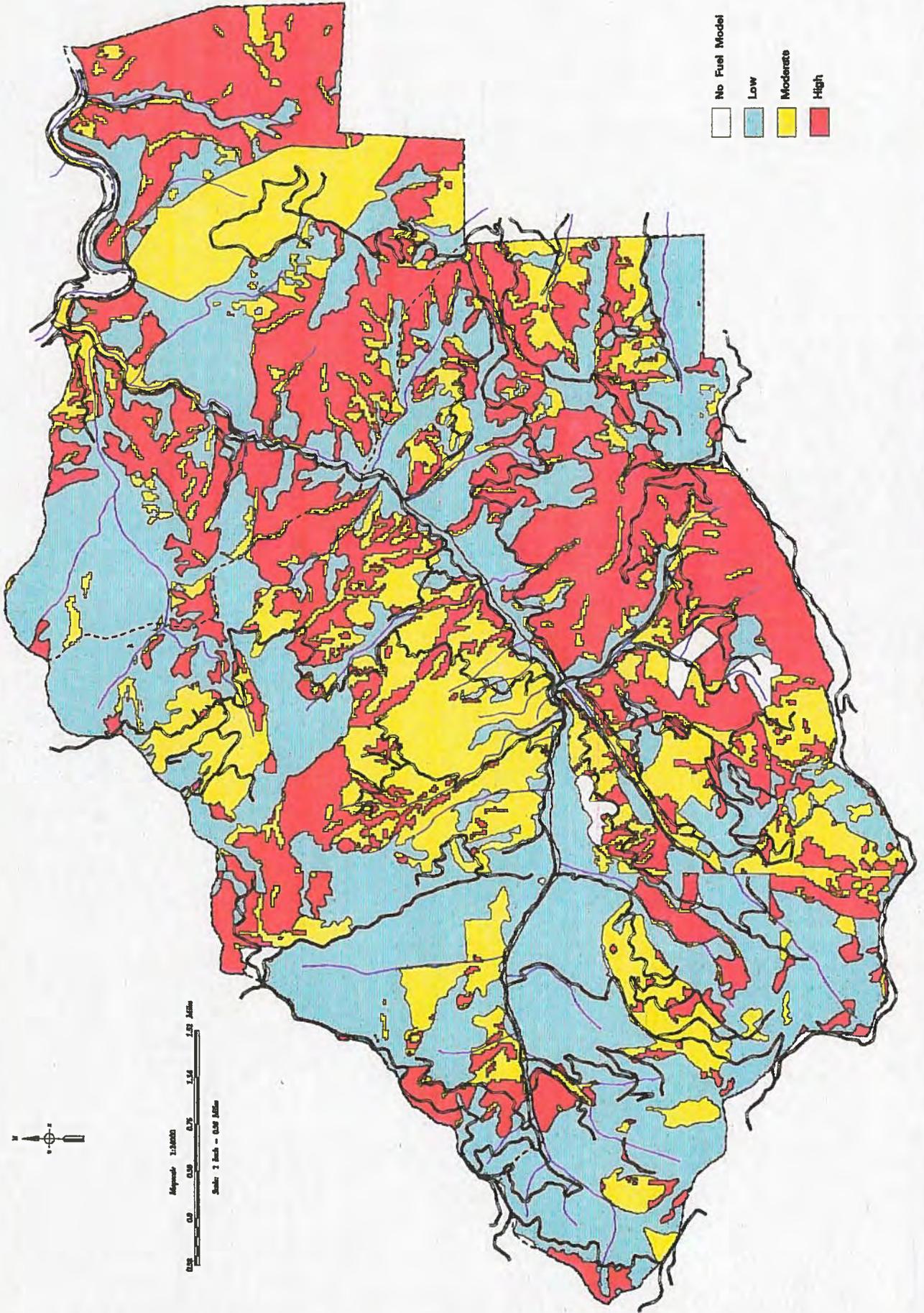


# Humbug Landscape Landscape Flows



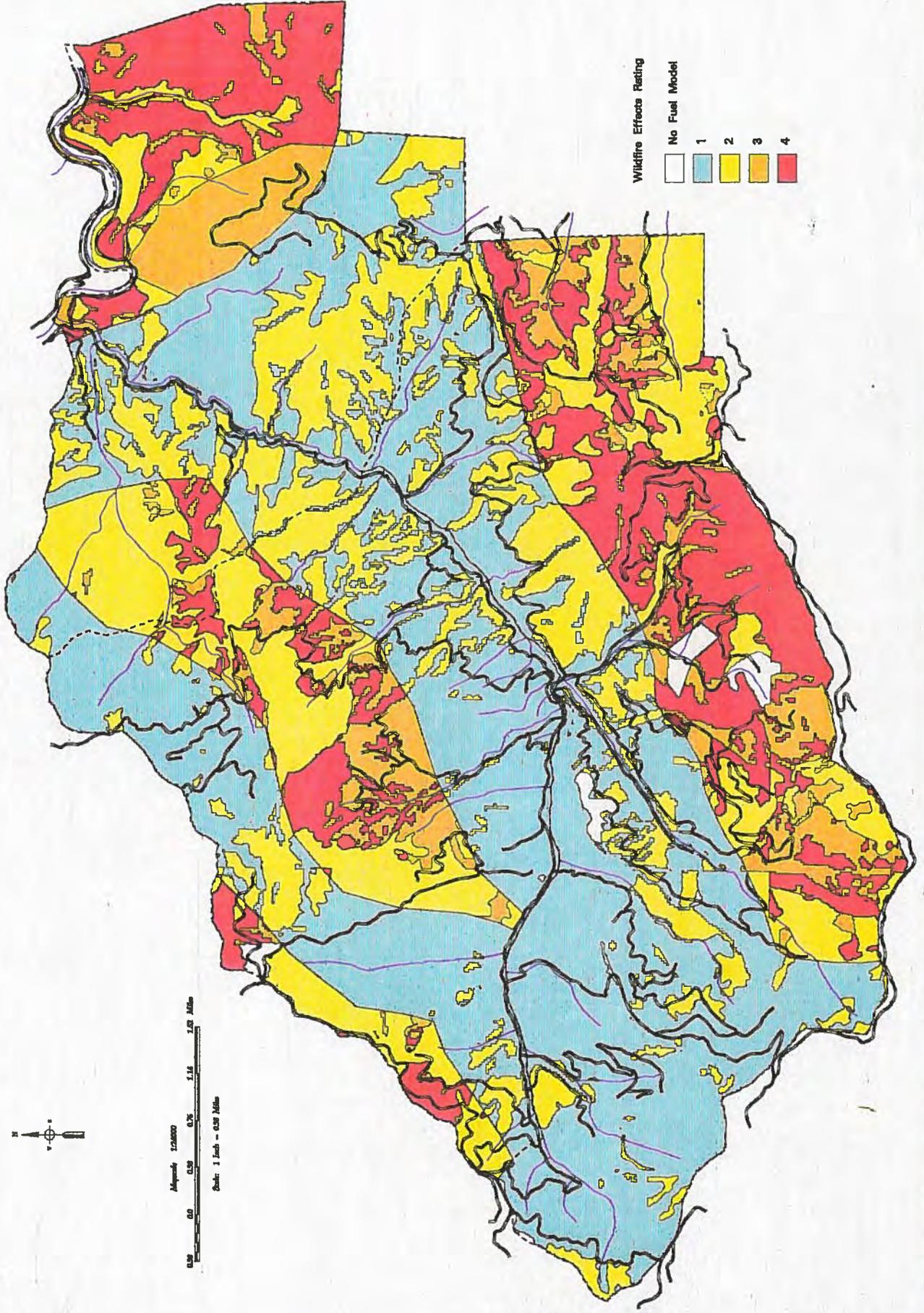


# Humbug Landscape Fire Hazard Classes



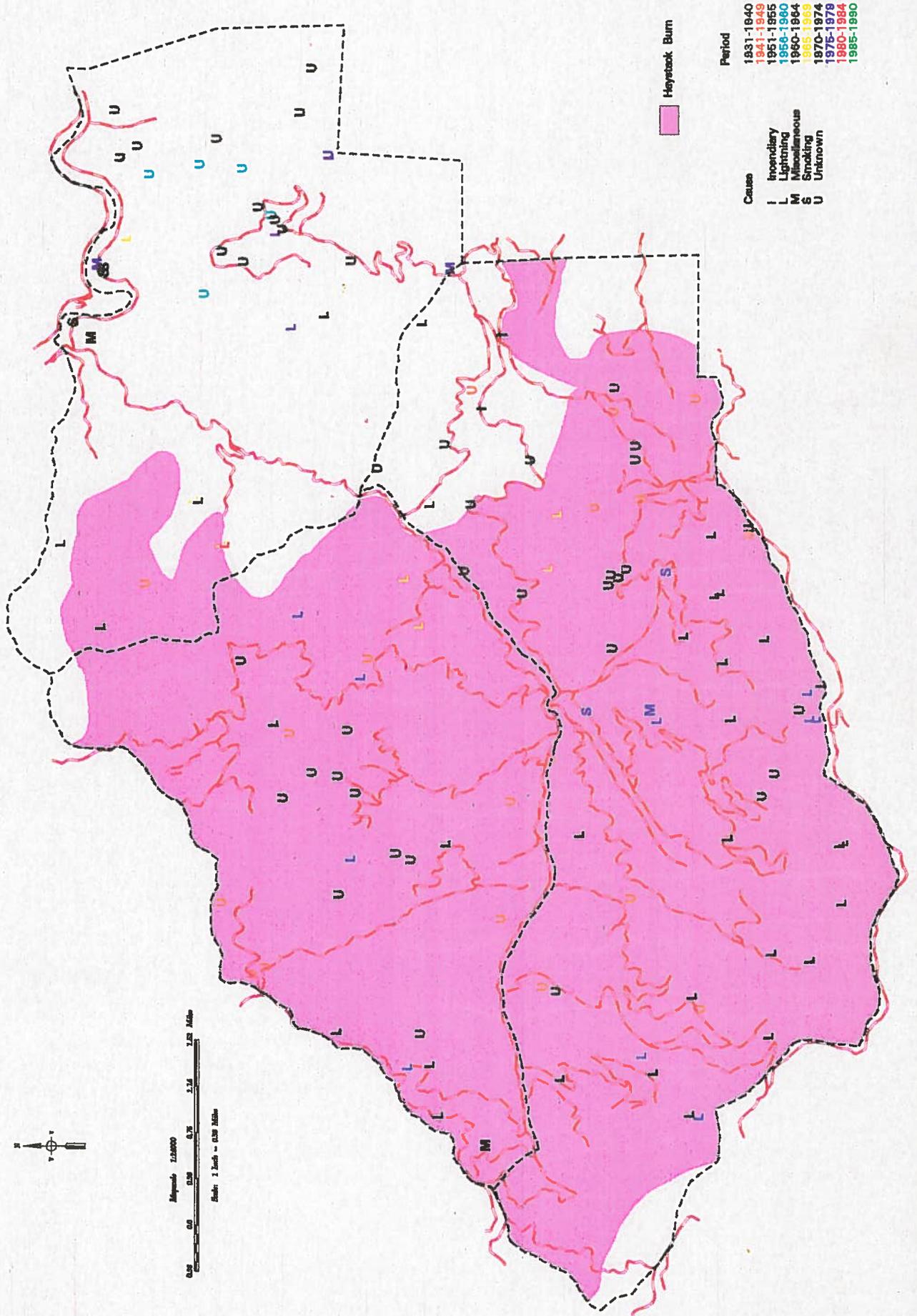


# Humbug Landscape Potential Wildfire Effects





# Humbug Landscape Fire Occurrence History



## SCALE OF ANALYSIS

Since the analysis process encompasses areas roughly between 10,000 and 100,000 acres, the level of detail will be general in nature. This general assessment of the landscape conditions serves to define management concerns and issues prior to initiating the NEPA process.

The analysis record serves as a source document for general characterization of landscape conditions and interactions. It can be used during the NEPA process to provide a framework for generation of alternatives, and may make recommendations where additional information is needed to assess environmental consequences. While a more detailed analysis may be necessary for NEPA sufficiency, that analysis can be focused on project specific issues and potential effects in subsequent NEPA documents.

## BASIC INFORMATION NEEDS

For every landscape there is baseline information necessary to perform the analysis. Additional information that is needed will depend on the flows, uses, and functions characteristic of each individual landscape. The baseline information includes:

**Land Management Plan map** - Defines spatially the management areas allocations in each landscape. General knowledge of land allocations for adjacent landscapes is also necessary.

**Topographic map with transportation system** - Serves as a point of reference for unique features or areas of concern, as well as general orientation of the landscape.

**Aerial photos** - Latest flight lines as well as earliest photos available. Obliques, orthophotos, SPOT images, and flight lines taken just before and after major events also serve as useful aids.

**Vegetation map** - (may be derived from timber type or ecological type data)

**Fuel Model map** - (forest crosswalk based on timber strata characteristics)

**Fire Risk map** - Based on district information from fire history atlas.

**Fuel Hazard map** - Developed from the fuel model map after initial field review. Combines fuel model with topographic features of slope and aspect to show hazard potential.

Additional maps that will be of use throughout the process include:

**Geohazard map** - May be an LMP product or district product in areas where additional field review has been accomplished.

**Order 2 Soils** - Will be uses when it is available. Particularly helpful if regenerability or productivity is a concern. LMP information could be useful in a gross scale for identifying unsuitable or noncapable grounds.

**Plantation map** - In landscapes with higher proportions of managed plantations, silviculture background information is a useful tool.

The initial planning meeting should identify resource concerns specific to a landscape; including wildlife use, unique features or habitats, human use patterns, or sensitive resources (i.e., sensitive plants, soils, or cultural resources). Additional needed map layers will be determined from this initial meeting. This meeting should be scheduled well in advance of the analysis process to provide sufficient lead time for data and map preparation.

## PROCESS STEPS

### STEP 1 - LANDSCAPE ELEMENTS

Since the relationship between structure and function is the keystone of understanding landscapes as ecological systems, identification of the landscape elements present, and their arrangement, is fundamental to getting started with any landscape analysis and design project.

The first step is to identify, map, and describe existing elements of the landscape and the landscape patterns. Vegetation will be the key component in identifying existing landscape elements. Landscapes are commonly described as having three kinds of elements: a matrix; patches; and corridors.

The **matrix** is defined as the most connected portion of the landscape, that is, the vegetation type that is most contiguous. An important ecological

feature of the matrix is that it is thought to exert strong control over landscape flows because of the connectivity of habitat it provides.

**Patches** are areas of vegetation that are relatively homogeneous internally and differ from what surrounds them (either the matrix or other patches). Examples of possible patches include:

- Meadows
- Rock outcrops
- Lakes
- Shrub, forb, and/or grass patches (including young plantations)
- Stands of trees in any seral stage that are distinctly different from the surrounding vegetation

The actual matrix/patch combination will vary between landscapes. A few examples of combinations that could be found in Klamath landscapes include:

- Matrix of mature forest with patches of plantations at various ages
- Matrix of oak woodland with small timber patches
- Matrix of hardwoods and scattered conifers with patches of young conifers
- Matrix of early seral vegetation (from large fires) with patches of remnant stands

In a diverse landscape that is quite porous, it may be difficult to distinguish a matrix in the variety of patches found.

**Corridors** are landscape elements that connect similar patches through a dissimilar matrix or aggregation of dissimilar patches. A corridor can also serve to facilitate flow of different material or organisms. Examples of corridors include:

- Roads, trails, or transmission lines
- Riparian areas along streams
- Habitat linkages, especially in landscapes with physiographic features which limit terrestrial movement

View the process of delineating landscape elements as one of identifying areas that are homogeneous with respect to the following characteristics:

- Plant community or ecosystem type
- Stage of succession, stability
- Within-patch structure
- Ecological capability, productivity

Other patch attributes, such as origin or likelihood of repeated disturbance may be included. Other characteristics which will help describe the landscape elements are:

- Average stand size
- Range of variability
- Patch shapes
- Patterns that are evident

Potential resources to help define landscape elements include:

- Current data bases, such as timber type information
- Typing from recent aerial photos, which can then be digitized on a map
- Complete new field inventories, such as an EUI or existing vegetation inventory
- LandSat remote sensing imagery

Nonvegetative elements that are also of value to map include:

- Geomorphology
- Soil productivity
- Fire hazard and potential for loss

The objectives of the analysis drive the degree of resolution that is needed. In other words, look ahead to the landscape flows or functions these landscape elements will be evaluated against, and choose a level of detail that makes analysis of relationships possible.

## STEP 2 - FLOWS AND LINKAGES

Key to understanding ecological functions at the landscape level is the concept of landscape flow. Certain ecological phenomena move across or interact with landscapes, or otherwise operate at a landscape level.

Flow phenomena are those things that move across or through landscapes, whether in the air, over land, in the soil, or in the water. They can be energy or material flows, expressed through living or nonliving ecosystem components. Flows may be generalized over large sections of the landscape, or confined to distinct patch types, or a particular landform feature.

It is not realistic or necessary to consider all the landscape flows in a particular analysis. Since the process is intended to lead toward a pattern of landscape elements that foster continued function of important landscape flows, two key questions should be asked:

- In the future, what flow phenomena will be critical in this landscape?
- Which flow phenomena are most likely to be affected by human activities?

Some flows may not be seriously affected by changes in the landscape pattern and thus are not as critical to the analysis.

The next phase of this step is to describe in spatial terms (on a map if possible) how the landscape flows are occurring. The following questions should be addressed:

- Where in the landscape does a particular flow occur?
- Is it dependent on a particular landscape element (matrix, corridor or patch type)?
- What is the direction of the flow?
- What is the time (e.g., is it seasonal)?

Some examples of flows include:

Water*	Fire*	Wildlife*
Wind	Fish	Humans*

\* Indicates those flows that are likely to be critical in every landscape on the Klamath National Forest.

Until this point, all discussion of landscape elements and critical flows are framed within the boundaries of the landscape being analyzed. Because different landscape processes operate at varying scales, different landscape flows require varying land areas.

The final phase of this step analyzes how the landscape, with its identified elements and critical flows, fits into the larger scale context. At this point the team examines how the most important flow phenomena interact with areas outside the analysis area, and what landscape elements contribute to, or inhibit, that interaction. The team should ask the following types of questions in order to get a better picture of these linkages:

- What things cross the borders and how do they do it?
- Does it contain a portion of a critical migration route for a certain wildlife species?

- How does the landscape fit into the province or subregion?
- Is it unique for any reason? Why?

Where flows have been identified to move across the landscape boundaries, provide a general characterization of linkages between landscapes. Consider the existing structural elements and land use expectations for the adjacent landscape. This does not require a detailed analysis, but rather an overview of aerial photos and land management direction for adjacent landscapes.

A key point to remember is to avoid excessive detail or analysis in this step. A team could get bogged down very quickly trying to relate everything to everything else, out to an unreasonably large scale. The practical approach is to let logic, information, and time available constrain this step, obtaining enough understanding of the landscape relationships to at least determine whether local analysis area and National Forest objectives are being met.

### STEP 3 - INTERACTIONS

Individual landscape flow phenomena will have specific ways of interacting with both a given landscape element AND the landscape pattern in aggregate; it is this interaction that provides insight into how the landscape functions as an ecological system. A landscape analysis that ignores any of the major flow phenomena, or fails to synthesize the relationships among them, is incomplete.

This step describes how the landscape elements (matrix, patches, corridors and pattern) function relative to the landscape flows. The central question for this step is:

- How do the individual landscape elements, as well as the landscape pattern, interact with (foster, inhibit, increase, direct, etc.) individual landscape flows.?

Also consider the sensitivity of various flows to each landscape element, or the importance of an element to a specific flow.

Sometimes it is useful to think in terms of the five basic categories of functions (capture, cycling, production, storage, output). Again, avoid unnecessary detail. It is inefficient to analyze every possible combination of landscape element and flow when such analysis does not appear to be yielding useful information. Keep in mind that the ultimate

objective is to describe how the landscape performs as a system.

The lack of information can be a problem. Not only is empirical data about the relationships between flows and elements lacking, but understanding of some of the conceptual aspects is rudimentary. However, it is important to use what IS known. Basic information that is lacking, or critical questions that cannot be answered, should be tracked. Research assistance is critical to better define interactions.

There are several ways to display interactions including:

- Maps
- Narrative description
- Matrix of elements and flows with brief description of each interaction
- Graphs displaying sensitivity of flows to elements

#### **STEP 4 - DISTURBANCE REGIMES, RANGE OF VARIABILITY, TRENDS, AND SUSTAINABILITY**

The origin of a landscape describes how it was created. Origin is important in understanding landscape dynamics from the standpoint of change, i.e. how likely is the event to occur again and create additional patches of a certain type.

The objectives of this step are to determine:

- What "natural" disturbance agents have been responsible in shaping the landscape pattern over time?
- What successional steps will occur following disturbance?
- How stable are the various landscape structures?

Landscapes and associated ecosystems are not static. One cannot use a single point in time to describe natural landscape patterns. Landscapes are dynamic and patterns change (sometimes radically) through time. The stability of the existing condition can be described in light of successional trends and the disturbance processes.

Disturbances are events that result in radical change in vegetative characteristics within the landscape. They can be described in terms of: type, intensity, frequency, duration, and effect. Fire, wind, insects, disease, and mass movement are often the disturbance elements that influence landscape patterns in the Klamath province. Their

relative importance varies from one area to another. In this process it is important to focus primarily on those that have major influence on landscape patterns and ignore any others.

Stability refers to the likelihood a landscape element will change significantly over time and the rate of that change. Changes need to be viewed from at least two perspectives, individual landscape elements and overall landscape pattern. Patches of individual landscape elements tend to be less stable in earlier successional stages and generally more stable during late mature stages. The stability of the landscape pattern (the arrangement of landscape elements) is basically a reflection of the combined stability of individual landscape elements and their position relative to each other.

It is important to first identify the natural disturbance processes responsible for shaping the character of the landscape. Describe the effect they would have on landscape patterns (arrangement, composition, size and shape of patches, etc.) In order to better define critical disturbance agents, the following questions should be addressed:

- What agents of change at the landscape level would have existed in the natural ecosystem?
- What would their effect have been on the landscape pattern (arrangement, composition, size and shape of patches; connectivity; characteristics of the matrix; etc.)?
- How might natural landscape patterns have influenced the behavior of disturbance phenomena?

Answering these questions shows what the landscape might be (the spirit of the place). It doesn't tell you how the landscape should be.

The second stage identifies a natural range of variability for the landscape elements. This is determined by describing the range of conditions likely to be created by disturbance processes and the stability of various landscape elements. Since landscapes are not static, a single point in time cannot be used to describe natural landscape patterns. In addition to identifying a range of seral stages, consider the structural attributes that were present in natural stands, the sizes of patches, and the likely arrangement on the landscape. Estimate range of conditions created by disturbance on the landscape over time.

Information about disturbances and their effects on landscape patterns is limited. Use information available about past disturbances including: old aerial photos; fire history atlas; lookout photo point contrasts; and research in landscapes with similar conditions.

The final stage characterizes general trends of the existing landscape elements if left unmanaged. It is not necessary to describe each successional step, but to characterize general trends and expected changes. Information that is useful at this step would be:

- Fire hazard map which can be used along with fuels information and environmental variables to assess wildfire hazard potential and associated risk to loss of resource (i.e., wildlife habitat, slope stability, soil productivity, water quality).
- Maps of suitable habitat for wildlife tracked as a key flow
- Maps depicting sensitive resources
- Maps of known insect and disease activity and associated risk rating.

Portrayal of expected future trends without management, helps identify areas where actions are necessary to maintain the desired condition. This can be particularly useful in terms of addressing issues such as wild fire potential, habitat suitability, or forest health.

#### **STEP 5 - FOREST PLAN OBJECTIVES AND MANAGEMENT DIRECTIONS**

The Forest Plan provides a framework and objectives around which the pattern of the landscape is expected to develop, and reflects agreements made between the public and the Forest Service. This step takes information from the Forest Plan that will help shape the desired condition for the landscape. This is an essential first step in designing landscape character and pattern for a particular area.

The objective is to define the applicable forest standards and guidelines; and use the knowledge of the landscape character, and ecological processes at work, to describe the desired condition of the landscape.

The task is to decipher from the Forest Plan what decisions have already been made about the desired landscape pattern. It is important to avoid trying to design all management direction (i.e., levels of use by particular resources). This will be

done at different levels of the planning process. Deal only with Plan direction that influences landscape patterns and character.

Review Forest-wide Direction in addition to individual Management Area direction. Usually, Forest Plan direction does not specifically address landscape pattern, but refers to it indirectly (for example, standards and guidelines describing opening sizes and arrangement in a deer and elk winter range allocation). A careful reading of the Forest Plan direction will yield a good deal of information about landscape pattern that may be couched in other terms.

There are varying levels of specificity concerning discussions of landscape pattern within each management area. Sometimes it is very vague. The decision maker needs to be involved in setting direction in these cases.

This step does NOT involve making decisions about land allocations. Those decisions were made in the Forest Plan. This step describes HOW those earlier decisions will be carried out for a particular area, with respect to landscape pattern and function.

The task is to produce a narrative description of future landscape patterns. The future landscape is to be described in terms of types and arrangement of landscape elements (matrix, patches, and corridors) through time.

Do not deal with all the resource issues that may be present, only with those that influence landscape pattern. Issues that relate to the tools used to achieve objectives such as herbicides and clearcutting are not dealt with here, they are better addressed during the NEPA process.

To complete this step, resource specialists need to identify important landscape functions/resource concerns. This information can be gathered from several different sources:

- Management Area Goal and Desired Condition Statements which generally provide a hierarchy of values or expectations for the analysis area.
- Public scoping to identify other important resource values.
- Resource specialists will help identify key values/resource concerns from maps, reports, and observations.

Ask some of the following questions to help make interpretations about structural elements and landscape patterns:

- Are there some rare, unusual, critical, or unique landscape elements we want to protect or enhance?
- Are there patches or areas of the matrix between which connectivity should be maintained?
- Is there anything missing that should be introduced or restored?
- To what extent, and where, do we want to emulate certain elements of natural landscape patterns?
- Are there areas of the landscape where it is desirable to minimize fragmentation?
- Are there areas where gradual changes rather than sharp edges are desirable?
- Are there areas where a high degree of edge and contrast is desirable?

Use the answers to the previous questions, and objectives from the Forest Plan, to develop statements about desired condition and pattern. The following questions then get to specifics (it might be best to answer these for each management area):

- What kinds, sizes, shapes, and arrangements of patches/corridors/matrix are desirable in different parts of the landscape?
- What kind of vegetative structures are desirable to maintain over time in various parts of the landscape?

Some people may become frustrated at this point because there may be more than one right answer. This part of the process is highly subjective. This is where excellent teamwork is very important.

#### **STEP 6 - MANAGEMENT OPPORTUNITIES**

This step is a synthesis of everything learned in the previous steps. The first objective is to establish any deliberate patterns that should be created or perpetuated. The second objectives is to compare the existing condition with the desired condition to identify opportunities, and possible management practices, to achieve, or maintain, the desired condition. The actual outcome of this step will depend on:

- Existing condition
- Critical flows
- Stability of landscape elements
- Management direction
- Degree of difference between existing and desired condition

The goal is to describe the relationship of future vegetation patterns to landforms, develop a conceptual circulation system of key flows, and fit the overall program to the landscape in a way that allows it to be visualized, mapped, and described.

An analysis of topography is an important first step because it defines, in large part, the operational environment of the landscape. It has a strong influence on natural vegetation patterns, flows of animals, wind and water. By "reading" the landforms, one can get a feel for how vegetation patterns might be placed in a manner that promotes connectivity, or what mixes of patch types reflects natural landscape diversity.

The second piece of information is a map which shows the most important pattern shaping influences derived from the Forest Plan, such as:

- Where forage openings are needed
- Where connectivity should be improved
- Which areas should be protected or restored

Again, the focus should be on items that will influence the large spatial patterns. Identifying and agreeing on the Desired Condition builds awareness of the limits of a particular landscape to optimize every resource objective.

There is no scientifically correct way to manage forest landscapes. While the science of landscape ecology is essential as background for making reasonable decisions, no amount of analysis can substitute for creative thinking. It is also important to remember that there is no way to "design" the way out of unresolved policy conflicts. Whether to place an area in wilderness or timber production is not a design question. This process has been developed to implement previous land use decisions (Forest Plan) at the landscape level.

It is easiest to begin with the most clearly defined pattern creating objectives, such as areas that are to be preserved, or only minimally altered. The idea is to give form to areas that will ultimately be treated in a similar manner.

Roads and trails (human circulation) should be an integral part of this step. Not only in respect to the interaction with other flows such as wildlife, but also as vital corridors for the human flow.

Generally the goal at this stage is to paint a picture of the large scale landscape pattern that is clear enough for people to see and interpret, and for further development of site specific projects.

Once this step is finished, the analysis and design process is complete. This product is used as a tool for:

- Generating project proposals
- Establishing the purpose and need for project implementation
- Issue identification
- Generating alternatives
- Evaluating the effects of proposals on landscape level phenomena
- Communicating with the public about how implementation of projects will affect scenic values and function ecologically
- Development of multi-resource plans for out year funding
- A catalyst for requesting ecosystems management funds for individual projects designed to achieve, and perpetuate, desired condition objectives at a landscape scale.

### **PUBLIC INVOLVEMENT**

It is a goal of the Forest Service to build and strengthen relationships with the public that we serve. Involving the public in processes beyond traditional scoping, as required by NEPA, is seen as a positive step in building those relationships.

Public involvement is the primary responsibility of the district. The core team can provide support in terms of describing the outcome of the analysis and design process. The public involvement strategy will be a topic for discussion at the initial planning meeting; including the level and timing of public involvement the district chooses to establish, as well as the assistance to be provided by the core team.

Involving the public in this process is encouraged. How and when to involve the public is left up to the discretion of each line officer. However, some general recommendations are provided .

While it is optional to involve the public at any point in the process, it is recommended to begin after

step five. Providing basic information to the public will help to focus the involvement efforts on providing input to the desired condition. For most effective involvement be prepared to provide the public and overview of:

- A general description of existing condition (relative to the landscape analysis)
- The critical flows and interactions that were tracked through analysis (as well as acknowledgement of those flows not tracked and why)
- Identified LMP prescribed patterns and objectives
- Issues, Concerns, and Opportunities that have been identified internally.

Public involvement during the landscape analysis and design process should not be confused with public scoping for NEPA sufficiency. This will come during the project planning phase. The level of public interest and resource issues that are raised can be an indicator of the level of NEPA documentation that may be warranted for specific projects within the landscape.

The goal is to allow an opportunity for the public to present their opinion of how the Forest Plan will be implemented within the landscape. Important resource issues will have been identified and this information can be used to prioritize landscape functions that are of particular public concern. This adds to the information that will be used when developing objectives about landscape patterns and functions.

Be clear that the objective is to establish a desired condition for a particular landscape, not to address environmental effects or evaluate project alternatives in this process. The input should link back to landscape ecology concepts of elements, flows, and interactions. Issues such as effects of herbicides, protection of archeological sites, etc. will be addressed during project evaluation. This process deals with desired conditions and critical flows to be maintained in the landscape.

Clearly define the public involvement objectives prior to initiating contact with potentially interested and affected publics. Utilize techniques such as those recommended by the Institute for Participatory Management and Planning (Hans and Anna Marie Bleiker) to develop a public participation strategy.

## APPENDIX D

### SCALE OF ANALYSIS

Analysis will extend over different levels in the hierarchy depending on the elements that are to be addressed.

<b>Analysis Scales and Relationship to Ecological Systems and Elements</b>									
	Global	Conti- nental	Physio- graphic Region	Physio- graphic Zone	Physio- graphic Area	River Basin	Water- shed	Stand or Reach	Site
Air Quality	*	*	*	*	*	*	*		
Water Quality			*	*	*	*	*	*	*
Weather	*	*	*	*	*				
Hydrology			*	*	*	*	*	*	
Fish/Aquatic Systems			*	*	*	*	*	*	*
Geomorphic Processes				*	*	*	*		
Fire/Fuels Regime & Risk			*	*	*	*	*	*	
Corridors	*	*	*	*					
Travel Linkages					*	*	*		
TES Viability		*	*	*	*	*	*	*	*
Fragmentation	*	*	*	*	*	*	*		
Habitat Relation- ships			*	*	*	*	*		
Forest Insects and Pathogens				*	*	*	*		
Nutrient Cycling/ Long-term Soil Production				*	*	*	*	*	*
Grazing Regime			*	*	*	*	*		
Succession- Community Structure/ Composition				*	*	*	*	*	

At the River Basin scale, the analysis may be based on extensive information and judgement. At the Watershed scale, analysis should be based upon the best available quantification of elements and processes. The same ecosystem elements and processes are used for both natural and existing condition descriptions to facilitate comparison.

## APPENDIX E

### ORDER 2 SOILS SURVEY SUMMARY

**1- Suitable for Commercial Timber Production (25% of survey area):**

A --Forest Survey Site Class 2-4 include the following mapping units: 8, 9, 10, 11, 15, 19, 23, 28, 29, 43, and 49.

B --Forest Survey Site Class 4-5 include the following mapping units: 6, 7, and 18.

**2- Marginal for Commercial Timber Production (35% of survey area):**

This includes the following mapping units: 12, 13, 17, 20, 21, 22, 35, and 40.

**3- Unsuitable for Commercial Timber Production (40% of survey area):**

This includes the following mapping units: 30, 31, 32, 33, 37, 38, 39, 41, 44, 47, and 50.

**NOTE:** A description of the map units and a table of management interpretations follow.

#### Map Unit

7--Bluesprin - Sawtell complex. This map unit is on mountain sideslopes. Slopes are 35 to 65 percent. Elevation is 2,600 to 3,400 feet. Aspect is generally north or northeast, but all aspects do occur. The natural vegetation is mainly Douglas Fir, Ponderosa Pine, and California Black Oak. The average annual precipitation ranges from 20 to 30 inches; the average annual air temperature is 52 degrees F., and the average frost-free season is 125 days.

This unit is 60 percent Bluesprin very gravelly loam and 30 percent Sawtell very gravelly loam. The Bluesprin very gravelly loam is on the upper portion of the slopes. The Sawtell very gravelly loam is on the bottom third of the slopes near the drainageways. The components of this unit are so intricately intermingled that it was not possible to map them separately at the scale used.

Included in this unit are small areas of Rock Outcrop, Decy soil and the Blackspar Taxajunct. The Rock Outcrop are near the top of the slopes with the Blackspar Taxajunct. The Decy soils are on long narrow benches. Included areas make up about 10 percent of the total acreage.

The Bluesprin soil is moderately deep and well drained. It is formed in residuum derived from phyllite and schist. Typically, the surface layer is grayish brown, very gravelly loam about 5 inches thick. The subsoil is brown, very gravelly clay loam about 10 inches thick. The substratum is brown, very gravelly clay loam about 25 inches thick, over fractured phyllite.

Permeability of the Bluesprin soil is moderate. Available water holding capacity is low. Effective rooting depth is 26 to 40 inches. Runoff is very rapid and the Erosion Hazard Rating is moderate.

The Sawtell soil is deep and well drained. It formed in residuum and colluvial material derived from phyllite and schist. Typically, the surface layer is pale brown, very gravelly loam about 7 inches thick. The subsoil is yellowish brown, very gravelly clay loam about 17 inches thick. The substratum is brown, very gravelly clay loam about 30 inches thick.

Permeability of the Sawtell soil is moderate. Available water holding capacity is moderate. Effective rooting depth is 50 to 60 inches. Runoff is rapid and the Erosion Hazard Rating is moderate.

This unit is suited to commercial timber production. The Forest Survey Site Class ranges from 4 to 5. Active colluvial movement has resulted in accumulation of surface cobbles and stones which impede hand planting.

Range Site not assigned.

## Map Unit

8--Chaix sandy loam, 0 to 15 percent slopes. This moderate deep, well drained, soil is on mountain sideslopes, knolls and ridgetops. It is formed in residuum derived from weathered granitic parent material. The natural vegetation is mainly Ponderosa Pine with a few scattered Incense Cedar, Douglas Fir and Whiteleaf manzanita. Elevation ranges from 3,600 to 4,700 feet. The average annual precipitation is 40 inches; the average annual air temperature ranges from 50 to 52 degrees F., and the average frost-free season ranges from 100 to 125 days.

Typically, the surface layer is brown, sandy loam about 8 inches thick. The subsoil is yellowish brown, sandy loam about 15 inches thick. The substratum is light yellowish brown, sandy loam to a depth of 40 inches. Reaction is slightly acid throughout the profile.

Included with this unit are small areas of Chanawakee sandy loam, mainly on knolls and ridgetops. Also included are small areas of Chaix sandy loam that are deep, and the Holland sandy loam. Included areas make up about 15 percent of the acreage.

Permeability of the Chaix sandy loam is moderately rapid. Available water holding capacity is low. Effective rooting depth is 25 to 40 inches. Runoff is very slow and the Erosion Hazard Rating is moderate.

This unit is suited to commercial timber production. The Forest Survey Site Class is 4. The major limitation of this soil is the moderate erosion hazard.

Range Site is 5.

## Map Unit

9--Chaix sandy loam, 15 to 35 percent slopes. This deep, well drained, soil is on mountain sideslopes and ridges. It is formed in residuum derived from weathered granitic parent material. The natural vegetation is mainly Deerbrush and Ponderosa Pine with scattered Incense Cedar, Douglas Fir and Whiteleaf Manzanita. Elevation ranges from 4,000 to 4,600 feet. The average annual precipitation is 40 to 50 inches. The average annual air temperature ranges from 50 to 52 degrees F, and the average frost-free season is 100 to 125 days.

Typically, the surface layer is grayish brown, sandy loam about 5 inches thick. The subsoil is light brownish gray, sandy loam about 24 inches thick. The substratum is light brownish gray, sandy loam to a depth of 60 inches. Reaction is slightly acid throughout the profile.

Included with this unit are small areas of Chawanakee sandy loam, mainly on ridgetops. Also included are small areas of moderately deep Chaix sandy loam intermingled with the deep Chaix sandy loam and Holland sandy loam adjacent to, but at lower positions on the slopes. Included areas make up about 15 percent of the total acreage.

Permeability of the Chaix soil is moderately rapid. Available water holding capacity is moderate. Effective rooting depth is 45 to 60 inches. Runoff is slow and the erosion Hazard Rating is high.

This unit is suited to commercial timber production. The Forest Survey Site Class ranges from 2 to 3. The major limitation of this soil is high surface erosion and brush competition.

Range Site not assigned.

## Map Unit

6--Bluesprin - Blackspar Taxajunct complex. This map unit is on mountain sideslopes. Slopes are greater than 65 percent. The natural vegetation is primarily Ponderosa Pine and Douglas Fir with a few scattered California Black Oaks and Deerbrush. Elevation is 3,600 to 4,400 feet. The average annual precipitation ranges from 30 to 40 inches, the average annual air temperature ranges from 50 to 52 degrees F., and the average frost-free season ranges from 100 to 125 days.

This unit is 75 percent Bluesprin, very gravelly loam and 15 percent Blackspar very gravelly loam, taxajunct. The components of this unit are so intricately intermingled that it was not possible to map them separately at the scale used.

Included in this unit are small areas of Chaix, Chawanakee, Rock Outcrops and Rubbleland. Included areas make up about 10 percent of the total acreage.

The Bluesprin soil is moderately deep and well drained. It is formed in residuum derived from phyllite and schist. Typically, the surface layer is grayish brown, very gravelly loam, about 5 inches thick. The subsoil is brown, very gravelly clay loam about 5 inches thick. The substratum is brown, very gravelly clay loam about 30 inches thick over fractured schist.

Permeability of the Bluesprin soil is moderate. Available water holding capacity is low. Effective rooting depth is 24 to 31 inches. Runoff is very rapid and the Erosion Hazard Rating is moderate.

The Blackspar Taxajunct is shallow and well drained. It formed in residuum derived from phyllite, schist, and greenstone. Typically, the surface layer is grayish brown, very gravelly loam about 4 inches thick. The subsoil is yellowish brown, very gravelly clay loam about 10 inches thick over highly fractured schist.

Permeability of the Blackspar Taxajunct is moderate. Available water holding capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid and the Erosion Hazard Rating is high.

This unit is suited to commercial timber production. The Forest Survey Site Class ranges from 4 to 5. Active colluvial movement has resulted in the accumulation of surface coarse fragments (cobbles and stones) which impede hand planting.

Range Site not assigned.

## Map Unit

10--Chaix sandy loam, 35 to 65 percent slopes. This deep, well drained soil is on mountain sideslopes and ridges. It formed in residuum derived from weathered granitic parent material. The natural vegetation is mainly Ponderosa Pine and Deer Brush with a few scattered Douglas Fir, Incense Cedar, Black Oak and Whiteleaf Manzanita. Elevation is 3,800 to 4,300 feet. The average annual precipitation is 40 to 50 inches, the average annual air temperature ranges from 50 to 52 degrees F, and the average frost-free season is 100 to 125 days.

Typically, the surface layer is grayish brown, sandy loam about 4 inches thick. The subsoil is light brownish gray, sandy loam about 40 inches thick. The substratum is light brownish gray, sandy loam to a depth of 60 inches. Reaction is slightly acid throughout the profile.

Included with this unit are small areas of Chawanakee sandy loam, mainly on the ridgetops. Also included are small areas of Holland sandy loam and Chaix sandy loam, moderate deep soil. Included areas make up about 15 percent of the total acreage.

Permeability of the Chaix soil is moderately rapid. Available water holding capacity is moderate. Effective rooting depth is 45 to 55 inches. Runoff is slow and the Erosion Hazard Rating is very high.

This unit is suited for commercial timber production. The Forest Survey Site Class ranges from 2 to 3. The major limitation of this soil is the very high erosion hazard and brush competition.

Range Site not assigned.

## Map Unit

11--Chaix - Chawanakee complex. This map unit is on valley floors and mountain side slopes. Slopes are 0 to 15 percent. The natural vegetation is Ponderosa Pine, Incense Cedar, and Deer Brush with a few scattered Douglas Fir and Whiteleaf Manzanita. Elevation is 4,000 to 4,600 feet. The average annual precipitation is 40 to 50 inches, the average annual air temperature ranges from 50 to 52 degrees F, and the average frost-free season is 100 to 125 days.

This unit is 45 percent Chaix sandy loam and 40 percent Chawanakee sandy loam. The Chaix sandy loam is on the valley floor of the drainage ways and the Chawanakee sandy loam is on concave slopes in drainage ways and the lower portions of the slopes. The components of this unit are so intricately intermingled that it was not possible to map separately at the scale used.

Included in this unit are small areas of moderate deep Chaix sandy loam and Rock Outcrop on the mountain sideslopes; River Wash along the drainage ways. Included areas make up about 15 percent of the total acreage.

The Chaix soil is very deep and well drained. It formed in colluvium and alluvium derived from granitic rock. Typically, the surface layer is grayish brown, sandy loam about 4 inches thick. The subsoil is light brownish gray, coarse sandy loam about 8 inches thick. The substratum is light yellowish brown, coarse sandy loam to a depth greater than 60 inches.

Permeability of the Chaix soil is moderately rapid. Available water holding capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is very slow and the Erosion Hazard Rating is moderate.

The Chawanakee soil is shallow and well drained. It formed in residuum derived from granitic rock. Typically, the surface layer is grayish brown, sandy loam about 3 inches thick. The subsoil is light olive brown, sandy loam about 7 inches thick. The substratum is olive brown decomposed granite about 13 inches thick over granite.

Permeability of the Chawanakee soil is moderately rapid. Available water holding capacity is very low. Effective rooting depth is 9 to 17 inches. Runoff is very rapid and the Erosion Hazard Rating is high.

This unit is suited for commercially timber production. The major limitation for commercial timber production is the high erosion hazard, shallow effective rooting depth of the Chawanakee soil. The Forest Survey Site Class ranges from 2 to 3 for the Chaix soil and 5 for the Chawanakee soil.

## Map Unit

12 - Chaix - Chawanakee complex. This map unit is on mountain sideslopes. Slopes are greater than 65 percent. The natural vegetation is mainly Douglas Fir, Ponderosa Pine with Whiteleaf Manzanita and Deer Brush. Elevation is 2,400 to 3,200 feet. The average annual precipitation ranges from 30 to 35 inches, the average annual air temperature is 52 degrees F, and the average frost-free season is 125 days.

This unit is 60 percent Chaix sandy loam and 25 percent Chawanakee gravelly sandy loam. The Chaix sandy loam is on concave slopes in drainage ways and the lower portions of slopes. Chawanakee gravelly sandy loam is on the upper portions of the mountain slopes and adjacent to Rock Outcrops. The components of this unit are so intricately intermingled that it was not possible to map them separately at the scale used. These soils are formed in material weathered from intrusive igneous rock.

Included in this unit are small areas of Chaix sandy loam, deep soils on the lower end of the slopes. Also included are areas of the Holland sandy loam and Rock Outcrop on convex positions near the top of slopes and bottom of drainageways.

The Chaix soil is moderately deep and well drained. It formed in residuum derived dominately from granitic rock. Typically, the surface layer is grayish brown, sandy loam about 4 inches thick. The subsoil is light brownish gray, sandy loam about 19 inches thick. The substratum is light brownish gray, sandy loam about 10 inches thick over fractured granite.

Permeability of the Chaix sandy loam is moderately rapid. Available water holding capacity is low. Effective rooting depth is 23 to 40 inches. Runoff is moderate and the Erosion Hazard Rating is very high.

The Chawanakee soil is shallow and well drained. It formed in residuum derived from granitic rock. Typically, the surface layer is brown, gravelly sandy loam about 5 inches thick. The subsoil is brown, gravelly sandy loam about 9 inches thick. The substratum is light yellowish brown, decomposed granite about 7 inches thick over granite.

Permeability of the Chawanakee soil is moderately rapid. Available water holding capacity is very low. Effective rooting depth is 12 to 20 inches. Runoff is very rapid and the Erosion Hazard Rating is very high.

This unit is marginally suited for commercial timber production. The Forest Survey Site Class ranges from 4 to 5 for the Chaix soil and 5 to 6 for the Chawanakee soil. The major limitations for commercial timber production is the very high erosion hazard and brush competition.

## Map Unit

13 -- Chawanakee - Chaix complex. This map unit is on mountain ridgetops and sideslopes. Slopes are 0 to 15 percent slopes. The natural vegetation is Ponderosa Pine and Incense Cedar with Whiteleaf Manzanita and Deer Brush. Elevation is 4,400 to 5,500 feet. The average annual precipitation ranges from 40 to 50 inches, the average annual air temperature ranges from 50 to 52 degrees F, and the average frost-free season is 100 to 125 days.

This unit is 70 percent Chawanakee sandy loam and 20 percent Chaix sandy loam. The Chawanakee sandy loam is on convex slopes near the top of slopes and adjacent to Rock Outcrops. Chaix sandy loam is on the lower portions of the slopes. The components of this unit are so intricately intermingled that it was not possible to map them separately at the scale used.

Included in this unit are small areas of Rock Outcrop and Holland sandy loam. Included areas make up about 10 percent of the total acreage.

The Chawanakee soil is shallow and well drained. It formed in residuum derived from granitic rock. Typically, the surface layer is brown, sandy loam about 6 inches thick. The subsoil is brown, sandy loam about 10 inches thick. The substratum is light yellowish brown, decomposed granite about 7 inches thick over granite.

Permeability of the Chawanakee soil is moderately rapid. Available water holding capacity is very low. Effective rooting depth is 10 to 20 inches to a paralithic contact. Runoff is moderate and the Erosion Hazard Rating is high.

The Chaix soil is moderately deep and well drained. It formed in residuum derived dominately from granitic rock. Typically, the surface layer is grayish brown, sandy loam about 5 inches thick. The subsoil is light brownish gray, sandy loam about 18 inches thick. The substratum is light brownish gray, sandy loam about 10 inches thick over fractured granitic.

Permeability of the Chaix sandy loam is moderately rapid. Available water holding capacity is low. Effective rooting depth is 23 to 40 inches. Runoff is moderate and the Erosion Hazard Rating is high.

This unit is marginally suited for commercial timber production. The Forest Survey Site Class is 5 for the Chawanakee soil and range from 2 to 3 for the Chaix soil. The major limitations for commercial timber production are shallow soil depth, droughty soils, high erosion hazard and the nature of the parent material. Management that minimizes the risk of erosion is essential in harvesting timber.

Range Site is 4 for the Chawanakee soil and 5 for the Chaix soil.

## Map Unit

15 -- Decy Variant, very cobbly loam, 0 to 15 percent slopes. This very deep, well drained soil is on dissected benches. It formed in alluvium derived from mixed parent material. The vegetation is mainly Douglas Fir with some understory of Poison Oak and Gooseberry. Elevation ranges from 2,300 to 2,900 feet. The average annual precipitation is 20 to 30 inches, the average annual air temperature is about 52 degrees F. and the average frost-free season is 125 days.

Typically, the surface layer is gray, very cobbly sandy loam about 2 inches thick. The subsoil is gray, very cobbly sandy loam about 14 inches thick. The substratum to a depth greater than 60 inches is olive, very cobbly loam.

Included with this unit are small areas of Bluesprin very gravelly loam and Sawtell very gravelly loam, mainly on side slopes.

Permeability of this Decy Variant is rapid. Available water holding capacity is moderate or high. Effective rooting deep is 60 inches or more. Runoff is very slow and the Erosion Hazard Rating is moderate.

This unit is suited for commercial timber production. The Forest Survey Site class ranges from 3 to 4. The major limitation for timber production is the 35 to 60 percent cobble content of the top 20 inches of the soil. This would limit plantability.

Range Site not assigned.

## Map Unit

17 -- Domingo - Hugo complex. This map unit is on mountain sideslopes and ridgetops. Slopes are 35 to 60 percent. Elevation is 2,000 to 2,300 feet. The natural vegetation is Buck Brush, Whiteleaf Manzanita, Bitterbrush with a few scattered California Black Oak and Ponderosa Pine. The average annual precipitation is 20 inches, the average annual air temperature is 52 degrees F and the average frost-free season is 125 days.

This unit is 60 percent Domingo loam and 25 percent Hugo loam. The components of this unit are so intricately intermingled that it was not possible to map them separately at the scale used.

Included in this unit are small areas of Marpa, Holland soils and Rock Outcrop. Included areas make up about 15 percent of total acreage.

The Domingo soils is deep and moderately well drained. It formed in residuum derived from phyllite and schist. Typically, the surface is brown, loam about 6 inches thick. The subsoil is yellowish brown, light clay loam about 10 inches thick. The substratum is yellowish brown light clay loam to a depth of 60 inches.

Permeability of the Domingo soil is slow. Available waterholding capacity is moderate. Effective rooting depth is 40 to 50 inches. Runoff is very rapid and the Erosion Hazard Rating is high.

The Hugo soil is deep and well drained. It formed in residuum derived from chert, phyllite, schist, and greenstone. Typically, the surface layer is brown, loam about 3 inches thick. The subsoil is yellowish brown, light clay loam about 39 inches thick parting to highly fractured phyllite and chert.

Permeability of the Hugo soil is moderate slow. Available water holding capacity is moderate. Effective rooting depth is 27 to 45 inches. Runoff is moderate and the Erosion Hazard Rating is high.

This map unit is suited for watershed, wildlife, and range. The Forest Survey Site Class ranges from 4 to 5.

The primary limiting factor for timber production is the marginal annual precipitation of 20 inches and the southernly aspect. Brush competition would also be a problem for timber and range.

Range Site is 1.

## Map Unit

18 -- Fiddletown extremely gravelly sandy loam, greater than 65 percent slopes. This deep, somewhat excessively drained soil is on mountain sideslopes. Aspect is generally north or east. It formed in residuum and colluvium derived from phyllite, schist, slate, and greenstone. The vegetation is mainly Douglas Fir with some Ponderosa Pine, California Black Oak, Canyon Live Oak, California Maple and Poison Oak. Elevation ranges from 2,000 to 3,200 feet. The average annual precipitation is 20 to 30 inches, the average annual air temperature of 52 degrees F; and the average frost-free season is 125 days.

Typically, the surface layer is gray, extremely gravelly sandy loam about 25 inches thick. The substratum is grayish brown, extremely gravelly sandy loam about 35 inches thick.

Included with this unit are small areas of Rock Outcrop, Rubble Land, Marpa and Woodseye soils. Inclusion comprise 15 percent of the unit.

Permeability of this Fiddletown soil is rapid. Available water holding capacity is low. Effective rooting depth is 40 to 60 inches, runoff is slow and the Erosion Hazard Rating is high.

This unit is suited for commercial timber production but reforestation would be difficult due to the 60 to 85 percent coarse fragment content and the resulting low water holding capacity of this soil. Plantability would be limited due to the high gravel and cobble content also. The Forest Survey Site Class ranges from 4 to 5.

Range Site not assigned.

## Map Unit

19 -- Gerle - Woodseye complex. This map unit is on mountain sideslopes and ridges. Slopes are 35 to 65 percent. Elevation is 4,800 to 5,500 feet. The natural vegetation is mixed conifer of Ponderosa Pine, White Fir, Douglas Fir and Incense Cedar with Snowbrush, Chinquapin and Gooseberry. The average annual precipitation is 50 inches, the average annual air temperature is 45 degrees F and the average frost-free season is 100 days.

This unit is 70 percent Gerle sandy loam and 20 percent Woodseye cobbly sandy loam. The components of this unit are so intricately intermingled that it was not possible to map them separately at the scale used.

Included in this unit are small areas of Chaix, Chawanakee, and Rock Outcrop. Included areas make up about 10 percent of total acreage.

The Gerle soils is moderately deep and well drained. It formed in residuum derived from granitic rock. Typically, the surface layer is brown, sandy loam about 8 inches thick. The subsoil is light yellowish brown, sandy loam about 15 inches thick. The substratum is very pale brown, decomposed granite about 15 inches thick over granite.

Permeability of the Gerle soil is moderately rapid. The available water holding capacity is low. Effective rooting depth is 22 to 40 inches to a paralithic contact. Runoff is slow and the Erosion Hazard Rating is high.

The Woodseye soil is shallow and well drained. It formed in residuum derived from granitic rock. Typically, the surface layer is grayish brown, cobbly sandy loam about 8 inches thick. The subsoil is light yellowish brown, very cobbly sandy loam about 11 inches thick over fractured granite.

Permeability of the Woodseye cobbly sandy loam is moderate rapid. The available water holding capacity is very low. Effective rooting depth is 11 to 20 inches. Runoff is moderate and the Erosion Hazard Rating is high.

This unit is suited to commercial timber production. The Forest Survey Site Class ranges from 4 to 5 for the Gerle soils and 5 for the Woodseye soils. The main concerns in producing and harvesting timber are high surface erosion and brush competition. Management that minimizes the risk of erosion is essential in harvesting timber.

Range Site not assigned.

coarse sandy loam, sandy loam, and loam with 0 to 15 percent pebbles.

The Bt horizon ranges from 10 to over 35 inches thick. It is reddish yellow, yellowish red, strong brown, (5 YR 6/6, 5/6, 7.5 YR 6/6, 5/6) dry and yellowish red, reddish brown, dark reddish brown, dark brown (5 YR 5/6, 4/6, 4/4, 4/3; 7.5 YR 4/4, 3/4) moist. The Bt is slightly to medium acid, gravelly sandy clay loam, gravelly clay loam, sandy clay loam and clay loam. Lower part of the Bt will grade into hues of 10 YR in some cases.

#### Map Unit

20 -- Hotaw sandy loam, 0 to 15 percent slopes. The deep, well drained soil is on mountain ridges, knolls and sideslopes. It formed in residuum weathered from granitic parent material. The vegetation is mainly Whiteleaf Manzanita and Buck Brush with a few California Black Oak, Oregon White Oak, Ponderosa Pine, Deer Brush and Poison Oak. Elevation ranges from 2,400 to 3,300 feet. The average annual precipitation ranges from 30 to 40 inches, the average annual air temperature is 52 degrees F and the average frost-free season is 125 days.

Typically, the surface layer is grayish brown, sandy loam about 4 inches thick. The subsoil is strong brown, sandy clay loam about 30 inches thick. The substratum is weathered granite about 25 inches thick.

Included with this unit are small areas of Marpa soils, Holland soil, and Rock Outcrops. Holland soil is over 40 inches deep. Also included are small areas of the component soil on slopes greater than 15 percent. Inclusions comprise 15 percent of unit.

Permeability of this Hotaw sandy loam is moderately slow. Available waterholding capacity is low. Effective rooting depth is 30 to 40 inches to a paralithic contact. Runoff is moderate and the Erosion Hazard Rating is moderate.

This unit is marginally suited for commercial timber production. The Forest Survey Site Class ranges from 5 to 4. The major limitation for commercial timber production are fertility, precipitation and brush competition. The fertility limitation is due to past surface erosion of 25 to 75 percent of the original top soil. There is a likelihood of nitrogen and sulfur deficiency in these soils due to the past erosion and burning of this area.

This unit is suited to range and wildlife. The production of vegetation suitable for livestock and wildlife is limited by the old growth of brush. Brush management improves deteriorated areas of range that are producing more woody shrubs than were present in the potential plant community. The present vegetation in most areas is mainly Whiteleaf Manzanita and Buck Brush with a few Black Oak, Oregon White Oak and Ponderosa Pine. Areas that

are heavily infested with undesirable plants can be improved by mechanical, chemical, burning treatments or a combination of these. This unit would respond well to fertilizer, seeding and to proper grazing use. Livestock and wildlife grazing should be managed to protect the unit from excessive soil erosion. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock. Management practices suitable for use on this unit are proper range use, deferred grazing, rotation grazing and brush management.

Range Site is 5.

## Map Unit

21 -- Holland sandy loam, 15 to 35 percent slopes. The deep, well drained soil is on mountain sideslopes and ridges. It formed in residuum weathered from granitic parent material. The vegetation is mainly Whiteleaf Manzanita, Greenleaf Manzanita, Deer Brush with a few scattered Black Oak, Ponderosa Pine and Douglas Fir. Elevation ranges from 2,800 to 4,000 feet. The average annual precipitation ranges from 30 to 40 inches, the average annual air temperature is 52 degrees F, and the average frost-free season is 125 days.

Typically, the surface layer is grayish brown, sandy loam about 4 inches thick. The subsoil is strong brown, sandy clay loam about 36 inches thick. The substratum is weathered granite about 25 inches thick.

Included with this unit are small areas of Hotaw sandy loam, Holland sandy loam with slopes 35 to 65 percent and slopes greater than 65 percent. Also soils similar to Holland soils but with the top soil eroded away and Rock Outcrop. Inclusions comprise 15 percent of the unit.

Permeability of this Holland sandy loam is moderately slow. Available water holding capacity is moderate. Effective rooting depth is 40 to 50 inches to a paralithic contact. Runoff is rapid and the Erosion Hazard Rating is high to very high.

This unit is marginally suited for commercial timber production. The Forest Survey Site Class ranges from 4 to 5. The major limitation for commercial timber production is past loss of top soil, high erosion hazard, and brush competition. The fertility limitation is due to past surface erosion of 25 to 75 percent of the original top soil. There is a likelihood of nitrogen and sulfur deficiency in these soils due to the past erosion and burning of this area.

This unit is suited to range and wildlife. The production of vegetation suitable for livestock and wildlife is limited by the old growth of brush. Brush management improves deteriorated areas of range that are producing more woody shrubs than were present in the potential plant community. The present vegetation is Whiteleaf Manzanita, Greenleaf Manzanita, Deer Brush with a few scattered Black Oak, Ponderosa Pine, Douglas Fir and Cheat Grass. Areas that are heavily infested with undesirable plants can be improved by mechanical, chemical, burning treatments or a combination of these. This unit would respond well to fertilizer, seeding and to proper grazing use. Livestock and wildlife grazing should be managed to protect the unit from excessive soil erosion. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock. Management practices suitable for use on this unit are proper range use, deferred grazing, rotation grazing and brush management.

Range Site is 5.

#### Map Unit

22 -- Holland sandy loam, 35 to 65 percent slopes. The deep, well drained soil is on mountain sideslopes and ridges. It formed in residuum weathered from granitic parent material. The vegetation is mainly Whiteleaf Manzanita, Greenleaf Manzanita, Deer Brush with a few scattered California Black Oak, Ponderosa Pine, and Douglas Fir. Elevation ranges from 2,800 to 4,000 feet. The average annual precipitation ranges from 30 to 40 inches, the average annual air temperature is 52 degrees F, and the average frost-free season is 125 days.

Typically, the surface layer is grayish brown, sandy loam about 4 inches thick. The subsoil is strong brown, sandy clay loam about 40 inches thick. The substratum is weathered granite about 16 inches thick.

Included with this unit are small areas of Hotaw sandy loam, Holland sandy loam at 0 to 15, 15 to 35, and 60+ percent slopes. Also soils similar to the Holland soil but with the top soil eroded away and some Rock Outcrop. Inclusions comprise 15 percent of the unit.

Permeability of this Holland sandy loam is moderately slow. Available water holding capacity is moderate. Effective rooting depth is 40 to 60 inches to a paralithic contact. Runoff is very rapid and the Erosion Hazard Rating is very high.

This unit is marginally suited for commercial timber production. The Forest Survey Site Class ranges from 4 to 5. The major limitation for commercial timber production is past loss of top soil, very high erosion hazard, and brush competition. The fertility limitation is due to past surface erosion of 25 to 75 percent of the original top soil. There is a likelihood of nitrogen and sulfur deficiency in these soils due to the past erosion and burning of this area.

This unit is suited to range and wildlife. The production of vegetation suitable for livestock and wildlife is limited by the old growth of brush. Brush management improves deteriorated areas of range that are producing more woody shrubs than were present in the potential plant community. The present vegetation is Whiteleaf Manzanita, Greenleaf Manzanita, Deer Brush with a few scattered Black Oak, Ponderosa Pine, Douglas Fir and Cheat Grass. Areas that are heavily infested with undesirable plants can be improved by chemical or burning or a combination of these methods. This unit would respond well to fertilizer, seeding and to proper grazing use. Livestock and wildlife grazing should be

managed to protect the unit from excessive soil erosion. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock. Management practices suitable for use on this unit are proper range use, deferred grazing, rotational grazing and brush management.

Range Site is 5.

## Map Unit

23 -- Holland sandy loam, greater than 65 percent slopes. The deep, well drained soil is on mountain sideslopes. It formed in residuum weathered from granitic parent material. The vegetation is mainly Whiteleaf Manzanita, Greenleaf Manzanita, Deer Brush, Ponderosa Pine with a few scattered Black Oak and Douglas Fir. Elevation ranges from 3,200 to 4,600 feet. The average annual precipitation is 40 to 50 inches, the average annual air temperature ranges from 50 to 52 degrees F, and the average frost-free season ranges from 100 to 125 days.

Typically, the surface layer is grayish brown, sandy loam about 4 inches thick. The subsoil is strong brown, sandy clay loam about 42 inches thick. The substratum is weathered granite about 15 inches thick.

Included with this unit are small areas of Holland sandy loam with slopes less than 65 percent, Chaix sandy loam, Chawanakee sandy loam, and Rock Outcrop. Also, soils similar to the Holland soils but with the top soil eroded away. Inclusions comprise 15 percent of the unit.

Permeability of this Holland sandy loam is moderately slow. Available water holding capacity is moderate. Effective rooting depth is 40 to 60 inches to a paralithic contact. Runoff is rapid and the Erosion Hazard Rating is very high.

This unit is suited for commercial timber production. The Forest Survey Site Class ranges 3 to 4. The major limitation for commercial timber production is past loss of topsoil, very high erosion hazard, and brush competition. The fertility limitation is due to past surface erosion of 25 to 75 percent of the original topsoil. There is a likelihood of nitrogen and sulfur deficiency in these soils due to the past erosion and burning of this area.

This unit is suited to wildlife but is limited for livestock use due to the 65 to 80 percent slopes, steepness of slope limit access by livestock and promotes over grazing of the less sloping areas. Brush management of the old growth improves deteriorated areas of wildlife habitat. Areas that are heavily infested with undesirable plants can be improved by chemical or burning or a combination of these methods. This unit would respond to fertilizer and seeding for the improvement of wildlife habitat. The plants selected for seeding should meet the seasonal requirements of wildlife.

Range site not assigned.

## Map Unit

28 -- Holland - Chaix complex, This map unit is on mountain sideslopes and ridgetops. Slopes are 15 to 35 percent. The natural vegetation is Douglas Fir, Ponderosa Pine, Incense Cedar, with Snow Brush, Deer Brush and Whiteleaf Manzanita in the open areas. Elevation is 3,800 to 4,600 feet. The average annual precipitation ranges from 45 to 50 inches, the average annual air temperature is 50 degrees F., and the average frost-free season is 100 days.

This unit is 70 percent Holland sandy loam and 15 percent Chaix sandy loam. The components of this unit are so intricately intermingled that it was not possible to map them separately at the scale used.

Included in this unit are small areas of Chawanakee, Gerle, and Hotaw soils. Also included is small areas of Rock Outcrop. Inclusion make up about 15 percent of the unit.

The Holland sandy loam, is deep and well drained. It formed in residuum derived from granitic rock. Typically, the surface layer is grayish brown, sandy loam about 6 inches thick. The subsoil is strong brown, sandy clay loam about 36 inches thick. The substratum is weathered granite about 24 inches thick.

Permeability of the Holland sandy loam is moderately slow. Available water holding capacity is moderate. Effective rooting depth is 40 to 50 inches to a paralithic contact. Runoff is rapid and the Erosion Hazard Rating is high.

The Chaix soil is deep and well drained. It formed in residuum derived dominately from granitic rock. Typically, the surface layer is grayish brown, sandy loam, about 5 inches thick. The subsoil is light brownish, gray sandy loam about 24 inches thick. The substratum is light brownish, gray sandy loam to a depth of 60 inches.

Permeability of the Chaix soil is moderately rapid. Available water holding capacity is moderate. Effective rooting depth is 45 to 60 inches. Runoff is slow and the Erosion Hazard Rating is high.

This unit is suited to commercial timber production. The Forest Survey Site Class ranges from 2 to 3. The major limitations of this unit are high soil erosion and brush competition.

Range Site is 5.

## Map Unit

29 -- Holland - Chaix complex. This map unit is on mountain sideslopes and ridgetops. Slopes are greater than 65 percent. The natural vegetation is Douglas Fir and Ponderosa Pine with a few Incense Cedar, California Black Oak, Deer Brush, Snow Brush and Whiteleaf Manzanita. Elevation is 4,000 to 4,600 feet. The average annual precipitation is 50 inches, the average annual air temperature is 50 degrees F., and the average frost-free season is 100 days.

This unit is 65 percent Holland sandy loam and 20 percent Chaix sandy loam. The component of this unit are so intricately intermingled that it was not possible to map them separately at the scale used.

Included in this unit are small areas of Rock Outcrop, Chawanakee, Gerle, Hotaw, and Blackspar Taxajunct. Inclusions make up about 15 percent of the unit.

The Holland sandy loam is deep and well drained. It formed in residuum derived from granitic rock. Typically the surface layer is grayish brown, sandy loam about 6 inches thick. The subsoil is strong brown, sandy clay loam about 36 inches thick. The substratum is weathered granite about 24 inches thick.

Permeability of the Holland sandy loam is moderate slow. Available water holding capacity is moderate. Effective rooting depth is 35 to 50 inches to a paralithic contact. Runoff is very rapid and the Erosion Hazard Rating is very high.

The Chaix soil is deep and well drained. It formed in residuum derived from granitic rock. Typically, the surface layer is grayish brown, sandy loam about 5 inches thick. The subsoil is light brownish gray, sandy loam about 24 inches thick. The substratum is light brownish gray, sandy loam to a depth of 60 inches.

Permeability of the Chaix soil is moderately rapid. Available water holding capacity is moderate. Effective rooting depth is 40 to 60 inches. Runoff is moderate and the Erosion Hazard Rating is very high.

This unit is suited to commercial timber production. The Forest Survey Site Class ranges from 2 to 3 for the Holland soil and 4 for the Chaix soil. The major limitations of this unit are very high soil erosion, very high runoff, and brush competition.

Range Site not assigned.

## Map Unit

30 -- Hugo loam, 0 to 15 percent slopes. This deep well drained soil is on mountain sideslopes and ridges. It formed in residuum weathered from phyllite, schist, and greenstone. The natural vegetation is mainly Buck Brush and Soft Chess with a few scattered Ponderosa Pine, Western Juniper, California Black Oak, Oregon White Oak and Bitter Brush. Elevation ranges from 2,000 to 2,400 feet. The average annual precipitation is 20 inches, the average annual air temperature is 52 degrees F., and the average frost-free season is 125 days.

Typically, the surface layer is grayish brown, loam about 4 inches thick. The subsoil is brownish yellow, loam about 8 inches thick. The substratum is yellowish brown, loam about 29 inches thick.

Included with this unit are small areas of Deadwood, Kindig, Madona, and Neuns soils. Also included are small areas of Rock Outcrop on ridges and knolls. Inclusions make up about 15 percent of the unit.

Permeability of the Hugo soil is moderate. Available water holding capacity is moderate. Effective rooting depth is 40 to 50 inches. Runoff is slow and the Erosion Hazard Rating is moderate.

This unit is marginally suited to commercial timber production due to the precipitation of 20 inches. The Forest Survey Site Class ranges from 5 to 7.

This unit is suited to range and wildlife. Brush management improves deteriorated areas of range that are producing more woody shrubs than were present in the potential plant community. Areas that are heavily infested with undesirable plants can be improved by chemical, mechanical or burning treatment. If the shrubs are managed to create open areas, this unit produces a good stand of desirable grasses and forbs. Management practices suitable for use on this unit are proper range use, deferred grazing, rotational grazing and spraying for brush management. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure.

Livestock grazing should be managed to protect the unit from excessive erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce vegetation suitable for grazing.

Range Site is 1.

## Map Unit

31 -- Hugo loam, 15 to 35 percent slopes. This deep, well drained soil is on mountain sideslopes and ridges. It formed in residuum weathered from phyllite, schist, and greenstone. The natural vegetation is mainly Buck Brush, Deer Brush and Bitter Brush with a few California Black Oak, Oregon White Oak and Ponderosa Pine. Elevation is 2,000 to 2,500 feet. The average annual precipitation is 20 inches, the average annual air temperature is 52 degrees F., and the average frost free season is 125 days.

Typically, the surface layer is grayish brown, loam about 4 inches thick. The subsoil is brownish yellow, loam about 10 inches thick. The substratum is yellowish brown, loam about 40 inches thick.

Included are small areas of Madona and Rock Outcrop on the ridges. Also included is small areas of the Hugo soil with less than 20 percent slopes. Inclusions make up about 15 percent of the unit.

Permeability of the Hugo soil is moderate. Available water holding capacity is moderate. Effective rooting depth is 40 to 55 inches. Runoff is slow and the Erosion Hazard Rating is moderate.

This unit is suited to range and wildlife. Brush management improves deteriorated areas of range that are producing more woody shrubs than were present in the potential plant community. Areas that are heavily infested with undesirable plants can be improved by chemical, mechanical or burning treatment. Seeding is a suitable practice if the vegetation is in poor condition. The plants selected for seeding should meet the seasonal requirements of livestock or wildlife, or both. Management practices suitable for use on this unit are proper range use, deferred grazing, rotational grazing and spraying for brush management.

Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. Livestock grazing should be managed to protect the unit from excessive erosion. Loss of the surface layer of soil results in a severe decrease in productivity and in the potential of the unit to produce vegetation suitable for grazing.

Range Site is 1.

## Map Unit

32 -- Kindig very gravelly loam, 0 to 15 percent slopes. This deep, well drained soil is on mountain sideslopes, ridges and knollw. It formed in residuum and colluvium derived from Phyllite, schist, slate and greenstone. The vegetation is mainly Soft chess with California Fescue, Filaree, Fiddleneck and Cheat grass. Elevation ranges from 2,000 to 2,400 feet. The average annual precipitation is 20 inches, the average annual air temperature is 52 degrees F., and the average frost-free season is 125 days.

Typically, the surface layer is yellowish brown, very gravelly loam about 4 inches thick. The subsoil is yellowish brown, very gravelly loam about 8 inches thick. The substratum is brown, extremely gravelly loam about 45 inches thick.

Included with this unit are small areas of Deadwood and Neuns soils. Also included is small areas of Rock Outcrop and Placer Diggings. Inclusion make up about 15 percent of the unit.

Permeability of the Kindig soil is moderately rapid. Available water holding capacity is low. Effective rooting depth is 40 to 60 inches. Runoff is very slow and the Erosion Hazard Rating is moderate.

This unit is marginally suited for commercial timber production due to droughty soils and precipitation of 20 inches. The Forest Survey Site Class is non commercial.

This unit is suited for range and wildlife. The present vegetation in most areas is mainly Soft Chess and Filaree. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plant increases. Therefore, livestock grazing should be managed so that the desired balance of species is maintained in the plant community. This unit responds well to fertilizer, to range seeding, and the proper grazing use. The plants selected for seeding should meet the seasonal requirements of livestock or wildlife, or both.

Range Site is 3.

## Map Unit

33 -- Kindig - Deadwood complex. This map unit is on mountain sideslopes. Slopes are greater than 65 percent. The natural vegetation is mainly Oregon White Oak, California Black Oak, and Poison Oak. Elevation is 2,000 to 2,400 feet. The average annual precipi

This unit is 60 percent Kindig very gravelly loam and 25 percent Deadwood very gravelly loam. The components of this unit are so intricately intermingled that it was not possible to map them separately at the scale used.

Included in this unit are small areas of Rock Outcrop and Deadwood very gravelly loam with less than 65 percent slopes. Included areas make up about 15 percent of the unit.

The Kindig soil is deep and well drained. It formed in residuum and colluvium derived dominately from phyllite, schist, slate and greenstone. Typically, the surface layer is yellowish brown, very gravelly loam about 4 inches thick. The subsoil is yellowish brown, very gravelly loam about 8 inches thick. The substratum to a depth 60 inches, is brown, extremely gravelly loam.

Permeability of the Kindig soil is moderate rapid. Available water holding capacity is low. Effective rooting depth is 40 to 60 inches. Runoff is moderate and the Erosion Hazard Rating is high.

The Deadwood soil is shallow and well drained. It formed in residuum derived dominately from phyllite, schist, slate and greenstone. Typically, the surface layer is dark yellowish brown very gravelly loam about 4 inches thick. The subsoil is dark yellowish brown, very gravelly loam about 14 inches thick over fractured phyllite.

Permeability of the Deadwood soil is moderately rapid. Available water holding capacity is very low. Effective rooting depth is 11 to 16 inches. Runoff is very rapid and the Erosion Hazard Rating is high.

This unit is not suited for timber production or range. It is suited for wildlife and watershed.

Range Site not assigned.

## Map Unit

35 -- Marpa gravelly loam, 35 to 65 percent slopes. This moderate deep, well drained soil is on mountain slopes and ridges. It formed in residuum derived from greenstone, phyllite and schists. The vegetation is mainly California Black Oak and Whiteleaf Manzanita with a few scattered Oregon White Oak, Ponderosa Pine, Deer Brush, and Buck Brush. Elevation ranges from 3,200 to 4,400 feet. The average annual precipitation is 40 inches, the average annual air temperature is 50 to 52 degrees F., and the average frost-free season is 100 to 125 days.

Typically, the surface layer is pale brown, gravelly loam about 3 inches thick. The subsoil is light yellowish brown, very gravelly clay loam about 26 inches thick. The substratum is weather greenstone parting to fractured greenstone rock at 38 inches.

Included with this unit are small areas of Kinkell, Blackspar Taxajunct, Bluesprin, Chaix, and Chawanakee soils. Also included, is small areas of Rock Outcrop. Inclusion make up about 15 percent of the unit.

Permeability of the Marpa soil is moderate. Available water holding capacity is very low to low. Effective rooting depth is 23 to 40 inches. Runoff is moderate and the Erosion Hazard Rating is high.

This unit is marginally suited for commercial timber production. The Forest Survey Site Class ranges from 2 to 4. The major limitations are droughty, moderate deep soils with high surface erosion. The unit also has plantability constraints due to high gravel content.

This unit is suited for range and wildlife. Brush management improves deteriorated areas of range that are producing more woody shrubs than were present in the potential plant community. Areas that are heavily infested with undesirable plants can be improved by chemical and prescribed burning. Trails or walkways can be constructed in places to encourage livestock grazing in areas where access is limited. Steepness of slope limits access by livestock and promotes overgrazing of the less sloping areas.

Range seeding is a suitable practice after prescribed burning. This unit responds well to fertilizer, to range seeding and to proper grazing use. The plants selected for seeding should meet the seasonal requirements of livestock or wildlife, or both. Livestock grazing should be managed to protect the unit from excessive erosion. Loss of the surface layer results in severe decrease in productivity and in the potential of the unit to produce vegetation suitable for grazing. This unit is limited for livestock watering ponds and other water impoundments because of the seepage potential.

## Map Unit

37 -- Marpa - Blackspar Taxajunct complex. This map unit is on mountain sideslopes and ridges. Slopes are 15 to 35 percent. The natural vegetation is Buck Brush, Deer Brush, Whiteleaf Manzanita with a few California Black Oak and Scrub Interior Live Oak. In the few open areas is California Fescue and Cheatgrass. Elevation ranges from 2,800 to 3,400 feet. The average annual precipitation is 20 to 30 inches, the average annual air temperature is 52 degrees F., and the average frost-free season is 125 days.

This unit is 70 percent Marpa gravelly loam and 15 percent Blackspar Taxajunct, very gravelly loam. The components of this unit are so intricately intermingled that it was not possible to map them separately at the scale used.

Included in this unit are small areas of Holland and Bluesprin soils. Also are small areas of Rock Outcrop. Inclusions make up about 15 percent of the unit.

The Marpa soils is moderately deep and well drained. It formed in residuum derived from greenstone, phyllite, and schist. Typically, the surface layer is pale brown, gravelly loam about 4 inches thick. The subsoil is light yellowish brown, very gravelly clay loam about 26 inches thick. The substratum is weathered greenstone parting to fractured rock at 38 inches.

Permeability of the Marpa soil is moderate. Available water holding capacity is very low to low. Effective rooting depth is 21 to 40 inches. Runoff is slow and the erosion Hazard Rating is moderate.

The Blackspar Taxajunct is shallow and well drained. It formed in residuum derived from greenstone, phyllite, and schist. Typically, the surface is light brownish gray, very gravelly loam about 4 inches thick. The subsoil is yellowish brown, very gravelly clay loam about 9 inches thick over fractured greenstone.

Permeability of the Blackspar Taxajunct is moderate. Available water holding capacity is very low. Effective rooting depth is 10 to 20 inches. The runoff is rapid and the Erosion Hazard Rating is moderate.

This unit is not suited for commercial timber production. The Forest Survey Site Class ranges from 5 to 6. The major limitations are low precipitation and droughty soils that are moderately deep to shallow.

This unit is suited for range and wildlife. The present vegetation in most areas is Buck Brush, Deer Brush and Whiteleaf Manzanita. Brush management improves deteriorated areas of range that are producing more woody shrubs than were present in the

potential plant community. Areas that are heavily infested with undesirable plants can be improved by chemical and prescribed burning.

Range seeding is suitable practice after prescribed burning. This unit responds well to fertilizer, to range seeding and to proper grazing use. The plants selected for seeding should meet the seasonal requirements of livestock or wildlife, or both. Livestock grazing should be managed to protect the unit from excessive erosion. Loss of the topsoil results in severe decrease in productivity and in the potential of the unit to produce vegetation suitable for grazing. This unit is limited for livestock watering ponds and other water impoundments because of the seepage potential.

Range Site is 3 for Marpa soil and 2 for Blackspar Taxajunct.

## Map Unit

38 -- Marpa - Blackspar Taxajunct complex. This map unit is on mountain sideslopes. Slopes are 35 to 65 percent. The natural vegetation is Buck Brush and White Leaf Manzanita with a few scattered Deer Brush, California Black Oak and Ponderosa Pine. Elevation ranges from 2,200 to 3,400 feet. The average annual precipitation is 20 to 30 inches, the average annual air temperature is 52 degrees F., and the average frost-free season is 125 days.

This unit is 60 percent Marpa gravelly loam and 25 percent Blackspar Taxajunct, very gravelly loam. The components of this unit are so intricately intermingled that it was not possible to map them separately at the scale used.

Included in this unit are small areas of Holland and Bluesprin soils. Also are small areas of Rock Outcrop. Inclusions make up about 15 percent of the unit.

The Marpa soil is moderately deep and well drained. Typically the surface layer is pale brown, gravelly loam about 4 inches thick. The subsoil is light yellowish brown, very gravelly clay loam about 22 inches thick. The substratum is weathered greenstone parting to fractured rock at 35 inches.

Permeability of the Marpa soil is moderate. Available water holding capacity is very low to low. Effective rooting depth is 21 to 35 inches. Runoff is moderate and the Erosion Hazard Rating is high.

The Blackspar Taxajunct soil is shallow and well drained. It formed in residuum derived from greenstone, phyllite, and schist. Typically, the surface is light brownish gray, very gravelly loam about 4 inches thick. The subsoil is yellowish brown, very gravelly clay loam about 9 inches thick over fractured greenstone.

Permeability of the Blackspar Taxajunct is moderate. Available waterholding capacity is very low. Effective rooting depth is 10 to 20 inches. The runoff is rapid and the Erosion Hazard Rating is high.

This unit is not suited for commercial timber production. The Forest Survey Site Class ranges from 5 to 7. The major limitations are low precipitation and droughty soils that are moderately deep to shallow.

This unit is suited for wildlife and range. Brush management improves deteriorated areas of range that are producing more woody shrubs than were present in the potential plant community. Areas that are heavily infested with undesirable plants can be improved by chemical and prescribed burning. Trails or walkways can be constructed in places to encourage livestock grazing in

areas where access is limited. Steepness of slope limits access by livestock and promotes overgrazing of the less sloping areas.

Range seeding is a suitable practice after prescribed burning. The plants selected for seeding should meet the seasonal requirements of livestock or wildlife, or both. Fertilizer is needed for optimum growth of grasses and legumes. Livestock grazing should be managed to protect the unit from excessive erosion. Loss of the surface topsoil results in severe decrease in productivity and in the potential of the unit to produce vegetation suitable for grazing. This unit is limited for livestock watering ponds and other water impoundments because of the seepage potential.

Range Site is 3 for the Marpa soil and 2 for the Blackspar Taxajunct soil.

## Map Unit

39 -- Marpa - Blackspar Taxajunct complex. This map unit is on mountain sideslopes. Slopes are greater than 65 percent. The natural vegetation is Buck Brush, Whiteleaf Manzanita with a few scattered California Black Oak, Oregon White Oak, and Scrub Interior Live Oak. Elevation ranges from 2,000 to 2,800 feet. The average annual precipitation is 20 inches, the average annual air temperature is 52 degrees F., and the average frost-free season is 125 days.

This unit is 55 percent Marpa gravelly loam and 30 percent Blackspar very gravelly loam, taxajunct. The components of this unit are so intricately intermingled that it was not possible to map them separately at the scale used.

Included in this unit are small areas of Holland and the Bluesprin soils. Also are small areas of rock outcrop. Inclusions make up about 15 percent of this unit.

The Marpa soil is moderately deep and well drained. It formed in residuum derived from greenstone, phyllite and schist. Typically, the surface layer is pale brown, gravelly loam about 4 inches thick. The subsoil is light yellowish brown, very gravelly clay loam about 26 inches thick. The substratum is weathered greenstone that parts to fractured rock at 38 inches.

Permeability of the Marpa soil is moderate. Available water holding capacity is very low to low. Effective rooting depth is 20 to 40 inches. Runoff is rapid and the Erosion Hazard Rating is high.

The Blackspar Taxajunct soil is shallow and well drained. It formed in residuum derived from greenstone, phyllite and schist. Typically, the surface is light brownish gray, very gravelly loam about 4 inches thick. The subsoil is yellowish brown, very gravelly clay loam about 9 inches thick over fractured greenstone.

Permeability of the Blackspar Taxajunct is moderate. Available waterholding capacity is very low. Effective rooting depth is 10 to 20 inches. The runoff is very rapid and the Erosion Hazard Rating is high.

This unit is not suited for commercial timber production. The Forest Survey Site Class ranges from 5 to 7. The major limitations are low precipitation and droughty soil that are moderately deep to shallow. Also the soil erosion is high to very high. Also, it is not suited for range use due to excess slope gradient.

This unit is suited for wildlife and watershed. Areas that are heavily infested with undesirable plants can be improved by chemical and prescribed burning. Range seeding is a suitable

practice after prescribed burning. The plants selected for seeding should meet the seasonal requirement of wildlife. Fertilizer is needed for optimum growth of shrubs and legumes.

Range Site not assigned.

## Map Unit

40 -- Marpa - Holland complex. This map unit is on mountain sideslopes and ridges. Slope is 15 to 35 percent. The natural vegetation is Whiteleaf Manzanita and Buck Brush with a few California Black Oak, Ponderosa Pine and Deer Brush. Elevation is 2,800 to 3,200 feet. The average annual precipitation is 30 inches, the average frost-free season is 125 days.

This unit is 70 percent Marpa gravelly loam and 15 percent Holland sandy loam. The components of this unit are so intricately intermingled that it was not possible to map them separately at the scale used.

Included in this unit are small areas of Blackspar Taxajunct soil and Rock Outcrops. Inclusions make up about 15 percent of this unit.

The Marpa soil is moderately deep and well drained. It formed in residuum derived from greenstone, phyllite, and schist. Typically, the surface layer is pale brown, gravelly loam about 4 inches thick. The subsoil is light yellowish brown, very gravelly clay loam about 30 inches thick. The substratum is weathered greenstone that parts to fractured rock at about 40 inches.

Permeability of the Marpa soil is moderate. Available water holding capacity is low. Effective rooting depth is 32 to 40 inches. Runoff is slow and the Erosion Hazard Rating is moderate.

The Holland soil is deep and well drained. It formed in residuum derived from granitic and dioritic rock. Typically, the surface is dark yellowish brown, coarse sandy loam about 6 inches thick. The subsoil is brown, coarse sandy clay loam about 42 inches thick over highly weathered granitic parent material.

Permeability is moderately slow. Available water holding capacity is moderate. Effective rooting depth is 40 to 50 inches. The runoff is slow and the Erosion Hazard Rating is high.

This unit is marginally suited for commercial timber production. The Forest Survey Site Class ranges from 4 to 5. The major limitations are precipitation of about 30 inches and the droughty Marpa soils that are moderately deep.

This unit is suited for range land and wildlife. The present vegetation is Whiteleaf Manzanita and Buckbrush. Brush management improves deteriorated areas of range and wildlife habitat that are producing more woody shrubs than were present in the potential plant community. Areas that are heavily infested with undesirable plants can be improved by chemical and prescribed burning.

Range seeding is suitable practice after prescribed burning. This unit responds well to fertilizer, to range seeding, and to proper grazing use. The plants selected for seeding should meet the seasonal requirements of livestock or wildlife, or both. Grazing should be managed to protect the unit from excessive erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce vegetation suitable for grazing. This unit is limited for livestock watering ponds and other water impoundments because of the seepage potential.

Range Site is 3 for the Marpa Soil and 5 for the Holland soil.

## Map Unit

41 -- Marpa - Rock Outcrop complex. This map unit is on mountain sideslopes and ridges. Slopes are 35 to 65 percent. The natural vegetation is Buck Brush, Whiteleaf Manzanita, and Poison Oak with a few Scrub Interior Live Oak, California Black Oak and Oregon White Oak. Elevation ranges from 2,000 to 3,300 feet. The average annual precipitation ranges from 20 to 40 inches, the average annual air temperature is 52 degrees F., and the average frost-free season is 125 days.

This unit is 65 percent Marpa gravelly loam and 20 percent Rock Outcrop. The components of this unit are so intricately intermingled that it was not possible to map them separately at the scale used.

Included in this unit are small areas of Blackspar Taxajunct, Bluesprin, and Holland soils. Inclusions make up about 15 percent of this unit

The Marpa soil is moderately deep and well drained. It formed in residuum weathered from greenstone, phyllite and schist. Typically, the surface layer is pale brown, gravelly loam about 4 inches thick. The subsoil is light yellowish brown, very gravelly clay loam about 26 inches thick. The substratum is weathered greenstone about 35 inches to fractured rock.

Permeability of the Marpa soil is moderate. Available water holding capacity is very low. Effective rooting depth is 20 to 35 inches. Runoff is moderate and the Erosion Hazard Rating is high.

This unit is not suited for commercial timber production. The Forest Survey Site Class ranges from non-commercial to 4. The major limitation are Rock Outcrop, droughty soils and low precipitation. Also the soil erosion is high.

This unit is marginally suited for range but is suited for wildlife. Areas that are heavily infested with undesirable plants can be improved by chemical and prescribed burning. Range seeding is a suitable practice after prescribed burning. The plants selected for seeding should meet seasonal requirements of livestock or wildlife, or both. Brush management improve deteriorated areas of range and wildlife habitat that are producing more woody shrubs than were present in the potential plant community. If the shrubs are managed to create open areas, this unit production of grasses and forbs would increase significantly.

Range Site is 3.

## Map Unit

43 -- Ovall gravelly fine sandy loam, greater than 65 percent slopes. This deep, well drained soil is on mountain sideslopes. It formed in residuum and colluvium derived from granitic rock. The vegetation is mainly Douglas Fir and Ponderosa Pine with a few California Black Oak, Willow and Poison Oak. Elevation ranges from 3,600 to 4,400 feet. The average annual precipitation is 40 inches, the average annual air temperature is 50 to 52 degrees F., and the average frost-free season is 100 to 125 days.

Typically, the surface layer is grayish brown, gravelly fine sandy loam about 7 inches thick. The subsoil is brown, gravelly fine sandy loam about 14 inches thick. The substratum is decomposed granite parting to highly fractured rock at about 42 inches.

Included in this unit are small areas of Chaix, Chawanakee, Bluesprin and Blackspar Taxajunct. Also included is small areas of Rock Outcrop. Inclusions make up about 15 percent of the unit.

Permeability of the Ovall soil is moderately rapid. Available water holding capacity is low to moderate. Effective rooting depth is 22 to 45 inches. Runoff is moderate and the Erosion Hazard Rating is high.

This unit is suited for commercial timber production and not suited for range due to the steepness of the slope. The Forest Survey Site Class is 4. The main concern are the high Erosion Hazard Rating and the loss of soil productivity as a result of soil erosion. Management that minimizes the risk of erosion is essential in harvesting timber. Proper design of road systems and care in the placement of culverts help to control erosion. Spoil from excavations is subject to rill and gully erosion and to sloughing. Roads and landings can be protected from erosion by constructing diversions and by seeding cut and fills.

Range Site not assigned.

## Map Unit

44 -- Placer Diggings - Riverwash. Placer diggings consist of areas of stoney, cobbly and gravelly material; commonly in beds of creeks, streams, river or of areas that have been placer mined and contain enough fine sand or silt to support some grass for grazing. The depth of the soil material is variable, ranging from 10 inches to more than 5 feet. Areas in stream beds frequently are flooded during the rainy season. Natural drainage varies from place to place.

Riverwash is unstablized sandy, silty, clayey or gravelly sediment that is flooded and washed and reworked frequently by rivers.

The vegetation is variable, but it generally consists of grass, blackberry and a few willow and alder. This land has some value for grazing and for wildlife habitat, and it provides watering places for livestock.

Range Site not assigned.

## Map Unit

47 -- Rock Outcrop - Woodseye complex. This map unit is on mountain sideslopes. Slopes are over 65 percent. The natural vegetation is Snowbrush, Deer Brush and Pinemat Manzanita with a few Lemmon Willow, Chinaquapin and Ponderosa Pine. Elevation is 4,800 to 5,600 feet. The average annual precipitation is 50 inches, the average annual air temperature is 45 degrees F. and the average frost-free season is 100 days.

This unit is 65 percent Rock Outcrop, and 20 percent Woodseye very gravelly sandy loam. Included in this unit are small areas Chaix, Chawanakee, Gerle and Tallac soils. Inclusions make up 15 percent of this unit.

The Woodseye soil is a shallow and well drained. It formed in residuum derived from granitic and metamorphized granitic rock. Typically, the surface is dark gray, very gravelly sandy loam about 13 inches thick. The substratum is brown, very gravelly loam about 5 inches thick over fractured granitic rock.

Permeability of the Woodseye soil is moderate rapid. Available water holding capacity is very low. Effective rooting depth is 10 to 20 inches. The runoff is very rapid and the Erosion Hazard Rating is very high.

This unit is suited for wildlife and watershed. It is not suited for timber or range. The major limitations are Rock Outcrops and shallow droughty soils that have a very high Erosion Hazard Rating.

Range Site not assigned.

## Map Unit

49 -- Tallac - Gerle complex. This map unit is on mountain sideslopes. Slopes are greater than 65 percent. The natural vegetation is Ponderosa Pine, White Fir, Douglas Fir and Snowbrush with a few Incense Cedar, Lemmon Willow, Chinquapin, and Western Raspberry. Elevation is 4,700 to 5,200 feet. The average annual precipitation is 40 to 50 inches, the average annual air temperature is 45 degrees F., and the average frost-free season is 100 days.

This unit is 45 percent Tallac cobbly sandy loam and 40 percent Gerle gravelly sandy loam. The components of this unit are so intricately intermingled that it was not possible to map them separately at the scale used.

Included in this unit are small areas of Chaix, Chawanakee, and Woodseye soils. Inclusions make up about 15 percent of the unit.

The Tallac soil is moderate deep and well drained. It formed in residuum derived from granitic rock. Typically, the surface layer is dark gray, cobbly sandy loam about 12 inches thick. The substratum is brown, very cobbly sandy loam about 24 inches thick over fractured granitic rock.

Permeability is moderate rapid. Available water holding capacity is moderate. Effective rooting depth is 34 to 40 inches. Runoff is moderate and the Erosion Hazard Rating is high.

The Gerle soil is moderately deep and well drained. It formed in residuum derived from granitic rock. Typically, the surface layer is brown, gravelly sandy loam about 18 inches thick. The subsoil is light yellowish brown, gravelly sandy loam about 26 inches thick.

Permeability of the Gerle soil is moderately rapid. Available water holding capacity is moderate. Effective rooting depth is 30 to 40 inches. The runoff is moderate and the Erosion Hazard Rating is very high.

This unit is suited for commercial timber production. The Forest Survey Site Class ranges from 4 to 5. The main concerns are the high to very high Erosion Hazard Rating, loss of soil productivity as a result of surface erosion, plantability of the cobbly soil and frost heave of young seedlings. Management that minimizes the risk of erosion is essential in harvesting timber. Proper design of road system and care in the placement of culverts helps to control erosion. Spoil from excavations is subject to rill and gully erosion, and to sloughing. Roads and landings can be protected from erosion by constructing diversions and by seeding cut and fills.

Reforestation, after harvesting, must be carefully managed to reduce competition from undesirable understory plants. Proper

site preparation controls initial plant competition, and spraying controls subsequent growth. If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees.

Not placed in a Range Site.

## Map Unit

50 -- Woodseye - Gerle complex.

This map unit is on mountain ridges and knolls. Slopes are 15 to 35 percent. The natural vegetation is Snowbrush with a few Deer Brush, Greenleaf Manzanita, Pinemat Manzanita and Chinquapin. Elevation ranges from 5,200 to 5,600 feet. The average annual precipitation is 50 inches, the average annual air temperature is 45 degrees F., and the average frost-free season is 100 days.

This unit is 70 percent Woodseye cobbly sandy loam and 15 percent Gerle gravelly sandy loam. The components of this unit are so intricately intermingled that it was not possible to map them separately at the scale used.

Included in this unit are small areas of Rock Outcrop and Tallac soils. Inclusions make up about 15 percent of the unit.

The Woodseye soil is shallow and well drained. It formed in residuum derived from granitic and metamorphized granitic rock. Typically, the surface layer is dark, gray cobbly sandy loam about 9 inches thick. The subsoil is brown, very cobbly sandy loam about 11 inches thick over highly fractured granitic rock.

Permeability of the Woodseye soil is moderate rapid. Available water holding capacity is very low. Effective rooting depth is 10 to 20 inches. The runoff is rapid and the Erosion Hazard Rating is moderate.

The Gerle soil is moderate deep and well drained. It formed in residuum derived from granitic parent material. Typically, the surface layer is dark gray, cobbly sandy loam about 12 inches thick. The subsoil is brown, cobbly sandy loam about 20 inches thick over fractured partly decomposed granite.

Permeability of the Gerle soil is moderately rapid. Available water holding capacity is low. Effective rooting depth is 20 to 33 inches. The runoff is slow and the Erosion Hazard Rating is moderate.

This unit is not suited for commercial timber production. The Forest Survey Site Class ranges from noncommercial to 5. The major limitations are shallow droughty soil with a very low available water holding capacity at high altitudes. It is suited for wildlife and watershed.

Range Site is 4 for Woodseye Soil and 3 for Gerle soil.

Table 2.

TABLE OF MANAGEMENT INTERPRETATIONS

Map Symbol	Mapping Unit Components	Regeneration Potential Precip. (In)			Soil Productivity Precip. (In)			Hydro-logic Group	Compaction Potential	Frost Action Potential	Range Site	Conifer	Woodland	Wildlife Habitat	Rangeland
		A	B	C	A	B	C								
		A	B	C	A	B	C								
1	Blackspar Taxajunct, 70% Bluesprin Series, 15%	20-30 VL VL VL	L	VL VL	20-30 L VL VL	C	L	M	2	-	-	-	Poor		
2	Blackspar Taxajunct, 60% Hugo Series, 30%	20-30 VL VL VL	L	L L	20-30 L VL VL	C	L	M	3	-	-	-	Good		
3	Blackspar Taxajunct, 60% Rock Outcrop, 30%	30 VL VL VL	L	L L	30 L VL VL	C	L	M	2	-	-	-	Poor		
4	Blackspar Taxajunct, 45% Rock Outcrop, 40%	20-30 VL VL VL	L	VL VL	20-30 L VL VL	C	L	M	8	-	-	-	Poor		
5	Bluesprin Series, 70% Blackspar Taxajunct, 20%	30 L L L	M	M L	30 M M L	B	L	M	-	-	-	Fair	-		
6	Bluesprin Series, 75% Blackspar Taxajunct, 15%	30-40 M M L	L	VL VL	20-40 M M L	C	L	M	-	-	-	Poor	-		
7	Bluesprin Series, 60% Sawtell Series, 30%	20-30 L L L	M	L L	20-30 M L L	B	L	M	-	-	-	Fair	-		
8	Chaix Series, 85%	40 M M M	M	L L	40 M M M	B	L	M	-	-	-	Poor	-		
9	Chaix Series, 85%	40-50 M M M	M	M M	40-50 M M M	B	M	M	5	-	-	-	Good		
10	Chaix Series, 85%	40-50 M M M	M	M M	40-50 M M M	B	M	M	-	-	-	Good	-		

\*1. Slope Aspect: A = NW to NE; B = NE to SE and W to NW; C = W to SE.

TABLE OF MANAGEMENT INTERPRETATIONS

Table 2.

Map Symbol	Mapping Unit Components	Regeneration Potential			Soil Productivity			Hydro-logic Group	Frost Action Potential	Range Site	Wildlife Habitat		
		Precip. (In) A	Precip. (In) B	Precip. (In) C	Precip. (In) A	Precip. (In) B	Precip. (In) C				Conifer	Woodland Hardwood	Wildlife Habitat
11	Chaix Series, 45% Chawanakee Series, 40%	40-50			40-50			B	M	5	Good	-	Good
		M	M	M	II	III	III						
12	Chaix Series, 60% Chawanakee Series, 25%	20-30			20-30			C	M	4	Poor	-	Poor
		L	L	L	L	L	L						
		30-40			30-40								
		L	L	L	M	M	L						
13	Chawanakee Series, 70% Chaix Series, 20%	40-50			40-50			C	M	-	Poor	-	-
		L	L	L	L	L	L						
		M	M	M	II	III	III						
14	Deadwood Series, 60% Rock Outcrop, 30%	20			20			A	L	-	-	-	Poor
		VL	VL	VL	L	VL	VL						
15	Dacy Series, 85%	20-30			20-30			A	L	-	Good	-	-
		M	L	L	III	M	M						
16	Domingo Series, 50% Blackspar Taxajunct, 35%	20			20			C	M	1	-	Good	-
		L	L	L	M	M	L						
		L	VL	VL	L	VL	VL						
17	Domingo Series, 60% Inigo Series, 25%	20			20			C	M	1	-	-	Good
		L	L	L	M	M	L						
18	Fiddletown Series, 85%	20-30			20-30			C	L	-	Fair	-	-
		M	L	L	M	M	L						
19	Gerle Series, 70% Woodseye Series, 20%	50			50			B	M	-	Good	-	-
		II	II	II	M	M	L						
20	Holland Series, 85%	30-40			30-40			B	M	5	-	-	Good
		L	L	VL	M	M	L						

\*1. Slope Aspect: A = NW to NE; B = NE to SE and W to NW; C = W to SE.

TABLE OF MANAGEMENT INTERPRETATIONS

Table 2.

Map Symbol	Mapping Unit Components	Regeneration Potential Precip.(In)			Soil Productivity Precip.(In)			Hydro-logic Group	Compaction Potential	Frost Action Potential	Range Site	Wildlife Habitat	
		A	B	C	A	B	C					Woodland	Rangeland
21	Holland Series, 85%	30-40 L L VL			30-40 M M L			B	M	M	5	-	Good
22	Holland Series, 85%	30-40 L L VL			30-40 M M L			B	M	M	5	-	Good
23	Holland Series, 85%	40-50 M L L			40-50 MI M M			B	M	M	-	-	Good
24	Holland Series, 85%	20-30 M M M			20-30 M M M			B	M	M	1	-	Good
25	Holland Series, 85%	20-30 M M M			20-30 M M M			B	M	M	1	-	Good
26	Holland Series, 85%	20-30 M M L	30-40 M M M		20-30 M M M	30-40 MI M M		B	M	M	1	-	Good
27	Holland Series, 85%	30-40 M M M			30-40 MI MI M			B	M	M	-	-	Good
28	Holland Series, 70% Chaix Series, 15%	50 M M M			50 II MI MI			B	M	M	5	-	Good
29	Holland Series, 65% Chaix Series, 20%	50 M M M			50 II MI MI			B	M	M	5	-	Good
30	Hugo Series, 85%	20 VL VL VL			20 L L VL			B	II	H	1	-	Good
31	Hugo Series, 85%	20 VL VL VL			20 L L VL			B	II	M	1	-	Good
32	Kindly Series, 85%	20 VL VL VL			20 VL VL VL			B	M	M	3	-	Fair
33	Kindig Series, 60% Deadwood Series, 25%	25-30 VL VL VL			25-30 VL VL VL			B	M	M	-	-	Fair
		VL VL VL			VL VL VL			C	L	L	-	-	Poor

\*1. Slope Aspect: A = NW to NE; B = NE to SE and W to NW; C = W to SE.

Table 2.

TABLE OF MANAGEMENT INTERPRETATIONS

Map Symbol	Mapping Unit Components	Regeneration Potential			Soil Productivity			Hydro-logic Group	Compaction Potential	Frost Action Potential	Range Site	Wildlife Habitat	
		40-50	20-30	40	40-50	20-30	40					Woodland	Rangeland
		Precep. (In) A	Precep. (In) B	Precep. (In) C	Precep. (In) A	Precep. (In) B	Precep. (In) C					Conifer	Hardwood
34	Kindig Series, 45% Holland Series, 40%	L L L	L L L	M I M I M	MI MI M	40-50	B	M	M	3	Good	-	-
35	Marpa Series, 85%	M M M	L L VL	M M L	M M L	40	C	M	M	3	-	-	Fair
36	Marpa Series, 50% Blackspar Taxajunct, 35%	VL VL VL	VL VL VL	L L L	L L L	20-30	C	M	M	3	-	-	Fair
37	Marpa Series, 70% Blackspar Taxajunct, 15%	VL VL VL	VL VL VL	L L VL	L VL VL	20-30	C	L	M	2	-	-	Poor
38	Marpa Series, 60% Blackspar Taxajunct, 25%	VL VL VL	VL VL VL	L L L	L L L	20-30	C	M	M	3	-	-	Fair
39	Marpa Series, 55% Blackspar Taxajunct, 30%	VL VL VL	VL VL VL	L VL VL	L VL VL	20-30	C	L	M	2	-	-	Poor
40	Marpa Series, 70% Holland Series, 15%	L L VL	M M L	M M L	M L L	30	C	M	M	-	-	-	Fair
41	Marpa Series, 60% Rock Outcrop, 20%	VL VL VL	VL VL VL	L L L	L L L	20-30	C	M	M	3	-	-	Fair
42	Neuns Series, 65% Deadwood Series, 25%	L VL VL	L VL VL	M L L	M L L	20	C	M	M	3	-	-	Fair
43	Oval Series, 85%	M M M	M M M	M M M	M M M	40	B	M	M	-	Good	-	-

\*1. Slope Aspect: A = NW to NE; B = NE to SE and W to NW; C = W to SE.

TABLE OF MANAGEMENT INTERPRETATIONS

Table 2.

Map Symbol	Mapping Unit Components	Regeneration Potential			Soil Productivity			Hydro-logic Group	Compaction Potential	Frost Action Potential	Range Site	Wildlife Habitat		
		1. A	B	C	A	B	C					Conifer	Hardwood	
44	Placer Diggings - Riverwash	Properties too variable to be estimated.												
45	Rock Outcrop, 45% Chawanakee Series, 40%	40-50			40-50			-	-	-	-	-	-	
46	Rock Outcrop, 50% Chawanakee Series, 35%	L VL	VL	L	L L	L	L	C	M	M	-	-	Poor	
47	Rock Outcrop, 65% Woodseye Series, 20%	50			50			-	-	-	-	-	Poor	
48	Rubble Land 70% Fiddletown Series, 15%	20-30			20-30			-	-	-	-	-	Poor	
49	Tallic Series, 45% Gerle Series, 40%	40-50	II	II	40-50	M	M	B	L	M	-	-	Good	
50	Woodseye Series, 70% Gerle Series, 15%	50	L	VL	50	L	L	D	L	M	7	-	Poor	
51	Woodseye Series, 55% Gerle Series, 30%	50	L	VL	50	L	L	D	L	M	-	-	Poor	
		II	II	II	M	M	L	B	M	M	6	-	Good	
		II	II	II	M	M	L	B	M	M	-	-	Good	

\*1. Slope Aspect: A = NW to NE; B = NE to SE and W to NW; C = W to SE.

## APPENDIX F

### VEGETATION TYPING SUMMARY

Vegetation typing was based on 1975 aerial photos. A copy of the 1976 vegetation typing contract follows and can be used as a detailed reference. Vegetation typing is synonymous with the term "timber types." Timber strata, on the other hand, is a simplified or consolidated version of timber types which is often used in Forest-wide inventories, analysis and modeling. Both timber type and timber strata were used in the Humbug Landscape Analysis and Design process. The following chart summarizes how size class and Density was used to describe the forested component of the Humbug Landscape.

#### SIZE CLASS

Timber Strata Code	Timber Type Code	DBH <sup>1/</sup>	Size Class Description	Humbug Landscape Description
1 <sup>2/</sup>	1	1.0-5.0'	Saplings	Pole-sized conifers
3	2	6.0-10.9'	Poles	Medium-sized conifers
3	3	11.0-24.0'	Small saw timber	Medium-sized conifers
4	4	25.0-39.9'	Medium saw timber	Large-sized conifers

#### DENSITY

Timber Strata Code <sup>3/</sup>	Timber Type Code	Crown Closure %	Density Description	Humbug Description
P	S	10-19%	Sparse	Poorly stocked
P	P	20-39%	Poor	Poorly Stocked
G	N	40-69%	Not Adequate	Well Stocked
G	G	> 70%	Good	Well Stocked

<sup>1/</sup> Original size class ratings were based on crown diameters, however there is an approximate one to one correlation between crown diameter and DBH.

<sup>2/</sup> Timber Strata Code 1 applies only to plantations.

<sup>3/</sup> Timber Strata Code X applies to plantations, or otherwise coded with planting date.

SPECIFICATION FOR TIMBER TYPE DELINEATION,  
STAND CLASSIFICATION AND TRANSFER MAPPING  
KLAMATH NATIONAL FOREST

100 SCOPE OF CONTRACT

This Contract involves all work necessary to:

- 110 Delineate and classify timber stands visible on color aerial photography, nominal scale 1:15,840. (Section 510)
- 120 Complete specified drafting and formatting of the furnished 1:48,000 scale U.S.G.S. 15' topographic quadrangle maps prior to their photographic enlargement in 7½' format to 1:24,000 scale and associated reproduction services. (Section 520)
- 130 Prepare 1:24,000 base maps for use by plotting and drafting private ownerships, including patented mining claims, (Section 540) on specified quadrangles.
- 140 Transfer timber type and stand classification data delineated on aerial photos, to the 1:24,000 scale topographic base maps using a stereoplotter. The Forest Service will use a K.E.K. stereoplotter to inspect plotting accuracy. Inspection procedure on accuracy requirements are contained in section 550 of these specifications.
- 150 Ink draft final overlays showing timber type and stand classification data. (Section 560)

Examples of acceptable Forest type and stand classification maps are available for viewing at the Klamath National Forest Supervisor's Office, 1215 South Main St., Yreka, California.

Contractors are expected to familiarize themselves with the type of finished product demanded prior to submitting a bid quotation for completing the work specified below.

200 PROJECT LOCATION AND SIZE

The project covers the entire Klamath National Forest including private ownership within the Klamath N.F. boundary, Salmon-Trinity Primitive Area, and Marble Mountain Wilderness Area, and encompasses approximately 1,697,000 net National Forest acres and 221,000 private. Project area maps attached (Exhibit 1) outline the area. The end product of this contract will be 85 finished ink-drafted overlays at 1:24,000 scale

delineating and classifying timber stands within the project area. Each of the 92 seven and one-half minute quadrangles encompassing the project area shall be a separate overlay; except all work required under this contract for the following quadrangles may be combined with an adjacent quadrangle as following:

Combine Hornbrook SE & SW  
Combine Fort Jones SE & NE  
Combine Yreka NW & SW  
Combine Orleans NW & NE  
Combine Bonanza King NW with Coffee Creek NE  
Combine Trinity Dam NW with Coffee Creek SW  
Combine MacDoel NE & NW

### 300 CONTRACT RESPONSIBILITY

The Contractor shall furnish the necessary plant facilities, personnel, materials, supervision, labor, equipment, and transportation to perform the work specified. All work shall be executed in an expeditious, orderly, and professional manner to the satisfaction and acceptance of the Contracting Officer in accordance with all conditions contained in these specifications.

### 400 GOVERNMENT-FURNISHED PROPERTY

The Government will deliver to the Contractor the following listed materials, supplies, property or services (hereinafter referred to as "Government-furnished property") at the places and times specified below. Contractor shall be liable for all loss or damage of such delivered Government-furnished property until completion and final acceptance of work required under this contract. If the Government fails to make timely delivery of such Government-furnished property suitable for its intended use, and upon written request from the Contractor, the Contracting Officer shall make an equitable adjustment of contract delivery or performance dates or contract price, or both, pursuant to the "Changes" clause of the General Provisions of this contract.

The Contracting Officer will make available to the Contractor, by mail or messenger at time of award or within 10 Calendar days thereafter, the property listed as follows:

- 400.1 One set of contact aerial photo prints, nominal scale 1:15,840, of the project area and a spot index map for these photos.
- 400.2 One set (31) of stable base 1:48,000 scale topographic maps in fifteen (15) minute quadrangle format as indicated in Section 520.1.

- 400.3 One set (approximately 85) unmarked, punch registered stable base film overlays for drafting transferred detail.
- 400.4 One set of ownership status and encumbrance maps at 1:31,680 scale (2" = 1 mile) showing all National Forest land within the project area.
- 400.5 Eight (8) metal registration pins.
- 400.6 One dozen OMEGA #832 non-photo blue pencils.
- 400.7 Sample master lettering for title, legend, and scale bar to be used in forming 1:24,000 base topographic maps.

## 510 TIMBER STAND DELINEATION AND CLASSIFICATION

### 510.1 Aerial Photograph Preparation

The effective photo area shall be delineated in black non-smear ink or pencil on every other photo or other means acceptable to the COR to assure complete photogrammetric coverage of the project area and matching of delineation from stereomodel to stereomodel.

### 510.2 Photo Delineation, Stand Classification, and Inspection

- 510.21 Delineate stand classes on photos by means of direct viewing stereoscopic study. Supplement this study by ground observation as needed to assure proper interpretation. Field checking will be confined to determining the accuracy of classification of those features visible on the aerial photos.
- 510.22 Timber stands and other land types will be delineated and classified in accordance with the stand classification system detailed in Technical Specification item 510.3
- 510.23 Minimum size for delineation and classification are:
  - a. Contrasting forest types or land classification shall be delineated to a 10 acre minimum size. Contrasting forest types are defined as changes between forest land (commercial and noncommercial forest land) and nonforest land; and changes between cutover and noncutover forest land.
  - b. Changes between hardwood and conifer forest types on commercial forest land shall be delineated to a 10 acre minimum size.
  - c. Noncontrasting forest types or land classification changes shall be delineated to a 20 acre minimum size. Noncontrasting changes are defined as other changes in forest type or land classification parameters detailed under item 510.3 not specified in a. or b. above.

- 510.24 On commercial forest land, ten percent (10%) of the stand classification may deviate by forest type, one size class, one density class, and still be acceptable. On noncommercial forest land twenty percent (20%) of the classifications may deviate by forest type, one size class or density class. All classified photos will be delivered to the COR for acceptance or rejection of delineation and classification before photogrammetric transfer to base map. The Contractor shall submit photos for inspection by completed 7½ minute quadrangle coverage. The period between delivering of classified photos and acceptance or rejection by COR is 21 days maximum, provided not more than eight (8) 7½ minute quadrangle photo coverage may be submitted in one 21 day period.
- The Contractor shall be notified in writing if the Forest Service can not complete the inspection within the 21 day period. Under such an occurrence, upon written request from the Contractor, the Contracting Officer shall make an equitable adjustment of contract delivery or performance dates or contract price, or both, pursuant to the "Changes" clause of the General Provisions of this contract.
- 510.25 Each 7½ minute quadrangle coverage will be the unit of acceptance or rejection of delineation and classification. Acceptance or rejection of delineation and classification will be based upon a field verification of two randomly selected photogrammetric models per quadrangle. Rejected 7½ minute quadrangle coverage will be returned to the Contractor for correction. Resubmitted 7½ minute quadrangles will be inspected in the same manner as an initial submission with a new randomly selected stereomodel chosen for field verification.
- 510.26 Rejection of ten (10) 7½ minute quadrangles presented for inspection of delineation and classification will be grounds for terminating the Contractor right to proceed for failure to prosecute the work in a manner that will assure timely completion.
- 510.27 Timber stand and other land delineations on the base map shall be in red, blue, or green non-smear ink or pencil. Stand and land classification symbols shall be in black non-smear ink or pencil. Symbols too large to be contained within the delineated area shall be placed outside the area and referenced to the area by a reference arrow.

### 510.3 CLASSIFICATION & LABELLING SPECIFICATIONS

All National Forest land within the project area shall be classified and labelled. Each of the delineated areas, hereafter referred to as a polygon, will be labelled to indicate vegetational species present or the absence of vegetation, size class of commercial conifer stands where applicable, and stand density of commercial conifers. Only labels defined as acceptable will be used. Labels consist of one or more codes in sequence from left to right. This is further explained in section 510.34. Section 510.33 shows codes to be used in constructing acceptable labels.

#### 510.31 Classification Standards

The polygons mapped on the National Forest can be allocated to the following broad categories:

1. Non-vegetated
2. Non-Forest
3. Forest
  - a) Coniferous forest
  - b) Hardwood forest

The non-vegetated polygons are those defined as Barren, Water, or Urban-Developed. Non-Forest includes grasslands, brushfields, meadows and marshes. Forest includes lands presently having tree crowns covering 10-percent or more of the land area, or tree seedling and sapling stands capable of occupying 10-percent of the land area at the small sawtimber stage or development.

#### 510.32 Rules for Classifying and Labelling Polygons

##### A. Species Labelling

1. Determine if polygon is vegetated. If not, polygon is labelled with the single most appropriate 2-digit alpha code indicating the surface condition.
2. If the polygon falls into a vegetated category, the following classification criteria apply (based on crown area to land area ratio)\*:

\*Where trees are less than small timber size crown area is projected as though trees were small timber size.

- a) Area is Forest if 10-percent or more is in tree crowns.
- b) If non-Forest, label will show most appropriate single 2-digit alpha code for non-forest based on a plurality of the area vegetational cover.
- c) If Forest, the two most predominant tree species will be coded in their order of prominence with the following exceptions:

- (1) If the area is 50 to 90 percent grass or brush, code the predominant tree species first, followed by the most appropriate non-woody or shrub code. If an unacceptable label results, ignore the tree component in labelling. If the area is over 50 Percent Forest, ignore the non-Forest Component for the tree species present.

- (2) When a particular tree species does not make up at least 20-percent of the tree crown area it cannot qualify as a second species code.

Exception - White fir, if perceptable in the stand and even though not next most predominant will always show as a second species.

- (3) Where hardwoods predominate mixed with conifers in a polygon, and commercial conifers make up at least 20-percent of the tree crown area, the appropriate commercial conifer code should appear as the second species regardless of the amount of some particular hardwood or non-commercial conifer second species.

#### B. Size Class Labelling

1. Size class codes are based only on the crown diameter of commercial conifers present on the polygon, and except for two-storied stands (see 2 below) are classified according to the predominant size class of commercial conifer species in crown area.

2. Two storied stands (code 6) are defined as stands of commercial conifers with an overstory of size class 4 or 5 and an understory at least two size classes smaller. Overstory density must not exceed 20-percent and the total density must be over 70-percent.

#### C. Density Class Labelling

1. Density class applies only to the commercial conifer

component in any polygon. Heavily stocked polygons could conceivably be classified as poor or sparse if the stocking were mainly in hardwoods and/or non-commercial conifers.

2. Density is estimated as the ratio of commercial conifer tree crown area to total area within a polygon of minimum size to be delineated.

3. Where trees of less than small timber size exist in a polygon, their crown areas are projected as though they were small sawtimber sized.

D. Other Classifications

1. Bare land caused by Management.

a) Clearcuts not yet regenerated

b) Brush to grass type conversions not yet growing grass

In these cases a single appropriate 2-digit alpha code will be used to label the polygon.

E. Sequence of Labels

Labels will always be in the following sequence:

Tree species or vegetation, tree size class, tree crown density.

The following tables list all the acceptable symbols and define all the acceptable labels that can be constructed with this symbol. The use of any additional symbols or labels must be approved by the Government through the COR.

510.33 Vegetation and Tree Species Symbols

<u>Map Symbol</u>	<u>Description</u>	<u>Further Specifications</u>
<u>I. Non-Vegetated</u>		
BA	Barren	Less than 10% vegetational cover. Bodies of Water 10 acres or over. Settlements, quarries, man-made land 10 acres or over
WA	Water	
UD	Urban-developed	

I. NON-VEGETATED  
EA (BARREN) WA (WATER) UD (URBAN-DEVELOPED)

II. Non-Forest

1. Non-Woody Vegetation

GL Grass  
GH Weeds, herbaceous cover

2. Shrubs

SB Sagebrush  
SA Chapparal      Manzanita and associa. shrubs  
SC Chamise      Adenostoma & associa. shrubs  
SM Montane      Buckbrush, chokecherry,  
                                 whitethorn, etc.  
SR Streamside, wet  
         meadow or bog shrubs  
SX Misc. Shrubs      Bitter brush, Mountain Mahogany, etc.

III. Forest

1. Non-Commercial Conifers

KP Knobcone pine  
DP Digger Pine  
FP Foxtail pine  
PJ Pinyon-Juniper Complex

2. Commercial Conifers

PP Ponderosa pine  
JP Jeffrey pine  
SP Sugar pine  
WP Western white pine  
LP Lodgepole pine  
WF White fir, grand fir  
RF Red fir  
DF Douglas-fir  
LC Incense cedar  
PC Port-Orford Cedar  
MH Mountain hemlock  
BS Brewer Spruce

3. Commercial Hardwoods      Non-Commercial Hardwoods

TQ Tankoak      LQ Liveoak  
PM Pacific Madrone      WQ Oregon White Oak  
BQ Black Oak  
CP CHINQUAPIN

IV. Other Classification

XX Clearcuts not yet regenerated  
TC Type Conversions, not yet vegetated

510.34 Acceptable Vegetation and Tree Species Labels

1. Any of the symbols shown in section 510.33 can stand alone as vegetation labels.
2. The combination of tree species and vegetation labels shown below are acceptable. No others will be used. Where the classifier finds a combination of vegetation and/or trees existing in a polygon, not covered by this label list, the label must be approved by the Government through the COR. The label will be based on the predominant single species or vegetation type in the polygon.
3. Acceptable Species Label Combinations

Tree Species

PPSP	WFPP	LCPP	WQPP
WF	SP	JP	DF
RF	JP	WF	BQ
DF	RF	BQ	LQ
LC	DF	WQ	
KP	BQ	LQ	LQPP
BQ			DF
WQ	RFSP	MHWP	RQ
LQ	JP	JP	WQ
	WP	RF	
JPSP	LP	LP	
WF	MH		
RF		KPPP	
SPPP	DFPP	BQPP	
WF	SP		
RF	WF	SP	
LC	LC	WF	
JP	TQ	DF	
	BQ	WQ	
	WQ	LQ	

Trees- Non-Forest Combinations

PPSB  
 SA  
 SM  
 SX  
 GL

JPSB  
 SM  
 LCSA  
 SM  
 GL

DFS  
 SM  
 GL

3. Cont'd Trees Non-Forest CombinationsWFSM  
SXKPSA  
SCBQSA  
GLWQSA  
GL510.35 Acceptable Size Class Symbols

1. Apply only to commercial conifer stands or components of stands
2. Use following codes based on predominant crown size:

<u>Code</u>	<u>Description</u>	<u>Size Class</u>
1		Seedlings and Saplings
2	Crowns $\geq$ 12 feet diameter	Poles
3	Crowns 13-24 feet diameter	Small Sawtimber
4	Crowns 25-40 feet diameter	Medium Sawtimber
5	Crowns over 40 feet diameter	Large Sawtimber
6	Two storied (See section 510.32B)	

510.36 Acceptable Density Symbols

1. Apply only to commercial conifer component of total stand density.
2. Use following codes based on total crown areas to polygon area ratio.

<u>Code</u>	<u>Crown Closure</u>	<u>Density Rating</u>
S	<20% Crown cover	Sparse
P	20-39% Crown cover	Poor
N	40-69% Crown cover	Not Adequate
G	$\geq$ 70% Crown cover	Good

510.4 Examples of Polygon Labels

<u>Label</u>	<u>Species Composition</u>	<u>Size Class</u>	<u>Density</u>
DF4N	> 80% Douglas-fir No white fir present	Commercial conifer mostly crowns 25-40 feet	40-69% of polygon in commercial conifer crowns.
DFWF6	Douglas-fir predominant White fir-present	Two storied See 510.33B2	Overstory 10-20% crown area total density over 70%
DFTQ3P	Douglas-fir predominant No white fir Tan oak at least 20% of tree crown area	Commercial mostly 13-24 feet crown diam.	Commercial conifer crowns 20-39% of polygon area.
SA	Over 50% manzanita and associated shrubs. Less than 10% tree crown cover of acceptable species codes.	n/a	n/a
LQSA	Over 50% manzanita and associated shrubs. Over 10% live oaks and other trees with live oak predominant.	n/a	n/a

520 DRAFTING AND FORMATING 1:48,000 SCALE MAPS

520.1 On supplied 1:48,000 topographic base maps (15 minute quadrangle format) the Contractor shall locate and draw seven and one-half (7½) minute quadrangle grid lines contained within the 15 minute quadrangle format using black Pelican "T" ink or equal. Line shall be drawn with .000 pen.

Listed below are the 7½ minute quadrangles contained in the 1:48,000 to be formatted as indicated above and photographed as specified in item 520.2:

U.S.G.S. QUADRANGLE COVERAGE - KLAMATH N.F.

<u>15' QUADS (1:48,000)</u>	<u>7½' QUADS (1:24,000)</u>	<u>FINAL # MAP SHEETS</u>
1. Ashland	1 SW	1
2. Talent	2 SE, SW	2
3. Preston Peak	4 (ALL)	4

VEGETATIONAL COMMUNITY TYPES

TITLE	MAP SYMBOL	DESCRIPTION
Barren Areas Water Urban-Developed	BA WA	Non-Forest Less than 10% living vegetative cover-- including rock and bare soil areas
Grassland Weeds & Herb. Cover	GL GH	Vegetation is made up of many combinations of species of low growing non-woody herbs and grasses.
Chapparal Sagebrush Chamise Shrubs-Montane Shrubs-Riparian Misc. Shrubs	SA SB SC SM SR SX	Associations of the "hard" woody shrubs. Manzanita and associated shrubs  Adenestoma and associated shrubs Buckbrush, chokecherry, whitethorn, etc. Streamside, west meadow or bog species Bitterbrush, Mountain Mahogany, etc.
Live Oak Oregon white oak Tanoak Pacific Madrone Black Oak	LQ WQ TQ PM BQ	Live Oaks, Oregon White Oak Quercus Garryana, "Garry Oak"
Pinyou-Juniper Foxtail Pine Western White Pine Mountain Hemlock Digger Pine Knobcone Pine Lodgepole Pine Incense Cedar Port Orford Cedar Brewer Spruce White Fir Red Fir Douglas-fir Ponderosa Pine Jeffrey Pine	PJ FP WP MH DP KP LP LC PC BS WF RF DF PP JP	Species $\geq$ 50% Crown of tree crown area " " " " " " " " " " " " " "
Clearcuts Type Conversions	XX TC	Areas 10 Acres and not regenerated Brush to grass, brush to tree type conversions not yet growing grass or trees.

**APPENDIX G**  
**ROADS BY ZONE**

<b>LANDSCAPE ZONE</b>	<b>ROAD NUMBER</b>	<b>MILES</b>
<b>EASTERN:</b>		<b>7.9*</b>
	46N16	2.4
	46N16A	0.4
	46N18	1.0
	46N52Y	3.3
	HWY 96	0.2
	<b>Subtotal</b>	<b>15.2</b>
<b>SOUTHWEST:</b>	<b>23.2*</b>	
	45N08X	1.8
	45N28	2.5
	45N29	2.3
	45N30	2.7
	45N32	2.6
	45N37	0.02
	45N39	5.1
	45N41	3.3
	45N43	1.4
	45N47	1.5
	45N53	3.9
	45N88	4.5
	45N96Y	1.9
	46N16	0.1
	46N27	1.8
	<b>Subtotal</b>	<b>58.6</b>
<b>NORTHWEST:</b>	<b>14.2*</b>	
	45N08X	0.02
	45N30	3.1
	45N32	1.7
	45N42	1.6
	45N47	2.2
	46N22	7.0
	46N24	1.3
	46N27	2.5
	46N52Y	0.4
	<b>Subtotal</b>	<b>34.0</b>
	<b>TOTAL</b>	<b>107.8</b>

\*Non-system or unattributed mileage.

## NUMERIC LISTING OF ROADS AND THEIR STATUS IN THE HUMBUG LANDSCAPE

FOREST ROAD # (COUNTY ROAD #)	ROAD NAME	LENGTH	MAINTENANCE LEVEL	LANES	SURFACING	TEMPLATE	CLOSURE	ADT	HSA
45N03X	High CCC Tie	.9	2	S	Native	H	N	1	N
45N04X	Eliza Gulch	2.6	2	S	Native	H	N	1	N
45N08X	Lawson Gulch	1.8	2	S	Native	H	N	1	N
45N09X	Big Humbug C/G	.1	2	S	Crush Agg	H	N	10	Y
45N28	High CCC (Gun Pk)	13.1	2	S	Native	H	N	10	Y
45N29 (7J020)	Long Gulch	3.1	2	S	Native	H	N	10	Y
45N30 (7J001)	Yreka Walker Road	17.9	3	S	Native	D	N	10	Y
45N32 (7J002)	Hawkinsville	8.7	3	S	Native	D	N	10	Y
45N37	Haystack Butte	2.5	1	S	Native	H	Y	0	N
45N39	Hawkinsville View	6.0	3	S	Native	D	N	20	Y
45N41	Middle Humbug Road	4.1	2	S	Native	H	N	10	Y
45N42	Jakes Glen	2.0	2	S	Native	H	N	1	Y
45N43	Ladybird	1.0	1	S	Native	H	Y	0	N
45N47 (7J031)	Elmo	4.8	3	S	Native	D	N	10	Y
45N53	Sucker Creek	7.5	2	S	Native	H	N	10	Y
45N88	Punch Creek	4.9	1	S	Native	H	Y	0	N
45N98Y	Keeler Creek	2.0	1	S	Native	H	Y	0	N
46N13Y (8J001)	Klamath River Road	16.0	2	S	Native	H	N	10	Y
46N16	Badger Mt.	5.8	2	S	Native	H	N	1	Y
46N18A	Badger Mt.	.7	2	S	Native	H	N	1	Y
46N18	Lower Clear Creek	2.3	2	S	Native	H	N	1	Y
46N22	Dowling Gulch	10.0	2	S	Native	H	N	10	Y
46N24	Kennebec Gulch	2.2	2	S	Native	H	N	1	Y
46N27	Deadwood Ridge	5.3	2	S	Native	H	N	10	Y
46N29	Upper Clear	1.0	2	S	Native	H	N	1	Y
46N30	Clear Vesa	2.3	2	S	Native	H	N	10	Y
46N39	Barkhouse Grouse	2.3	2	S	Native	H	N	1	Y
46N52Y (8J002)	Humbug Creek	3.8	3	S	Native	D	N	100	Y
	<b>TOTAL</b>	<b>134.7</b>							

Please Note: **Surfacing** = crushed aggregate, native material, etc., **HSA** = Highway Safety Act- if road is passable by passenger car then HSA applies, and **Template** = Cross section of road for over 50% length; D - x-section includes ditch, and H - x-section does not have ditch, shoulder or berm

Road Closures: Y = Year Long Closure, and ADT = Average Daily Traffic

Maintenance Level: 1 = Assigned to intermittent roads during road closure, 2 = Assigned to roads open for use by high clearance vehicles, and 3 = Assigned to roads open and maintained for travel by a prudent driver in a standard passenger car.

SOURCE: TIS & RMO Report, 1-19-92

TRANSPORTATION SYSTEM MAINTENANCE HANDBOOK

Exhibit 1

General Relationship Between Maintenance Levels

PARAMETERS	MAINTENANCE LEVEL				
	1	2	3	4	5
Service Life	Intermittent Service-Closed Status	Constant Service or Intermittent Service - Open Status (Some uses may be restricted under 36 CFR 261.50)			
Traffic Type	Open for non-motorized uses. Closed to motorized traffic.	Administrative, permitted, dispersed recreation, specialized, commercial haul.	All National Forest Traffic - General Use, Commercial Haul		
Vehicle Type	Closed-N/A	High clearance, pick-up, 4x4, log trucks, etc.	All types - passenger cars to large commercial vehicles		
Traffic Volume	Closed-N/A	Traffic volume increases with maintenance level			
Typical Surface	All types	None, Native, or Aggregate -- may be dust abated	Aggregate -- usually dust abated; paved		
Travel Speed	Closed-N/A	Travel speed increases with maintenance level			
User Comfort and Convenience	Closed-N/A	Not a consideration	Low Priority	Moderate Priority	High Priority
Functional Classification	All Types	Local Collector	Local Collector	Local Collector	Local Collector
Traffic Service Level	Closed-N/A	D	A, B, C -- Traffic service level increases with maintenance level		
Traffic Management Strategy	Prohibit or Eliminate	Discourage or Prohibit cars, Accept or Discourage high clearance vehicles.	Encourage, Accept	Encourage	Encourage

## APPENDIX H

### FIRE HISTORY STUDY (Unpublished)

An intensive fire history study is being conducted on the Happy Camp RD, Klamath NF by Alan H. Taylor (Pennsylvania State University) and Carl Skinner (PSW-Redding). Very little information is currently available concerning the historical role of fire in the Klamath Mountain Geological Province. Previous studies in this region include those of Wills (1991) on Hotelling Ridge, Agee (1991) in the Siskiyou and unpublished data from Skinner from the Trinity Mountains. More work is necessary to adequately describe the historical role of fire in this area due to its rugged topography, vegetative diversity, proximity to the coast, and its latitudinal position between California mixed-conifer forests of the Pacific Northwest.

The project has been designed to be a very intensive fire history study in order to address the following questions:

- *What were pre-settlement fire return intervals and how often have they changed since settlement?*

- *How did fire return intervals vary with climatic fluctuations over the last 400-500 years?*

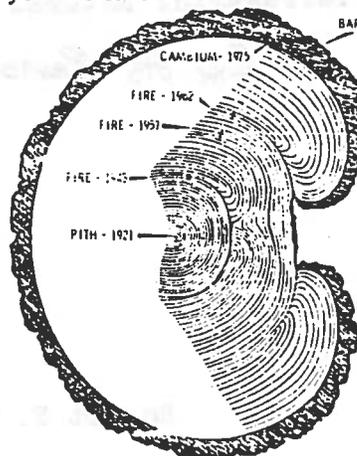
- *What were pre-settlement spatial patterns of tree age classes?*

- *What were the spatial/temporal patterns and dynamics of forest patches over the landscape during the period of fire scar record?*

- *What are the implications of the above for describing probable pre-settlement and pre-fire suppression stand structure and tree species compositions?*

This study is part of a larger project to develop decision support systems based on interfacing ecological models with enhanced capabilities of GIS and information presentation technology. This larger project is a partnership involving the Klamath NF, PSW, Penn State Dept. of Geography and UC Davis Dept. of Agronomy and Range Science.

The fire history study area is north of Happy Camp on Thompson Ridge. Its area is approximately 4000 acres, much of which is within an HCA for the northern spotted owl. Approximately 2/3 of the area burned during the 1987 fires. Elevations range from 2200-5000 ft. Slopes are generally in excess of 50% with 80% not being uncommon. Forests are mostly mixed-conifer dominated by Douglas-fir in the lower 2/3 of the slopes and by white fir above. Other common conifer species represented are incense cedar and sugar pine. Ponderosa pine is found only on the west side of Thompson Ridge and western yew in drainage bottoms on the east side. Common hardwood species are golden chinquapin, madrone, black oak, big-leaf maple, and canyon live oak.



Eighty sample plots have been established distributed throughout the study area. Data have been collected on each plot to describe the current stand structure, species composition, site characteristics and address the above questions. With greatly appreciated assistance from the Happy Camp RD, we have collected over 200 stump slabs (9+ tons of material) representing the fire scar record and over 1200 tree cores. The material is being shipped for processing in the Tree Ring Lab at Penn State. Analysis of the data is planned to take place this winter with the first reports of findings to be prepared in the spring of 1993.

CARL SKINNER  
PSW - Redding

**APPENDIX I**

**State of California  
The Resources Agency  
DEPARTMENT OF FISH AND GAME**

**Preliminary Descriptions of the  
Terrestrial Natural Communities of California**

*Exerpts Pertaining to Siskiyou Co*

by

**Robert F. Holland, Ph. D.**

**Vegetation Ecologist  
Nongame-Heritage Program  
Sacramento, CA 95814**

**October 1988**

## Preface

The Natural Diversity Data Base is a computerized inventory of the locations of populations of rare and threatened plants, animals, and natural communities in California. These "elements of natural diversity" represent the dual approach taken to assure that California's rich biological heritage is adequately represented in the inventory.

On one hand, a minority of the state's biota is in such precarious condition that species-oriented management is required to assure that they will survive into the next century. These taxa (882 plants, 178 invertebrates, and 278 vertebrates) are the ones currently included in the Natural Diversity Data Base. However, even if we lived in an ideal world and were able to secure the long-term prospects for every one of these 1138 taxa, much of California's biota would want for protection. This "fine filter" approach of species-oriented protection would let many of the state's more common taxa slip through without protection until such time as they become "rare enough" to require this type of conservation effort.

On the other hand, there are several plant communities in California that, for any number of reasons, do not harbor any of these 1138 taxa. What is needed, then, is a "coarse filter" to catch the actual majority of the state's biota. This "coarse filter" is provided by the natural community component of the inventory.

This approach is patterned after The Nature Conservancy's natural heritage program methodology, which has been evolving for more than a decade. More than forty states have established similar programs. Basic to this system is the preparation of a list of species and communities to include in each state's inventory. Linnean taxonomy provides such a tool for plants and animals, but no such universally accepted protocol exists for plant communities. After several years effort including a few false starts, the NDDB adopted with some modifications a classification originated by Cheatham and Haller (1) to satisfy this need.

The Cheatham and Haller system, as modified by NDDB, divides California's landscape into about 375 "natural communities". Native species and natural communities are chosen as inventory elements because in combination they comprise all of a region's biotic diversity. They are tangible units that can be counted, protected, and managed. Including natural communities in such an inventory allows for the preservation of ecosystem components that may support valuable or sensitive species as yet unknown to science. More importantly, by protecting representative samples of all natural communities, we will protect the habitats of most plants and animals. This relieves the workload on the "fine filter", maximizes the returns on limited resource protection resources, and hopefully will keep several species from ever being considered for inventory.

The current list of natural communities appears as Appendix A to this report. This is the third revision since the classification was adopted by NDDB. Each of these revisions, though, has consisted of a simple list of communities: no set of descriptions has accompanied any of the previous revisions. The list has evolved enough that there is no easy way to determine what constituted each of the communities. Users have been left with the sometimes difficult and frustrating task of rectifying Cheatham and Haller's scheme with the NDDB list.

The descriptions presented here were prepared with hopes of meeting this need. I have prepared brief descriptions of nearly every element in the classification. These include descriptions of the overall aspect of each community, the abiotic site factors typically found on a site, a short list of characteristic species found in typical stands, the geographic range of the community, and one or more citations to literature.

These descriptions were prepared primarily from literature and discussions with biologists knowledgeable about particular areas. Only in a few areas did I have the luxury of extensive field work. I have every expectation that the descriptions will profit from scrutiny by the larger biological community of California. To this end I solicit constructive criticism of both the classification and the descriptions.

This is not intended as a definitive treatment on California's vegetation. Rather, it is a draft patterned after the early lists of plants of limited distribution within California that lead ultimately to the California Native Plant Society's Inventory of Rare and Endangered Vascular Plants of California. About 125 of the communities in the classification are preceded by an asterisk (\*). These are the communities that we currently feel are rare enough to merit inclusion in the inventory. We are particularly interested in knowing particulars about surviving examples of these communities.

We also would like to know: 1) are there gross errors in the description, site factors, characteristic species, and distribution of each element? 2) Are there important literature citations that should be added? 3) Are there important communities that should be added to the list? 4) Are there communities that are too common to merit inclusion in the inventory, but currently have an asterisk? Input from California's botanists should help this classification in as many ways as it has helped to refine the CNPS Inventory.

Careful comparison of Appendix A with the main body of the report will reveal several communities for which there are no descriptions. These are listed in Appendix B. These are the elements for which I could not find adequate information to prepare even the briefest description. This can be attributed to several possible causes: 1) the community doesn't really exist, 2) the community exists but I was not able to ferret out any

published information or anybody who knew about it, 3) the community was mentioned in some published work, but not with enough detail to allow a cogent description. I am particularly interested in any information that will allow moving any community out of Appendix B.

I would like to acknowledge the considerable assistance I have received during the preparation of these descriptions. This help has run the gamut from actual field work to enlightening publications to brief conversations about some minor point. Drs. J. Griffin, R. Haller, J. Major, and R. Thorner together with N.H. Cheatham deserve special thanks. Deborah Jensen, my immediate predecessor as Data Base ecologist, has helped innumerable times to answer questions both large and small. Cynthia Roye has assisted ably in every aspect of this report's preparation. Joanne Gonzales, Laurie White, Rosemary Martinez and Pat Mallette all helped with the word processing. The most valuable help of all, however, has come from the biologists throughout California who were willing to take a few minutes (or a few days) to clarify some intriguing detail. I find myself in the position of gladly accepting all the blame for any errors (of omission or commission) in this report, while gratefully crediting California's biological community for all of this document's factual content.

ELEMENT NAME: Montane Ceanothus Chaparrals

ELEMENT CODE: 37530

DESCRIPTION: Dense, 1-3 m tall mostly sclerophyllous chaparral dominated by any of several species of Ceanothus. Plants winter-dormant, most active in late spring and early summer. These stands are taller (to 10 feet) and much denser than other Montane Chaparrals. At least three types are recognized based on the dominant species: 37531 - Deer Brush Chaparral (C. integriramus); 37532 - Whitethorn Chaparral (C. leucodermis); and 37533 - Tobacco Brush Chaparral (C. velutinus).

SITE FACTORS: Similar to and often intergrading with Upper Sonoran Mixed Chaparral (37100), but generally higher (therefore cooler and moister). Most stands are successional after fire, landslide, gold mining, or other catastrophic disturbances. Best developed on dry, exposed sites.

CHARACTERISTIC SPECIES: Amelanchier pallida, Arctostaphylos parryana, A. patula, Ceanothus integriramus, C. leucodermis, C. velutinus, Holodiscus boursieri, H. microphyllus, Lonicera involucrata, Prunus emarginata, Quercus chrysolepis, Sorbus scopulina

DISTRIBUTION: Scattered widely in the lower elevation conifer zones (5000-8000 feet) throughout California.

ELEMENT NAME: Buck Brush Chaparral

ELEMENT CODE: 37810

DESCRIPTION: A dense chaparral to ~ 3 m tall, clearly dominated by Ceanothus cuneatus with some admixture of Adenostoma fasciculatum. Cover is higher than in Chamise Chaparral (37200) but is not so dense because the branches are not so interwoven.

SITE FACTORS: Dry slopes and alluvial fans, usually below ~6,000 feet. This may be a climax chaparral in parts of its range, but it clearly is seral to some deciduous oak woodlands (71110-71140) or Lower Montane Coniferous Forests (84000) at many sites.

CHARACTERISTIC SPECIES: Adenostoma fasciculatum, Ceanothus cuneatus, Garrya fremontii, Heteromeles arbutifolia, Quercus dumosa, Rhus diversiloba

DISTRIBUTION: Widely distributed from southwestern Oregon to northern Baja California, especially in the north where it appears to replace Chamise Chaparral (37200)

ELEMENT NAME: Poison Oak Chaparral

ELEMENT CODE: 37700

DESCRIPTION: A chaparral dominated by poison oak. (Therefore little compositional data available).

SITE FACTORS: Is this a disturbance type maintained by frequent fires?

CHARACTERISTIC SPECIES: Toxicodendron diversilobum, Mimulus aurantiacus, others?

DISTRIBUTION: ?

SOURCES: ?

ELEMENT NAME: Black Oak Woodland

ELEMENT CODE: 71120

DESCRIPTION: Open to dense woodlands are dominated by Quercus kelloggii. Shrubby understories usually are partly open, often with Cercocarpus betuloides. Pinus ponderosa is a common associate on all but the poorest sites. Most stands are even aged and younger than 125 years. Ground cover usually is well developed, contributing to a good litter layer.

SITE FACTORS: Mainly a seral community maintained by fire. Quercus kelloggii is a vigorous stump sprouter. Stands younger than about 60 years are not very resistant to fire. Stands that have been overtopped by taller conifers may decline because Q. Kelloggii is very shade-intolerant. Best developed between 1500 ft and 3000 ft, in areas receiving 30-50 inches of rain. (to 7000 in southern California)

CHARACTERISTIC SPECIES: Arbutus menziesii, Abies concolor, Libocedrus decurrens, Lithocarpus densiflorus, Pinus jeffreyi, Pinus attenuata, P. coulteri (in south), P. ponderosa, Pseudotsuga macrocarpa (in south), P. menziesii, Quercus chrysolepis (poor sites), Q. garryana, Q. kelloggii, Pteridium aquilinum, Q. wislizenii, Umbellularia californica, Aesculus californicus, Q. Douglasii, Ceanothus intergerrimus, Arctostaphylos viscida, Rhamnus crocea, Lonicera interrupta, Cercis occidentalis, Cercocarpus betuloides, Toxicodendron diversiloba.

DISTRIBUTION: Discontinuously scattered from the central Oregon Cascades south through the mountains to near the Mexican border. Best developed in the southern Cascades and Klamath mountains and northern parts of the Coast Ranges and Sierra Nevada, especially between 2500 and 5000 feet.

SOURCE: 12, 13, 27, 68, 150, 155

ELEMENT NAME: Westside Ponderosa Pine Forest  
 ELEMENT CODE: 84210

**DESCRIPTION:**

An open, park-like forest of coniferous evergreens to 70 m tall, dominated by Pinus ponderosa. The understory typically is sparse, consisting of scattered chaparral shrubs and young trees. There is often considerable accumulation of needle litter and pine cones on the ground. Growth occurs mostly from late spring to midsummer and is probably limited by summer and fall drought. Cones mature in the early autumn. All plants are essentially dormant in winter.

**SITE FACTORS:**

Well-developed in areas with warm, dry summers and cool, moist winters with considerable snow accumulation at the higher elevations. Often on south-facing slopes, except near lower elevational margins. Usually on coarse, well-drained soils; often granitic or basaltic, very rarely serpentine. Probably maintained by occasional ground fires. Crown fires may result in temporary replacement of the forest by dense Montane Chaparral (37500). At its lower limits, intergrades with Coast Range Ponderosa Pine Forest (84130) in the North Coast Ranges, with Blue Oak Woodland (71210) on nonrocky soils in the interior North Coast Ranges and Cascade-Sierra foothills, with Coulter Pine Forest (84140) in southern California, with Knobcone Pine Forest (83210) on rocky, often serpentine soils; with Lower Montane Chaparral (37510) on dry, rocky soils in the Cascades and northern Sierra Nevada; with Californian Mixed Chaparral (37110) in the southern Sierra and extensively in southern California. Within its elevational range, intergrades with Montane Chaparral (37500) or Coulter Pine Forest (84140) on dry, rocky sites and with Sierran Mixed Conifer Forest (84230) on moist sites. At its upper limits, intergrades with Sierran Mixed Conifer Forest (84230) on moist slopes and with Jeffrey Pine Forest (85100) on dry slopes.

**CHARACTERISTIC SPECIES:**

Abies concolor, Arctostaphylos patula, Calocedrus decurrens, Ceanothus integerrimus, C. cordulatus, Chamaebatia foliolosa, Lithocarpus densiflorus, Pinus attenuata, P. Coulteri, P. Lambertiana, P. ponderosa, Quercus chrysolepis, Q. Kelloggii, Rhamnus californica

**DISTRIBUTION:**

Higher elevations of the interior North Coast Ranges and Siskiyou Mtns. from Lake Co. to Siskiyou Co. and northward into Oregon. Abundant on the west side of the Cascade Range and Sierra Nevada from the Siskiyou Mtns. to northern Kern Co. Also on the coastal sides of the eastern San Gabriel Mtns, Los Angeles-San Bernardino Cos.; the San Bernardino Mtns., San Bernardino Co.; and the San Jacinto Mtns., Riverside Co. Sparingly present in the San Rafael-San Emigdio Mtns., Santa Barbara-Ventura Cos.; Tehachapi Mtns., Kern Co.; Palomar and Cuyamaca Ranges, San Diego Co. Elevation from 2000-5000 ft (900-1500 m) in the north to 4500-6500 ft (1300-2000 m) in the south. The lowest-occurring montane forest type over most of its range.

SOURCES: 1, 37

ELEMENT CODE: 84230 *Sierran Mixed Conifer Forest*

## DESCRIPTION:

Similar to "Westside" Ponderosa Pine Forest (84210), but denser, with the crowns often touching, often slightly taller (to 75 m) and with several dominant species. Abies, Pseudotsuga and Cornus are more common on moist sites; Pinus spp. and Ceanothus spp. on dry sites. Pseudotsuga is lacking south of northern Fresno Co. Understory much as in "Westside" Ponderosa Pine Forest but with scattered, broadleaved mesophytic shrubs and small trees, and with greater accumulation of wood on the ground. The growing period is similar to that in "Westside" Ponderosa Pine Forest, concentrated in early summer.

## SITE FACTORS:

Similar to "Westside" Ponderosa Pine Forest (84210), but usually on moister soils. Usually on north-facing slopes near its lower elevational margin. In areas of greater winter snowpack than "Westside Ponderosa Pine Forest, "Eastside" Ponderosa Pine Forest (84220), Lower Montane Chaparral (37500) or Upper Montane Chaparral (37520). Intergrades with Sierran White Fir Forest (84240) on cool, moist, north-facing slopes within its elevational range. At its upper limit, intergrades with Upper Montane Mixed Conifer Forest (85200) on drier slopes or with Upper Montane Fir Forest (85300) on moist, north-facing slopes.

## CHARACTERISTIC SPECIES:

Abies concolor, Artostaphylos patula, Calocedrus decurrens, Castanopsis sempervirens, Ceanothus cordulatus, C. integerrimus, C. prostratus, Cornus nuttallii, Pinus jeffreyi, P. lambertiana, P. ponderosa, Prunus emarginata, Pseudotsuga menziesii, Quercus kelloggii, Ribes roezlii, R. nevadensis, Ribes spp., Sequoiadendron gigantea

## DISTRIBUTION:

Very similar to "Westside" Ponderosa Pine Forest (84210), but ranging, in addition, to the east side of the Sierra Nevada-Cascade crest on moist slopes from southeastern Siskiyou Co. to the Lake Tahoe region. Elevation from 3000-6000 ft (900-1800 m) in the north to 5000-7000 ft (1500-2100 m) in the south, averaging slightly higher than "Westside" Ponderosa Pine Forest. Also present on the summit plateau of the Sierra San Pedro Martir, Baja, California between 7000 and 8000 ft (2100-2400 m).

SOURCES: 1, 42, 43

## APPENDIX J

### FIRE HAZARD AND RISK ASSESSMENT

9/29/93

This is a brief outline of the process steps and assumptions used in development of the Humbug fire hazard and risk assessment. This is a coarse filter which characterizes the wildfire potential across the landscape using consistent methodology to describe hazard. This assessment can indicate areas of concern to focus further attention on fuels reduction. This can be of value when prioritizing areas for further review and possible treatment. People must remember that this is a coarse filter assessment, when using the fire hazard map. This information will require a good deal of refinement for use in fuels reductions projects, particularly a prescribed fire project.

#### FUEL MODEL MAP

The preliminary map is a crosswalk of fuel models based on LMP timber strata information. Technical Report INT-122 was used as a reference for fuel model descriptions. The following refinements were made to LMP crosswalk derived map:

Fuel Model 1 - globally changed to fuel model 2. Although there are patches that still fit best as a fuel model 1, for the most part these patch types have a brush component and are best characterized as a 2. This is a nominal component within the landscape and patch sizes do not tend to be very large. It mostly occurs along the ridges of the landscape boundary.

Fuel Model 5 - globally changed to fuel model 6. Again there are areas that would be best characterized if left as a 5, but overall decadence in the brush types indicate a 6 would be best descriptor. Generally the eastern zone has pockets of less decadent brush. Within the northwest zone, in the manzanita brush types, there are larger areas which could best be described as a 5. Given the short time period, and coarse filter approach, fuel model 6 was used to describe the brush strata in general. The brush patches would require more detailed assessment prior to implementation of a prescribed burning project.

NCF - Not given a fuel model crosswalk. In this landscape a fuel model 6 best characterizes the NCF lands. For the most part they are scrubby white oak and brush associations, with more structural diversity than found in the manzanita brush types. They also have the higher degree of decadence as found in the buckbrush types. It is likely that individual stands could be fuel typed differently during field review.

Fuel Model 11 - Attributed to older plantations (>30 years). These had to be attributed on a polygon by polygon basis. Information for TSI records and walkthroughs were used to make a call. Not all stands have recent information. In some instances, small stands were incorporated into adjacent fuel model. General rule of thumb and assumptions are:

Thinned Stands - Remained as fuel model 11. Assumption is the thinning slash in untreated stands have created a slash fuel model

Poorly stocked stands - Went into fuel model 6. Assumption is the brush component will be the fire carrier. For the most part these stands are >30 years old, presumed brush with decadence. It is quite likely some of these would best be characterized as a fuel model 5, or need to redraw boundaries and create more than one polygon to include a timber fuel model and brush fuel model (possible in large stands with patchy distribution of conifers).

Adequately stocked stands - Went into a fuel model 9. Assumption is the litter accumulation is the fire carrier. Stands went into fuel model 9 rather than an 8 because majority of area has high component of

ponderosa pine. Further evaluation of individual stands would indicate species composition and most appropriate fuel model.

Fuel Models 8, 9, and 10 were left unchanged. Each of these is highly variable and no consistent assumption could be applied to make changes. Stands will require further refinement to develop burning Rx's which will successfully achieve objectives of cleaning up ground fuels or understory regeneration without exceeding acceptable levels of mortality in the overstory component.

In some of the very sparsely stocked (10-20% crown closure) stands the brush component may actually be the fire carrier.

Another factor not tracked is development of an understory of conifer regeneration. Presence of an understory component in sufficient quantities would create ladder fuels which contribute to crown fire potential. This would place moderate hazard fuels (such as 8 and 9) into a high hazard class.

## **FIRE HAZARD**

This is a derived layer which utilizes a slope map, fuel model map, and fuel model to hazard crosswalk.

Three slope classes are used, consistent with the slope classes used in LMP geologic hazard classification (0-34%, 35-65%, and >65%).

Each fuel model is run through BEHAVE program. This is a modeling program which uses fuel model, slope, and weather parameters to predict fire behavior and resistance to control for suppression purposes. The 90th percentile weather from district records was used to model late summer afternoons typical of late July or August. All fuel models were run through each slope class, to determine increases in hazard, if any, with increased steepness of terrain.

The final product is a crosswalk in which flame lengths and rate of spread are evaluated to determine resistance to control. The output is a rating of low, moderate or high hazard:

Low - Flame lengths <4' - Fires can generally be attacked at the head or flanks by persons using handtools. Hand line should hold the fire.

Moderate - Flame lengths 4-8' - Fires are too intense for direct attack on the head by persons using handtools. Hand line cannot be relied on to hold fire. Equipment such as dozers, pumpers, and retardant aircraft can be effective.

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

Although flame lengths are generally used to define hazard, it should be noted that some fuel models will have low flame lengths but extremely rapid rate of spread, which will place them into a higher hazard class. For example in Humbug fuel model 2 (?) is a grass/low brush fuel model which never exceeds 4' flame lengths, but the rate of spread is 114 chains per hour. This exceeds the ability of hand crews, or equipment, for direct attack without air support.

The derived layer incorporates the information into a spatial display of hazard assessment for the landscape. This begins to provide the link to risk and the resource values.

At present this layer is still being developed for the Humbug landscape. Based on preliminary review of the fuel models and the BEHAVE runs. It is presumed that most of the landscape will be in moderate to high fire hazard, with large areas being considered as high hazard.

## FIRE RISK

Based on district fire atlas. Indicates location of starts over a 60 year period. General fire risk assessment was derived for the three zones, defined based on site capability and vegetative composition (east, northwest, and southwest zone).

A mathematical formula is used to derive a risk value. Included in the formula are the number of starts, number of years of historical information, and number of acres involved. The values in the formula are:

- x = number of starts recorded for area from fire history records
- y = period of time records cover (for Humbug it is 60 years)
- z = number of acres analyzed (displayed in thousands 16,400 = 16.4)

$$\{(x/y)10\}/z = \text{Risk rating}$$

The value derived corresponds to a likelihood of fire starts per 1000 acres. Following are the risk ratings and range of values used in the assessment:

Low Risk = 0-0.49 - Project at least one fire expected every 20 or more years per thousand acres

Moderate Risk = 0.5-0.99 - Project at least one fire expected in 11-20 years per thousand acres

High Risk =  $\geq 1.0$  - Project at least one fire expected in 0-10 years per thousand acres

Preliminary risk rating in Humbug was characterized as moderate, ranging from 0.60 to 0.88. Further evaluation of the occurrence map indicates distinct bands of concentrated occurrence in each zone. Further refinement of the assessment is likely to indicate areas of high risk along the upper slopes of the landscape. The analysis has not been performed at this time, but will be incorporated into the final assessment.

## POTENTIAL WILDFIRE EFFECTS

This is the end product of the assessment. By incorporating hazard and risk, a matrix is developed which measures the likelihood a stand will be lost to wildfire. The output is a tabular report identifying the number of acres in each category, and a spatial display of location of those acres.

### POTENTIAL WILDFIRE EFFECTS MATRIX

HAZARD	RISK		
	LOW	MODERATE	HIGH
LOW	1	1	2
MODERATE	1	2	3
HIGH	2	3	4

## TREATMENT OF MANAGEMENT CREATED FUELS

### FIRE EFFECTS

CLASS	DESCRIPTION	MANAGEMENT ACTION
Class 4	Very high or quite likely stand will be lost to a wildfire	Unacceptable treat fuels to a Class 3 level
Class 3	High likelihood stand will lost to wildfire	Fuel buildups at this level may be permitted about 25% of the time
Class 2	Moderate likelihood stand will lost to wildfire	Fuel buildups at this level permitted about 75% of time
Class 1	Low likelihood of stand loss to wildfire	Permitted anytime

It should be noted that the forest standards focus on management created fuels (i.e., thinning slash), but this assessment can be used in development of a strategy to treat natural fuels to achieve ecosystem health and various resource objectives. This enables fuels planners to determine whether forest standards are being met, and where fuels hazard reduction may need to occur.

Evaluation of the various resource values and objectives along with the Wildfire effects matrix can be used to develop a fuels management plan which can best move the landscape towards the desired condition. For example much of Humbug is expected to exceed forest standards. Since it cannot be treated at once, efforts may be focused on protection of existing late seral stands and treatment of older plantations for recruitment into mature stand structure. Another area of emphasis may be reduction of hazard on deeply weathered granitics to reduce susceptibility to large stand replacement fires.

**Note:** At this time the fire/fuels assessment has not been completed. But the all steps to the process have been described. The final results of this analysis will be discussed in greater detail in Step 4 as part of the general trends.

## APPENDIX K

### NATURAL RANGE OF VARIABILITY DISCUSSION BY MANAGEMENT AREA

This summarizes the general links between the management areas and zones defined in Humbug landscape. Rather than define a specific set of ranges for each management area, general conclusions about drawn about where the management area occurs and how it might have looked in the past. This discussion focuses on the conifer elements. It is presumed that the natural range of variability for brush elements did not differ significantly between zone.

This is compared with the desired condition ranges established for each management area to ensure that desired condition objectives are not at cross purposes with the processes which have created the landscape.

Riparian Management Zones and the *Calochortus* management area did not have a range of seral stages defined in the desired condition. The *Calochortus* management area is a small area (100 acres) of unique habitat in the landscape.

The Riparian Management Zones occur throughout the landscape in all zones. The characteristics of the RMZs would change somewhat according to the stream class and aspect, but range of variability would not differ significantly. Predominantly the riparian areas would have been in a late seral condition, with understory development and/or pockets of regeneration occurring in openings created in the canopy as overstory trees die and eventually become downed woody material.

The Retention Management Area occurs along the Klamath River corridor in the east zone of the landscape. The natural range of variability defined for conifers in this zone includes the area with visual retention management emphasis. It should be noted that percent of stands of large diameter conifers may trend toward the low end the range of variability due to the extreme site limitation along the river corridor.

The Partial Retention Management occurs predominantly in the east zone and includes the eastern portions of both the northwest and southwest zone. Although stand composition and arrangement changes by zone, both the northwest zone and east zone were defined as having comparable ranges of seral stages. The amount of this management area in the southwest zone not significant.

The natural range of variability is similar to the desired condition ranges. It is presumed that a higher percentage of stands might have become large diameter conifer patches in the past, as a result fire maintaining open stand conditions and longer persistence in a mature phase.

The General Forest Limited Scheduled Harvest area occurs in all three zones, but is predominantly found on the granitic soils of the northwest zone. The natural range of variability is similar to that discussed under Partial Retention in this zone.

In the southwest zone the range of variability is higher, with a greater proportion of seedling/sapling stands and large diameter conifers than found elsewhere (wider distribution across the seral stage range). Compared to the desired condition ranges, where the range of variability is reduced and a lower percentage of large diameter conifer stands will exist. It should be noted that these areas in the southwest zone will tend to be at the high end of the desired condition ranges in the medium and large diameter conifer stands (higher site capability on long rotations).

The General Forest areas are predominantly found in the southwest zone. The natural range of variability described for this zone best characterizes the General Forest past conditions. As previously mentioned, this zone was described as having a wider range of variability. The desired condition ranges reduces the range of variability and places more emphasis on young conifer stands. The ranges are skewed more towards maintenance of a medium diameter conifer stand, higher proportion of seedling/sapling stands (top end of natural variability range) and a much lower percentage of large diameter conifers than were likely to be found in the past.

## APPENDIX L

### WATERSHED CUMULATIVE EFFECTS

Humbug landscape is nested within a clustered compartment which was analyzed for watershed cumulative effects for the Draft Forest Land Management Plan. Compartments 134, 136, 137 and 138 were used for the Humbug watershed analysis. Because this coincides so closely with the Humbug landscape boundary, we are able to display the effects of this analysis. In other words, we can use this analysis to project maximum acres that can be treated or disturbed per year in the Humbug Landscape in accordance with LMP assumptions.

The Equivalent Roaded Area (ERA) model was used in forest planning to compare existing disturbance to a threshold of concern (TOC). In theory, disturbance beyond this threshold level is correlated with increased peak flow and resultant decline in water quality.

The existing disturbance level includes roads, landings, fire effects, plantations in the coefficients. The threshold of concern for this clustered compartment watershed analysis was based on indices of channel stability, beneficial uses, watershed erodibility, watershed slope stability and watershed peak flow response.

Disturbance coefficients were established in forest planning for various silvicultural and vegetative treatments. The units of measure are ERA; the ration of hydrologic disturbance relative to that of a road prism [eg. one acre of clearcut = .21 acres of road in terms of watershed (run-off) response]. These include:

1/ Prescribed fire which results in a medium or high intensity burn would be similar to a clearcut disturbance coefficient (i.e. brush rejuvenation burn prescription). However, light underburning which is designed to consume fire fuels while retaining canopy closure and soil organic materials would not be considered a disturbance.

- Clearcut = .21
- Moderate or high intensity burn = .20 1/
- Regeneration with reserves = .18
- Group selection = .16
- Thinning = .16
- 1 mile of road = 4.1

9.0% = Humbug Threshold of Concern  
7.2% = Humbug Existing Disturbance Level

-----  
1.8% Slack

There is a 1.8% slack to apply to this landscape when projecting future treatment opportunities in order to meet Draft Land Management Plan disturbance levels for low to moderate risk of peak flow increase. Research indicates that full recovery is reached 33 years following planting.

#### *Long Term Disturbance (sustainable level)*

Based on a sustainable basis, it is estimated that approximately 343 acres/year over the long term could be treated and still be within the specified TOC of 9%. This projection is based on the following calculation:

**Landscape Acres (NF Lands) = 22,637**

- 9% TOC of 22,637 acres = 2,037
- 2,037 acres/.18 (average disturbance coefficient) = 11,317
- 11,317 acres/33 years = 343 acres/years over long term.

**Note:** The 343 acres/year is well within the 1.8% slack allowable to apply to this landscape.

- 9% TOC of 22,637 acres = 2,037
- 7.2% of 22,637 acres = 1,630 which equals 407 acres of slack.

APPENDIX M

HABITAT TYPE CLASSIFICATIONS

HABITAT TYPE CLASSIFICATIONS

CODE #

HABITAT TYPE

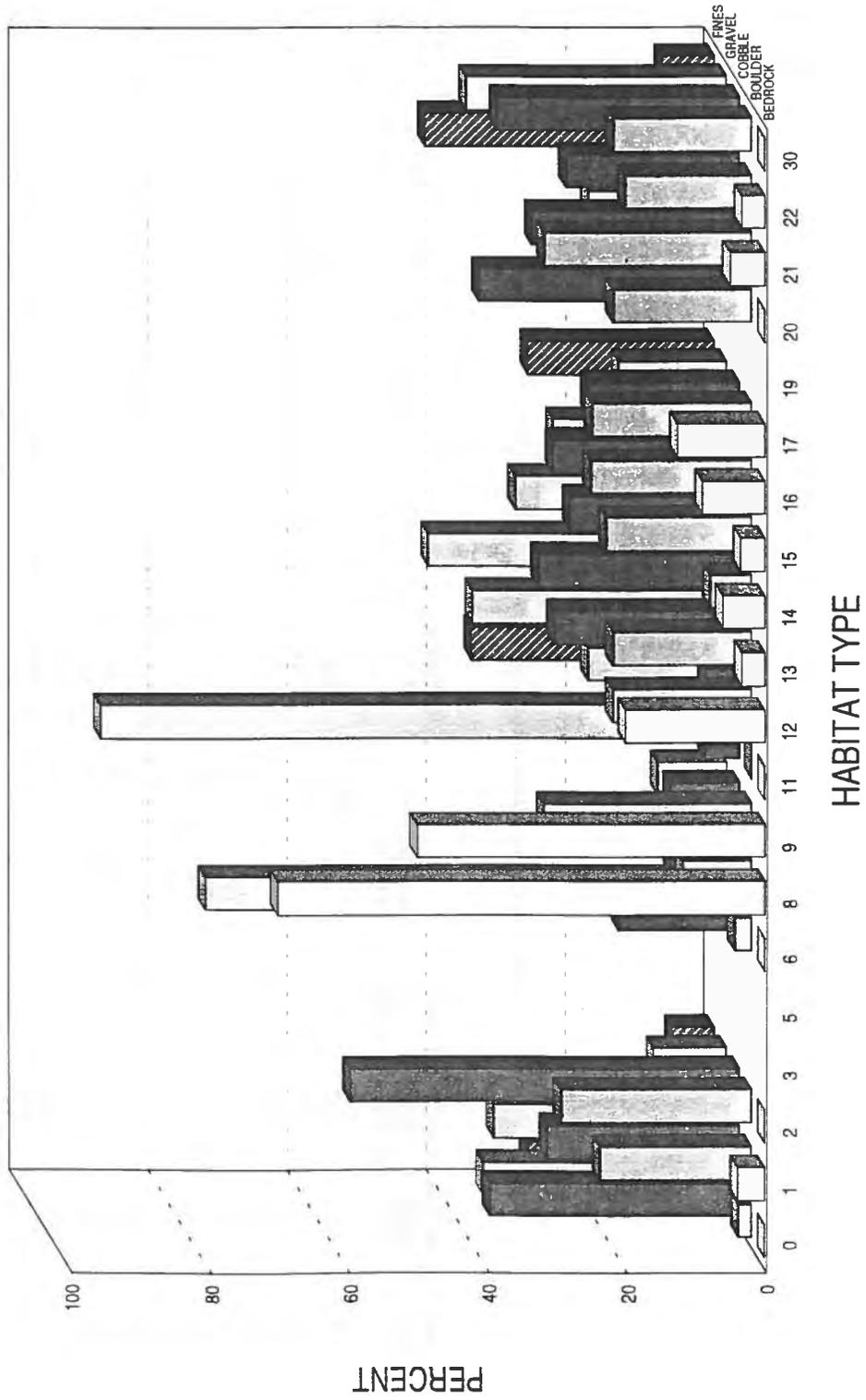
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- LOW GRADIENT RIFFLE 1
- HIGH GRADIENT RIFFLE 2
- CASCADE 3
- BACKWATER POOL (BOULDER) 5
- BACKWATER POOL (ROOT WAD) 6
- TRENCH POOL 8
- PLUNGE POOL 9
- LATERAL SCOUR POOL (ROOT WAD) 11
- LATERAL SCOUR POOL (BEDROCK) 12
- DAMMED POOL 13
- GLIDE 14
- RUN 15
- STEP RUN 16
- MID CHANNEL POOL 17
- CHANNEL CONFLUENCE POOL 19
- LATERAL SCOUR POOL (BOULDER) 20
- POCKET WATER 21
- CORNER POOL 22
- MAN MADE STRUCTURES 30

1989 HUMBUG CREEK HABITAT/DIVING SUMMARY SHEET

HABITAT TYPE	CHANNEL LENGTH (FT)	CHANNEL WIDTH (FT)	CHANNEL MEAN DEPTH (FT)	CHANNEL MAX. DEPTH (FT)	PERCENT SHADE	LWD	SPAWNING AREA (SQ.FT)	PERCENT SUBSTRATE COMPOSITIO					PERCENT COHO EMBED.	DIVING OBSERVATIONS		
								FI	GR	CO	BO	BR		(NUMBER)	(NUMBER)	(NUMBER)
0	1340	0	0.0	0.0	40	0.0	20000	27	35	36	2	0	30	400	117	
1	14506	11	0.5	1.0	49	130	32506	13	34	28	22	4	20	28		
2	193	10	0.5	0.8	63	5	45	6	11	56	28	0	26			
3	54	8	0.8	1.2		50	50									
5	9	4	1.0	1.2		0	0									
6	47	16	0.7	1.7	68	60	25	5	75	18	3	0	5	46	1	
8	18	5	1.0	1.7	20	0	0	0	10	10	10	70	0	13		
9	57	16	1.2	2.0	90	0	10	0	10	10	30	50	5	10		
11	149	11	0.8	1.5	95	75	40	5	90	5	0	0	5	37	7	
12	66	11	0.7	1.4	60	0	30	35	20	5	20	20	45	43	9	
13	187	15	0.7	1.5	47	0	210	13	37	27	20	3	28	54	23	
14	608	12	0.6	1.1	79	0	1800	16	43	29	6	6	18	145	3	
15	4241	11	0.7	1.7	61	45	3118	21	31	25	21	4	33	191	54	
16	2977	10	0.7	1.3	52	30	3992	16	25	27	23	9	20	774	43	
17	661	12	1.4	2.4	53	20	809	27	16	22	23	13	27	447	58	
19	29	20	0.8	1.2		0	18									
20	52	10	0.8	1.4	75	0	20	18	25	38	20	0	23	75	2	
21	150	9	0.6	1.1	60	0	220	15	20	30	30	5	20	34	2	
22	271	11	0.9	1.6	52	20	97	42	12	25	18	3	32	32	32	
30	80	10	1.0	1.9	30	100	55	8	38	35	20	0	15	121	10	
	25695	11	0.8	1.4	58		63045	16	31	25	17	11	21	2688	361	

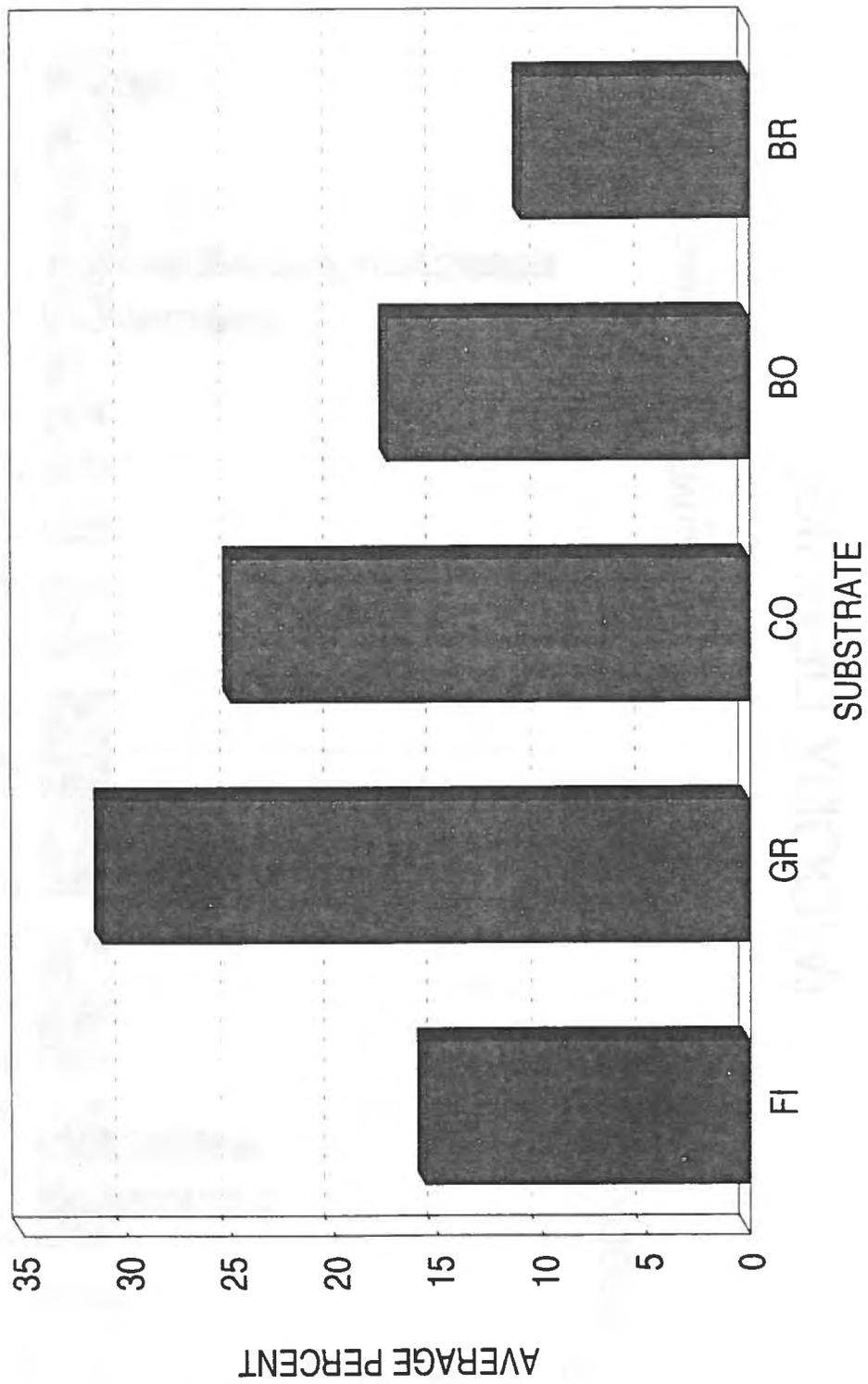
# HUMBUG CREEK

## SUBSTRATE COMPOSITION BY HABITAT TYPE



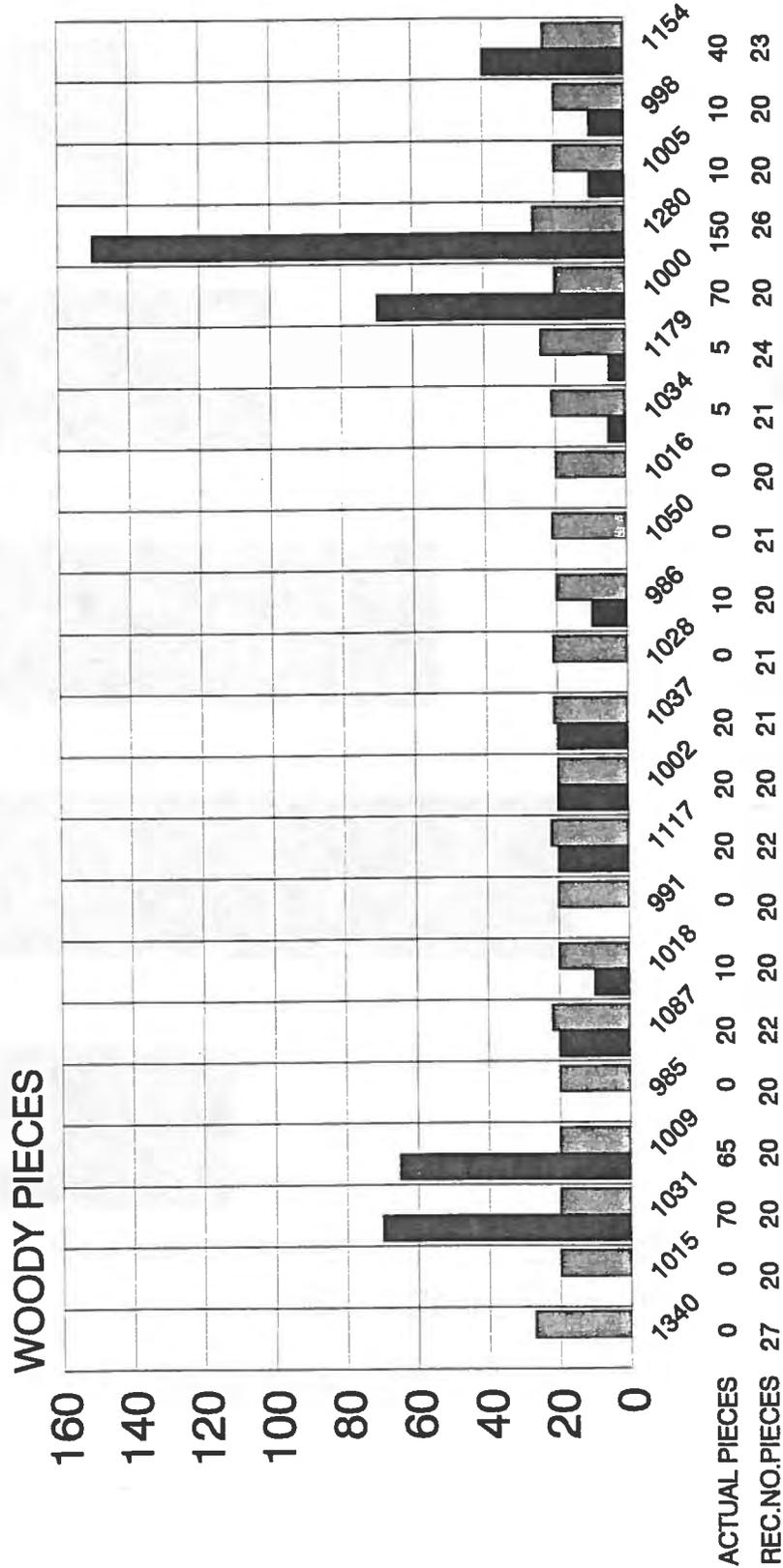
# HUMBUG CREEK

(AVE. SUBSTRATE COMPOSITION)



# HUMBUG CREEK (WOODY DEBRIS)

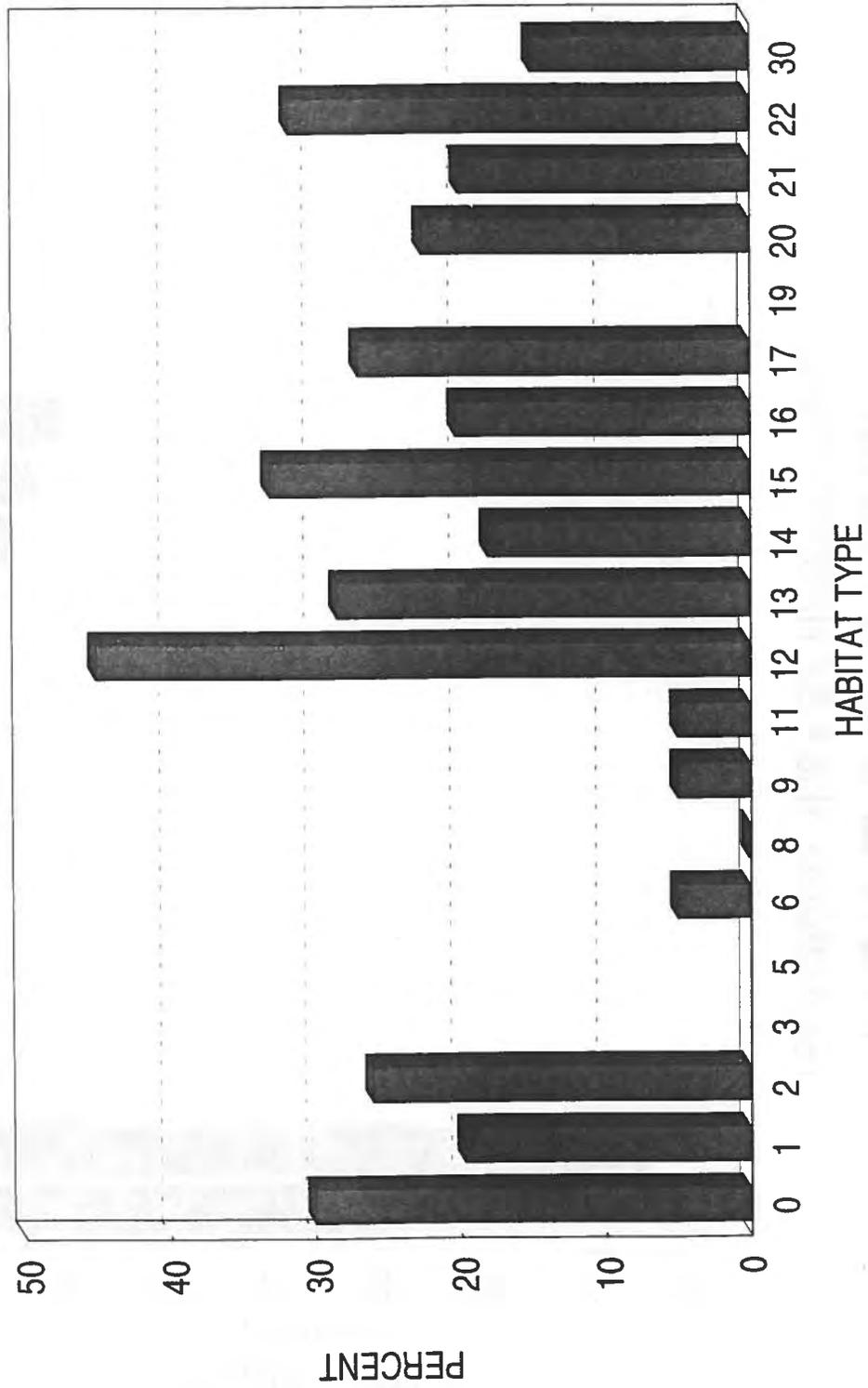
■ ACTUAL PIECES    ▒ REC. NO. PIECES



HAB. UNIT LENGTHS-NEAREST 1000'

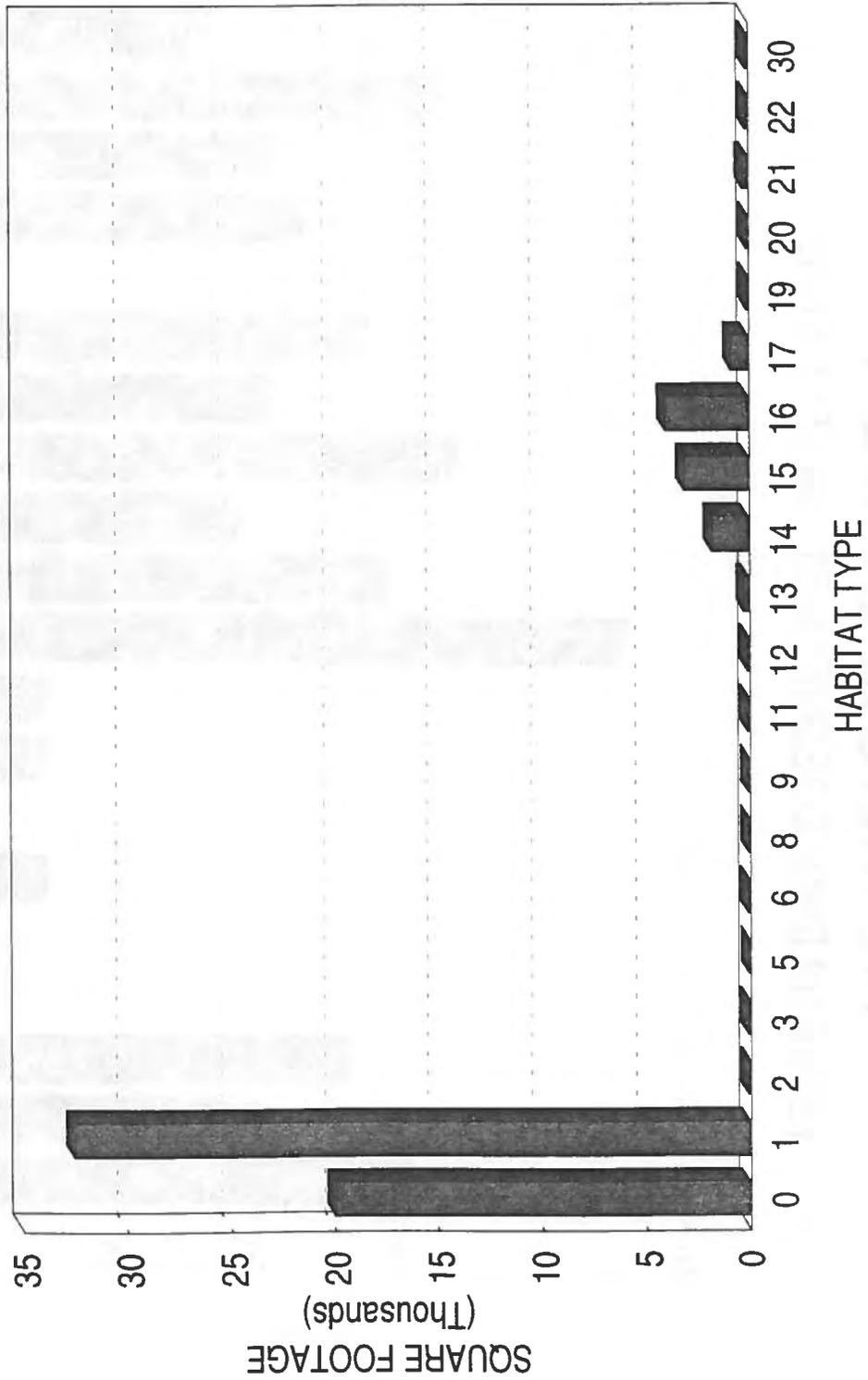
# HUMBUG CREEK

(STREAM EMBEDDEDNESS BY HABITAT TYPE)



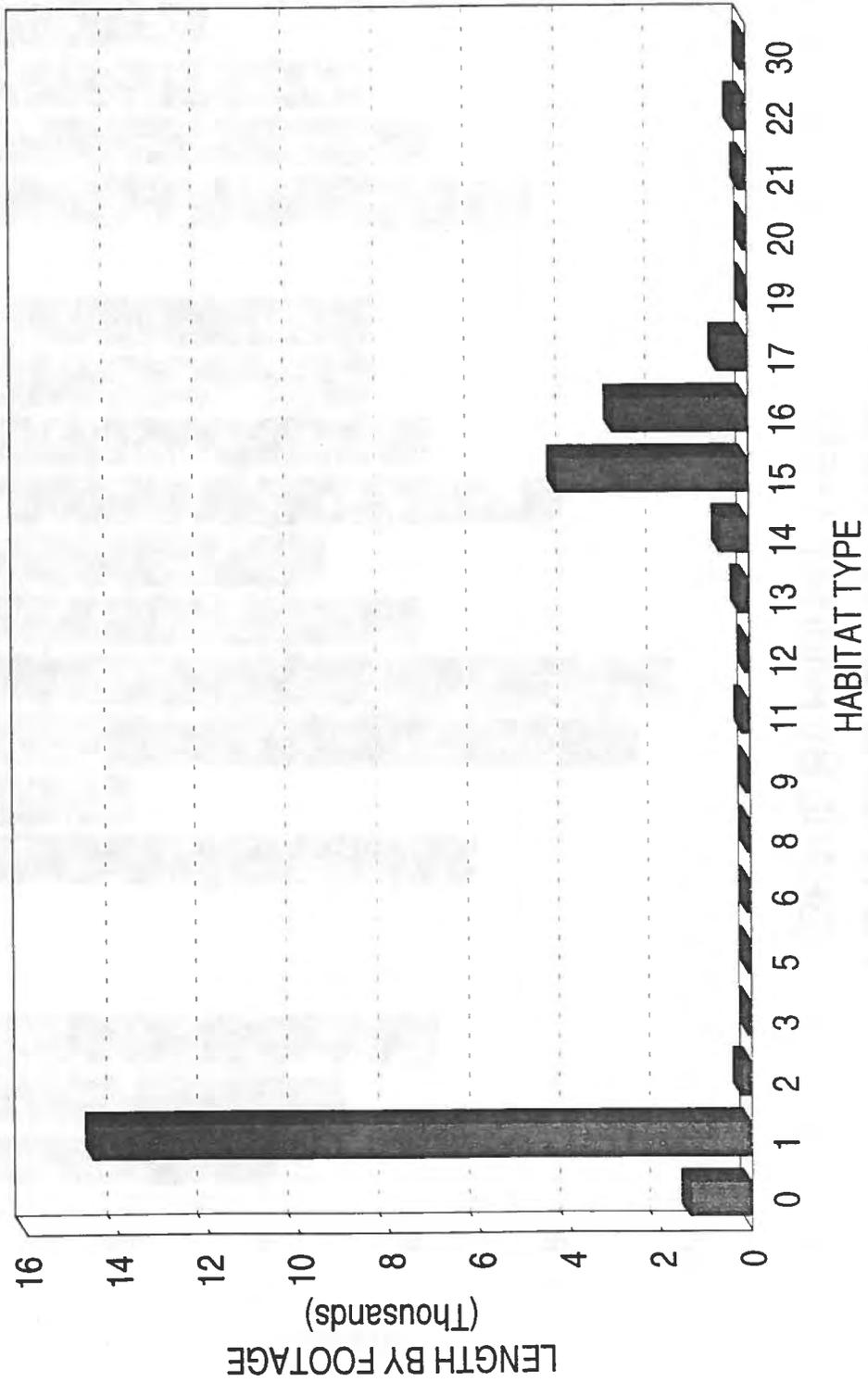
# HUMBUG CREEK

(SPAWNING AREA BY HABITAT TYPE)



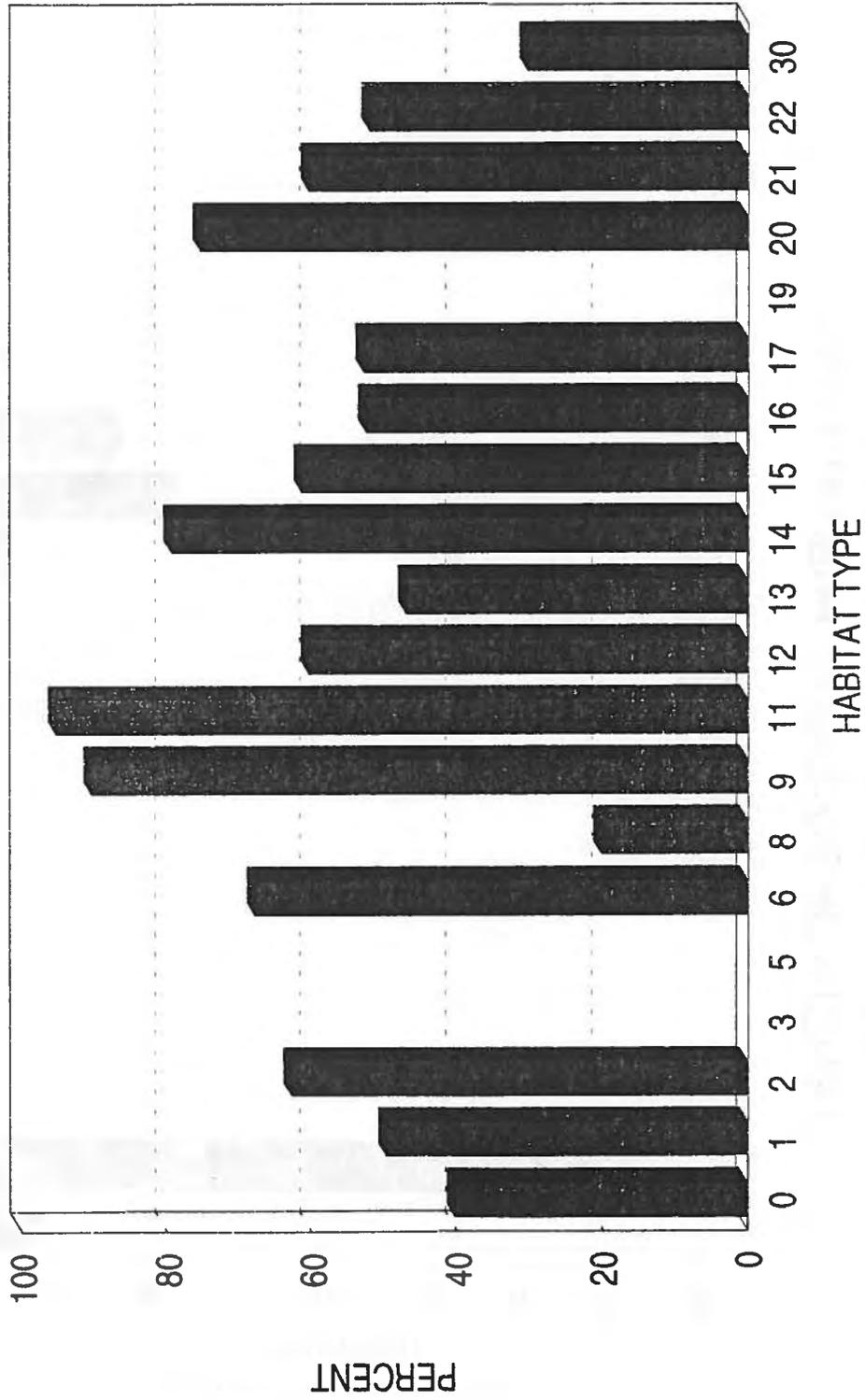
# HUMBUG CREEK

(LENGTH OF STREAM BY HABITAT TYPE)



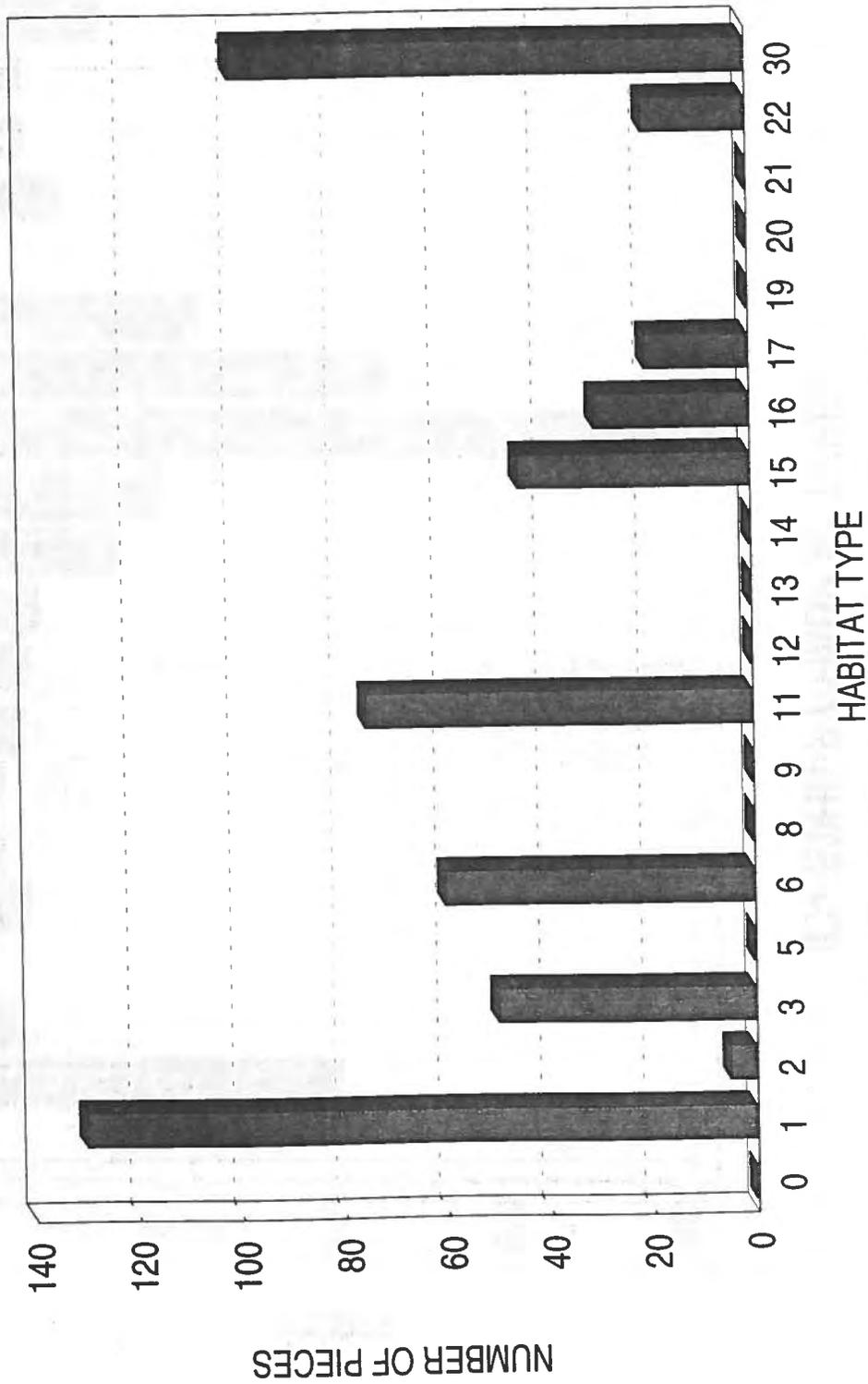
# HUMBUG CREEK

(SHADE BY HABITAT TYPE)



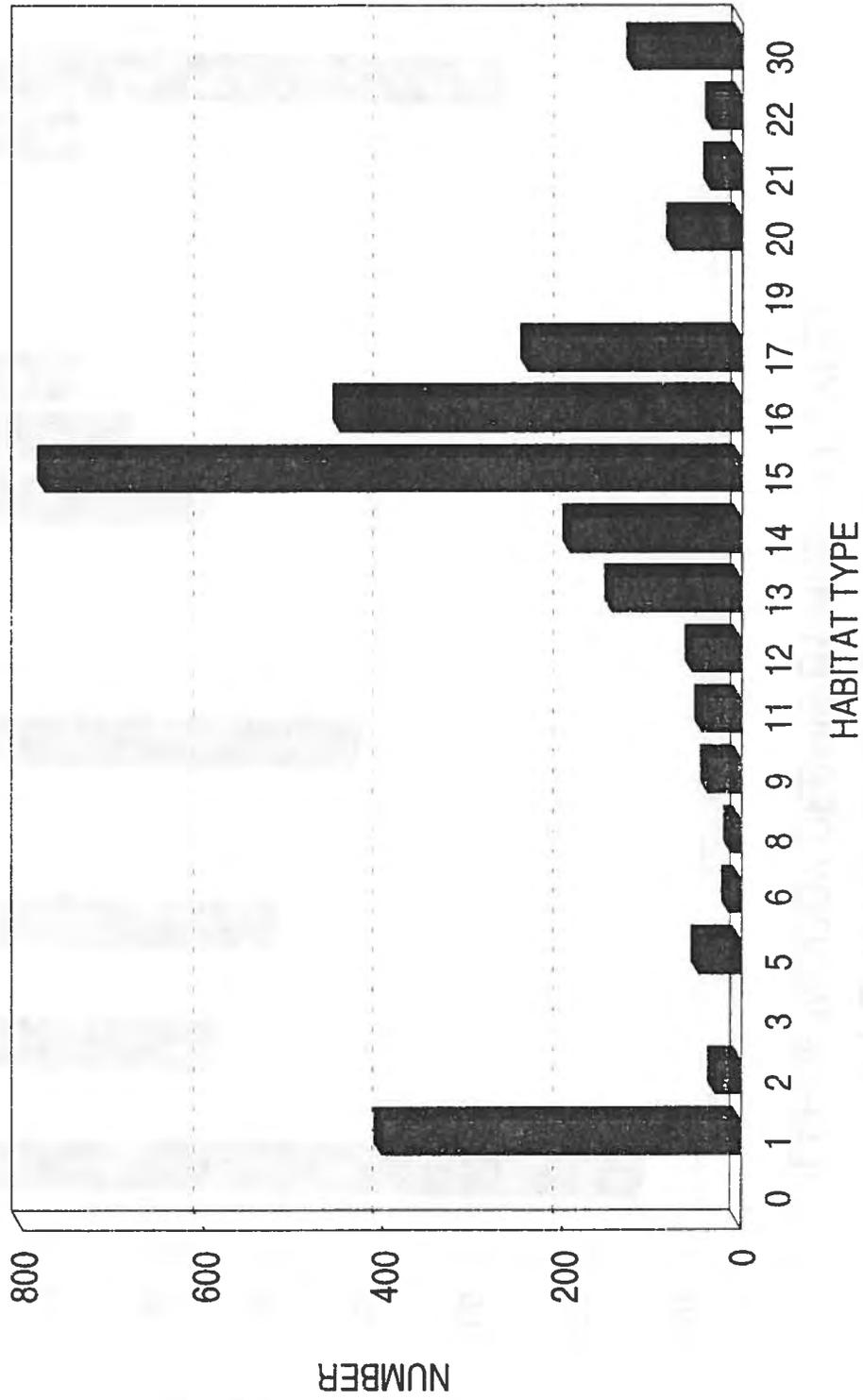
# HUMBUG CREEK

(LARGE WOODY DEBRIS BY HABITAT TYPE)



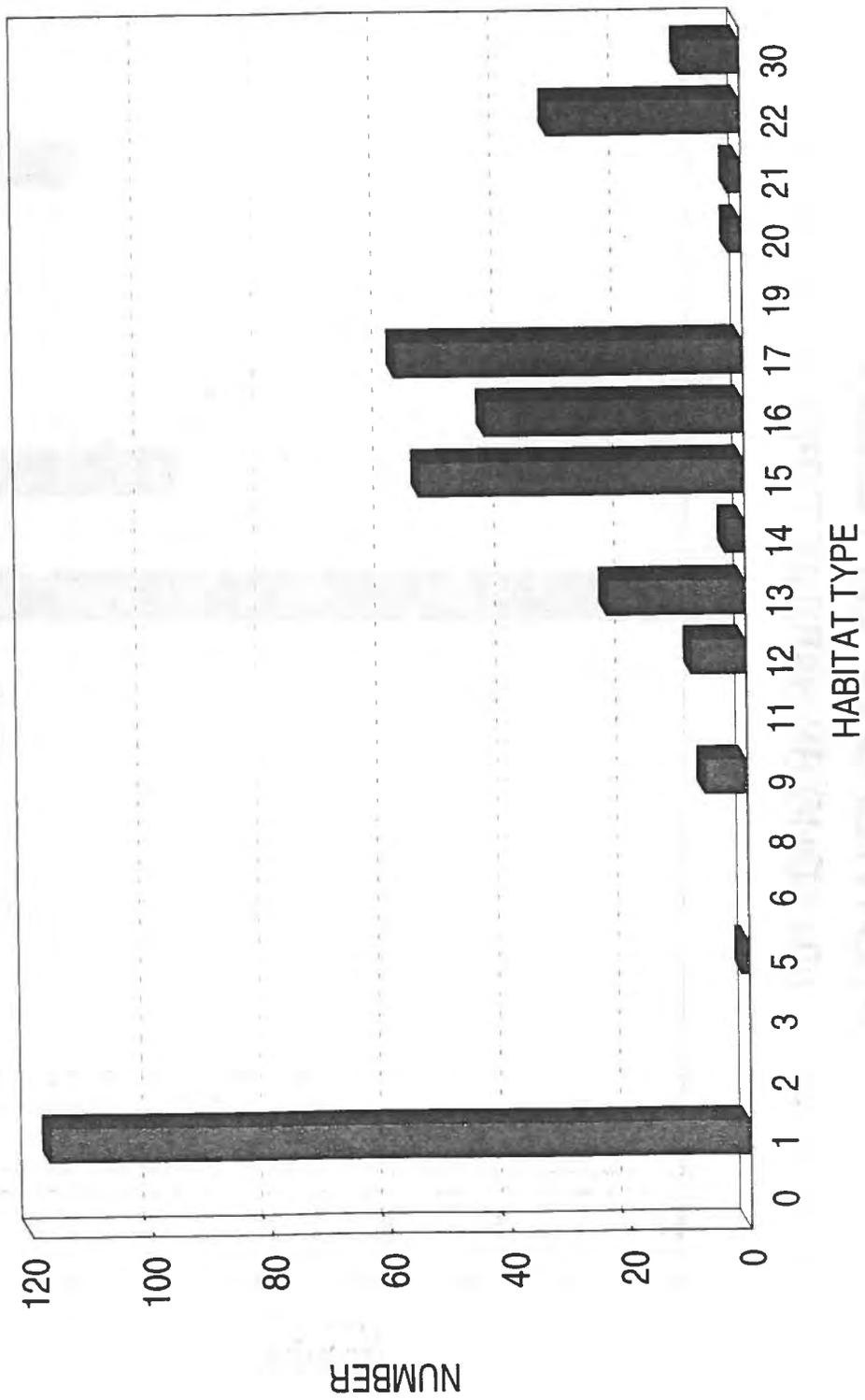
# HUMBUG CREEK

(O+ STHD BY HABITAT TYPE)



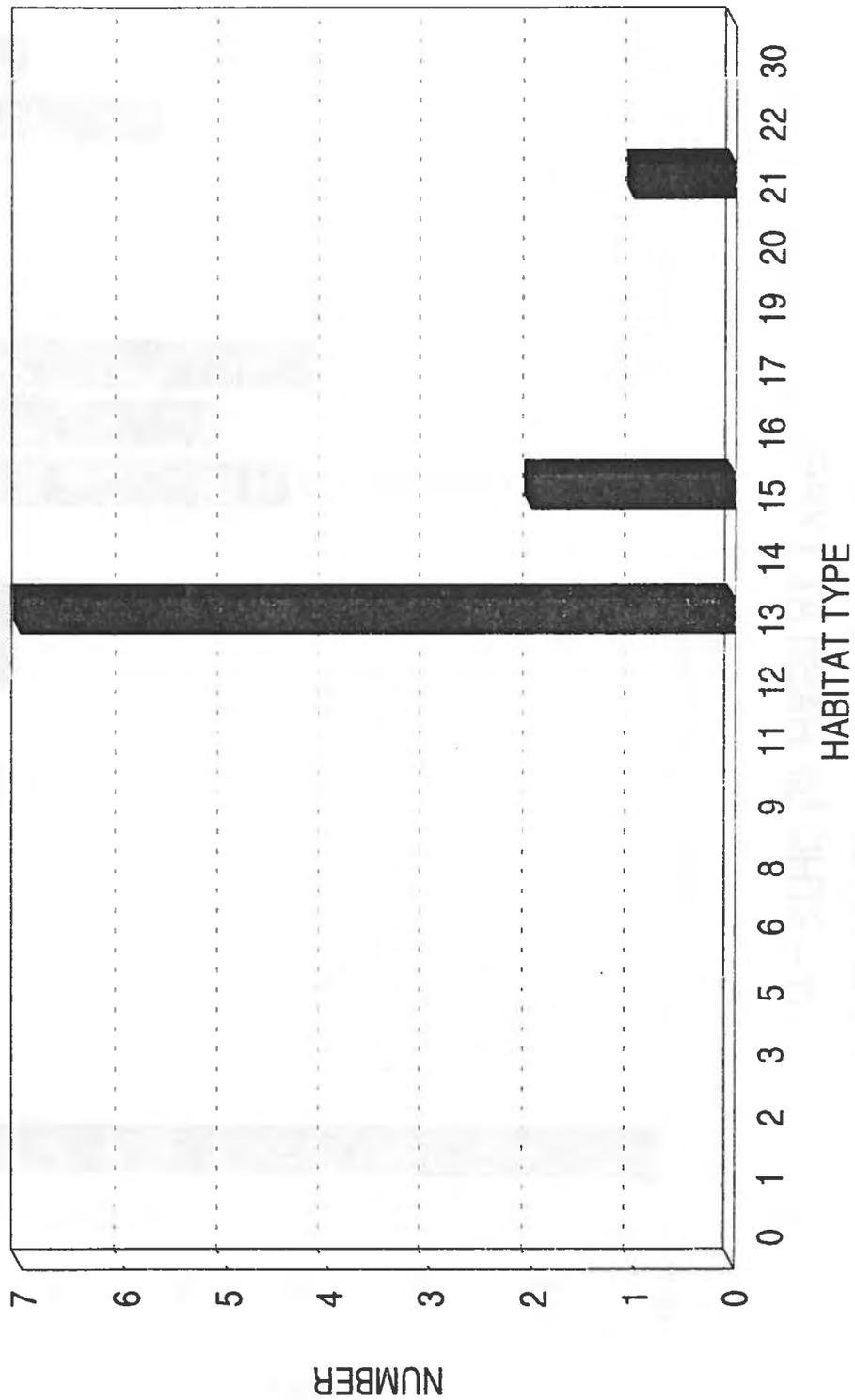
# HUMBUG CREEK

(1+ STHD BY HABITAT TYPE)



# HUMBUG CREEK

(O+ COHO BY HABITAT TYPE)



## APPENDIX N

### WATERSHED AND FISHERIES OPPORTUNITIES PURPOSE AND NEED SUMMARY

The following watershed and fisheries opportunities are identified in Step 6 and displayed on the Management Opportunities (2 of 2) map. Two different surveys and the professional expertise of the District Hydrologist and Fisheries Biologist were consulted to clarify the purpose and need for these identified opportunities.

Vegetative surveys were conducted in 1979 and 1980 along the main stem and the Middle Fork of Humbug Creek which documented "fair to poor" Pfankuch streambank stability ratings. Stream surveys were completed in 1989 along the main stem of Humbug Creek and the results are summarized in the Habitat Type Classification Summary and Graphs (*Appendix M*).

#### OPPORTUNITIES:

##### **1. Fish Passage Improvement and Private Land Acquisition**

Fish passage along the lower 1/4 mile of Humbug Creek is impaired. Mining tailings, the construction of dams (which regulated high flows needed to remove alluvial material in the flood plain), and the subsurface flow during drought years, reduce the population for both the fall run of chinook salmon and coho salmon.

The 1989 stream survey did not record any chinook salmon, which can be partially explained by the low water levels that year which inhibited their passage. In the early 1980s chinook salmon were documented in Humbug Creek by Fisheries Biologist Lonna Martishong. Conversations with local residents also suggest that chinook and coho salmon were present in the 1930s. It is recognized that chinook salmon are generally large system spawners and their occurrence in Humbug Creek coincide with high survival rates and in years with adequate water flows.

Coho salmon can also be adversely affected by inadequate water flows. Their November spawning runs overlap between the chinook and steelhead and it is not uncommon to have inadequate precipitation and low water flows in November. Their small population, displayed on Page 102, are concentrated in dammed pool habitat types.

Although Humbug Creek is considered primarily a steelhead producing stream, improved passage could result in greater numbers of both fall chinook and coho salmon. This would increase species diversity considered to be present prior to pre-settlement disturbances. It is desirable to maintain Humbug Creek as it functioned prior to disturbance (mining and dams) as long as recommended fish passage improvements are compatible with existing natural hydrologic processes. It is the professional judgement of both the District Fisheries Biologist and the District Hydrologist that recommended improvements could be engineered in a way to minimize future maintenance requirements. Steelhead, chinook, and coho utilize different habitat types so competition among the species is not a concern.

##### **2. Road Stabilization**

County Road 45N30 from Kennebec Gulch northwest along Rider Gulch is a sediment source to Humbug Creek. There are opportunities to stabilize soils and reduce erosion. A watershed improvement needs (WIN) inventory is recommended to help identify specific sites for treatment.

The Stream Embeddedness Chart (Page 95) displays that over half of the habitat types exceed the 20% embeddedness guidelines recommended in the Draft Forest LMP. This is of particular concern because

73% of existing habitat types are the preferred spawning habitats (low gradient riffles and runs - Page 96), and these are close to or exceed the 20% stream embeddedness guideline.

Although Humbug Creek currently supports good production of fry from this spawning habitat, there is a justified concern about future production rates. It is not unreasonable to believe that this condition could degrade over time.

### **3. Low Water Survival and Pool Restoration**

Summer mortality of young fish is high because Humbug Creek lacks sufficient deep pools and side channels for rearing habitat. Seventy-three percent of existing habitat types are low gradient riffles and runs (Pages 91 and 97). Pool deepening and side channel opportunities are highlighted between the Humbug Picnic Site northeast to the private land in Section 21.

The territory an individual fish needs is dependent upon the total suitable space available, habitat quality, and fish age. In the case of Humbug Creek, there is not enough suitable pool habitat available for half of the population. About 50% of the steelhead population are found in the limited pool habitat type (Pages 100 and 101). The other 50% is found in the low gradient riffles and runs because the suitable pool habitat is already fully occupied.

Side channel creation and pool deepening opportunities are methods to increase suitable rearing habitat which would improve summer survival rates and increase overall Steelhead production.

### **4. Increase the Amount of Large Woody Debris**

Within channel diversity could be improved through the recruitment of large woody debris. According to Fisheries Biologist Stephen Fox, the area highlighted on the Management Opportunities Map as low water survival and pool restoration (particularly 18,747 feet of low gradient riffle and runs), would benefit the most from recruiting additional large woody debris.

It is desirable to have at least 20 pieces every 1,000 lineal feet. Currently there is approximately 9 pieces per 1,000 lineal feet over 3.6 miles of stream (47% of the desired level). Refer to Pages 91, 94, and 99 for the survey information.

18,747' of stream (approximately 3.6 miles)

18.7 X 20 (desired pieces per 1,000 lineal feet) = 374 desired

18.7 x 9.4 (existing pieces/ 1,000 lineal feet) = 175 (47% of desired).

### **5. Streambank Improvement and Protection**

Vegetative surveys conducted in 1979 and 1980 identified areas where there is less than 50% vegetative cover. These areas received a "poor" Pfankuch stability rating and are displayed on the Management Opportunities Map (2 of 2) as potential sites for streambank protection and improvements. District Hydrologist, Sharon Koorda, recommends this area be re-surveyed to monitor vegetative changes which may have occurred over the last 13 years.

It is desirable to maintain or restore 80% canopy closure along streambanks where site capability will allow. According to the 1989 stream survey, only plunge pool and lateral scour pool habitat types meet this guideline and they represent only 1% of the habitat type available along Humbug Creek (Page 98).